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GEOLOGICAL REPORT

AND

ORE TONNAGE CALCULATIONS

N3L3-0932

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Maps - Separate file -

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At the commencement of 1970 development, Mr. JAY A. ROTHENBERGER, geologist for Behre & Dolbear studies, was in charge of the geological direction.

Since April 7, Mr. Rene Campi took up the duties of geologist resident.

The geological team was assumed by:

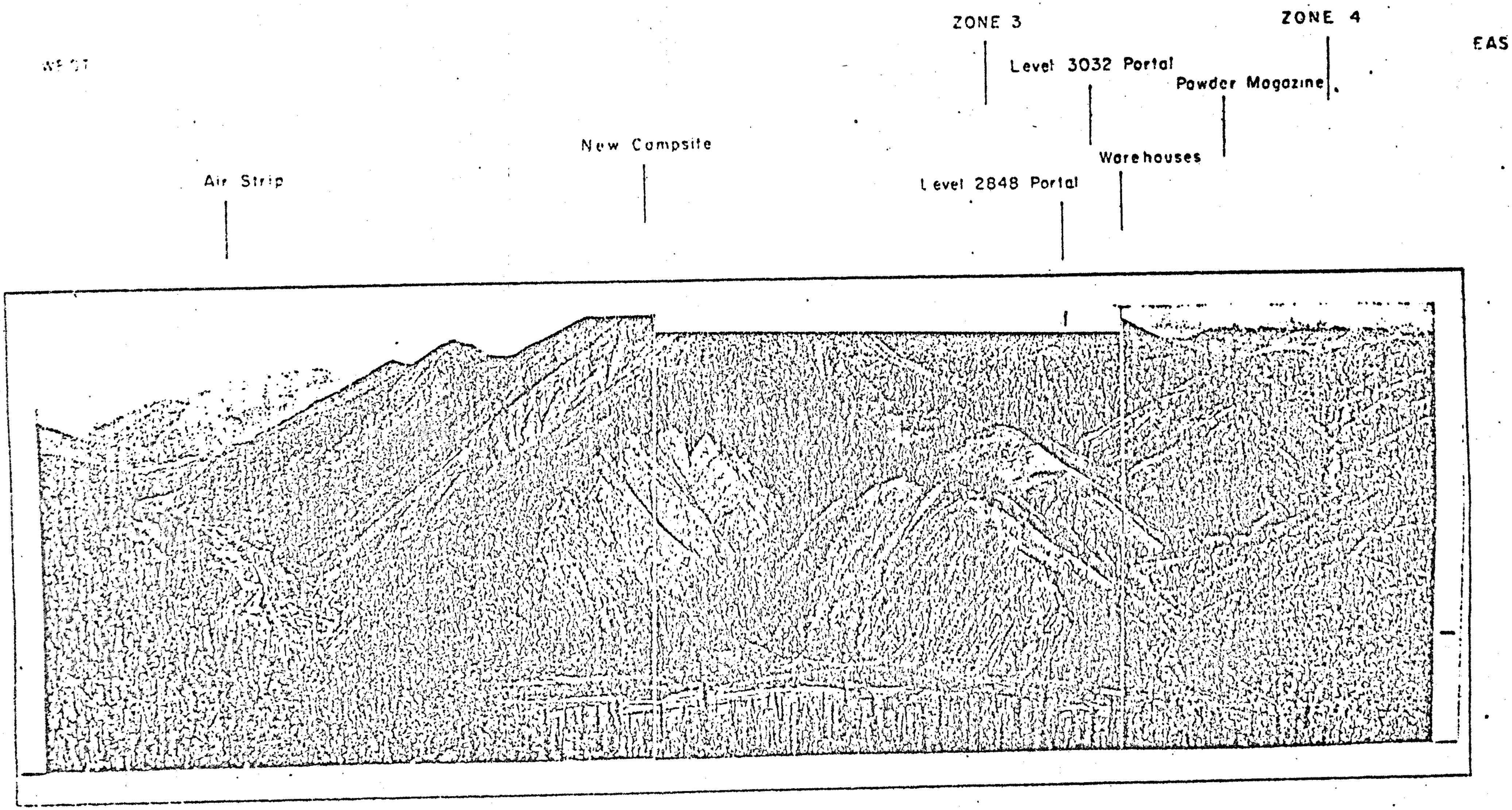
- WILLIAM D. LLOYD, geologist assistant, arrived May 26.
- JEAN-MARC PAYETTE, sampler, arrived April 25. Since August, he took up the duties of assistant-surveyor and draughtsman.

The survey team was directed by YVON ARMAND and its members were:

- ROBERT DENNISSON, survey helper; left August 3.
- STAN K. BUZIAK, surveyor, arrived May 30.

Also working on Nahanni Project were:

- JEAN-GILBERT MICHAUD, on a study mission from June 16 to July 8.
- PHILIPPE LAUNEY (Western Division): study of possibilities of extension North of property (July 1970).



Zone 3 and Camp (General view from the south)

- 1 - INTRODUCTION -

I - 1. Historic.

The showings of Prairie Creek zone 5 and veins NW-SE of zones 3 and 4 were known since 1929. They were apparently shown to a prospector by an Indian and are located 200 miles NNE of Fort Nelson (B.C.), and 110 miles East of Fort Simpson (N.W.T.)

The oldest report on these showings comes from geologist ALAN E. CAMERON who during the summer of 1935 visited the area. After a long trip on the way up the Nahanni in his canoe he visited the showings of Prairie Creek and Lafferty Creek (quartz vein containing some copper.) He noted: "The presence of graptolites on the West side of Sheep Creek (presently Harrisson Creek) suggests that movements along this zone (very tectonized zone from turning-point fault East of zone 5) brought silty rock of Silurian to cover limestones of Devonian... by a strong thrust coming from West."

This remarquable comment concludes the summary of the stratigraphy and tectonic of this area. None of the geologist visiting the prospect between 1966 and 1969 mentioned it; they all attributed the country rock to the Devonian. One of them wrote: "In the Prairie Creek zone the formations were irregularly folded and faulted... However, the local structure does not seem to have a significant importance in the localization of mineralization."

In 1966 Cadillac Explorations Ltd. Company obtained a prospecting permit for Prairie Creek area and at the end of 1969, 202 claims covered approximately 10,000 acres. K.J. CHRISTIE, P. Engineer assumed the direction of the Project; R.H. FAST acted as superintendent executive.

In 1969 the BEHRE & DOLBEAR group is responsible for the geological direction and delegates Dr. A.F. BANFIELD.

We are also in possession of Dr. S.H. ROSS and A.R. STILL memos (1969).

Penarroya took the effective direction of Research and Works in 1970.

1-2. Works accomplished.

1966 was an exploration year: the 12 zones were inventoried and zones 10 to 12 covered by claims since they were not included in the prospecting permit. A primary facilities (camping and airport grounds) was built.

In 1967, stripping and trenches were made on zones 2, 7 and 8. But the heavy work of research was centred on zone 5 and Prairie Creek Valley.

A geophysical study in E.M. on the RONKA MARK III machine was made: intervals of 100 feet and frequency of 2400 cycles/second; the intervals were brought down to 50 and 25 feet in the anomalous zones. Three parallel axial conductors were localized in the Valley. The most important was tested by 5 drill holes indicating the presence of disseminated graphite and pyrite.

In 1968 a drilling campaign investigated zones 1, 4, 7 and 8. A sampling was made on zones 7 and 8. On July 18, an underground development was started by a trace on the thickest vein NW-SE of zone 3 (actual level 3032). These works were stopped on September 26, after a drift of 1003 feet was made: they had met the main vein at joint 2 bis.

In 1969 the main effort was concentrated on zone 3: drillings and underground developments. Drilling was stopped after two holes on each of the 7, 8 and 9 zones. On the other hand exploration drifts were started in zones 7 and 8 but the results were negative. A surface sampling of zones 7 and 8 was made under Dr. S.H. ROSS's direction. To complete the exploration, stripping of mineralized outcrops were made on showings 6 to 12.

Penarroya's objective in 1970 was to investigate vein of zone 3 and follow an intensive exploration on zones 6 to 12.

Works and drillings in zone 3 enabled us to recognize the North part of the structure. The downstream or South part was recognized by deep but unproductive drillings. At the same time a large bulk sampling was made in every cross-cut: approximately 240 samples were taken, pulverized and split, then analyzed as follows: lead and zinc (total and non sulphide), copper, silver and cadmium. All cross-cuts were mapped at the scale of 1"=10' (1:120) with the results of this sampling.

Zones 6 to 9 were recognized by crossed-section drillings showing the small extension of these showings. Outcrop strippings were made in zones 7 and 12. In order to guide and synthesize these underground explorations, a geological study enabled us to place all showings in their stratigraphical and tectonical context.

The two following tables give a summary of underground development and drillings accomplished:

<u>Underground developments</u>

	Zone 3	Zone 7	Zone 8	Total	
Year 1968	1003'	0	0	1003'	
Year 1969	3602.5'	912'	793.5'	5308'	
Year 1970	4416.5'	0	0	4416.5'	+ventilation raise: 216'
Total	9022'	912'	793.5'	10,727.5'	+ventilation raise: 216'

In 1969, zone 3: level 3032': 2797.7' ; level 2848': 804.8'.

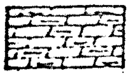
DRILL - HOLES

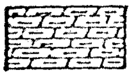
ZONES	1	2	3	4	5	6	7	8	9	TOTAL
YEAR 1967										
DRILL					5					5
LENGTH					1037'					1037'
YEAR 1968										
DRILL	2	11	12	5			1	6		37
LENGTH	197'	1177'	2409'	828'			208'	1500'		6391'
YEAR 1969										
DRILL			14				1	1	2	18
LENGTH			7686'				348'	555'	390'	8979'
SUB-TOTAL										
DRILL	2	11	26	5	5		2	7	2	60
LENGTH	197'	1177'	10095'	828'	1037'		628'	2055'	390'	16407'
YEAR 1970		1 to 3 (underg.)	1 to 3 (Surface)							
DRILL		5	8			4	4	4	1	26
LENGTH		1836	7685'			2018'	1987'	2387'	340'	16251'
TOTAL										
DRILL			52	5	5	4	6	11	3	86
LENGTH			20988'	828'	1037'	2018'	2646	4442'	730'	32658'

NORTH - SOUTH SECTION SHOWING THE CHANGES OF FACIES

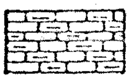
LEGEND

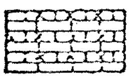
 Dolomite ; s : sandy dolomite ; c : crystallized dolomite

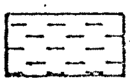
 Shaly dolomite

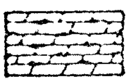
 Dolomitic Shale

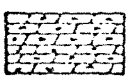
 Limestone

 Shaly Limestone

 Bioclastic and calcitic levels

 Bituminous shale

 Dolomite with siliceous beds (cherts)

 Dolomite with siliceous elements

G Graptolites

II - GENERAL STUDY OF STRATIGRAPHY AND STRUCTURE.

The geological maps (North and South of prospect) have been sketched according to the observations made on the scale 1"=500' (or 1:6000) along the 20 East-West cross cuts spaced of approximately 1500' (500m). In the mineralized zones, most of the outcrops have been observed. These maps were made according to the enlargements of aerial photographs of the Government Survey, on the scale of 1"=1085' (or 1:13000); still the prominent topography of this area creates very strong distortions.

The stratigraphy of reference was observed on the West side of the main anticlinal, at the level of zone 3. This choice is justified by the lack of major tectonical features and the presence of graptolites. Some species of these fossils have been determined par A. PHILLIPPOT, Professor at RENNES UNIVERSITY (FRANCE), they characterize the Valentian (Lower Silurian).

II - 1. Stratigraphy.

This area's formations are mapped by the Geological Service of Canada as belonging to a comprehensive unit regrouping the Ordovician, the Silurian and the Devonian. The graptolites zone constitutes an excellent marker horizon that can be easily followed all along the structure. However the synthesis descriptions of the S.G.C.'s comments made by Ph. LAUNEY enabled us to attribute local denominations to each of these formations.

II - 1-1. Petrographic units.

Index 2 shows variations of facies following a North-South cross cut. The formation localized at the base of the cross cuts (Wittaker) is fairly homogeneous. Yet we find that for the others the North part is much more carbonated (limestone or dolomite) than the silty South part.

During the mapping we observed some facies variations West to East: West the facies correspond to the general descriptions; towards East we find the disappearance of silty facies and the appearance of very abundant and thicker bioclastic levels. Extreme East, we establish either a reef (at the base), or bioclastic formations containing important tanathocenose (at the summit).

The indicated thicknesses are measured on the mapped zone.

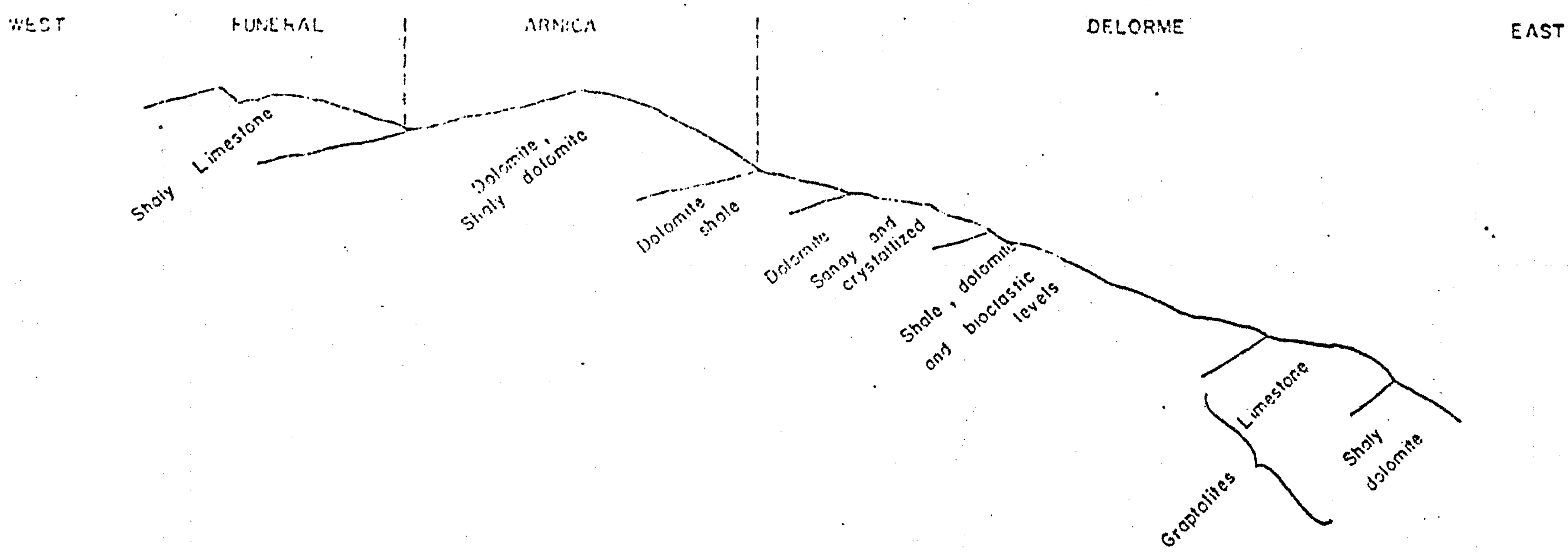
a) Funeral formation (Middle Devonian: greater at 850').
This formation is constituted by a thick black shaly-limestone unit in metric or decimetric banks. This rock patina is yellow and the bed is clearly visible. The reef aspects similar to this formation are constituted by dark grey crystallized limestones or by limestones containing black siliceous features. Notice the presence of intercalary shaly limestones and bioclastic levels. The patina is usually clear and the bank's thickness varies from 30 to 5cm. It is the Manetoe formation, lower thickness at 850'.
By lateral zone or above this formation we notice the Landry formation: light grey bioclastic dolomites containing coralline lens. We notice fairly thick levels of "entroc dolomites". The patina is very light and the bedding not clearly individualized: it usually is a more or less regular cleavage. Thickness 350' or less.

b) Arnica formation (Lower Devonian?: 900' to 1050'.)
This formation's attribution to the lower Devonian has been made by difference: Funeral and Dolomite formations have a good "datum", and there is no dissonance in these three unit's stratigraphy.
The most common aspect is constituted by a dark grey shaly-dolomite in banks of 40cm, and contains dolomite levels with black siliceous facies (cherts) and black shaly-dolomite levels. At the base we notice one or two slightly bedded shaly-dolomites levels with a pink-grey patina debited in small "plaquettes"; this aspect may have one or two fairly thick bioclastic levels. These dolomitic aspects are very often fetid.
Towards East we have dolomitic "perireefal" aspects. The upper part is mainly constituted by a dolomite alternation and by bioclastic dolomitical levels. At the base, crystallized dolomitic levels alternate with black cherts dolomite. The banks are from 20 to 10cm. The patina varies from light to dark grey.

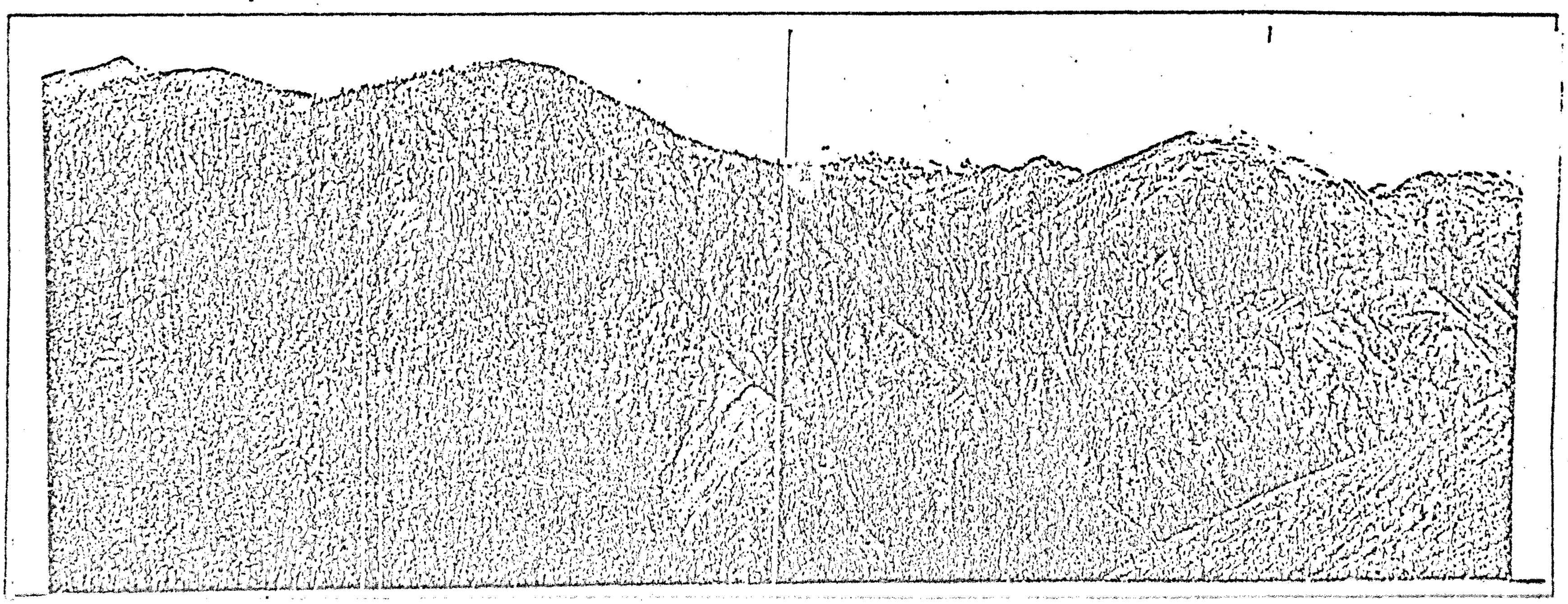
As a general rule bioclastic levels of Funeral and Arnica formations contain a great deal of "crinoid", debris, brachipodes, bryozoaries and coralites. The granularity is approximately 5mm, but can considerably increase in the reef's vicinity.
As for the stratigraphy (ref. table No. 2) we must notice that the upper part of Arnica formation can lateraly pass to the lower part of Funeral formation; and also between Arnica and Manetoe formations.

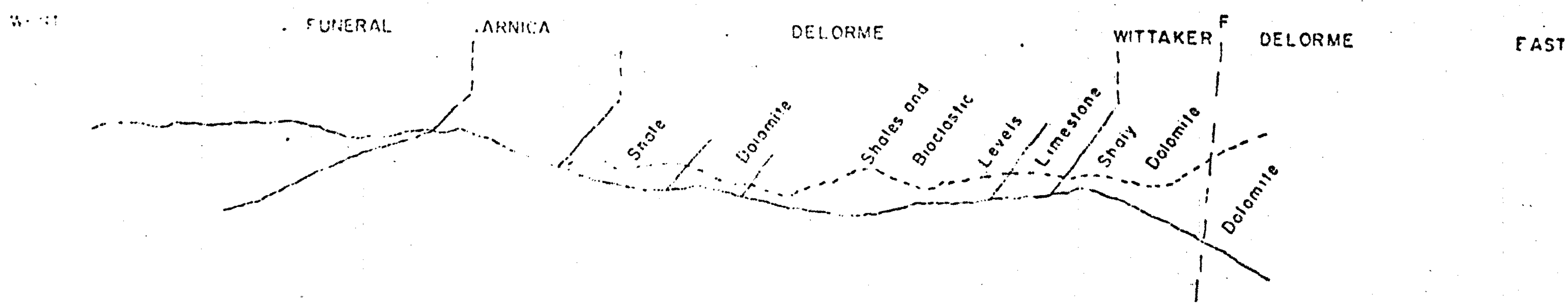
c) Delorme formation (Silurian: 2000' approximately)
The median and upper parts of this formation are characterized by a yellow patina. The lower patina is grey to yellow grey.
The upper part is mainly constituted by grey dolomites with black "microsandstone" and "microsiliceous". Below we find less mixed dolomites. The bedding is very clear and the rock's debit comes in millimetric "plaquettes" or in centimetric "plaques".
Towards South these dolomites are much more silty and the frequency of shaly-dolomite zones increases. West of zone 3 we notice ripple-marks in microsandstone facies. Towards East of zones 6 and 7, we notice a light black sandstone level surrounded by microsandstones dolomites.
The median part has a growing thickness North to South. It is constituted by dolomitic silty rock and black shaly-dolomites with intercals of limestone bioclastic levels of 20 to 30cm. Debris inside are small and constituted by "entrocs", bryozoairies and brachipodes (Spirifer?). These silty rocks seem to contain a great quantity of organic material and seem also more bituminous North than South. The lower part is constituted by limestone or black shaly-limestones which change to grey silty shaly rocks. The limestone aspect is very thick in zones 3 to 6 where it contains more or less thick shaly-dolomite levels. South, limestone aspects form less important discontinued levels. This group is overlaid by a zone of black bituminous silty rock with adamantine or purplish-blue glints; this level is discontinued and can repeat itself in the median part.
There is no important aspect variation between the Delorme lower part and the Whittaker formation aspects: we find in it again limestones and silty-dolomites. Still we preferred to have the lower limit part of Delorme formation coincide with the graptolites appearance. In consequence we introduced a geological limit which worked as a marker horizon in the mapping of petrographic units.

WEST FLANK OF THE MAIN ANTICLINE

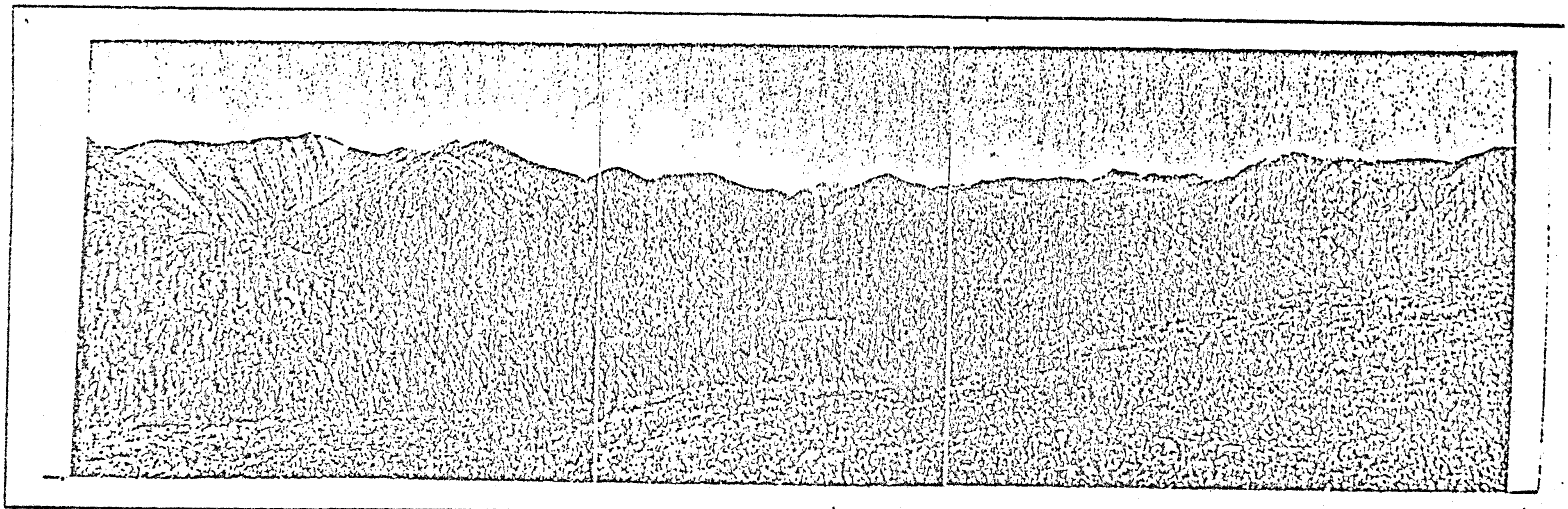


West of the zone - 5





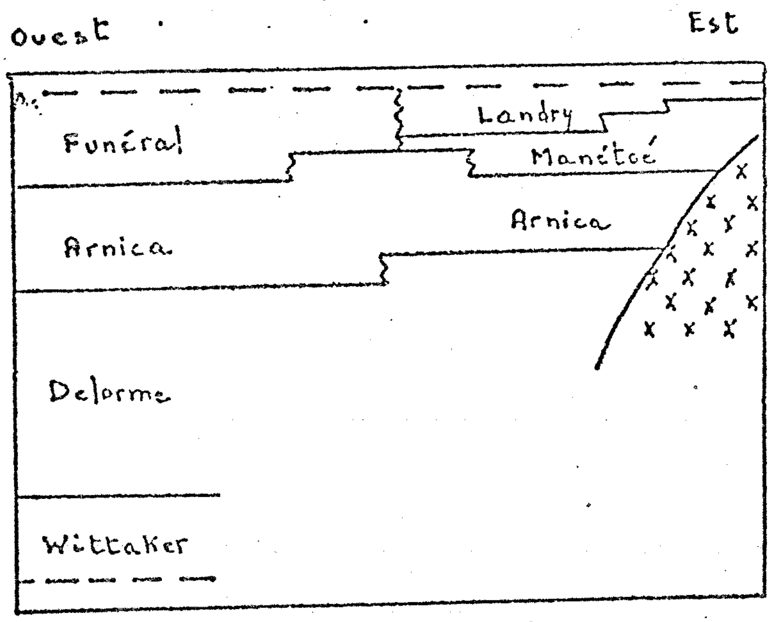
WEST FLANK OF THE MAIN ANTICLINE



ZONE 9 (From South)

d) Wittaker formation (Ordovician?: greater at 800').
This formation is only visible in the central part of the main anticlinal, and is characterized by a dark grey patina.
The upper part is mainly constituted by black shaly-dolomites of 5 to 10cm, and changing to thin black silty rocks. Lateraly this aspect alternates to limestones. Strength 250'.
Black and often crystallized dolomites containing black siliceous beds form the median part. These siliceous features can again be noticed in the limestones of the upper part (zone 6) or in the shaly-dolomites (zones 7 & 8)
The lower part outcrops only a little: it is constituted by black dolomite containing calcite stains or white dolomite, or black siliceous units of 3 to 5cm. In the upper part we notice a bioclastic level only constituted by very fine lamellibranch valves. Drillings of zone 3 showed the existence of fine dolomite bioclastic levels in this zone and mainly constituted by bryozoaire debris, lamellibranch and very small "entrocs".
Very often the bedding units of this formation are waved.

A more detailed stratigraphy of Wittaker formation and of the lower part of Delorme formation in zone 3 is drawn in the included index.
Tables 3 and 4 give a view of this stratigraphic geomorphology.
The sketch below shows aspects variations and stratigraphic similarities of different formations.



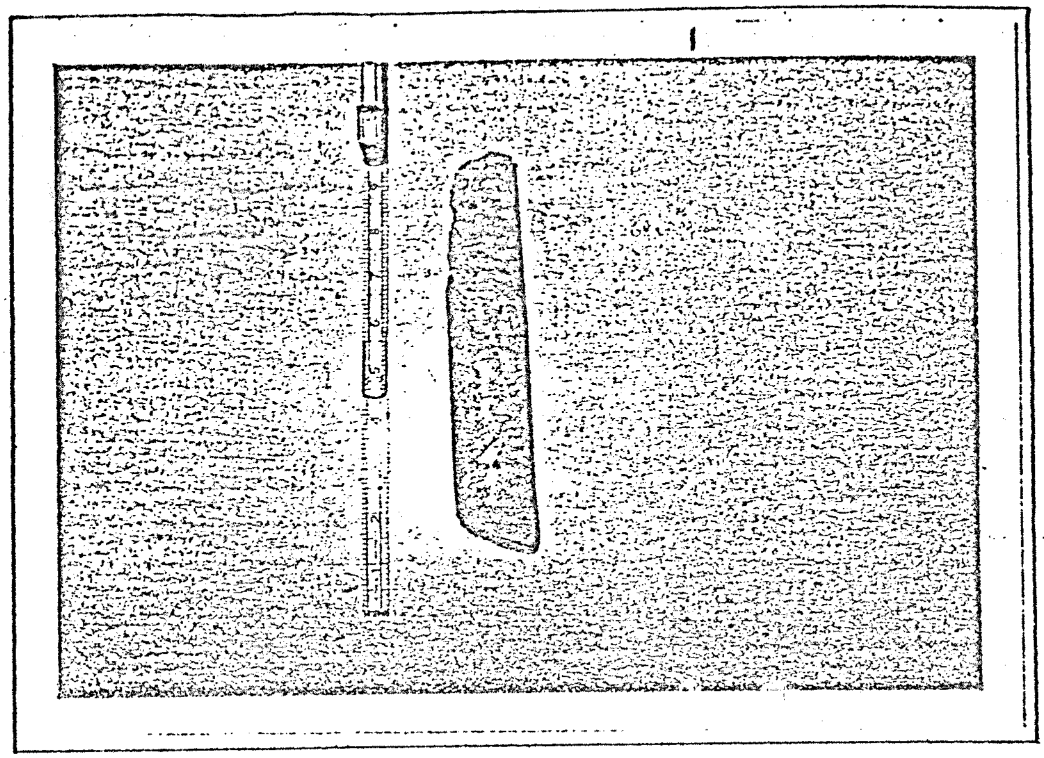
Echelle verticale : 1/26.000

There is no discordance in this stratigraphic and gradation occurs by a mixe recurring zone.

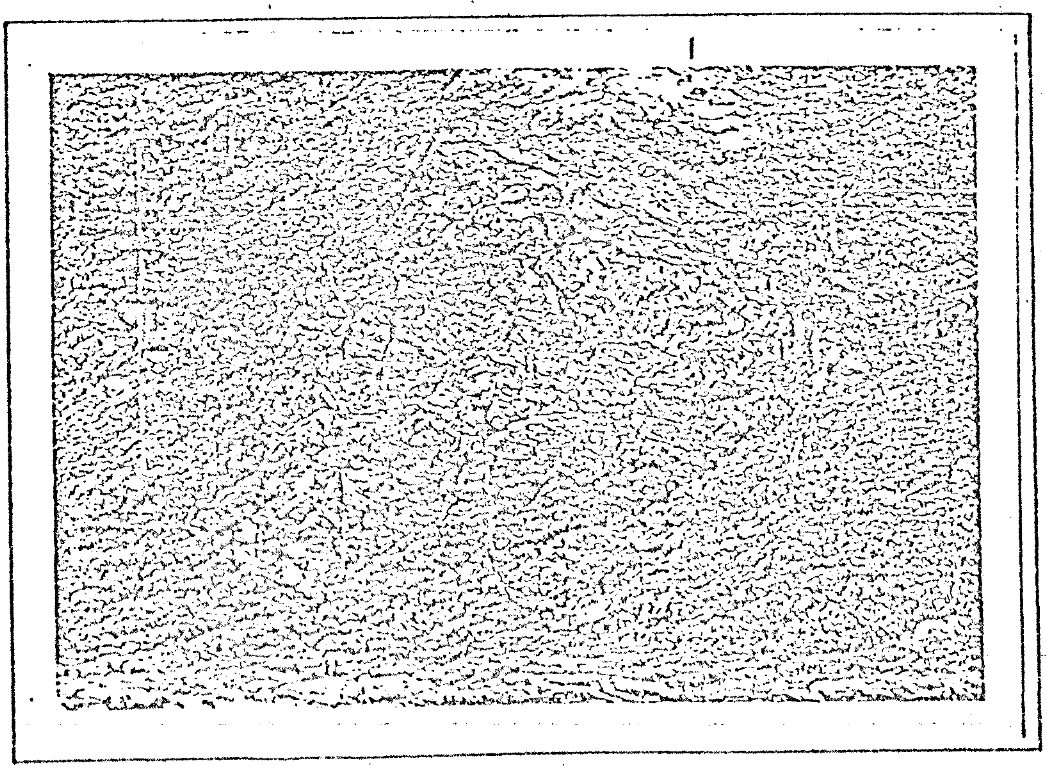
II - 1-2. Sedimentary structures and scattered sulphides.

a) Sedimentary structures.
Besides bioclastic levels and ripple-marks already mentioned, we notice two other types of sedimentary structures. West of zone 3 we notice a "slumping" in the shaly-dolomites, below dolomitic aspects of Delorme formation (upper part).
We notice on the same table an intraformational breccia.

SEDIMENTARY STRUCTURES



Intraformational breccia with bioclastic cement
(7-D-2, 103')



Slumping structure under the dolomite of the DELORME formation
(Prairie Creek, West of Zone 3)

This type of structure is fairly common in the upper part of Wittaker formation and in the lower part of Delorme formation; it is a silty dolomite and limestone zone. These breccias seem mainly located between zones 1 to 7 with a greater frequency around zone 6 level: this can be due to the proximity of the reefal zone.

b) Scattered sulphides.

During the drillings and mapping we found several levels containing scattered sulphides. The location of these levels is indicated on the stratigraphic cross-section (table 2).

The most important zone on a quantitatif viewpoint is located in the siliceo facies units of Wittaker formation. We notice some scattered sphalerite in the bioclastic dolomite zones. In the calcite stained dolomite zone there is a lev containing geopetal structure stains: the lower edge is underlined with a ligh yellow brown sphalerite; there is calcite in the center; the upper edge is constituted by crystallized pyrite. This type of structure is noticed in drillings and in the 2848' drift of zone 3 (table 6), and in the stream locate between zones 10 and 11 (table 7). It is the only level easily visible at the outcrop.

Another sulphides level was noticed during drillings of zone 3, at the 25 cross-cut level. It concerns a light yellow sphalerite and some bedded galena in a light grey limestone. This level has a width of only 15cm (table 8), and is located in the gradation zone between silty dolomites and limestones.

The limestone zone contains several scattered pyrite levels, and as a rule is well crystallized (cubes) and seems located in slightly silty beds. In the limestones upper part we notice some very fine and clear sphalerite in some bioclastic levels (table 8), in very small quantity only.

It is nearly impossible to notice outcrops in these two bedded or scattered sphalerite and galena levels. Due to the frequency of pyritic levels limeston are oxided and have a yellowish brown outcrop.

II - 1.3. Paleogeographic interpretation test.

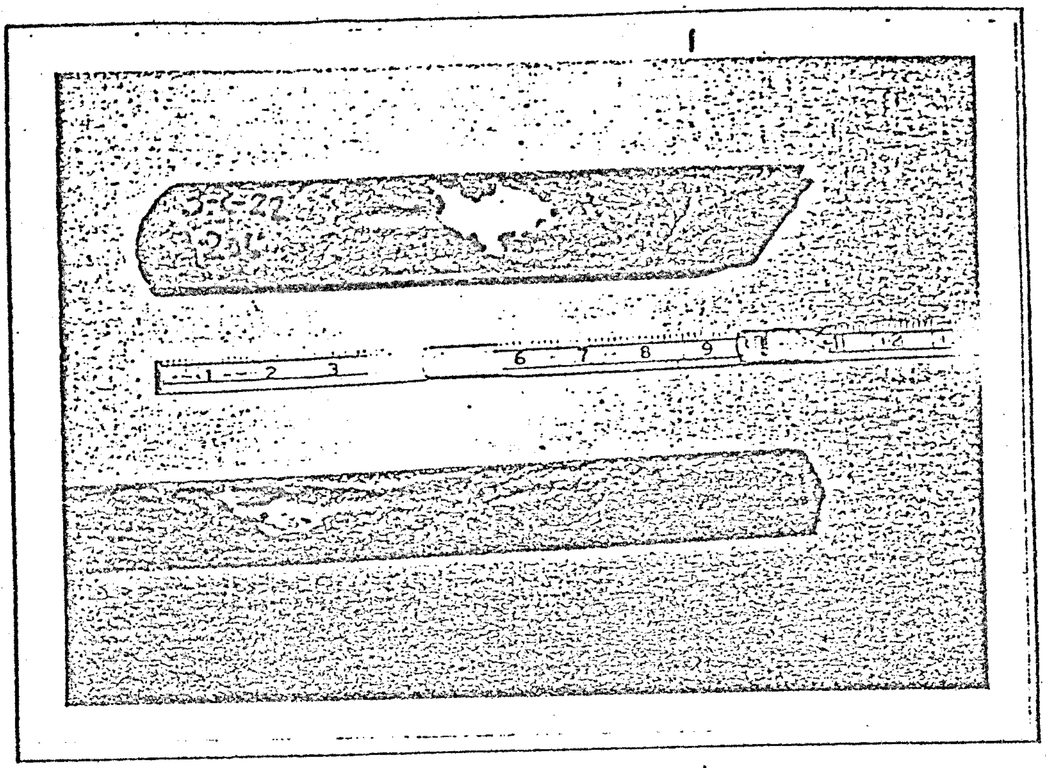
The presence of a reef built formation East constitutes the dominant stratigraph character of this zone. We do not know the era it appeared at and its base. Due lateral gradation of facies we can tell it is developed from the middle or super Silurian (median part of Delorme formation) to the middle Devonian (Manetoe form tion). Towards the Devonian it seems the reef is less active and that the perire formations (Arnica and Manetoe) transgress towards East. In a geometric viewpoin it describes a circular arc with the occidental extremity located East of zones 6 and 7; towards North strike is N20°E to N30°E, and seems N150°E to N160°E towa South. In the lower part this reef up grade seems 65° to 70° and corresponds to the Devonian in the upper part.

The perireef formations located West are essentially carbonated and have a very bioclastic character starting at the Devonian.

The lower North Silurian is mainly constituted by limestone: it is an interesting anomaly among these mainly dolomitic formations.

The upper Silurian is constituted by possibly microsandstone dolomite and contai a sandstone level: this phenomenon is probably related to the slow-down of the reef development at the Devonian and indicates a change of environmental paleogo graphic conditions.

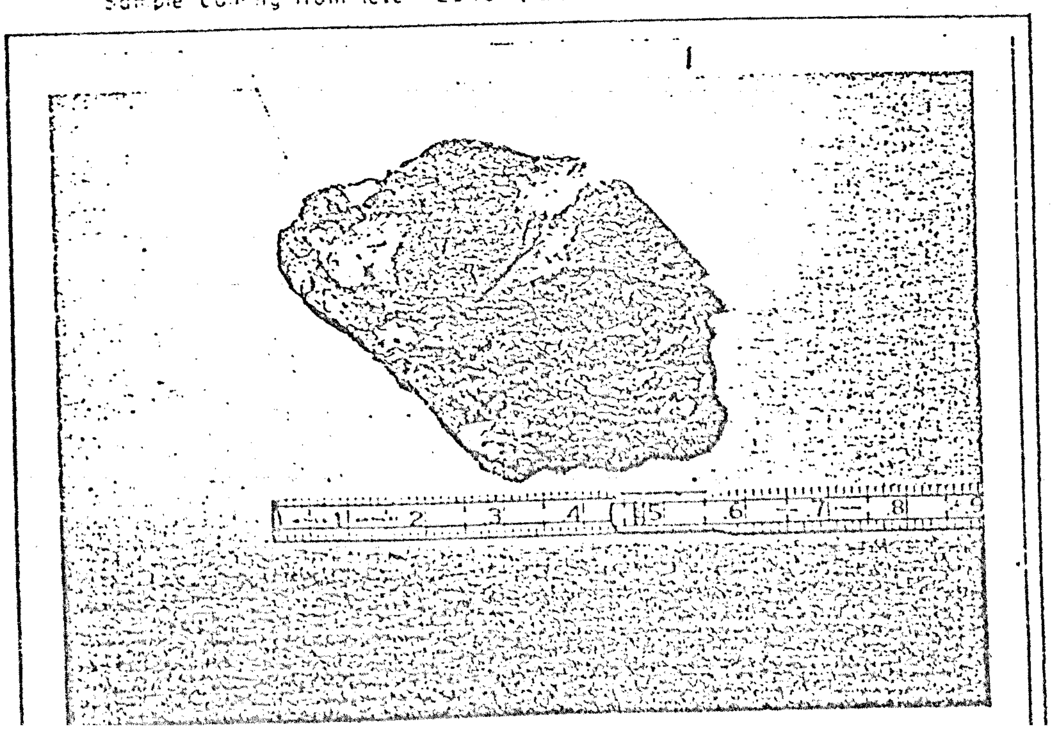
SEDIMENTARY SULPHIDES



Cores 3-C-22 (206') and 3-C - 21 (602')

Assymatrical blebs of calcite or dolomite with pyrite (up) and sphalerite (down)
WITTAKER FORMATION.

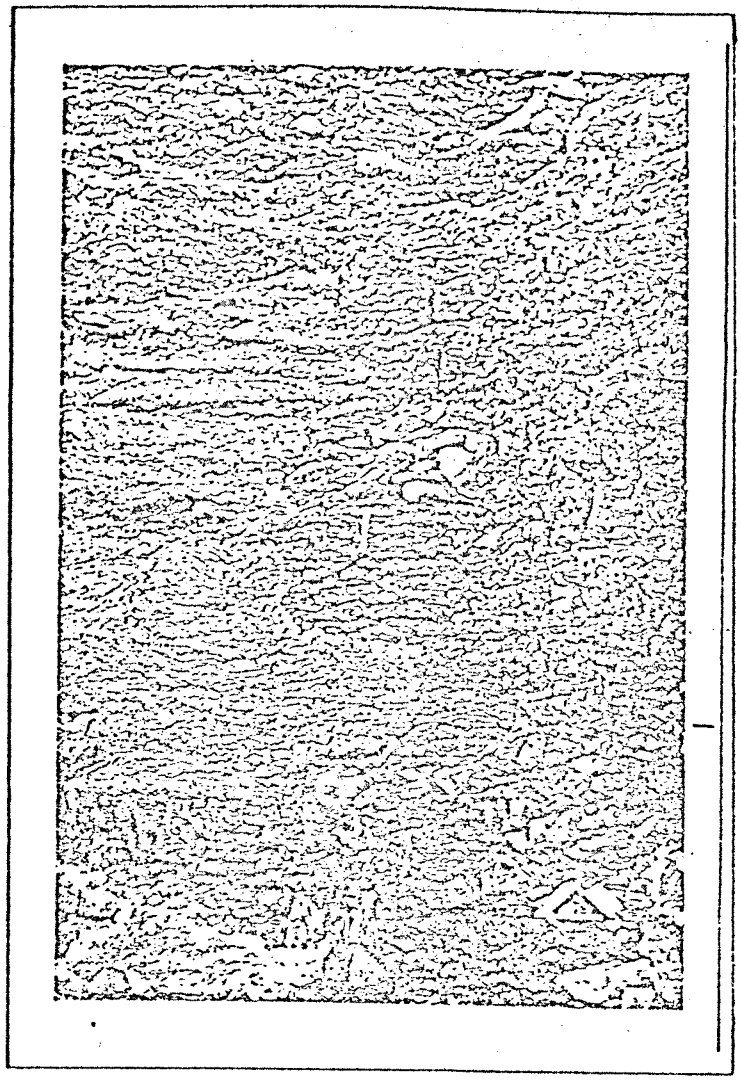
Sample coming from level 2848 (Zone 3)

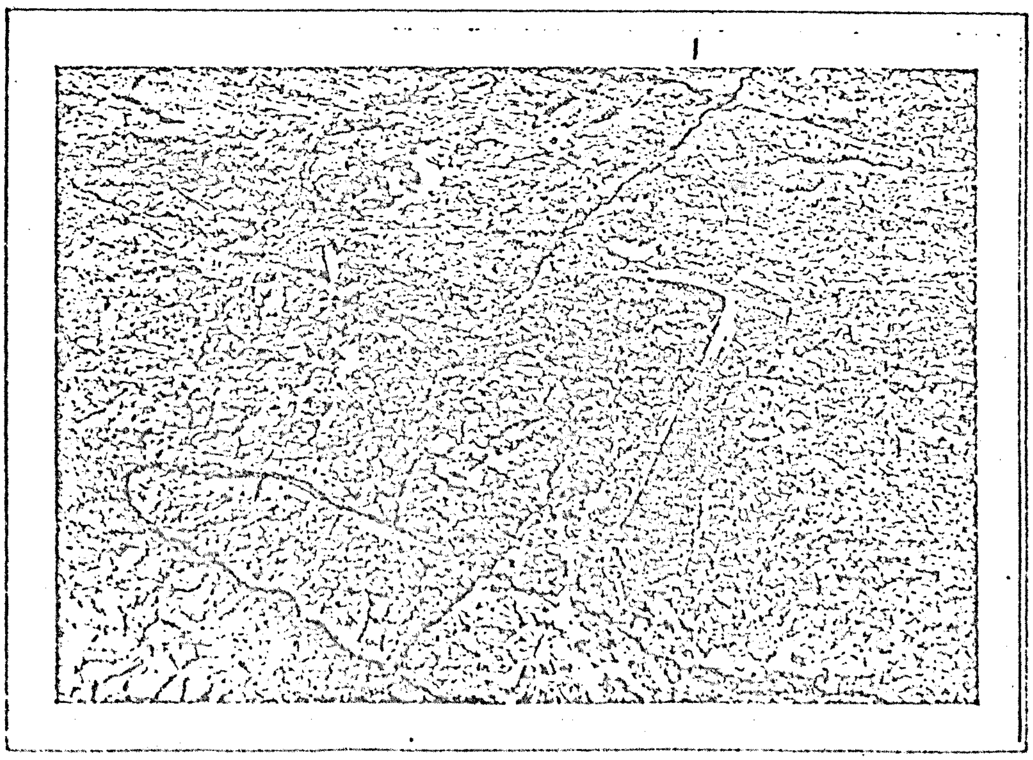


SEDIMENTARY SULPHIDES

WITTAKER FORMATION with blebs of calcite; borders are in sphalerite and pyrite

Creek between Zones 9 and 10

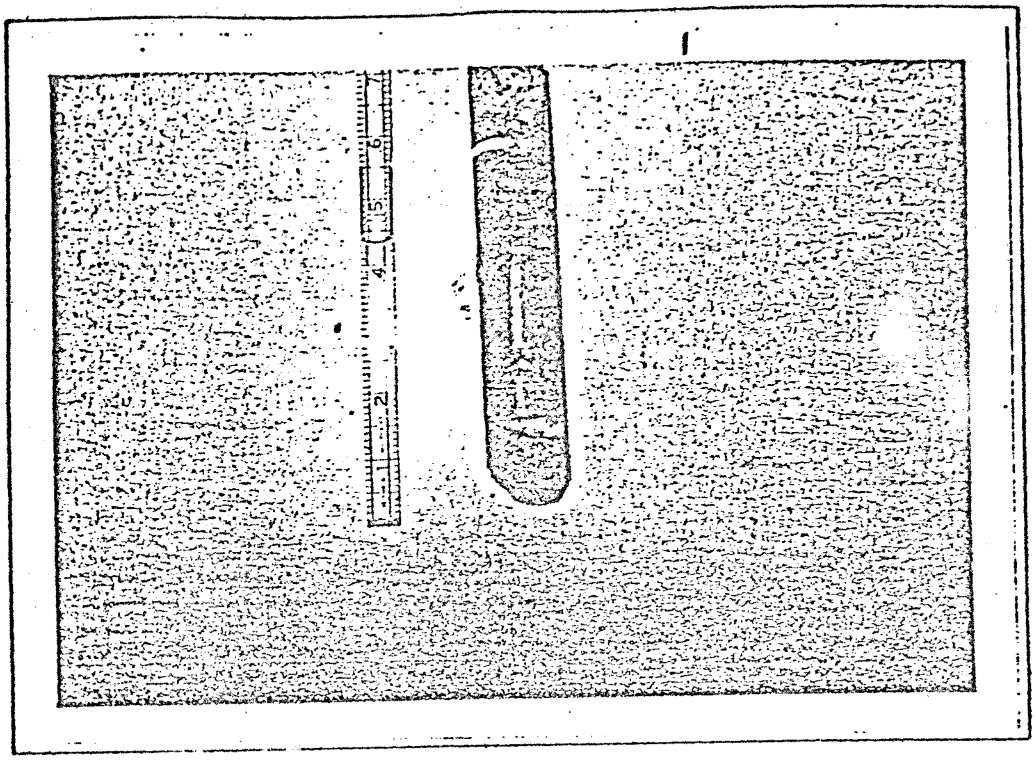




Light brown colored zone is sphalerite

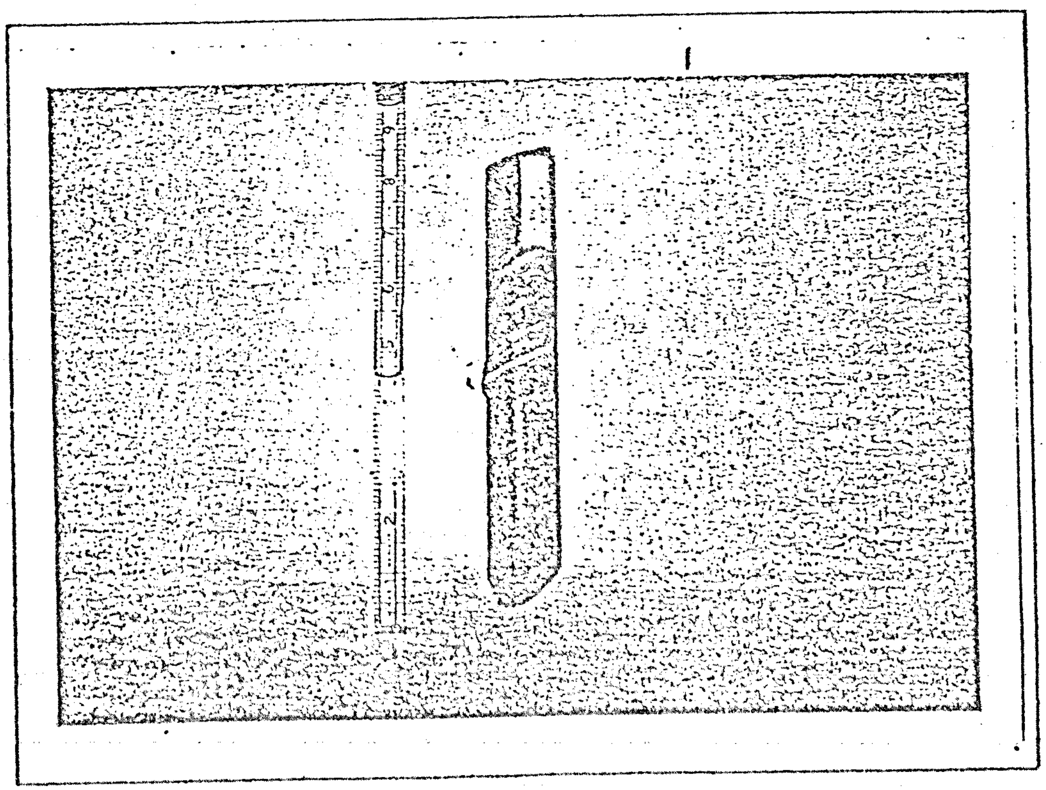
Creek between Zones 10 and 11

SEDIMENTARY SULPHIDES



Upper bioclastic limestone (Sulphides is not visible)

DELORME (3-D-34, 182')



Lower limestone interbedded sphalerite and galena

DELORME (3-DJ-4, 18[illegible]

We do not know the perireef equivalent of Wittaker formation. However we must notice the scattered sulphide levels are located at the upper part of Wittaker formation; besides the lower part of Delorme formation contains some intraformational breccia.

Towards East facies are much more silty and contain some organic material towards Silurian , and become more homogeneous towards the lower Devonian; it is very monotonous towards the middle Devonian (shaly-limestone facies of Funeral formation).

The zone of the showings is therefore located at the limit of the carbonated perireef and silty formations which edge a built reef towards the Silurian and Devonian.

The greatest activity zone of this reef seems located on the Silurian and more specifically on the lower Silurian. In the middle Devonian, the basin facies of Funeral formation transgress gradationally towards the Landry formations facies. This seems to put an end to the paleogeographic historic of this reef.

II - 2. Tectonic.

Two major units mould this zone of tectonic distortions. The first one is a static unit: it is due to a tense carbonated mole East, constituted by the Siluro-Devonian reef formation. The second one is a dynamic unit; it is due to the tangential thrust coming West and striking against the carbonated mole.

The geometry of the block and the West-East tangential thrust give the tectonic units.

II - 2-1. Structural units.

See maps and geologic cross-cuts index.

In the North part, a simpler tectonic enables us to single out four units:

- Towards West a main anticlinal containing mineralized indices and a very regular and prominent West flank has a main strike axle of N10^{o}E.
- A median synclinal is constituted by Arnica and Funeral formations with an axle strike of N10^{o}E.
- A faulted anticlinal towards East follows up in a more regulary way towards NE with an axle strike varying between N10^{o} and N35^{o}E.
- A structural table-land towards East is constituted by the reef, and seems widely folded with tectonic N145^{o}E axles.

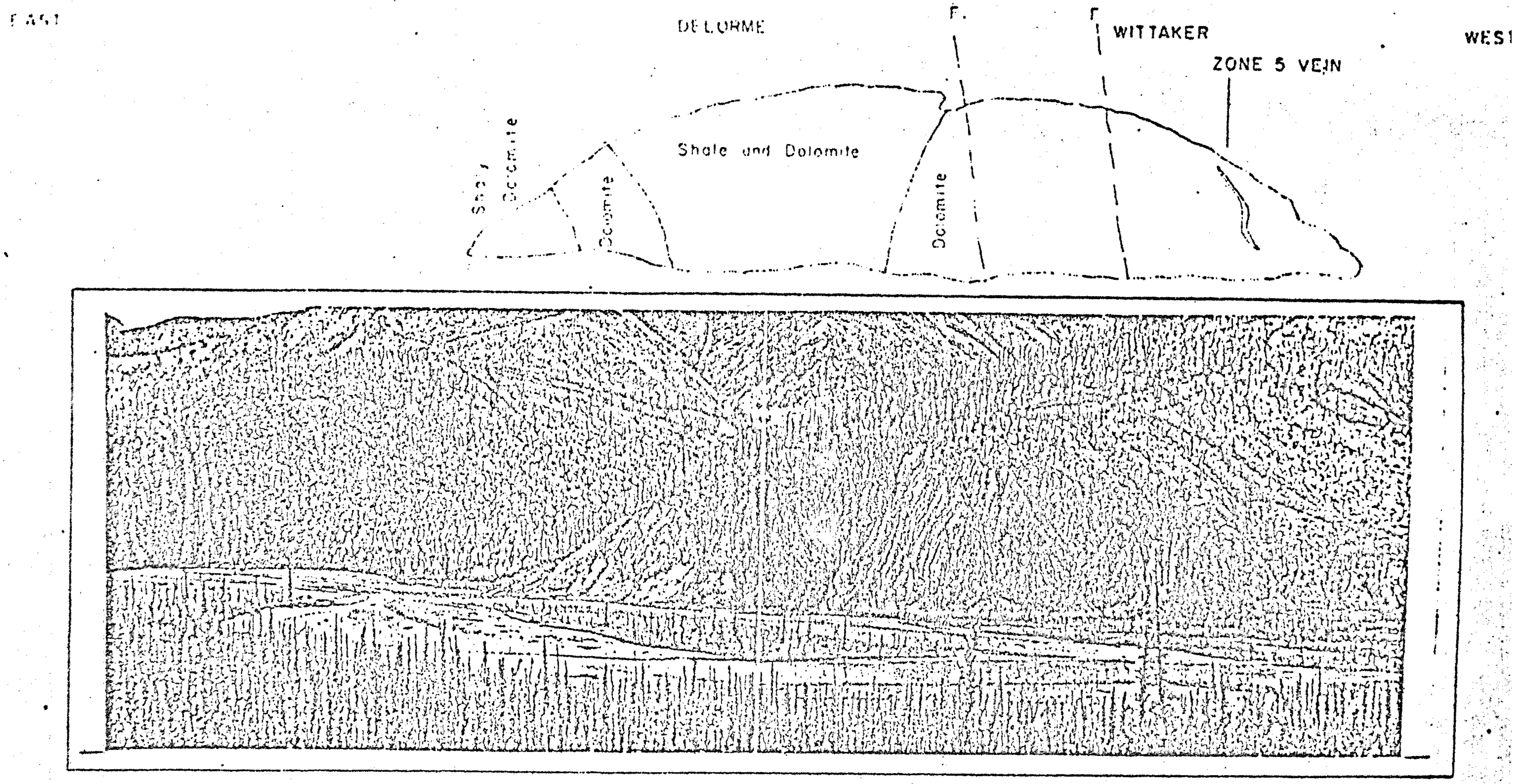
We find the first three units scattered towards North of the mapped zone between N10^{o}E, and N30^{o}E strikes, and moulding the reef mole.

Towards South we find the main anticlinal always follows the same strike, and the reef zone forms a convex circular arc towards West. This results in a very sensitive distortion of the structural units.

II - 2-2. Evolution of structural units.

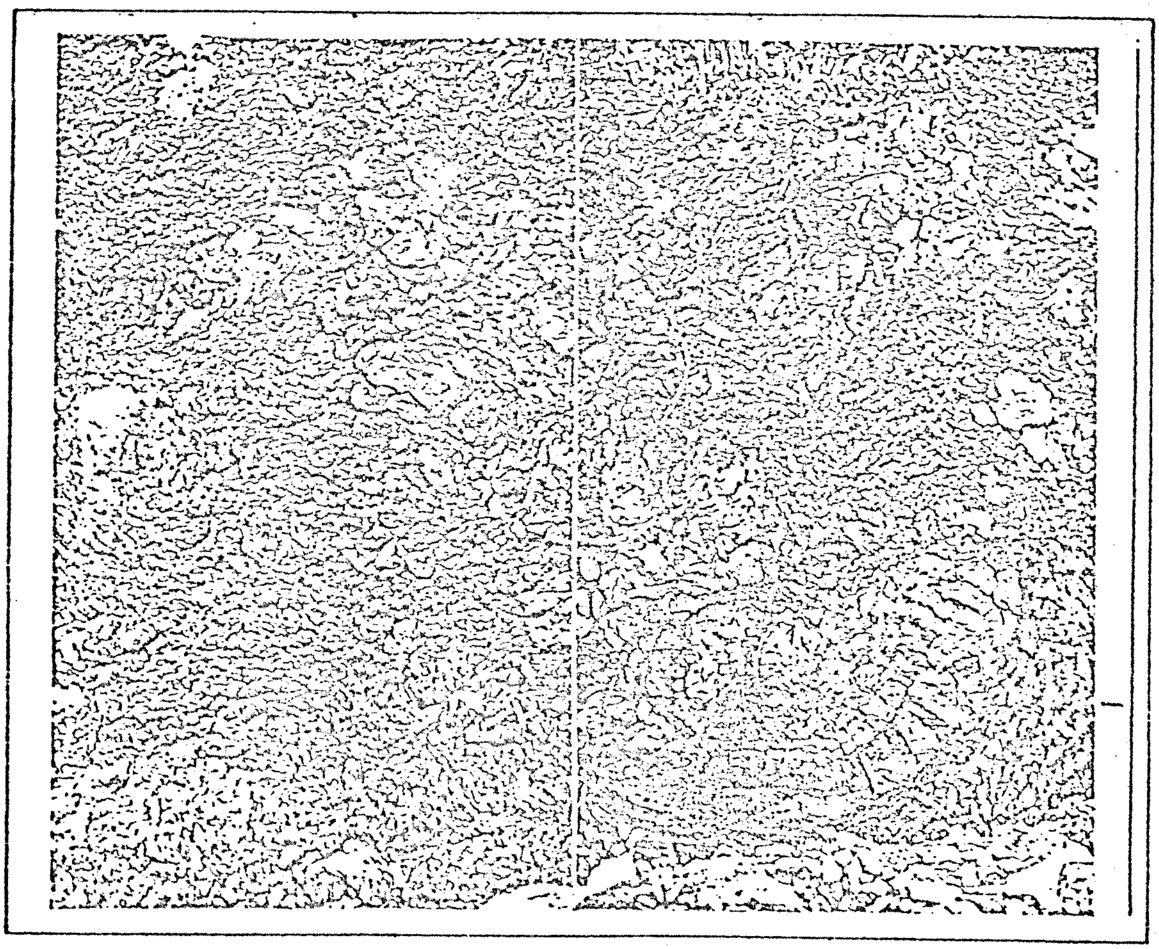
South of zone 6, dips of formations on summits are less stressed than vertical formations in the valleys. The difference is between 10^{o} to 20^{o} for an uneveness of 1000' (300m). This underlines the very superficial character of these movements which only affect a relatively weak thickness of sediment. The above individualized structural units are not deep-rooted: we can consider these distortions as "tectonic cover" and abstract the eventual presence of a substratum.

TECTONIZED ZONES



Zone 5 . Fault-syncline, hinge zone (View from the north)

TECTONIZED ZONES



Hinge zone – bioclastic level in dolomitic shale

Creek between zones 10 and

3 ft

a) Main anticlinal.

This dissymetric anticlinal has a fairly up-graded East flank (60°) in the North part and we can see faults or tectonized zones of minor importance at the summit: throws do not seem to exceed 200' (60m).

At the level of zone 3 the East flank becomes very prominent and is laminated by a faulting joining Wittaker formation and median part of Delorme formation (throw: 1500' or 500m). South of zone 6 this faulting joins a turning-point fault (see below).

East flank of zones 6 to 8 is intensely folded (60 to 90°) and is very often affected by secondary faultings with a throw of 500' (150m approx.)

South of zone 8, the anticlinal is cut-down at the summit at the valley level, and the East flank is hardly perceptible on the reliefs. We notice some laminated zones orientated N150°E to N160°E.

From a dissymetric anticlinal (North) this structural unit evolues to a dip West (towards South) monoclinal structure.

b) Median synclinal.

Regular in the North part, this synclinal is pinched and faulted at level of zone 3. South it evolues in a "turning-point faulting" where formations are very strongly folded (table 10) and faulted at the same time. The result is a very tectonized zone where dips vary between 75 and 90°, and where laminated zones are very important (table 9) with level of silty aspects.

South of zone 6, this turning-point faulting cuts-down the main anticlinal and starts with the East anticlinal. Along this feature the throw is maximum with level of zones 6-7 to 8-9 and reaches 1800' (550m).

This tectonized zone has a reverse dip in zones 6 (60°W) 7 and 8 (75-80°W), and vertical elsewhere.

c) East anticlinal.

This anticlinal is dissymetric NE of mapped zone, with a very up-graded East flank.

Up to zone 6 this structure offers a turning-point faulting phenomenon along which grows the throw from North to South and reaches 1800' (550m). At this level, the major feature joins up with the faulting edging the reef mole and has a 70 dip towards West.

Between zones 6 and 9 we have a reverse East anticlinal and both flanks form a West monoclinal dip. Level with valleys we notice several turning-point faults of a reduced size which give an idea of the tectonic complexity of this zone.

South of zone 9, the anticlinal structure falls back to normal with a vertical East flank.

East of this anticlinal, cross-cut of zone 9 shows a reverse synclinal; this structural axle is possibly followed to level of zone 6: it is not mapped but suggested in cross-cuts of zones 6 and 7 (see table index).

d) Carbonated mole.

This rigid block is edged by a dip West of faultings zone along the reef edge.

Following axle strikes N150°E this reef seems widely waved.

Perireef formations of the West edge are slightly folded following parallel axles towards the faultings edge strikes.

Towards South, the East anticlinal is edged by a synclinal evolving North in a turning-point fault and merges with faulting edge of reef mole East of zone 8. This faulting units Arnica perireef aspect to Funeral formation which here transgresses on perireef facies.

The anticlinal structures are constituted by short anticlinal evolutions with North or South plunges. These variations are due to oblique axles facing N100°E to N110°E: this phenomenon is clearly visible between zones 7 and 8, 5 and 6, and North of zone 3.

Besides, the main anticlinal structure shows an axle culmination at zone 8 level; on both sides the axles plunge North and South. The East anticlinal structure shows two axles culminations: one North of zone 3 and the other level with zone 12. This phenomenon explains height variations of throws along the median turning-point faulting: level with zone 8 this throw is maximal (1800').

II - 3. Conclusion.

According to Ph. Launey's synthesis, the prospect area is located on the East flank of a shallow-water structurally showing by a North-South Siluro-Ordovician anticlinal zone. Two middle and superior Devonian synclinal basins frame this local structure.

The zone of showings is located West of a reef coral formed at the inferior and middle Devonian and Silurian, but we do not know the base. A gradation of facies on the periphery between essentially carbonated formations (bioclastic towards Devonian) and silty formations containing a fairly large quantity of organic material (inter-reef - fore-reef facies?). Indices are located on this level. We notice three zones containing sulphides of syngenetic origin on perireef aspects of superior Ordovician and inferior Silurian.

No Plutonic intrusion was noticed.

The reef zone forms a strong mole striked by a tangential West-East thrust. This tectonic caused a dip West faulting zone probably merging with the reef limit. The reef zone itself is hardly folded.

With a very regular main anticlinal on the West flank the tangential thrust must be regular: This phenomenon explains the apparent line of mineralized showings located at the summit part of the structure. The form and complexity of tectonic structures located between this anticlinal and the reef mole depend essentially of the reef form: they are formed in the available space.

In relation with the West block the faulting group stressing these foldings always show a sagging East block. This phenomenon and a turning-point fault in the monoclinal structures are typical of a tangential tectonic.

III - Showings 1 to 4.

Showings were numbered North to South 1 to 12. They are located next the summit part of the main anticlinal. Since they are located in the same structure North of Prairie Creek these 4 showings are grouped. The first showings were zones 3 and 4 along with veins of zone 5.

III - 1. General Characters.

This zone begins the fan-shaped opening of structural units: turning-point faulting zones disappear and main anticlinal offers a well defined East flank which constitutes the West flank of median synclinal towards North.

This anticlinal has an axle strike N15°E plunging towards North with a 13° average angle. In fact, this axle elongates in degrees: in the degrees zones the plunge is 5 to 8° towards North;but oblique axles N100°E and 110°E create sudden up-grade changes. One of these features is located level with West tributary of Harrisson Creek: East-West bedding strike surface with a North dip; level with cross-cuts 14 and 15 we find vertical dips in a very clear inflexion zone.

Due to this structural peculiarity and to topography, formations located North are more recent than the ones containing the showings. In fact, these are located level with aspects containing scattered sulphides: Wittaker formation and lower part of Delorme formation. This can explain the lack of showings North of zone 2.

If we build ellipsoid of tectonic stressing we have an axle facing N15°E (anticlinal and grouped faultings) and another one facing N100°E (strike of tangential thrust). The tangential tectonic causes East blocks along the faultings to give way. Due to the polarity of these mobilizations strikes of combined tensions are not the same: strike N60°E located between two axes is a stressing strike; strike N150°E in the opposite direction is a relaxing zone. Mining works enable us to notice this phenomenon(see index table showing mineralization of zone 3, flat view): strike of veins N150°E, North of mining works is combined with siliceous cleavages facing N60°E.

These N150°E veins are surface showings of this zone and we will call them NW-SE.

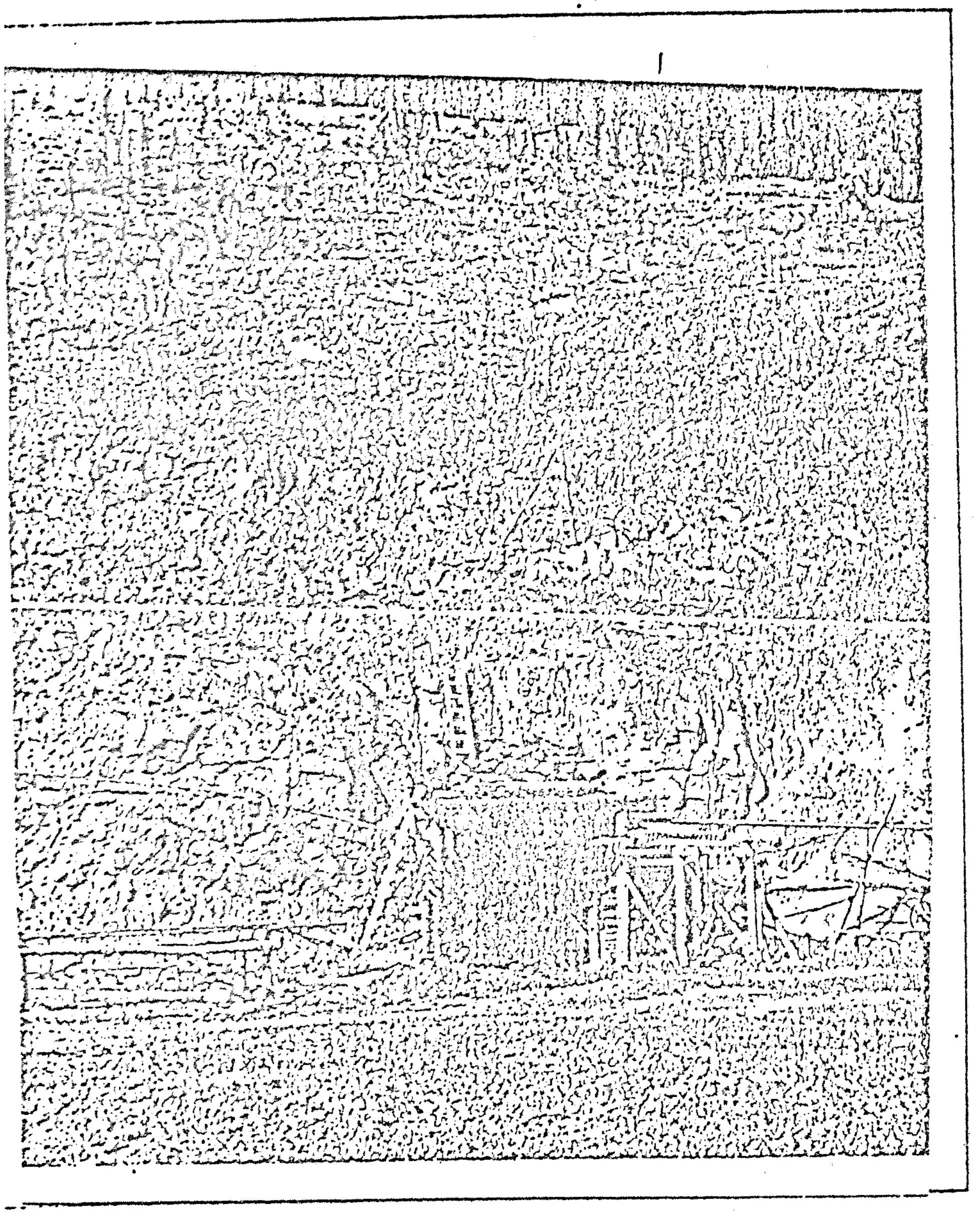
III - 2. North West - South-East veins.

These veins characteristics is their orientation and the lack of relative dissemination into wall rock.

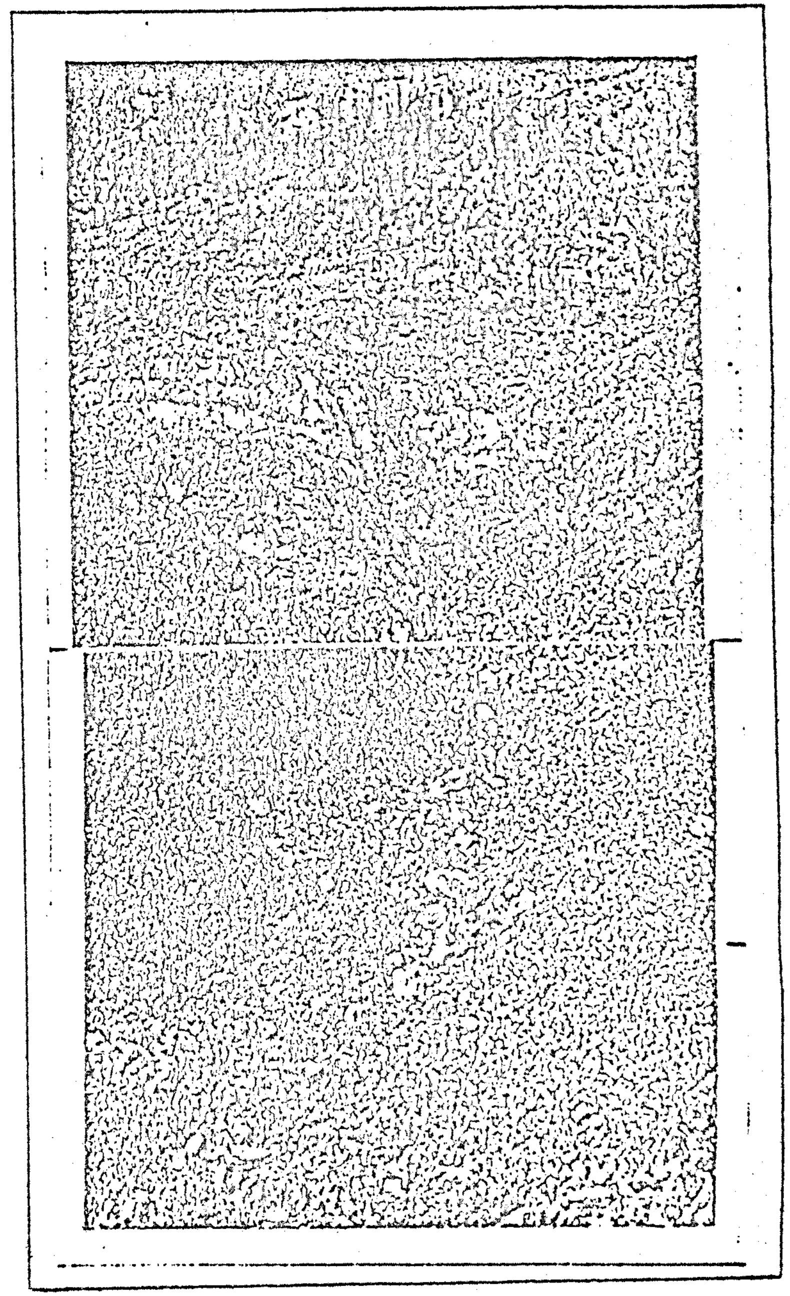
III - 2-1. Zones 1 and 2.

Zones 1 and 2 are close to one another (40m) and are both located on limestones and dolomitic levels of Delorme formation. Showing 1 is constituted by two little veins of 5cm facing N30°W on a waved bedded zone. Two drillings were made in 1968 without intersecting any mineralization. Showing 2 is located South-East of the first one and in its prolongation (table 11). It is a galena vein with little carbonate and tetraedrite: its length is about 150' (50cm); its width varies between 0' to 2' (60cm), and its strike varies between North-South and N25°W. In 1968 10 drillings have been made in this zone: supposing that poor recovery zones are due to oxidation of vein, its dip varies between 65 to 70°NE and its downdip is 90' (30cm).

VEINS NORTHWEST — SOUTHEAST



Level 3032, portal and veins NW-SE (Zone 3)
(localized on the right of the ladder)



Vein NW-SE (Zone 2)

2 m.
6 ft.

III - 2.2. Zones 3 and 4.

Zone 3 is constituted by veins and veinlets on the West flank of Harrisson Creek. They gather in groups on a distance of 600' (200m) up to the entrance of level 3032. As a rule they are thick 2 to 5cm and are constituted by quartz, and sometimes carbonates; some of them contain galena and sphalerite, and others could have a width of 30cm on a length of 1 to 3m: in which case we can see a pocket of more or less oxided sulphides.
We notice a small quantity of veins on the zone 4, they are located on the East flank of Harrisson Creek, in prolongation of vains of zone 3. In one of them we notice some copper carbonate; the other ones are sterile.
The direction of these veins and veinlets is N20°W to N30°W.

Main vein NW-SE of zone 3 has a strength of 2' (60cm) (see table 11): mining works started on it July 1968.

III - 3. Main mineralization.

This main vein facing N15°E and with a East dip was unkown until mining works started on a NW-SE vein cross-cutting it in September 1968. It was explored by 8217' of tunnelling at level 3032. Thirty four surface drillings and 5 mining drillings summing up to 19.600' (6000m. approx.) complete these works.

III - 3.1. Description and localization.

The vein is mainly constituted by quartz, sphalerite and galena; magnesium and calcium carbonates are frequent; we also notice grey coppers (tetraedrite) combined with galena. In the limestone zone we notice a dolomitization of walls, and perhaps a silicification. The walls are brecciated, often microfolded and laminated. These last phenomena could be on the roof or on the mineralization wall, but there is no throw between both walls.

The drawing of isobath curves and the cross-cuts of drillings show the existence of a reverse faulting at 400' (120m) East of the vein. This feature faces N10°E and has a dip of 75°W approximately; the East block is vertically moved less than 200' (60m). Table of zone 3 (in Mineralization & Structure Index) shows this faulting becomes vertical towards North, then at East dip. Mineralization disappears at this level, and the faulting becomes underlined by very laminated black clayed products.

III - 3.2. Extension and nature of vein.

This theory shows that the lower limit of mineralization could be the East located faulting. The upper limit is constituted by a sub-lithographic limestone zone in banks of 30cm and in which the fracture caused a stockwerk of veinlets and succeeding collapse of banks, When these limestones are near the faulting zone we notice interstratified (?) centimetric veins; mineralized lenses of the main vein are in the laminated and in the faulting breccia zone.

We were not able to notice any direct relation between mineralization and levels containing scattered sulphides; there does not seem to be a distribution due to lithology. However, evolution of East faulting caused an evolution in the adjusting fracture and mineralization nature changes South to North:

- South, the fracture shows a slight throw (cross-cut 2 East), and contains a quartz and galena mineralization with pulverized zones. Up to cross-cut 8 we see a "relaxed-faulting" type with prominent sheared.
- Cross-cuts 9 to 20 have an important increasing quantity of massive sulphides and 50% of vein, thus indicating a mainly relaxing type.
- In cross-cuts 21 to 29 we notice essentially brecciated mineralizations: quartz and sulphides or "gouge". There is some pieces of massive sulphides on the roof. The vicinity of the faulting must cause important collapsings. The adjusting fracture has fairly clear limits and a reduced width, but after cross-cut 24, mineralization is located in the strong faulting zone (40' or 12m) and has more definite limits; still the vein is roughly localized at the apex of the structure.
- In cross-cuts 30 and towards North, the faulting is underlined by a siliceous laminated zone containing lead and zinc oxides (3%Pb and 7%Zn) near the mineralized lens. Drillings showed that on the wall near the faulting, there were relaxing breccias zones containing sulphide stains. Succeeding this breccia we find veinlets of 1 to 3cm towards West. These two phenomena point out the adjusting accompaniement of the back to normal faulting.
- From cross-cut 25 we see a new aspect of tectonic stressings indicated by extension veins facing N30°W and related to a siliceous fracture facing N60°E. These veins are constituted by massive sulphides and their walls show no breccia or collapsing. Their strength is usually weak (less tant 20cm) but their frequency can be interesting. Vein of zone 2 is due to this phenomenon.

III - 4. Research works:

Mining works were made to verify if the lack of ore North of workings was not due to presence of limestone level. But they intersected the faulting zone without meeting any mineralization.
Deep drillings from the surface did not intersect any mineralization above the fracture and faulting intersection.
One horizontal mining drilling, 2 North drift and drilling 3-D-34 showed there was no mineralized adjusting fracture less than 200' (65m) West of vein.

III - 4.1. Extension possibilities.

Absence of outcrop, negative drillings and frequency of veins N150°E indicate there is no prolongation towards South.
Zone 4 is located on East flank of main anticlinal. The prominent folding of this zone is not promoter of a relaxing tectonic type of zone 3.

IV - OTHER SHOWINGS

IV - 1. Zone 5.

This showing is located on the East flank of main anticlinal, limit of siliceous beds dolomites and silty dolomites of Wittaker formation (table 12), and is first showing known in 1928.

IV - 1.1. Geology.

This vein is mainly constituted by quartz. Strike and dip vary: we measure N165°E-70°W at extremities, N5°E-60°W at center. Outcrop height: 50' (15m), disappearance of vein on the upper part, and increasing strength up to 2' (60cm) on the lower part. Pockets of more or less oxided carbonates of lead are located in the thickest part: their width vary from 30cm - 3cm.

Related to this mineralization, we notice interstratified quartz veins caused by succeeding movements in the anticlinal flank.

IV - 1.2. Workings.

An electromagnetic geophysic prospection was made in this zone in 1967; drillings acknowledge the main drive in the valley. They only intersected a "graphite" zone which is probably a black siliceous or shaly-bituminous zone.

In fact, there is probably no extension towards South due to the presence of a faulting turning-point. If there is a North extension, it will not be a very importan one. It rather is an extension vein of NW-SE type: no important fracture manifestatic is perceptible in the walls since they are net and do not show any relative movement.

IV - 2. Zone 6.

This zone is constituted by a dome with a very abrupt North flank, and where formations outcrop very well; but there is no showings. The East flank is overburden and covered up by vegetation; three showings are visible.

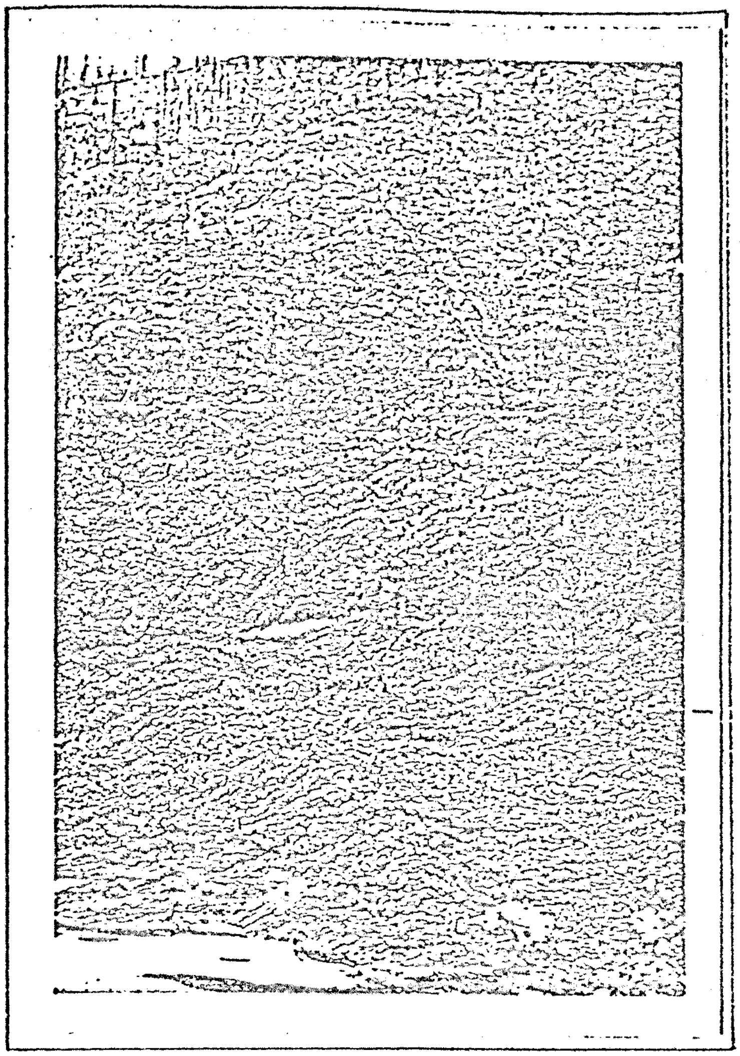
IV - 2.1. Geology.

Geological map and cross-cuts show that compression zone against the reef formation is very important. East anticlinal is reverse and form a monoclinal with Delorme formation. The faulting edging the main anticlinal is reverse and has a 60°W dip: throw 1200' (400m). The anticlinal itself is a tabulary facies.

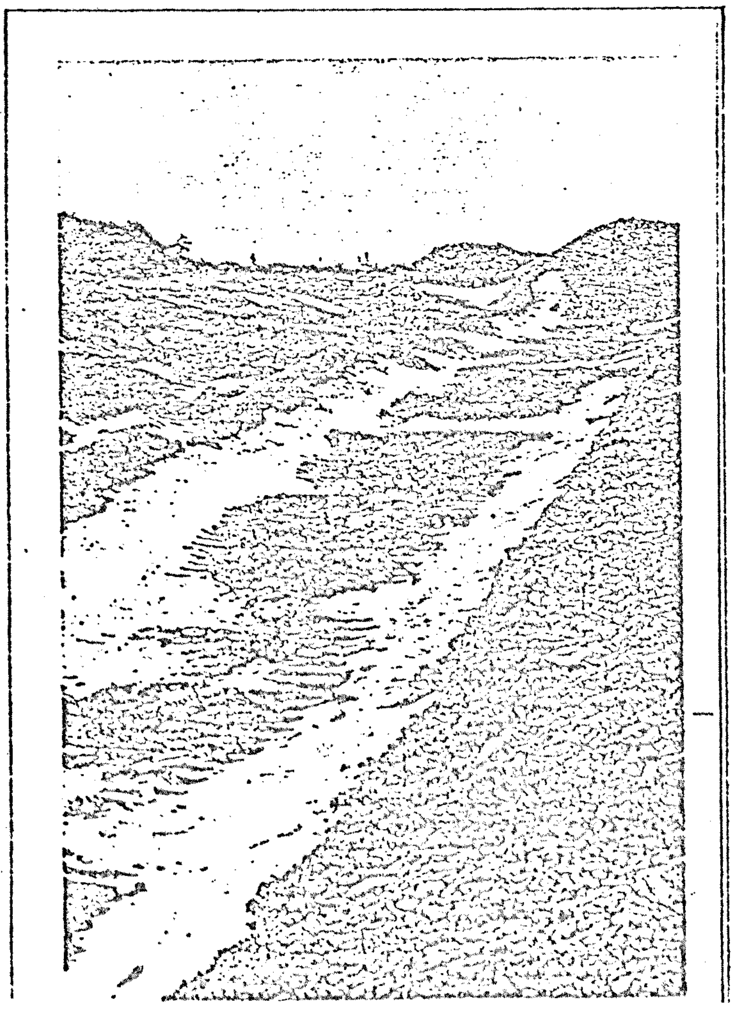
There is three visible zones (table 13):

- The summit showing is a formation of small sulphide lens, quartz and carbonates. The underlinement is made by following a shear-zone facing N130°E (table 12). The length is 150' (50m) and width is not over 1,5' (45cm).
- The center showing is constituted by two veins facing N130°E and joined by an oblique zone. Total length is 80' (25m), width is difficult to measure. We notice in the North overburden, debris of galena and carbonates.

ZONES 5 & 6



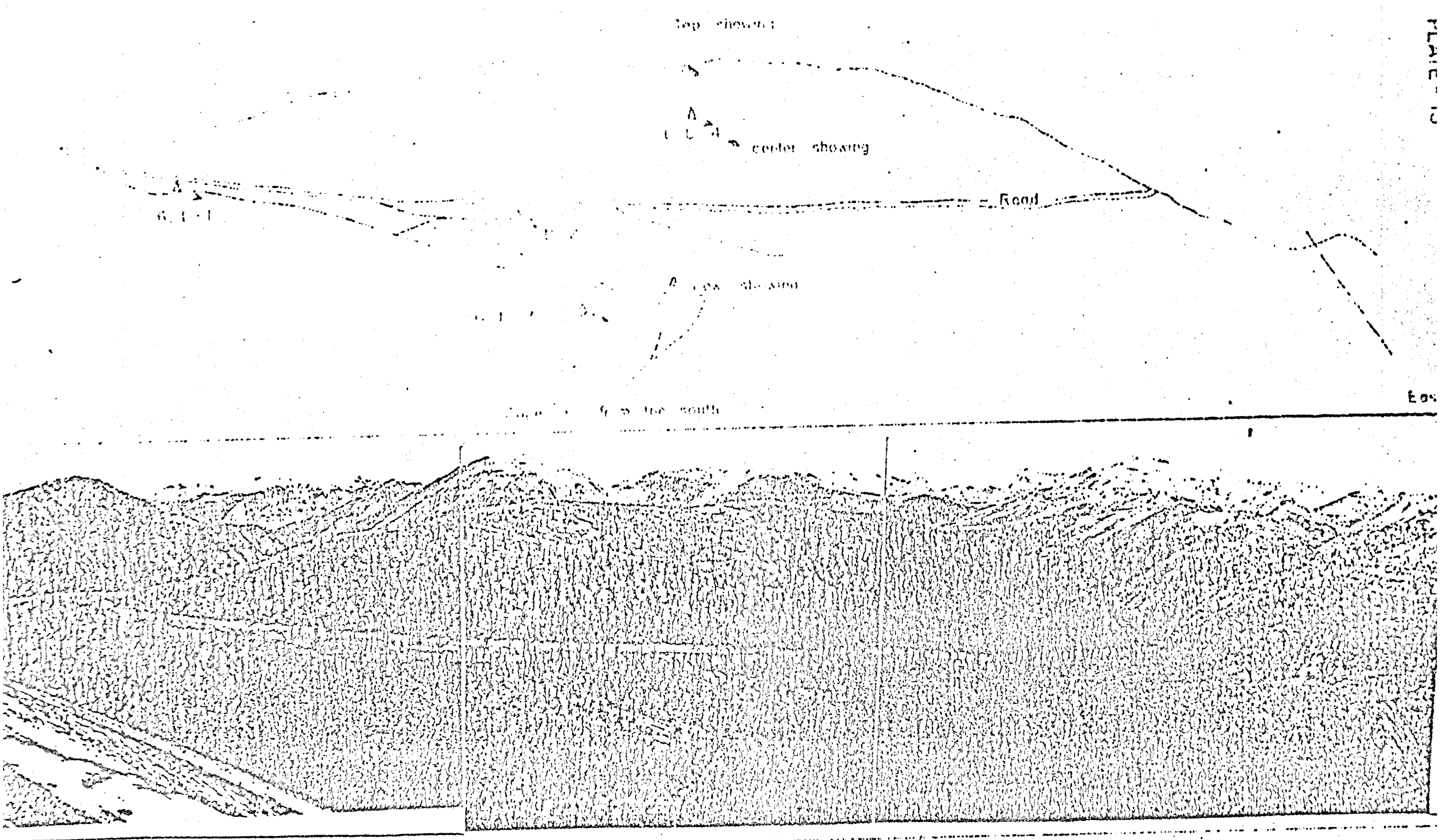
Vein of zone - 5



Vein of zone - 6 (top showing)

PLATE - 15

ZONE - 6



... from the south

- The low showing is constituted by a quartz zone facing N30°E and contains zinc and galena oxides. On the low part there was an outcrop containing galena, this zone is located only a few metres from the major faulting edging the main anticlinal.

IV - 2-2. Accomplished works.

Although North flank outcrops and the ones on the road on South flank do not show any tectonic structure similar to the one of zone 3, two drillings 6D-1 and 6D-2) intersected the main anticlinal structure. The results are negative and support the surface indications: there is no secondary faulting and no adjusting fracture.
Both showings in the upper and median part of the anticlinal have a strike and a component typical of shear-zones extension related to a major faulting. On both extremities of summit showing, cross-sections showed the lack of horizontal and vertical extensions.
A drilling explored the North part of the showing center. No mineralization was intersected; however a lost core siliceous zone was crossed through. North of this showing sections were made to find the origin of overburden debris: no mineralization was noticed on the newly found outcrops.

The mineralogic and orientation of the lower showing is alien from the others. It seems that a mineralized lens is located in a relaxing-collapse zone near the major faulting. The faulting along the main anticlinal changes its strike and dip (see cross-cuts and geological map): strike varies from N20°E to N5°E, and dip from 60°W to 80°W. This causes small adjustment zones which in consideration with the geological environment and the polarity of tectonic units cannot have an extension.

IV - 3. Zone 7.

In zones 7 and 8 the main anticlinal is again the East flank, and the West flank has a strong dip. Besides, the vicinity of the reef mole stresses the compression exertions.

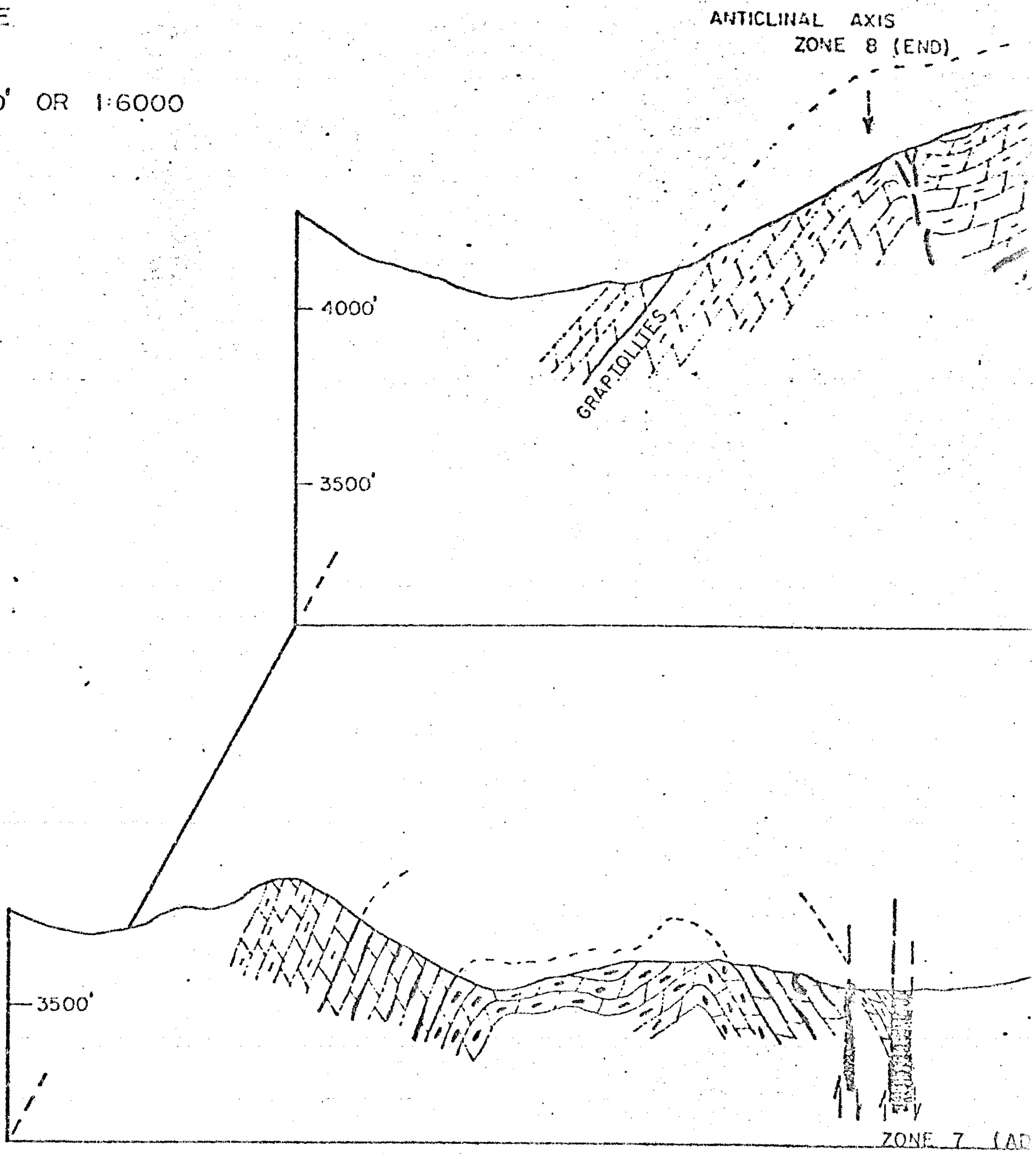
IV - 3-1. Geology.

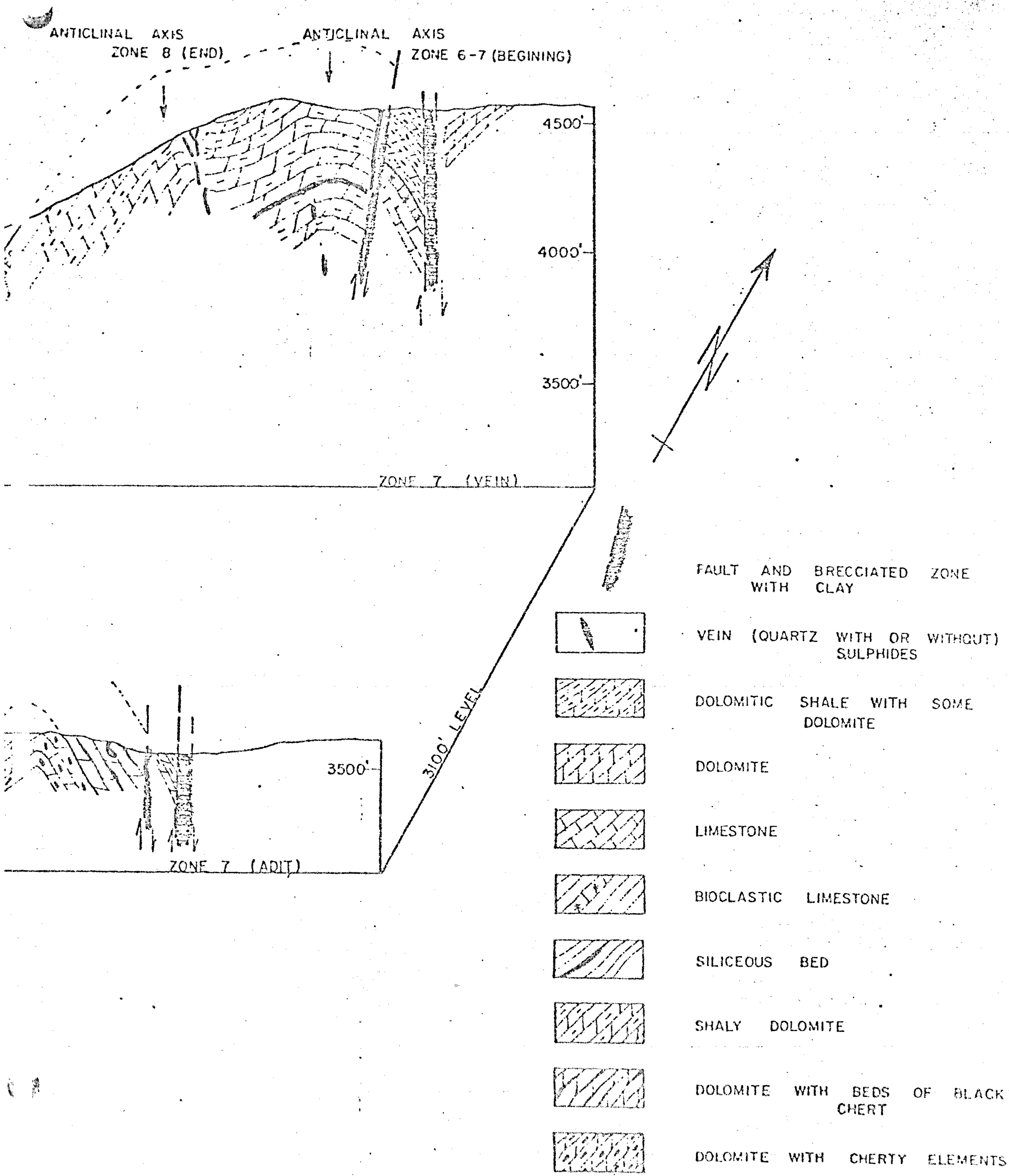
Showings are located in the upper part of Wittaker formation. On a structural viewpoint, this zone is characterized by an oblique axis N100°E located on the South flank: this feature causes an axis splitting (see geological map). Zone 8 anticlinal has an axial plan which ends-up by a faulting zone; the axis of zone 7 is located further East (see table 14). This phenomenon causes a double fold along with a fracture.
The East anticlinal flank is faulted and the throw along this structure is 200' (60m).

ZONE 7

SECTIONS SHOWING STRUCTURE

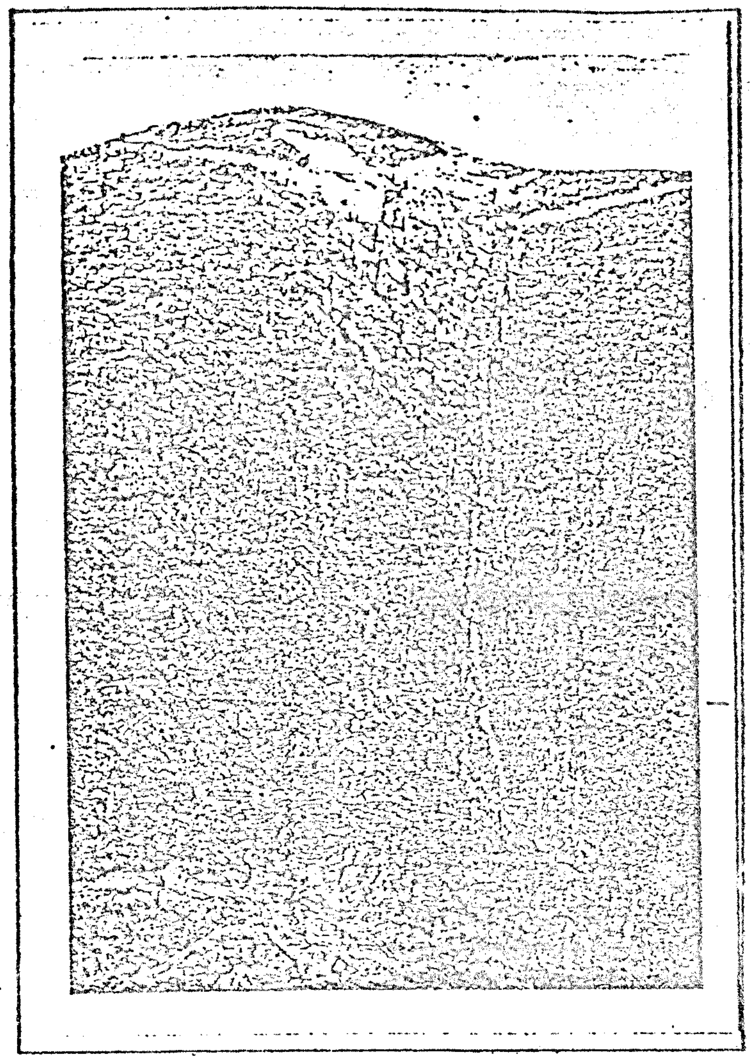
SCALE — 1" = 500' OR 1:6000




ANTICLINAL AXIS
ZONE 8 (END)
ANTICLINAL AXIS
ZONE 6-7 (BEGINING)
4500'
4000'
3500'
ZONE 7 (VEIN)
3100' LEVEL
3500'
ZONE 7 (ADIT)
FAULT AND BRECCIATED ZONE WITH CLAY
VEIN (QUARTZ WITH OR WITHOUT) SULPHIDES
DOLOMITIC SHALE WITH SOME DOLOMITE
DOLOMITE
LIMESTONE
BIOCLASTIC LIMESTONE
SILICEOUS BED
SHALY DOLOMITE
DOLOMITE WITH BEDS OF BLACK CHERT
DOLOMITE WITH CHERTY ELEMENTS

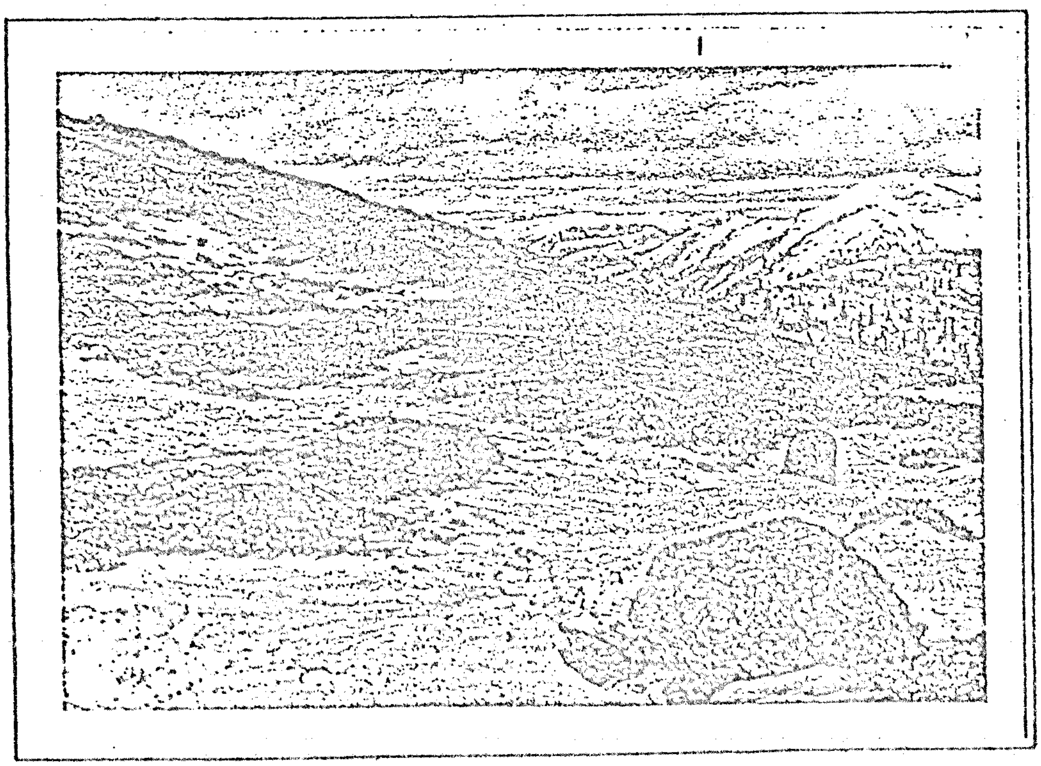
ZONE - 7

Vein →



General View From South

Portal of Adit →



Main vein showing

(South to North)

IV - 3-2. Showings.

The importance of the showings is very irregular. On the West flank (table 14) we notice a quartz and carbonated stockwerk of veinlets and veins facing N250°E to N10°E. In some places we find mineralized lens of 1' (30cm) width and of 20' (6m) length. This corresponds to the summit part of the curve caused by the anticlinal axle of zone 8.
On the East flank we found three small showings of quartz and oxides, they must correspond to the lens veins in the tectonized part between both folds.
The flat quartz veins found in the exploration drift are in an environment of dolomite with siliceous beds: they are set in a collapsed structure of the intern part of this double anticlinal structure.
The mineralized main vein is located on the East flank on the anticlinal and on the roof of the secondary faulting, and is mainly constituted by quartz, galena and sphalerite with tetraedrite as a complementary mineral. Its structure is roughly striped, strike is N15°E and a 80°W dip. There is a continue mineralization: edged on the wall by a very laminated siliceous zone, and the roof wall is simply brecciated and cemented by dolomite and quartz. This phenomenon seems to indicate that collapsing plans are on the faulting wall and that tangential thrust determined a relaxing zone on the faulting roof. So the main mineralization of zone 7 is located in an adjusting structure where collapsing movements are more important than relaxing movements.

IV - 3-3. Accomplished works.

After drilling 7-B-1 and 7-C-2 in 1969, an exploration drift was driven 1100' (330m) downdip of vein (table 15). These works only intersected quartz veins, some of which contained some sulphide stains.
Cross-section drillings done this year showed the vein narrowed in the deep part and had a maximum downdip depth of 300' (100m). The length of known outcrops was 460' (138m), and is in fact 690' (208m) (table 15).
The lack of mineralization in the deep part along the faulting is probably due to the non-existence of relaxing zone in the median and intern parts of the anticlinal. At this level formations are compressed against the carbonated mole: this stressing is pointed out by a faulting turning-point in the intern part of the East anticlinal (see cross-sections).
Drilling 7-C-2 was given-up, but it intersected the West stockwerk zone: veinlets are sterile in the deep part.

Drilling 7-D-4 intersected the median lens zone, and showed this is not a strong mineralization (vein 5 to 10cm).

IV - 4. Zones 8 and 9.

These zones are characterized by the progressive disappearance of the East anticlinal flank. The strong dip of West flank formations is typical to zones 7 to 9. The carbonated mole withdraws towards East.

IV - 4-1. Geology.

Showings are always located in the same stratigraphic levels. Level with zone 8 the East flank of the main anticlinal is clearly individualized and is set-apart by two secondary faultings of a non-important throw: lower than 35' (10m) for West and lower than 200' (60m) for East (see tables 16, 17 and geological map).

In the valley parting both zones, the faulting group merges in a reverse turning-point faulting with a West dip. The structure East flank is entirely laminated.

Level with zone 9, the faulting is constantly present and, in the upper part the structure East flank reappears on a weak width. This indicates that compression is less stressed in upper parts than in lower levels of structure.

IV - 4-2. Showings.

A small quartz lens appears on the zone North flank and, is located in the anticlinal turning-point zone, level with the small West faulting.

The main vein lays-out the same faulting in the summit part of the anticlinal, ans is constituted by three lens parted by siliceous and laminated zones containing a quartz blade. Mineralization is roughly stripped and contains quartz, galena and several lead and zinc oxides. The strike is not continue: it varies from N10°E North to N15° South; the average dip is 77° East. As in the zone 7 vein we find the mineralization West of the guiding feature; East we notice the laminated zone. This analogy points out the importance of tangential tectonic causing relaxing zones on the opposite side of the block mole, whatever the host structures dip. The discontinuity of the mineralization character is due to the lack of a homogeneous stressing: the reef mole is stratigraphically lower and diminishes towards East, changing the stressing balance.

In the valley parting zones 8 and 9, quartz outcrops are slightly mineralized lenses and mark-out the major faulting (table 18).

The quartz, galena and cerussite lens North of zone 9 seems to have a N150°E strike. We do not notice any extension towards South and trench made North was unproductive.

Both lenses located South of zone 9 (table 19) face N10°E. The eastern one contains important galena pockets but does not seem to have horizontal extension.

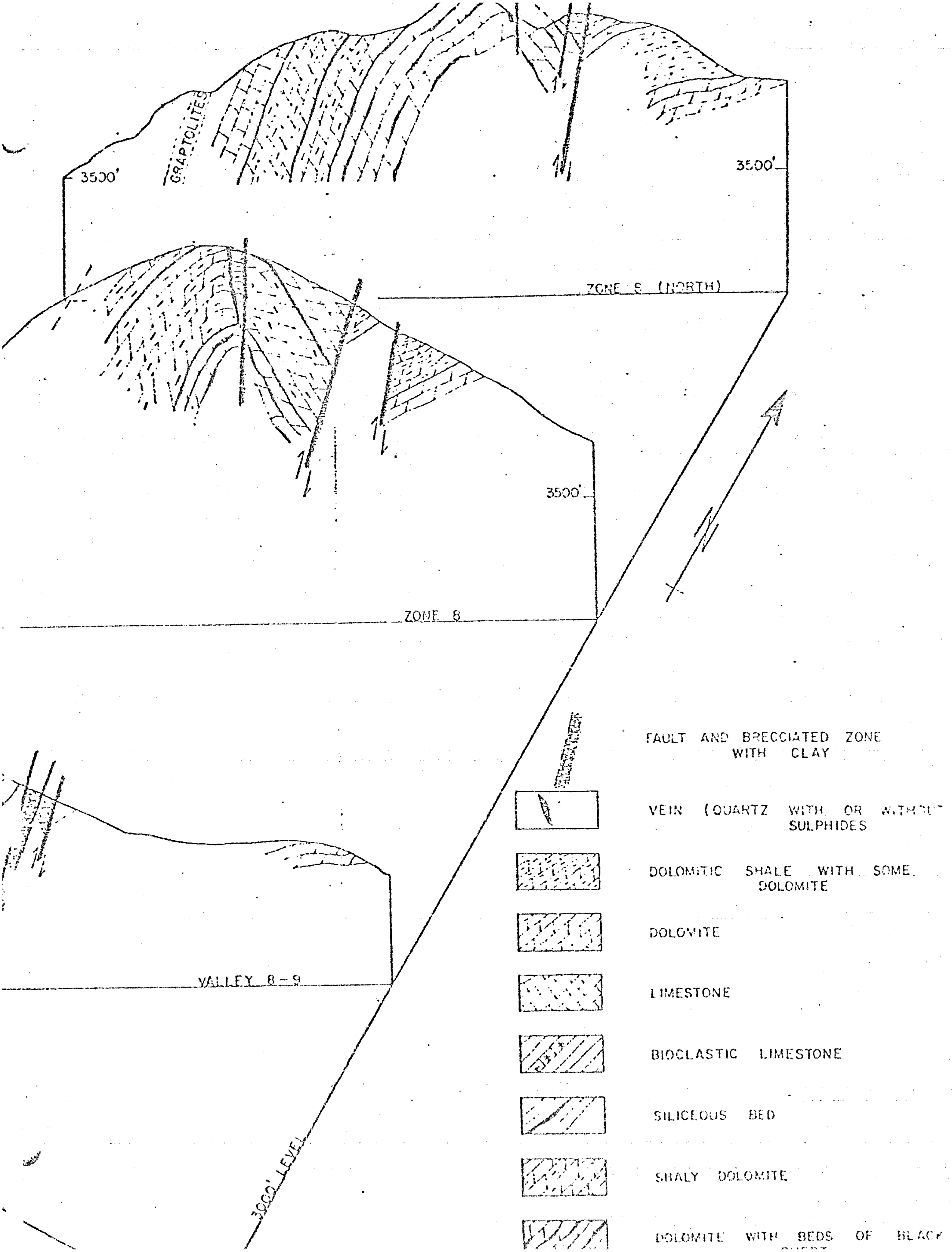
IV - 4-3. Accomplished works.

Drillings established zone 8 vein up to 300' (100m) deep.
In 1969 an exploration drift was driven 1200' (360m) downdip of the vein with negative results.

Cross-section drillings this year show that vein had a maximum downdip depth of 300' (100m) in the median part. South, trenches show a 200' (60m) downdip; North, although formation outcrop, there is no perceptinle mineralized outcrop. Maximum length 920' (276m).

Drilling in the valley between zones 8 and 9 showed that mineralization of the major faulting was reduced. Cores analyzed in this structure on zone 7 and valley, show 0.5 to 1% lead and 2 to 5% zinc.

Lens of zones 9 were explored by one negative drilling. However this mineralization like the zone 8 does not probably have a downdip depth. Besides it probably does not have an horizontal extension, since the tectonic phenomenon due to the mineralization discontinuity in zone 8 is still more stressed in zone 9.

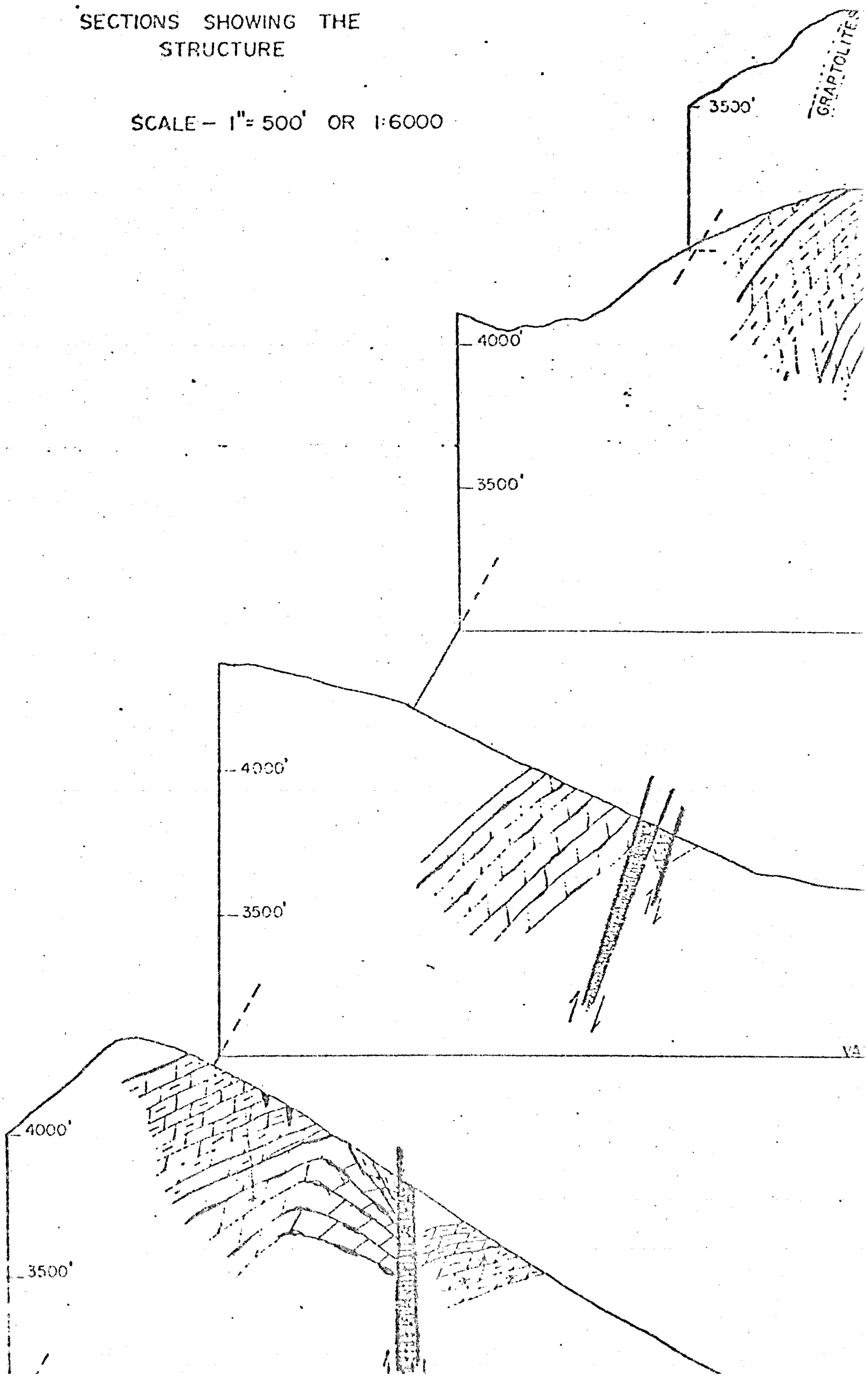


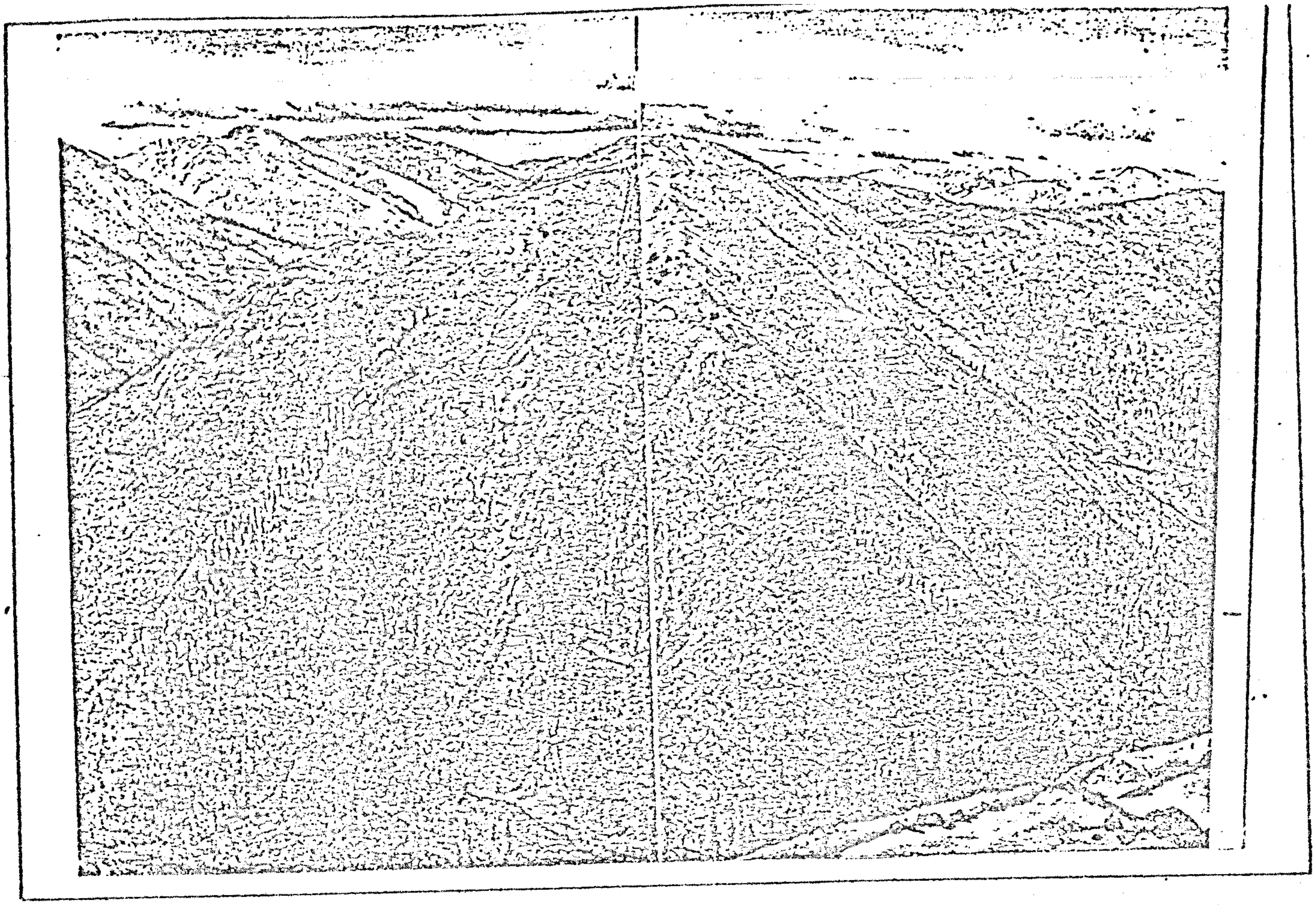
GRAPTOLITES
3500'
3500'
ZONE 8 (NORTH)
3500'
ZONE 8
VALLEY 8-9
3000' LEVEL
FAULT AND BRECCIATED ZONE WITH CLAY
VEIN (QUARTZ WITH OR
SULPHIDES
DOLOMITIC SHALE WITH SOME DOLOMITE
DOLOMITE
LIMESTONE
BIOCLASTIC LIMESTONE
SILICEOUS BED
SHALY DOLOMITE
DOLOMITE WITH BEDS OF BLACK

ZONES 8 and 9

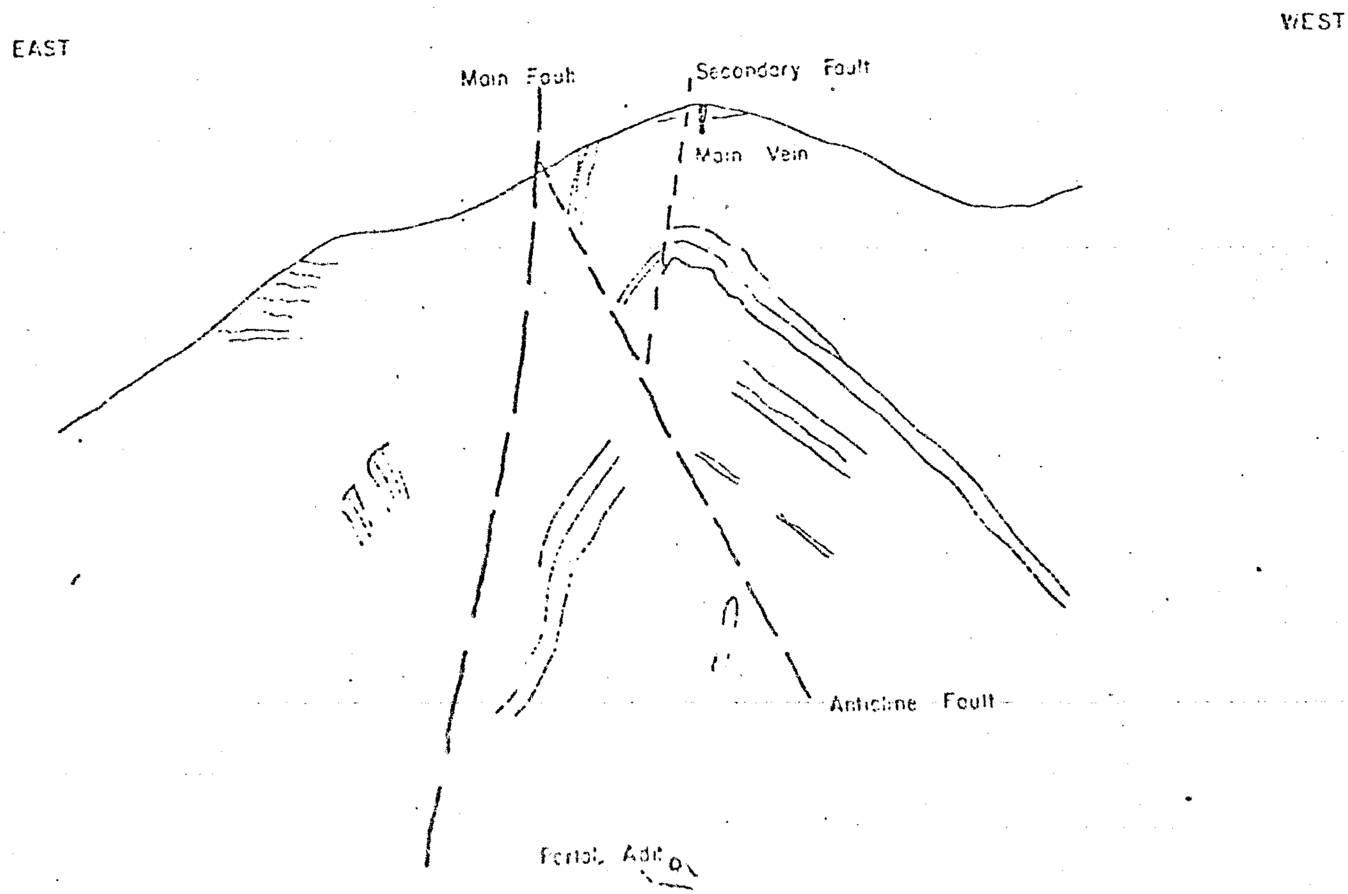
SECTIONS SHOWING THE STRUCTURE

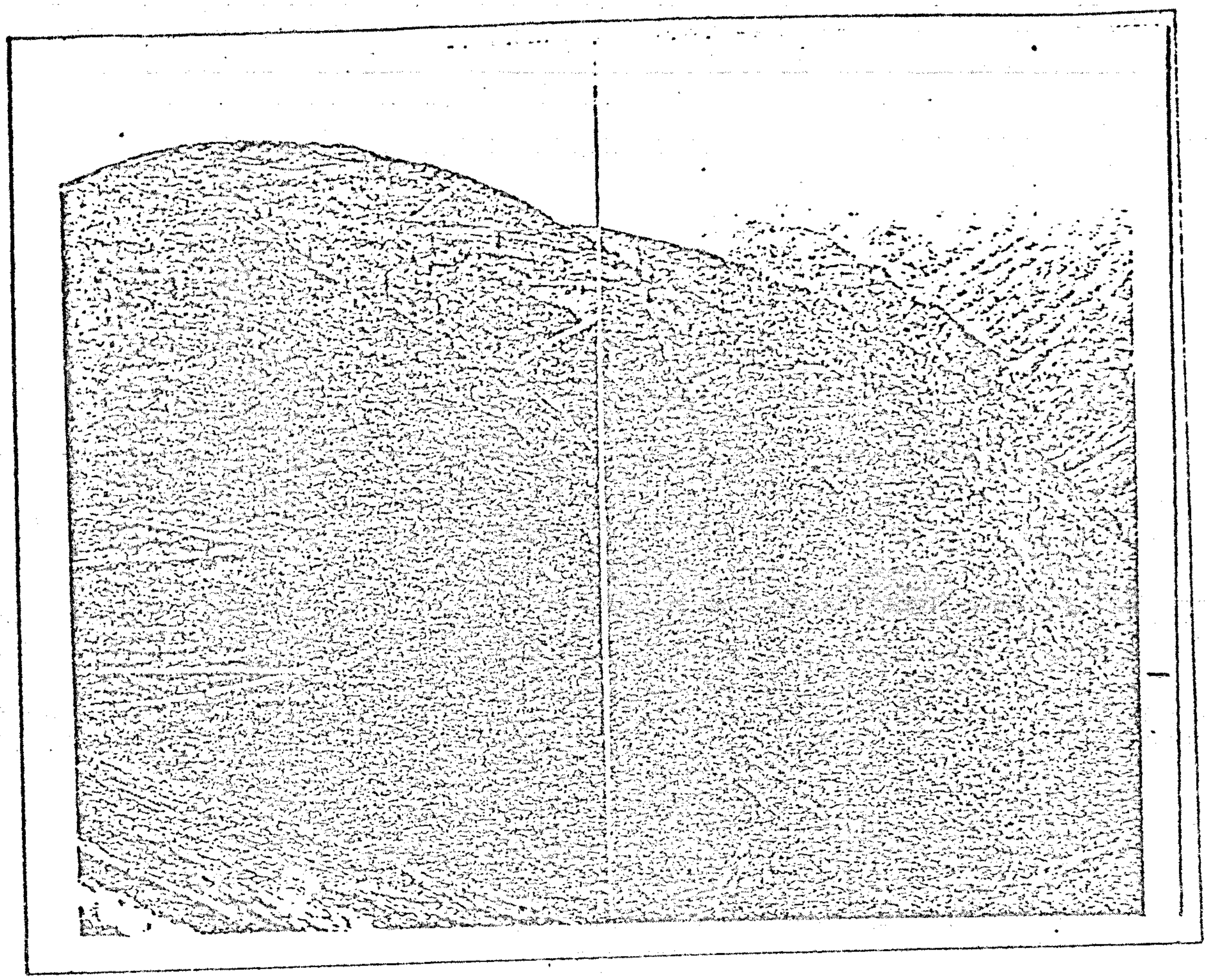
SCALE – 1" = 500' OR 1:6000



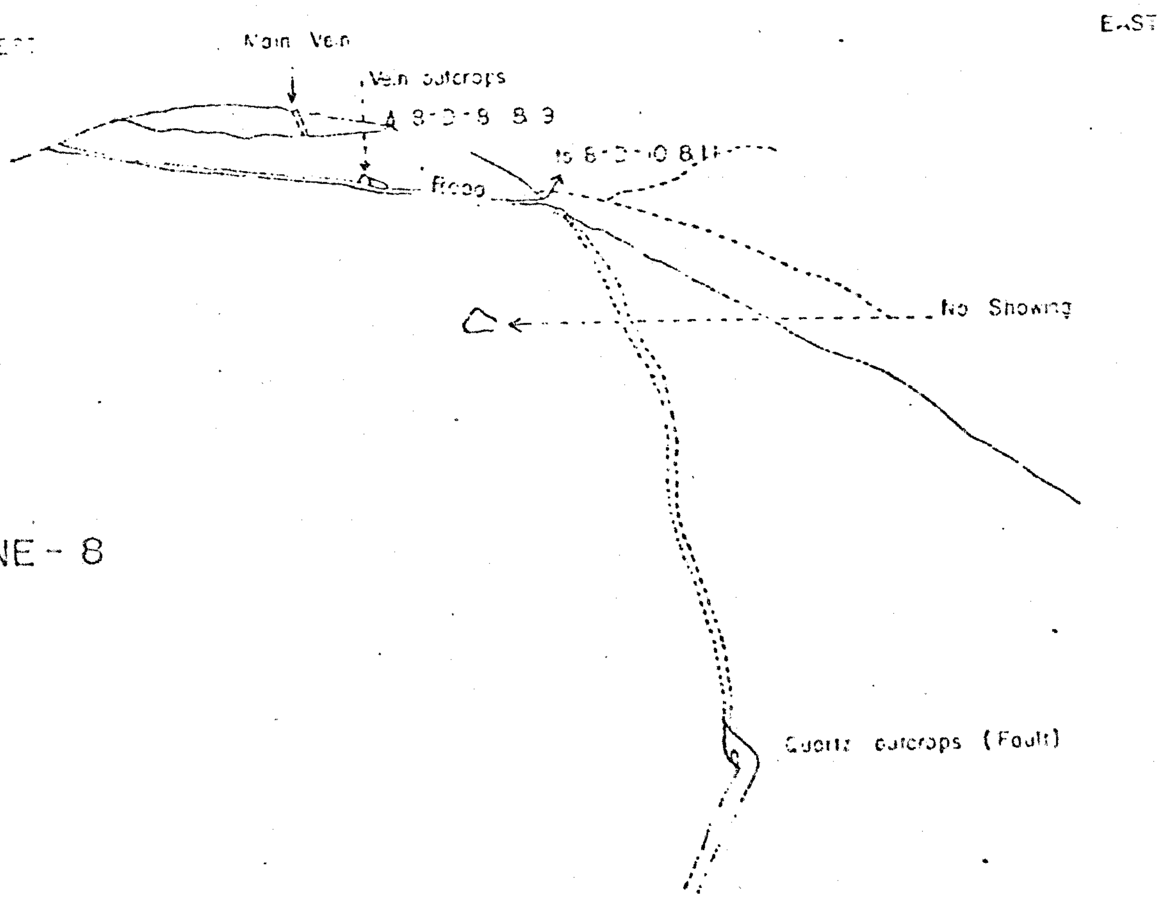


ZONE - 8 General View From Zone - 7





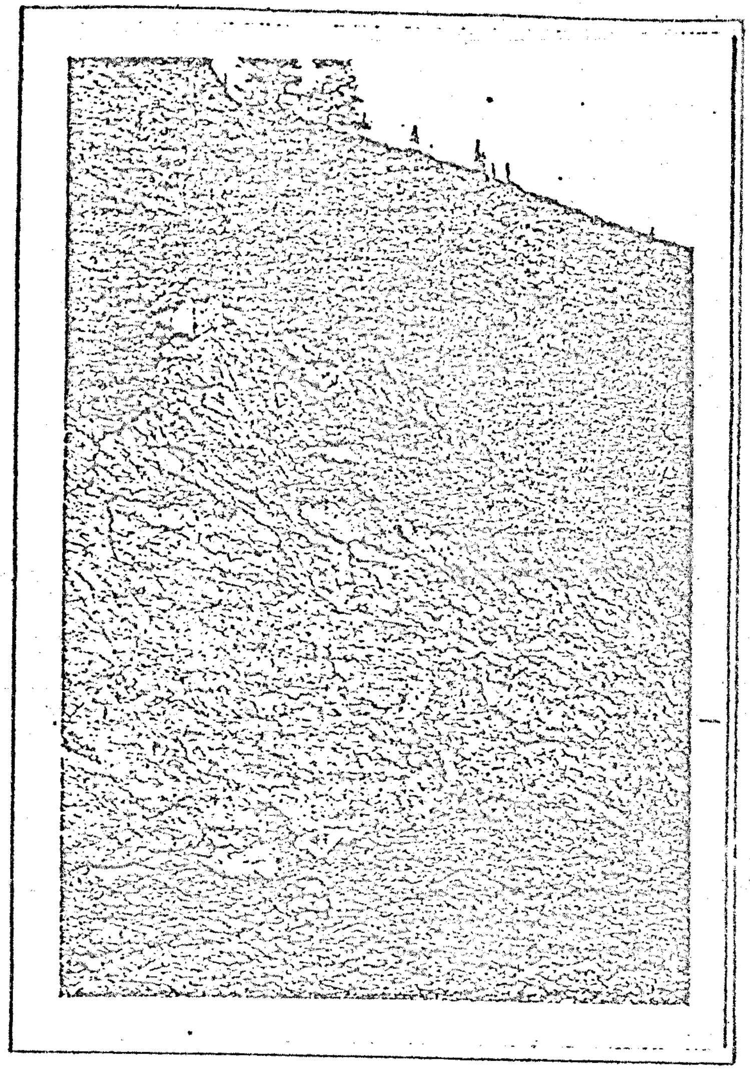
General View From Zone - 9

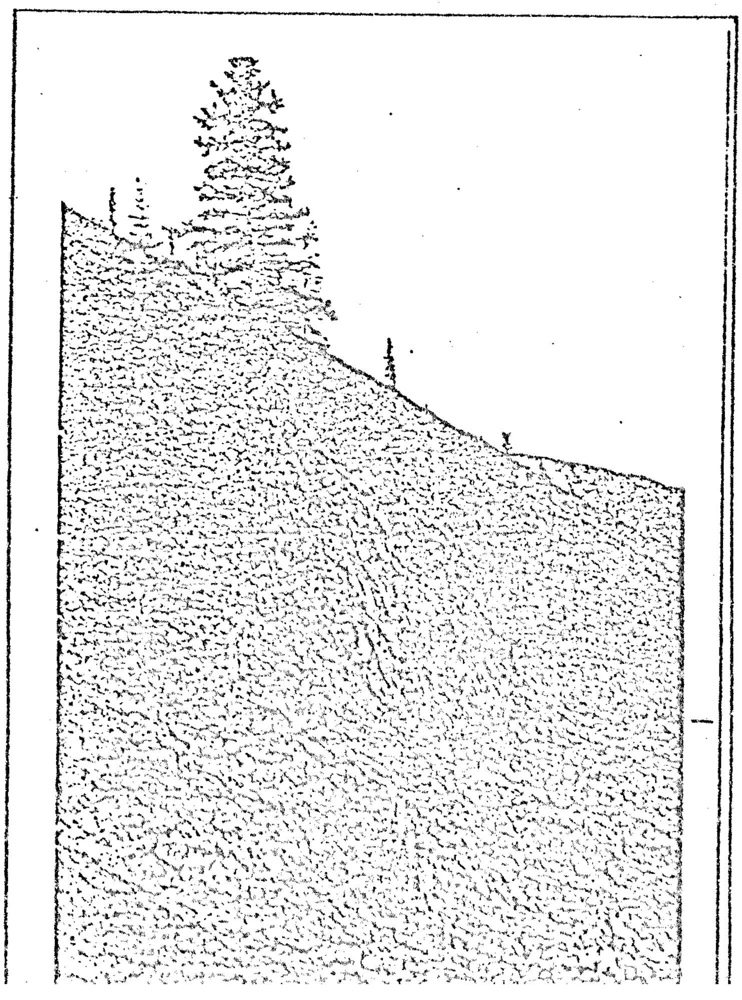


ZONE - 8

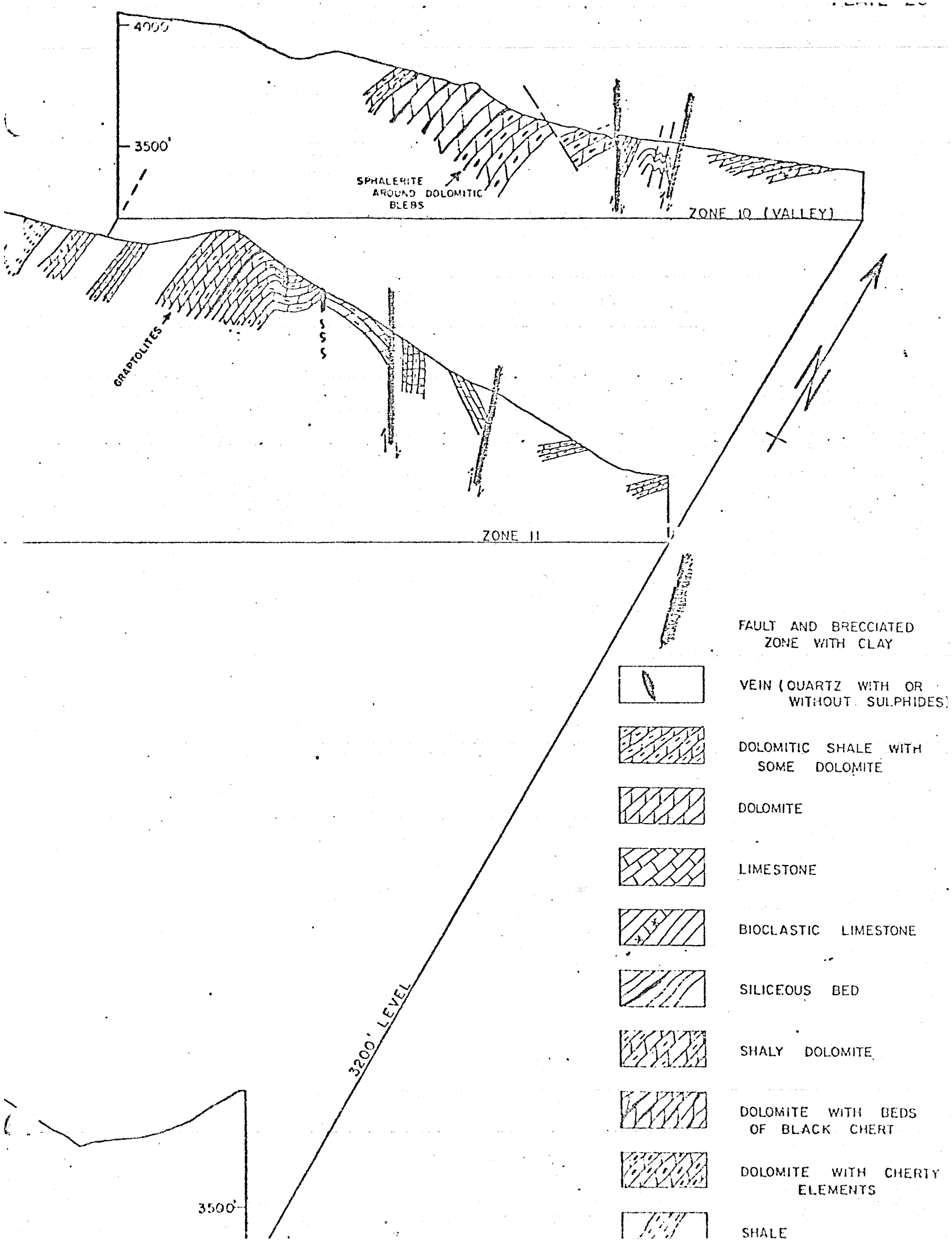
ZONE - 9

Vein of Southwest





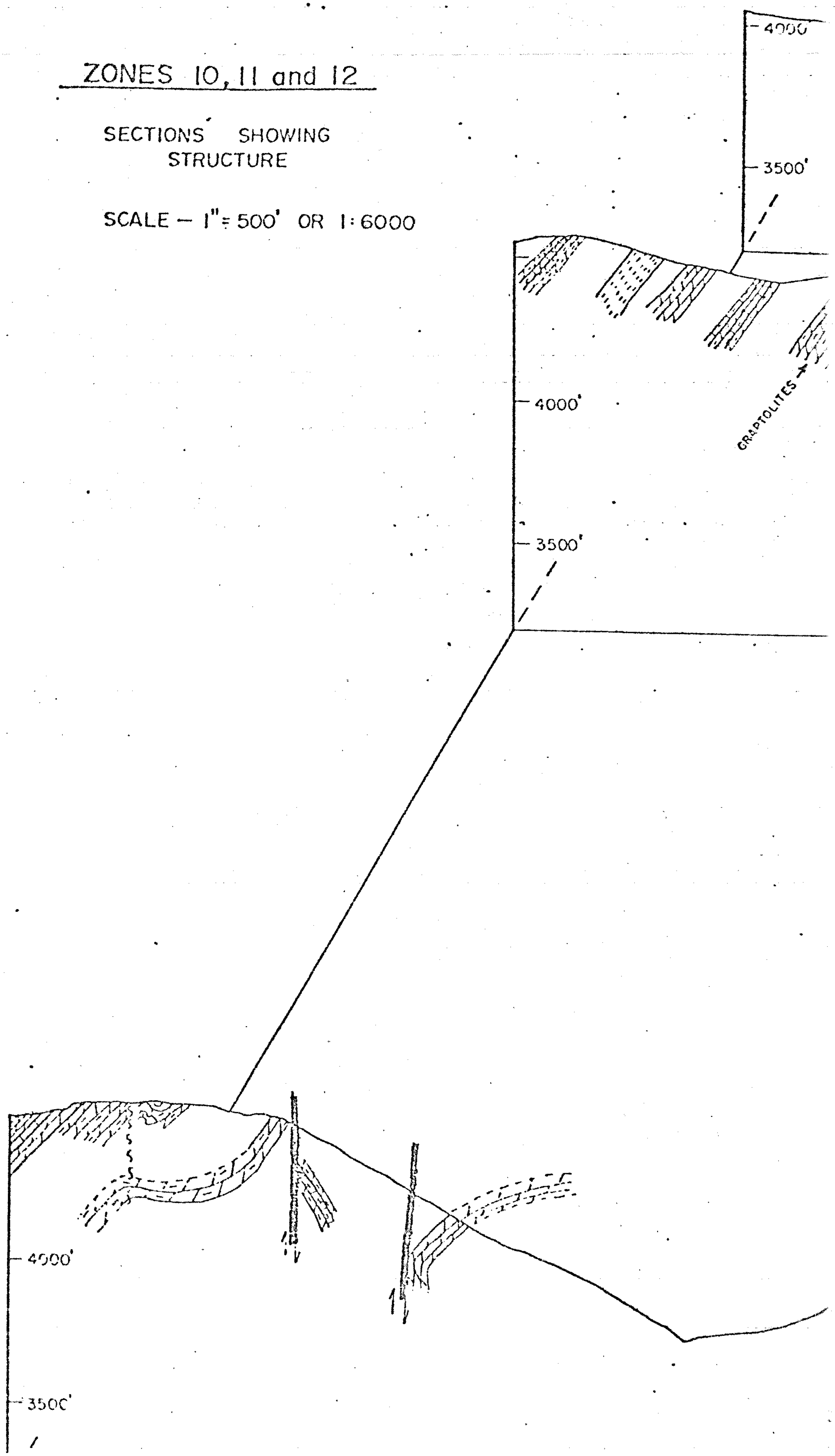
Vein of Southeast

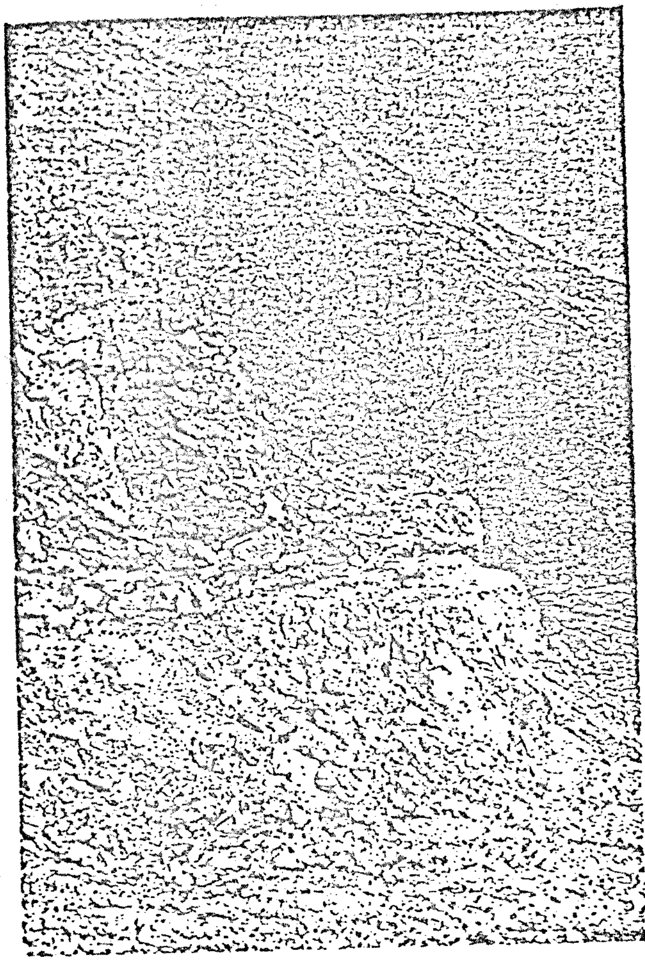

4000'
3500'
SPHALERITE AROUND DOLOMITIC BLEBS
ZONE 10 (VALLEY)
GRAPTOLITES
ZONE 11
3200' LEVEL
3500'
FAULT AND BRECCIATED ZONE WITH CLAY
VEIN (QUARTZ WITH OR WITHOUT SULPHIDES)
DOLOMITIC SHALE WITH SOME DOLOMITE
DOLOMITE
LIMESTONE
BIOCLASTIC LIMESTONE
SILICEOUS BED
SHALY DOLOMITE
DOLOMITE WITH BEDS OF BLACK CHERT
DOLOMITE WITH CHERTY ELEMENTS
SHALE

ZONES 10, 11 and 12

SECTIONS SHOWING STRUCTURE

SCALE – 1" = 500' OR 1:6000

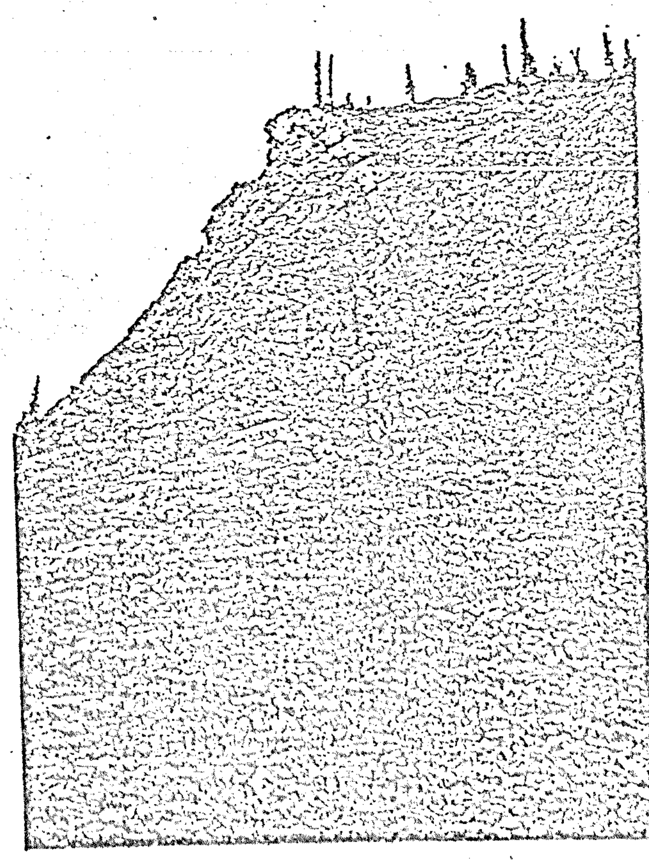




Zone - II : Quartz Veins

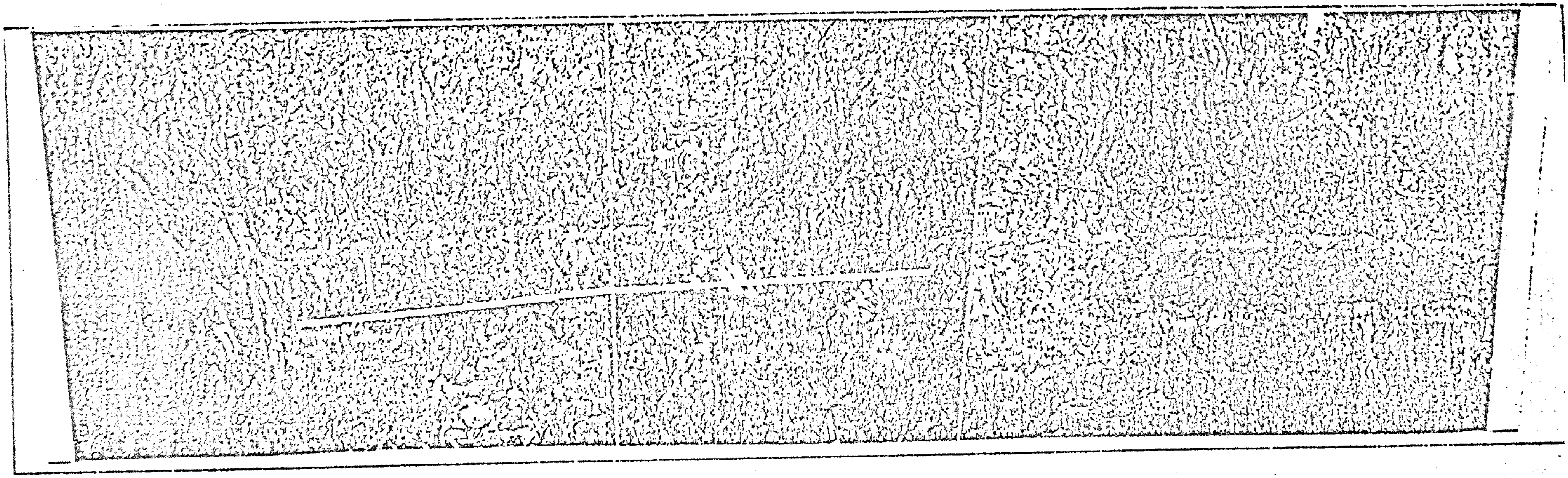
(To Northwest)

WEST EAST



Quartz vein in the faulted zone near the reef border (East Zone-6)

UNDERGROUND

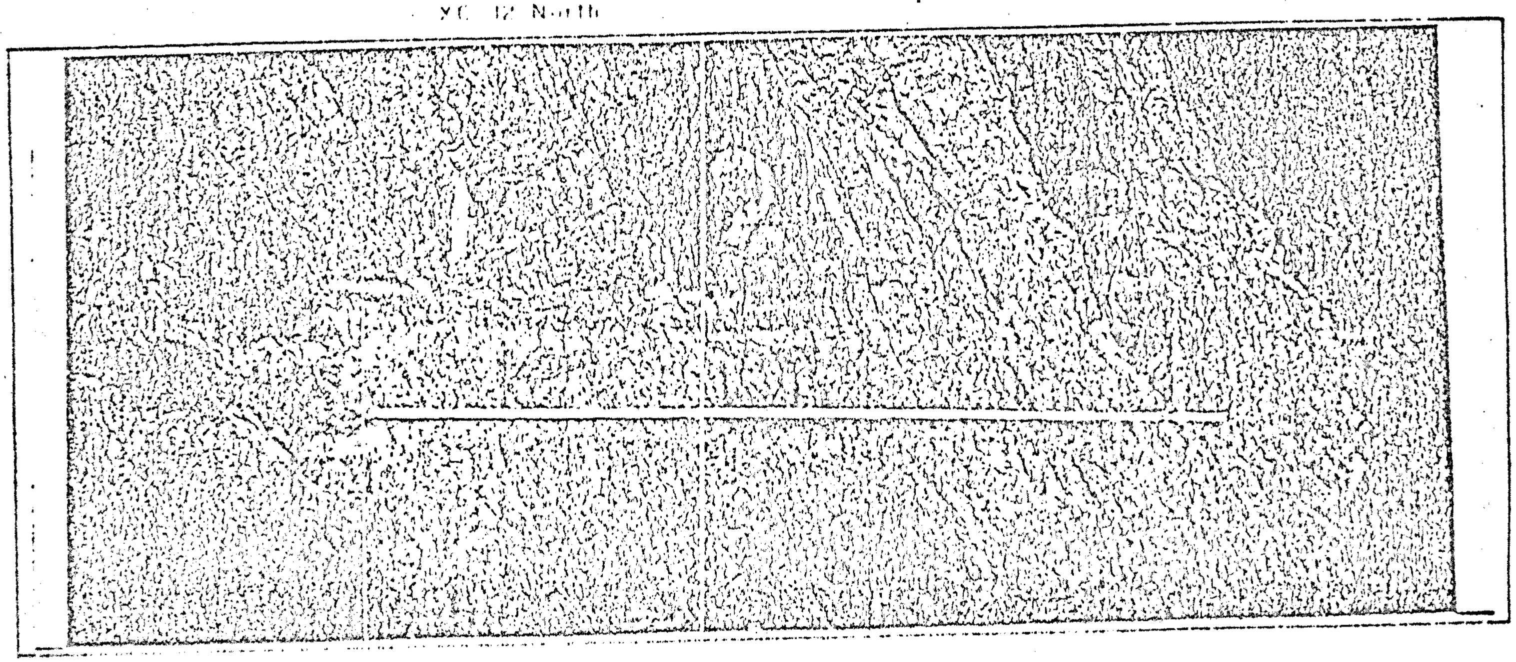


XC 9 North

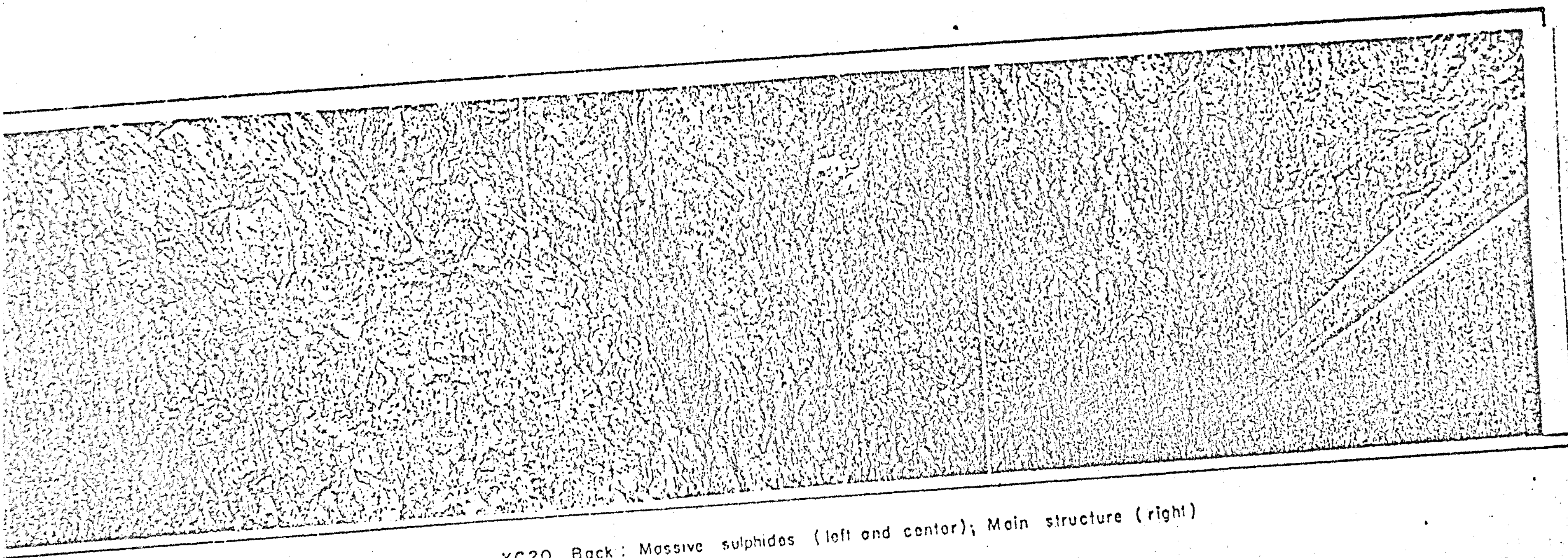
Massive sulphides

3 ft
0.9 m

XC 12 North



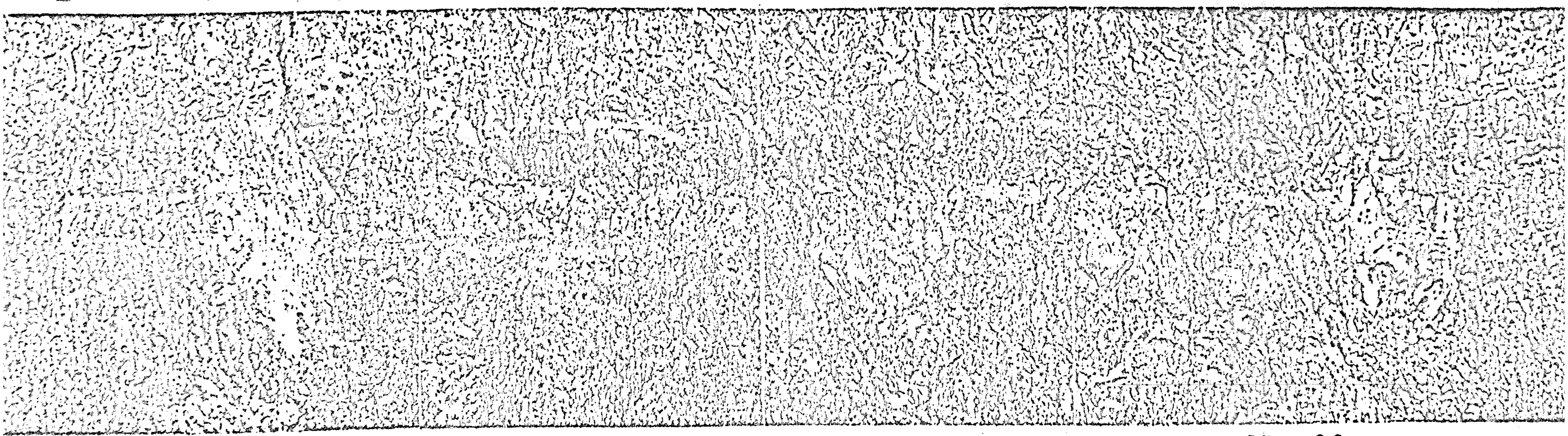
UNDERGROUND



XC20 Back : Massive sulphides (left and center); Main structure (right)

7 Ft.
2 m.

UNDERGROUND

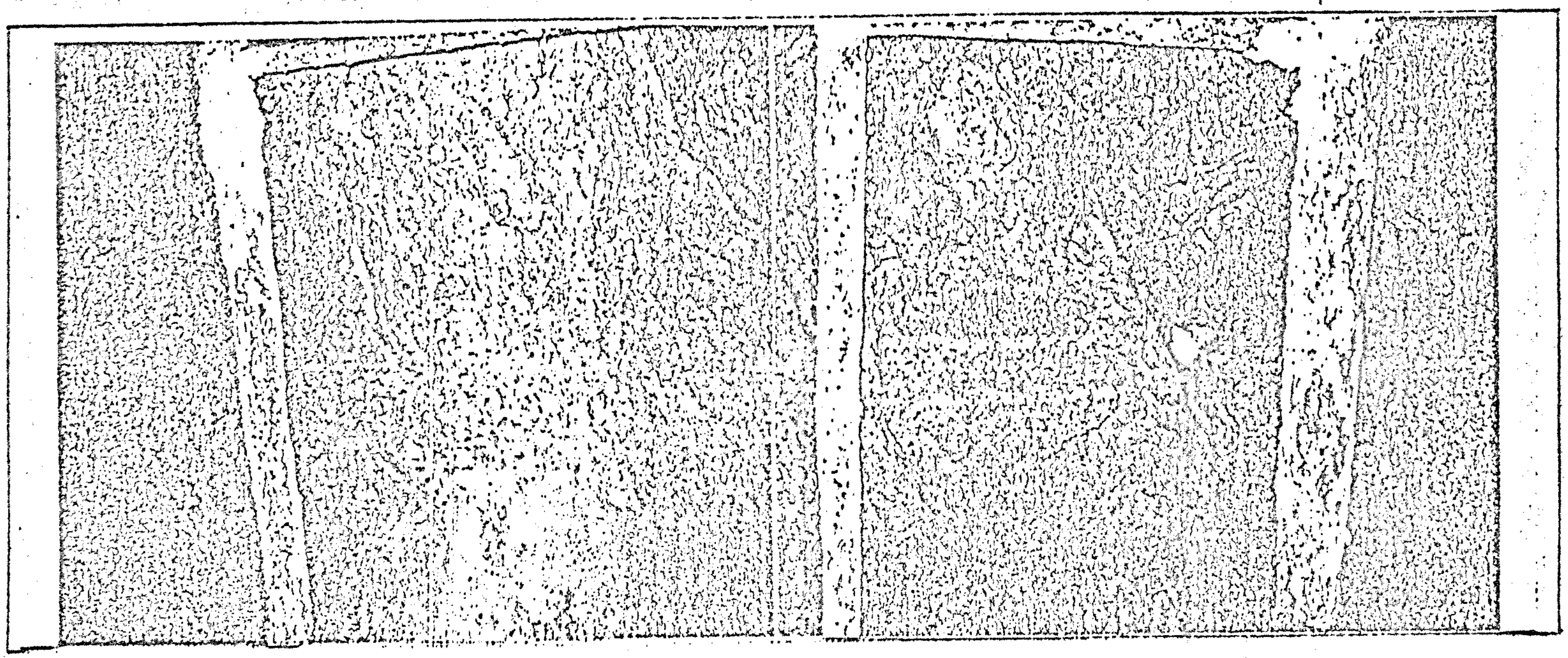


XC10 North : Massive sulphides (left); brecciated quartz and gauge (right)

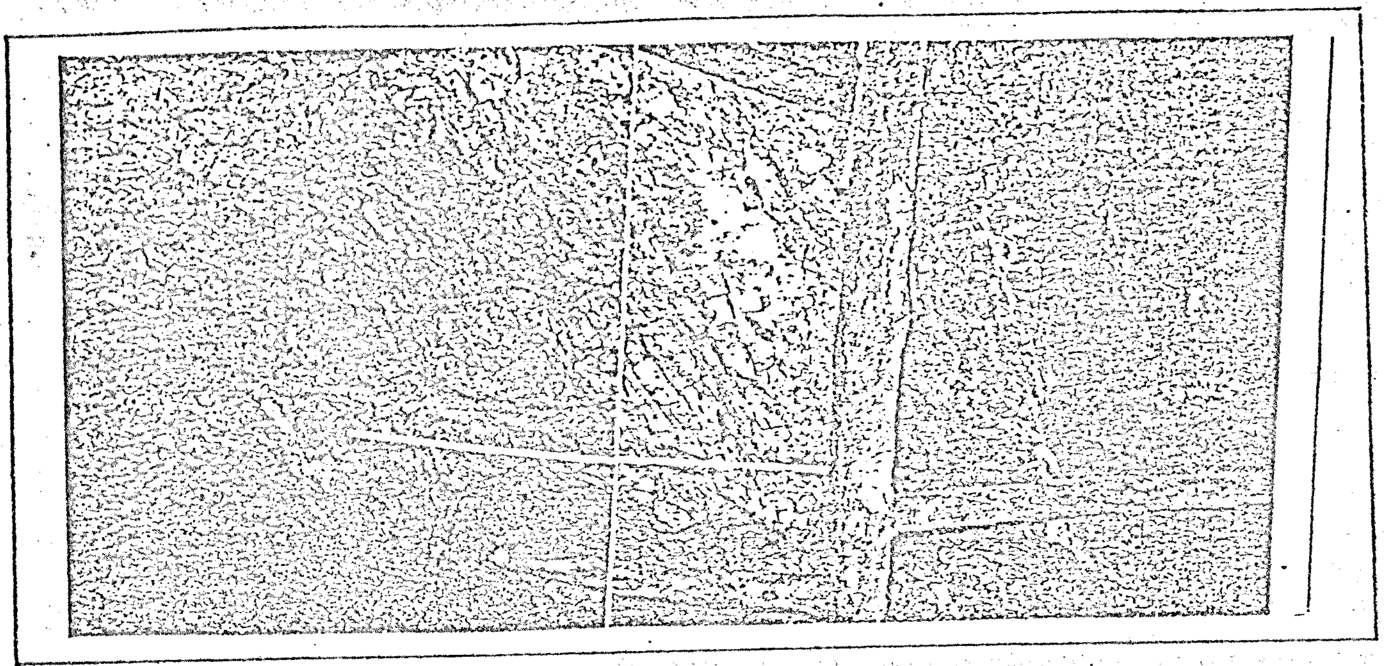
3ft. or 0.9m

XC14 North: Altered massive sulphides (right)

3ft. or 0.9m



UNDERGROUND



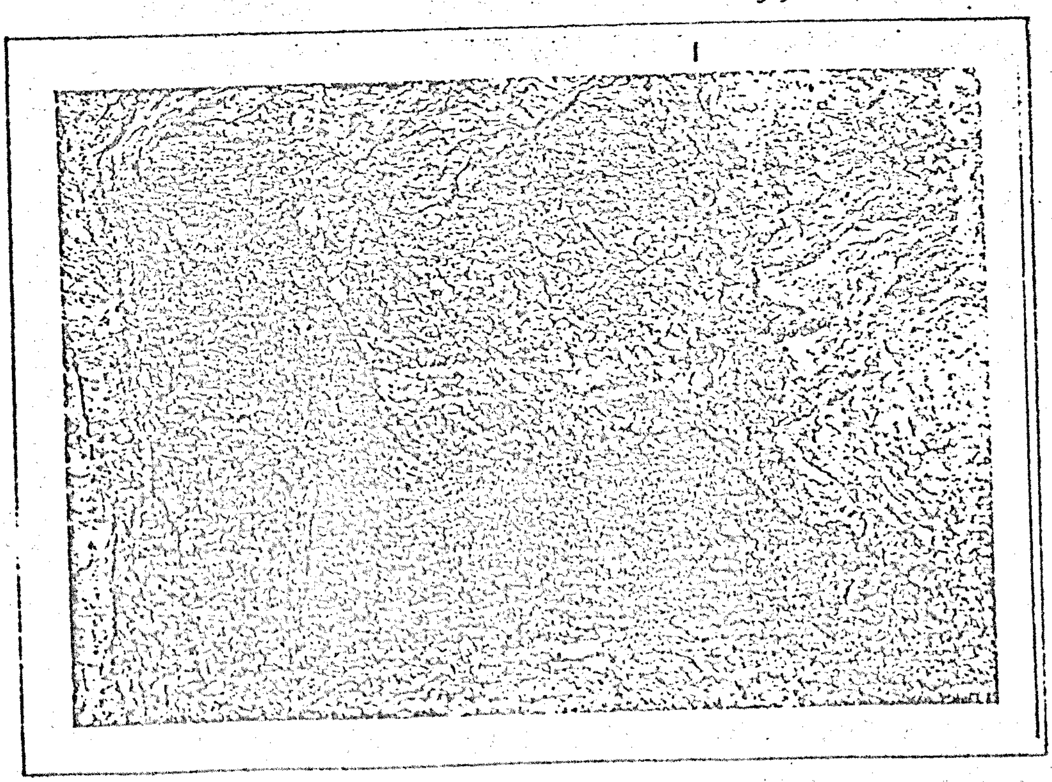
XC - 3 (North)

3 ft.
0.9m

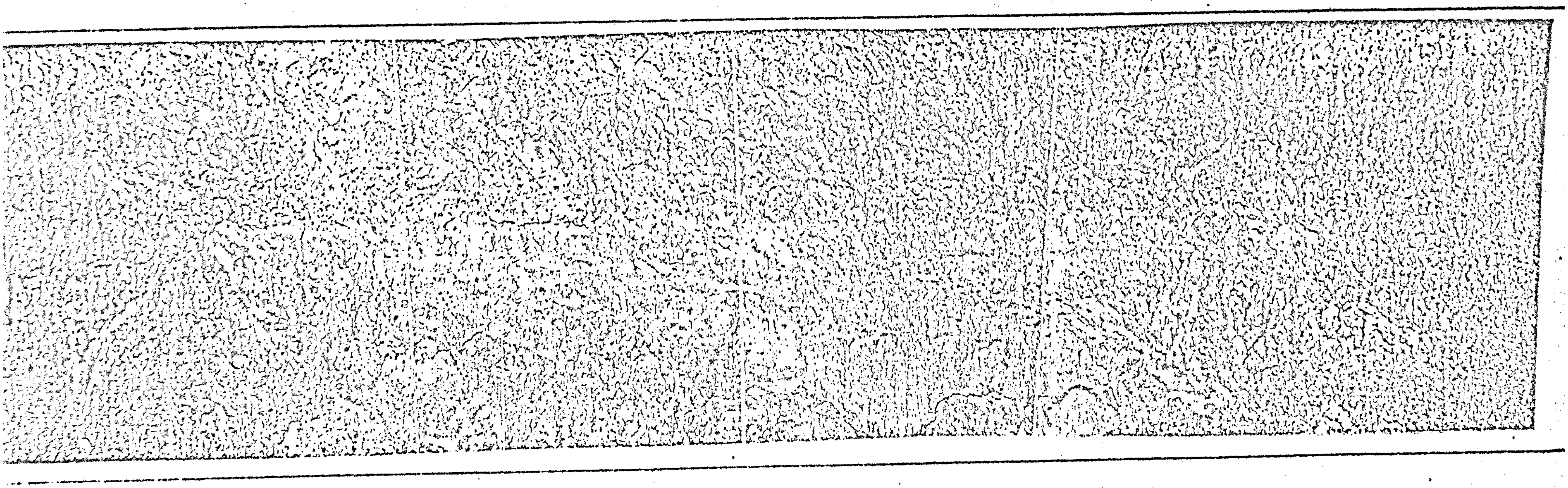
Quartz and sulphides (mainly galena)

XL - 5 , Face

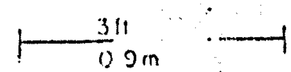
3 ft
0.9m



UNDERGROUND



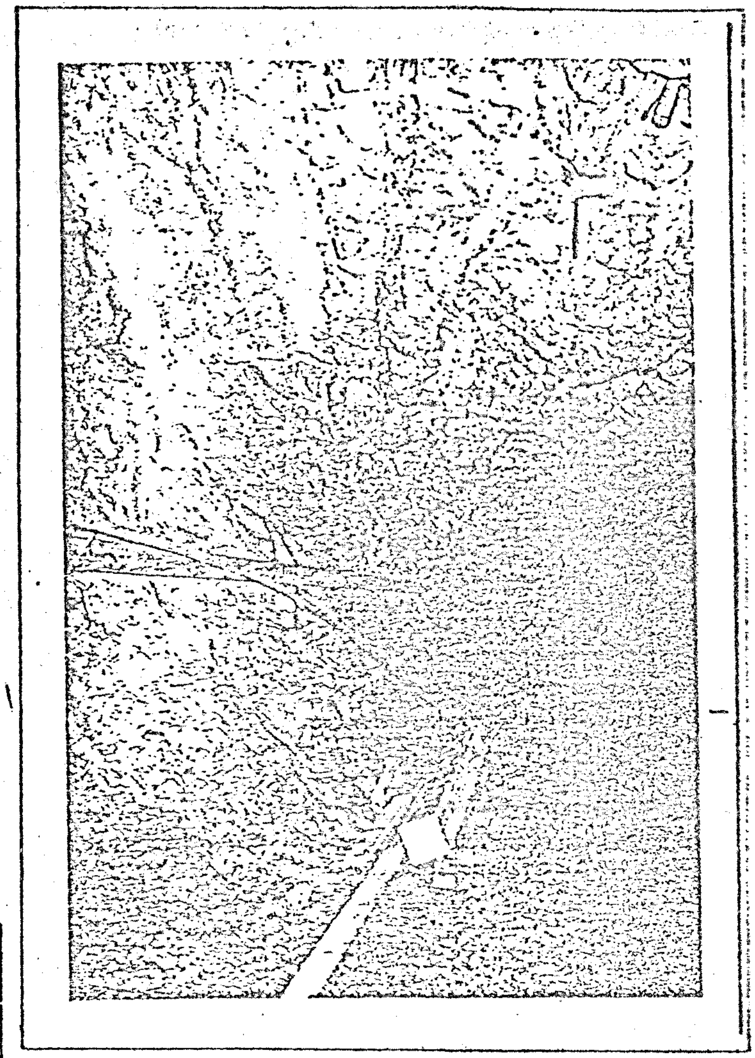
Quartz and sulphide · brecciated and oxidized - XC · 6' North

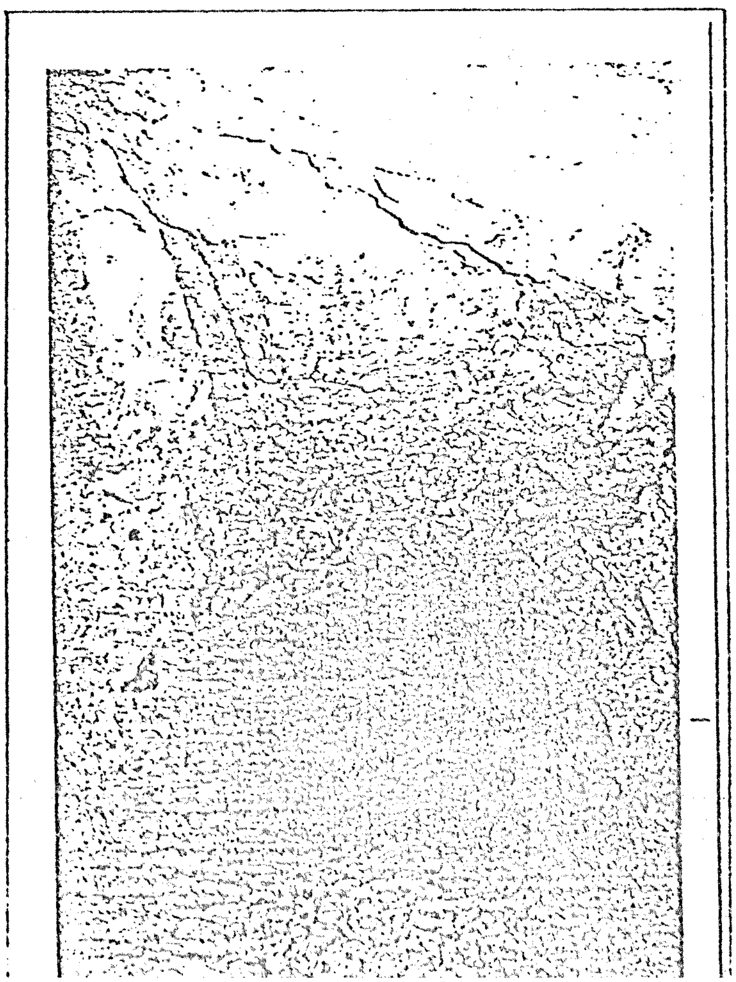


UNDERGROUND

XC - 18 (to North)

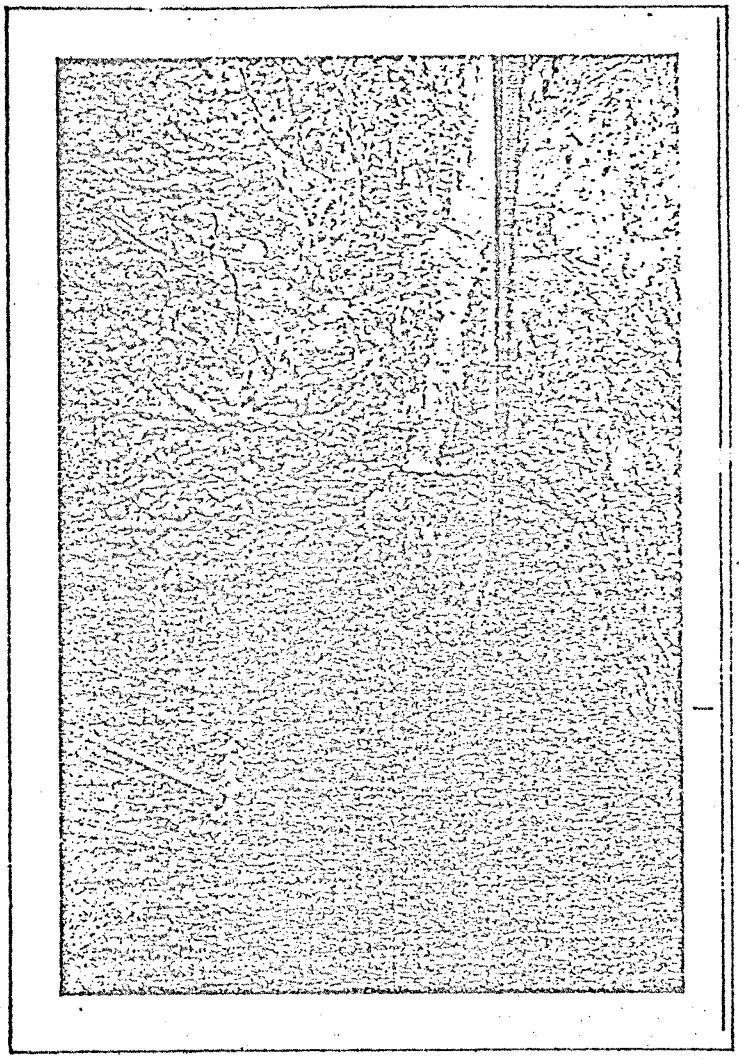
Drifting in vein





XC - 20 to 2.

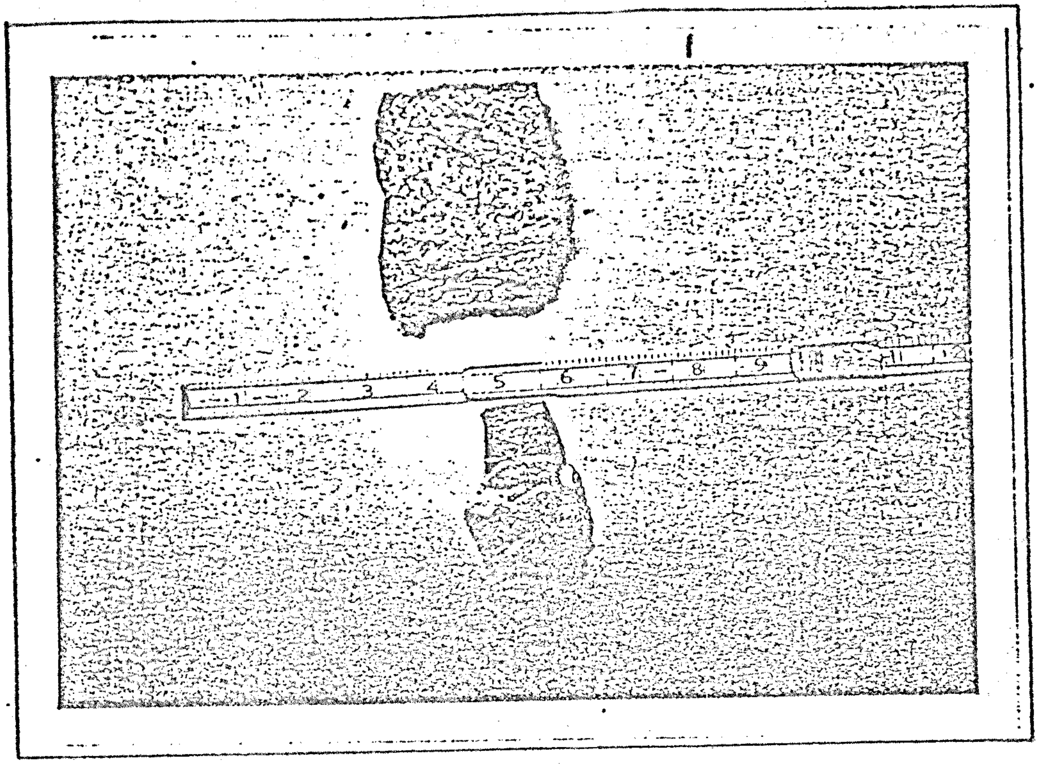
UNDERGROUND



Vein of galena, Portal level 3032

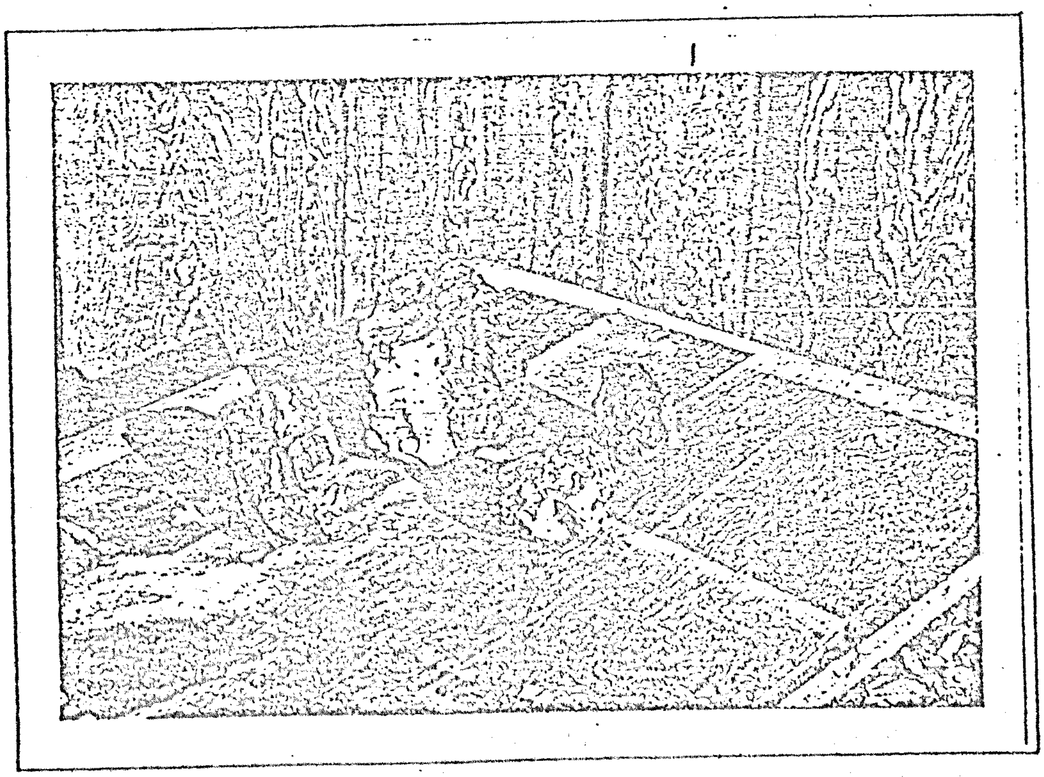
Direction Northwest

MINERALIZATIONS



Up: Vein NW-SE   Down interbedded vein

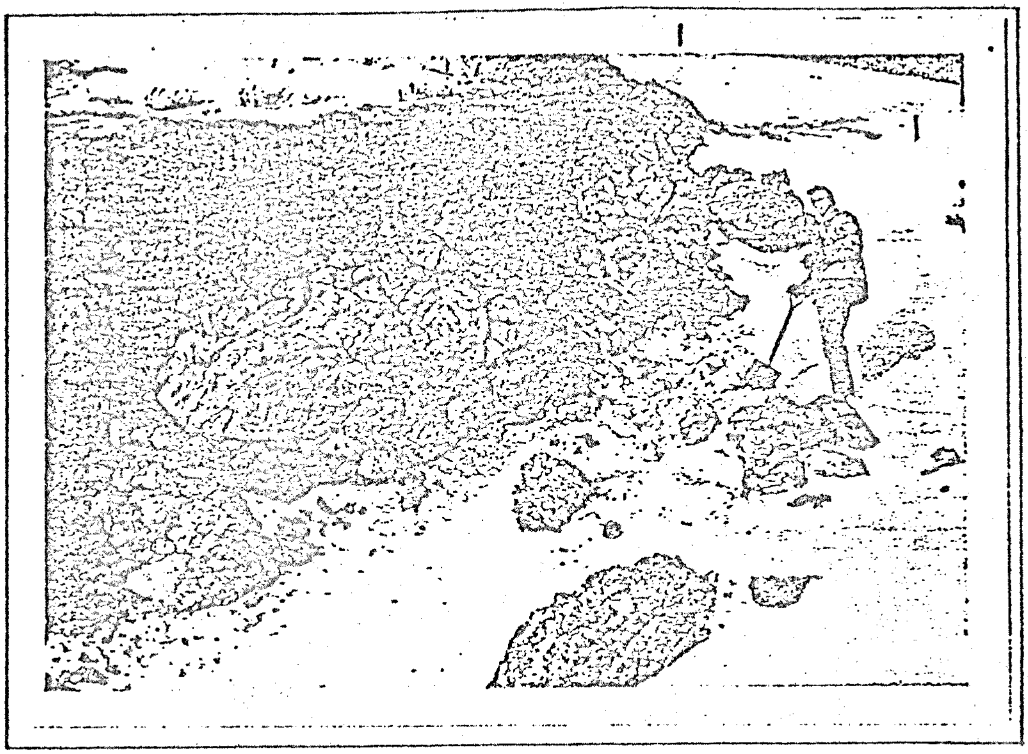
(Level 3032)



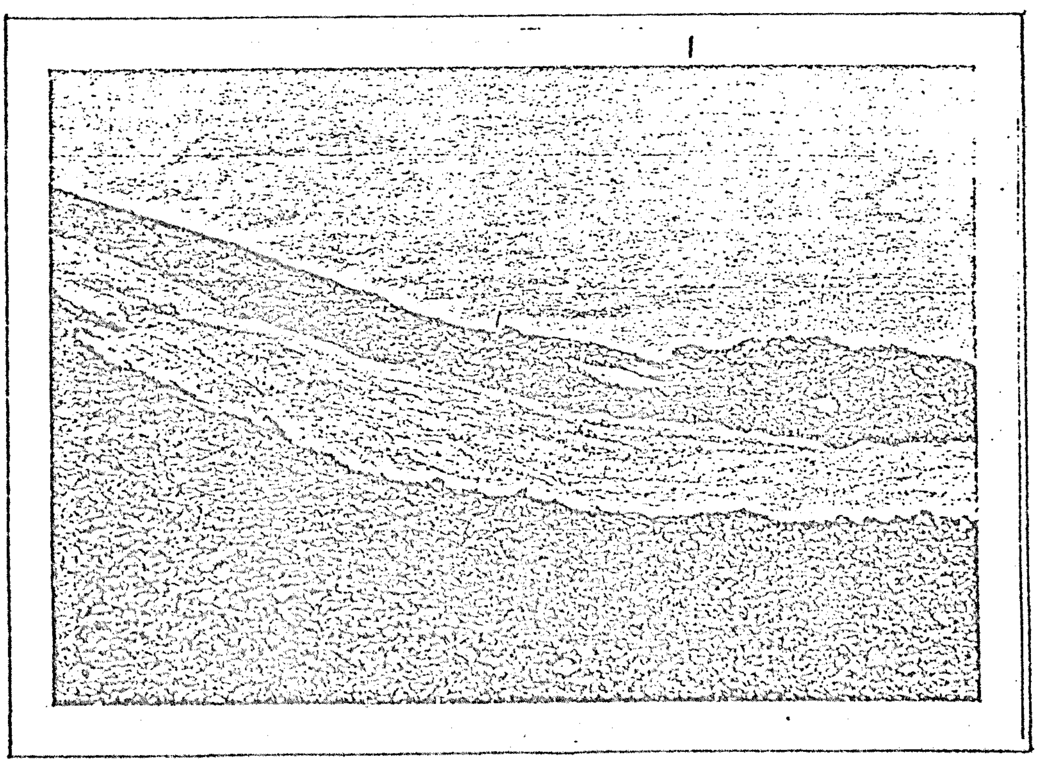
Quartz and massive sulphides; Quartz and galena

Galena and copper carbonates

ZONE - 7

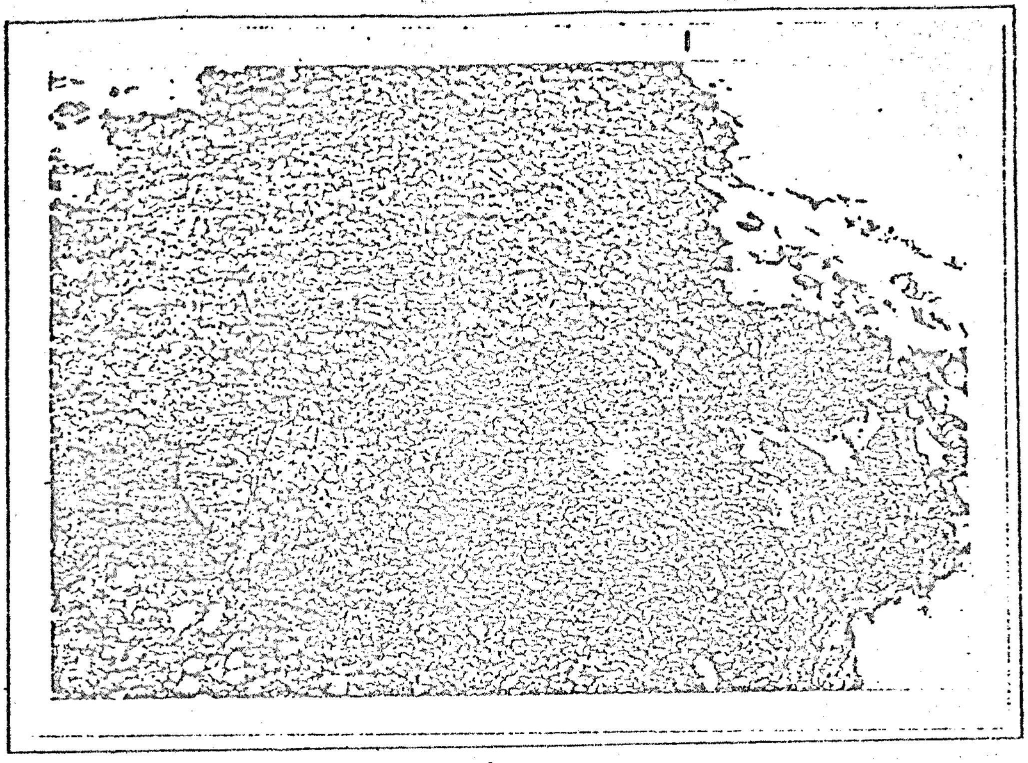


Vein (South part)

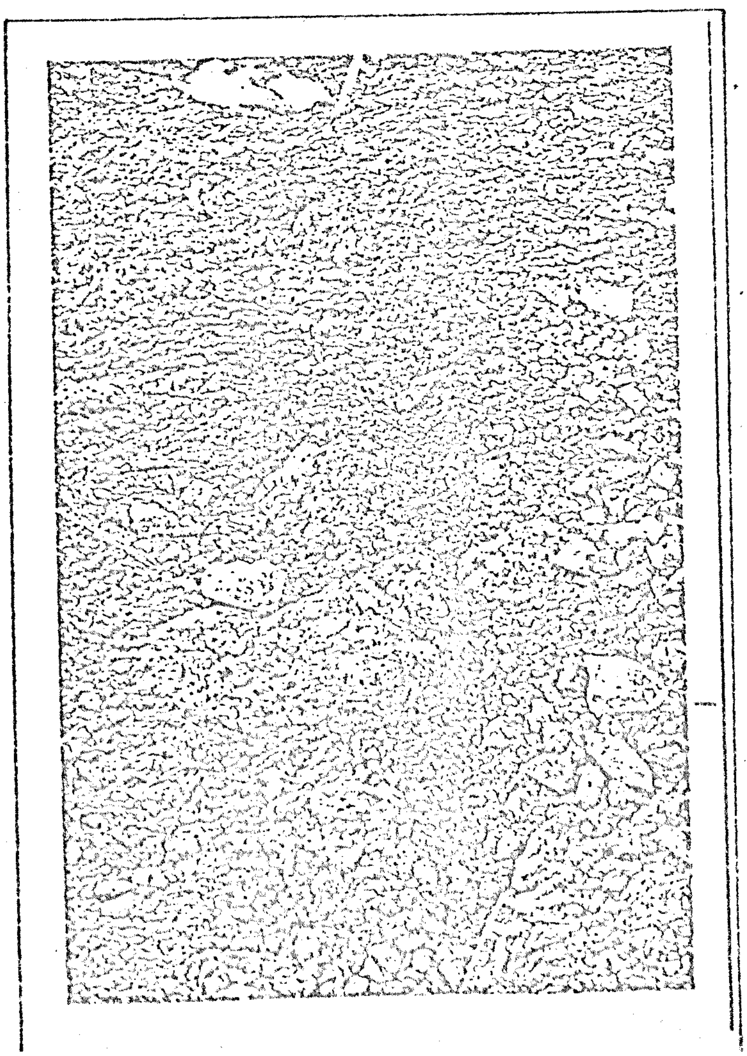


Vein (near the top) with channel sampling

ZONE - 7



Mineralization : Quartz and galena

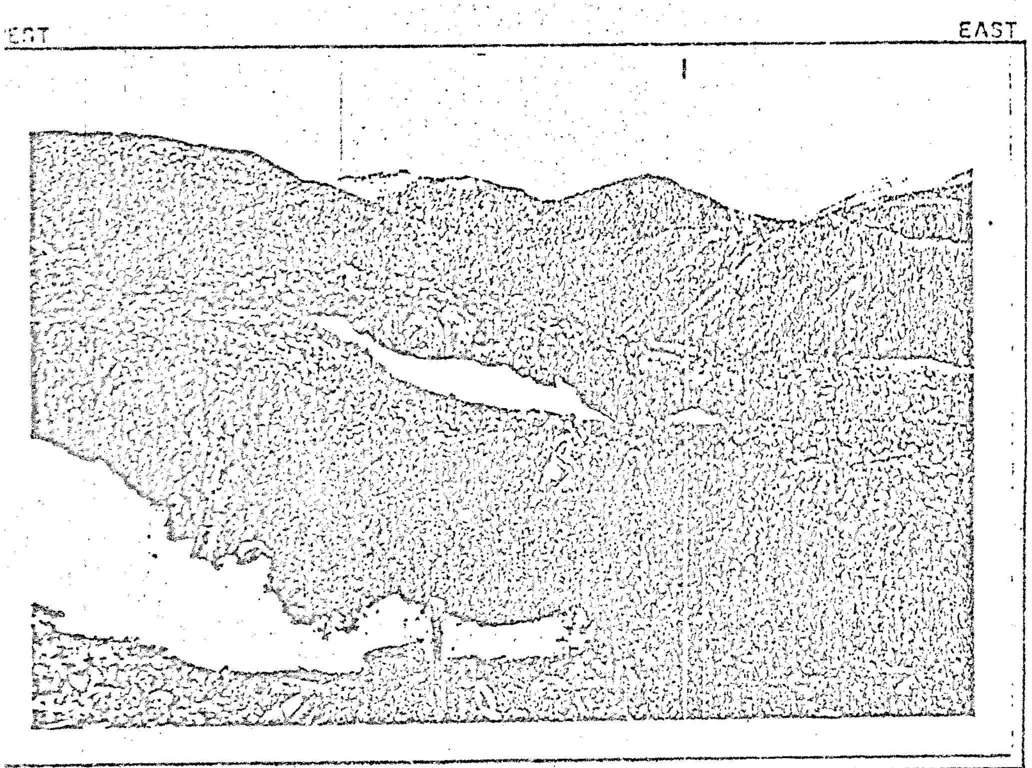


Mineralization Quartz , carbonates of copper
galena

Channel sampling of Dr Ross

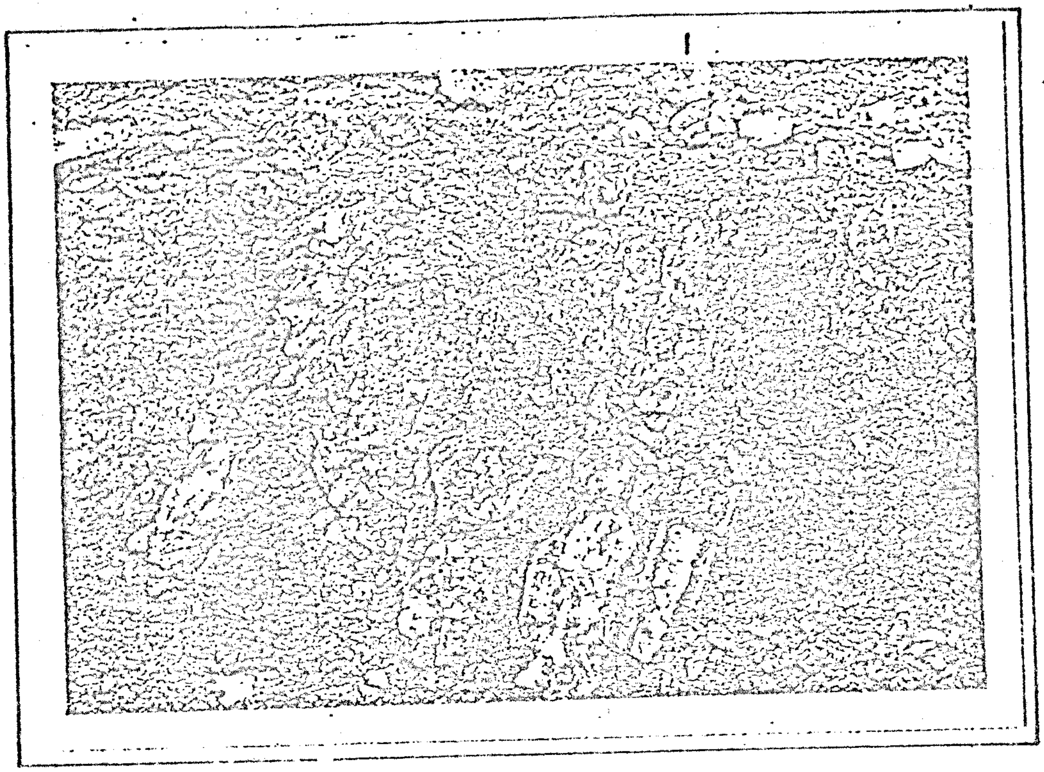
ZONE - 8

North Trench



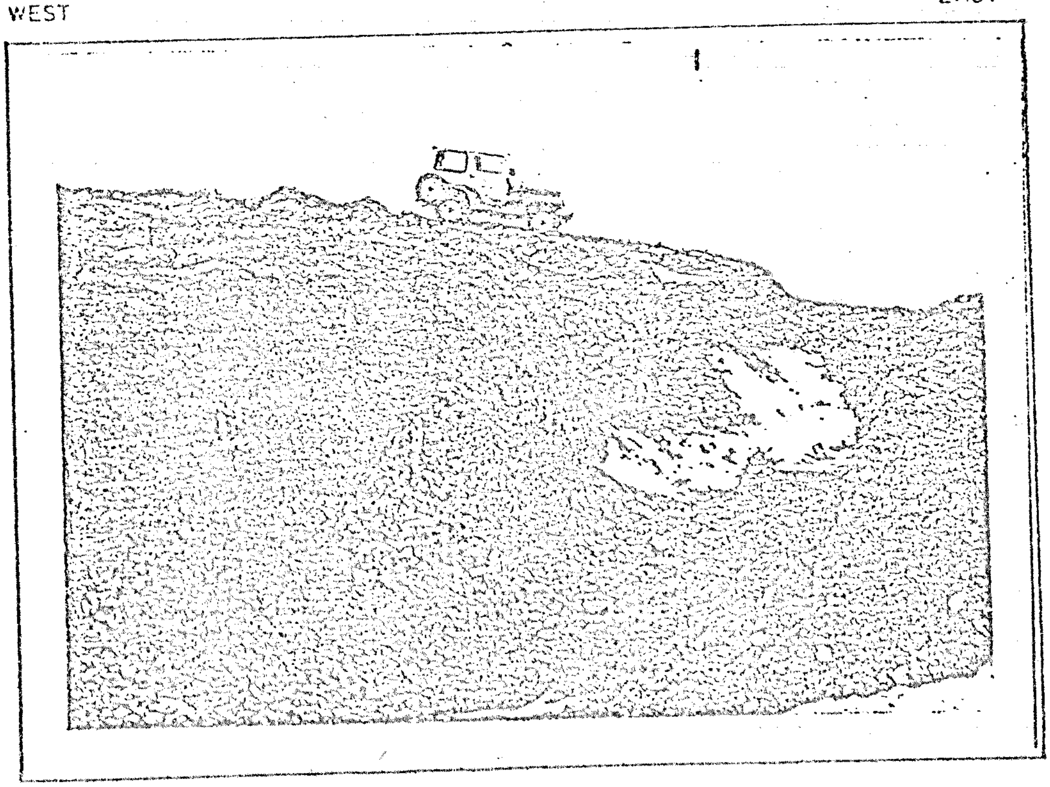
South Trench

Main showing of Zone - 8



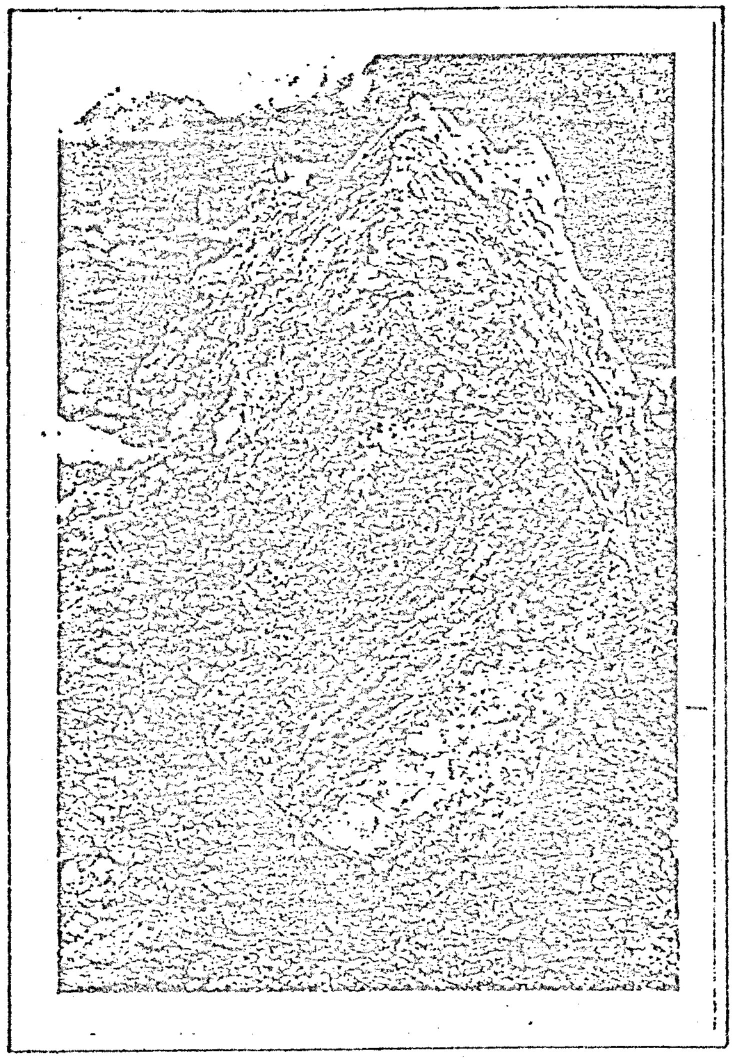
Northern Lens

WEST EAST

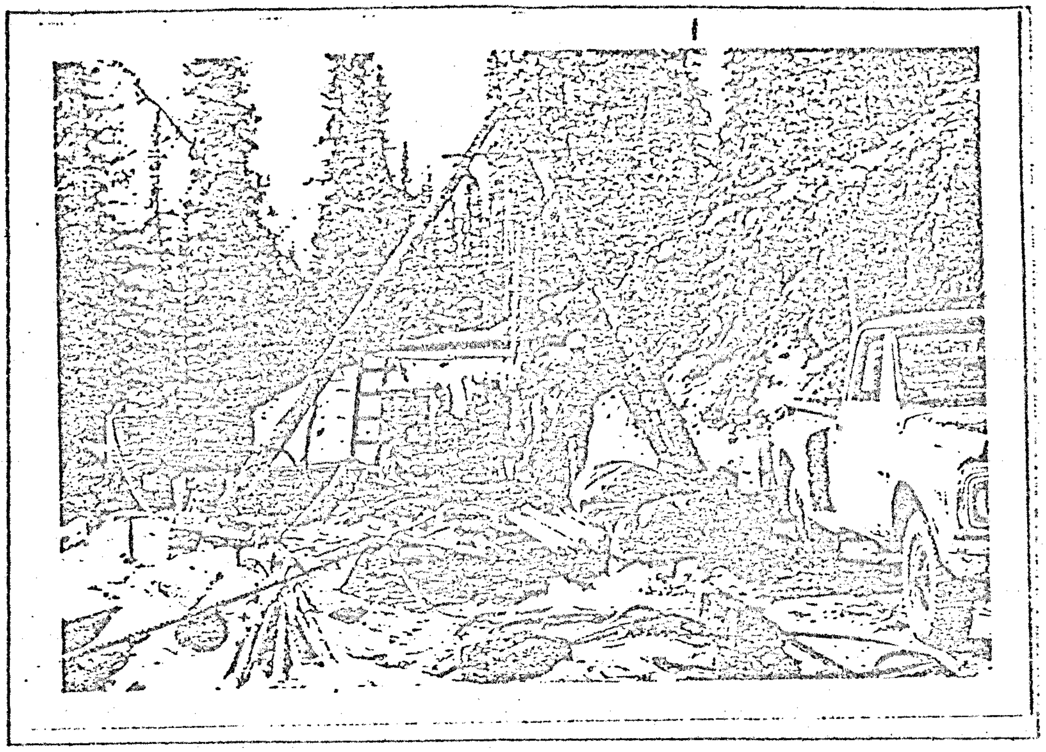


Trench along the shear zone with quartz vein

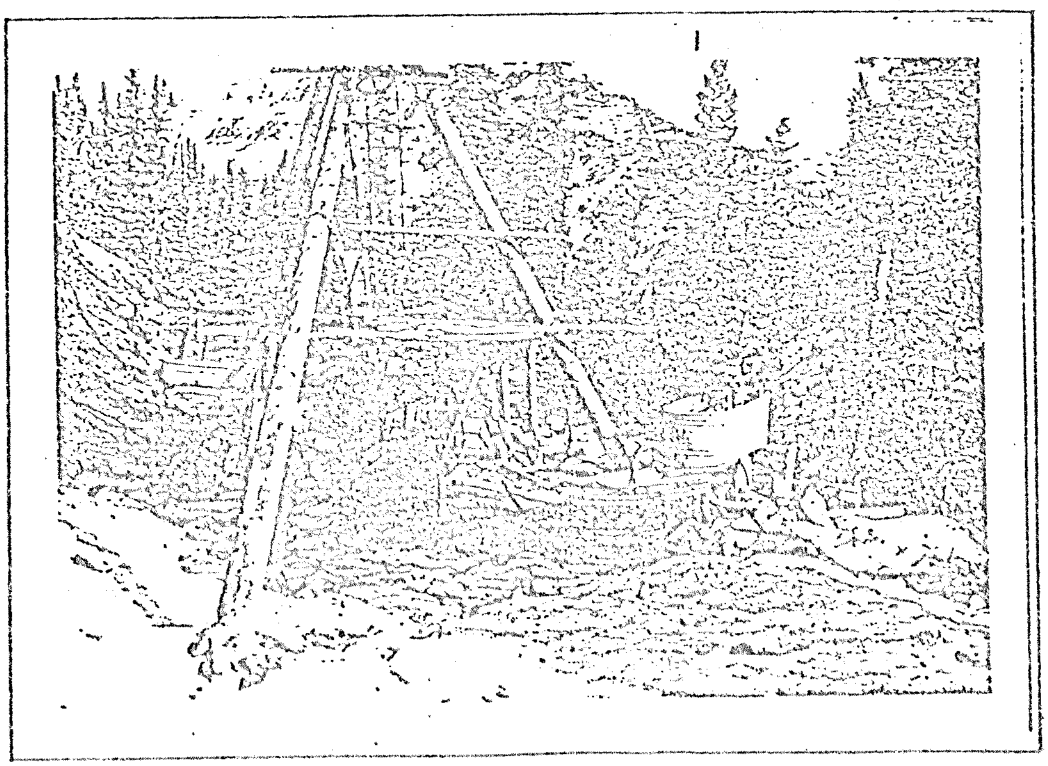
MINERALIZATION

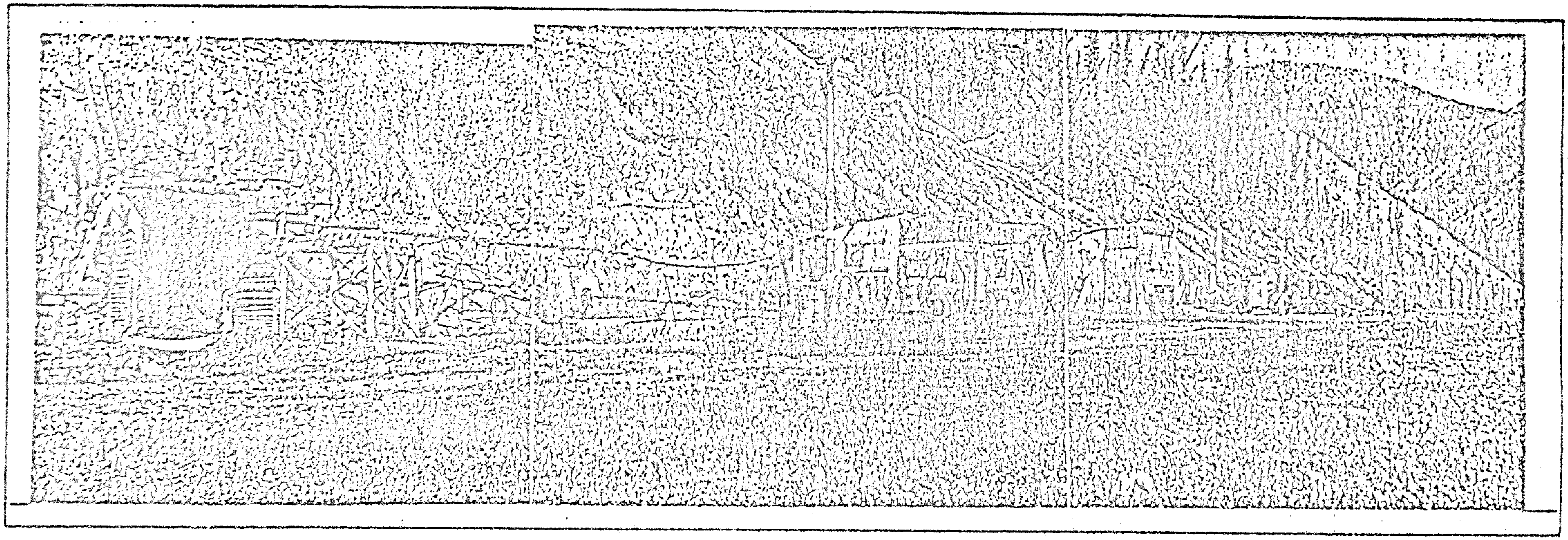


Mineralization of Zone - 8



Drill Hole Nº 6-D-3
(September 1970)





Zone 2   Level 3032 Portal with the compressors and the power plant

IV - 5. Zones 10 to 12.

IV - 5-1. Geology.

These zones main characteristic is the lack of East flank on the main structure.
East anticlinal is not any longer reverse and towards East we notice a synclinal in the reef formations: decline of carbonated mole towards East causes a relaxing zone in structure. However the median turning-point faulting still subsists and is wider (table 20).

The diminishing reef is characterized by an important increase of siliceous products in formations.

IV - 5-2. Showings and works accomplished.

We find two unproductive quartz lens in the valley parting zones 10 and 11. These showings are located in the faulting zone and are similar to the ones in the valley of zones 8-9.

Two of them are lined-up along a N150°E shear-zone: 3 to 4m length and maximum width 40cm (table 21). Mineralization is constituted by small pieces of oxided galena in quartz. Lack of tectonic movement can ascribe this mineralization to extension veins.

The two other veins face N10°E with a mineralization similar to the other ones. The walls are laminated, but strippings did not show any horizontal extension. Although of strike similar as the main structure, these veins do not show any underground potential since they are not located on an adjusting feature: it is only a small shear-zone near the main faulting.

Sections of zone 12 showed a siliceous shear-zone; we notice a small quartz and calcite lens towards North.

There is no drilling on these showings.

V - PROPERTY UNDERGROUND

V - 1. Zone 3.

Zone 3 mineralization was investigated by a drift driven in the foot wall at level 3032'. From this, cross-cuts were made every 100' (30m).

Some drillings established the upper part, but oxided ore was poorly recovered. Other drillings explored veins between elevations 2800' and 2900'.

Deep drillings investigated the downdip at depth.

V - 1.1. Sampling.

Except for cross-cut 13 that was too loose, all cross-cuts have been sampled by an horizontal channel on North and South walls (and sometimes the back.)The channel is located 4' (1,20m) from the ground and is 8" (20cm) wide and 3" (7cm) deep. Each ore or wall type constitutes a sample.

Each of them was crushed to a mesh of less than half-centimeter (1/5"), then split with the Jones Riffle. A 4lb (2Kg) sampling was sent to the laboratory for analysis: LORING LABORATORIES, Calgary, Alberta. They were particularly analyzed for lead and zinc (total and non-sulphide), silver and copper. Cadmium was analyzed above 13% zinc.

Drillings for arsenic and gold were made: very little arsenic and nearly no gold.

Each cross-cut was mapped at the scale 1":10' (1/120). Channels and analyses results were reported on sketches of both walls and crown. Geologic units were drawn on another map.

It was necessary to re-sample the previously driven and sampled cross-cuts in order to obtain a representative sample of the vein for metallurgical tests and to have assays completed to determine the non-sulphide percentages of lead and zinc which had not been previously evaluated.

V - 1.2. Types of ore.

For a more exact potential tonnage calculation and for verification of a zonal mineralization we classified different types of ore.

a) The "massive sulphides" type contains a largely crystallized brown-green sphalerite constituting about 50% of mineralization. The rest is constituted by finely crystallized galena, quartz and carbonates. If the vein is not narrow there is no structure; but in the limited zones there is a roughly orientation parallel to the walls. (tables 22 to 24). In oxided zones sphalerite becomes a yellowish powdery.

b) The "quartz and galena" type contains mainly quartz and galena pockets, either widely crystallized or parallely stripped to the pocket limits. Galena is sometimes facing according the walls edge (table 25). North of cross-cut 8 sphalerite is often mixed to galena. As a general rule, this ore is very brecciated, and sometimes laminated and pulverized (table 26).

c) "Gouge" type is mainly well presented according to cross-cut 21, and is constituted by sulphides (sphalerite and galena) finely crystallized in a mainly carbonated matrix containing some quartz. The unit is laminated and often powdery.
Another "gouge" type is a grey breccia related to a pulverized "quartz and sulphides" type. It could be a type of Karstic filling in the oxidation zone or a washed and oxided "gouge" ore type (table 24).

d) "Dolomitic breccia" is constituted by brecciated and laminated walls dolomite, and often contains quartz and dolomite related to sulphides and forming veinlets or pockets (table 22).

Veins facing N30°W are usually constituted by massive sulphides containing some calcite. In the siliceous beds dolomites zone quartz forms the matrix (tables 28 and 29).

V - 1-3. Distribution of ore types.

We read in chapter III we can divide the main vein in three parts correspondent to different tectonic stressing zones:

- In cross-cuts 2 to 8, main part of mineralization is constituted by quartz and galena brecciated or not.
- In cross-cuts 9 to 21, mineralization mainly contains massive sulphides.
- North of cross-cut 21, "gouge" type ore replaces massive sulphides.

We made a simple statistic study of division of ore types, using the sample length as a numeric factor, this gives an idea of division and of metal contained in case of a selective exploitation. So we can make a more exact calculation of ore density.

Extern dolomitic breccias (walls) are not included in the percentage calculation, only give an idea of underground dilution.

We did not use the "geologic" divisions indicated above. We regrouped sections 9 to 24. Afterwards we probably have a lens mineralization; the walls dilution will be very important, and the exploitation probably very expensive since mineralization is located in a large and unstable tectonized zone. This division is rather "underground".

We find results of this study in the four following tables. The fifth one is recapitulatory of mineralized zone.

-SECTIONS 2 A 8

	Width	%	Pb(Tot) %	Zn(Tot) %	Pb/Zn	Ag oz/t	Cd %
Massive Sulphides	—	—	—	—	—	—	—
Quartz and Sulphides	68.2'	58	11.41	6.42	1.77	4.66	—
Quartz and Sulphides Brecciated	34.0'	29	4.41	6.48	0.60	1.87	—
Gouge	10.6'	9	2.86	5.30	0.53	1.06	—
Dolomitic breccia (internal)	4.9'	4	7.41	13.59	0.54	2.08	—
Dolomitic breccia (external)	(46.2')	—	1.53	4.50	0.34	0.47	—
TOTAL	118.6'	100	8.42	6.63	1.26	3.41	—

-SECTIONS 9 A 24

	Width	%	Pb(Tot) %	Zn(Tot) %	Pb/Zn	Ag oz/t	Cd %
Massive Sulphides	142.9'	42	17.56	25.05	0.70	9.55	0.16
Quartz and Sulphides	37.3'	11	11.44	11.68	0.97	5.77	0.11
Quartz and Sulphides brecciated	68.3'	20	10.18	10.73	0.94	5.46	—
Gouge	32.5'	39	12.75	16.33	0.78	7.96	0.11
Dolomitic breccia (internal)	61.1'	18'	4.40	7.88	0.55	1.85	—
Dolomitic breccia (external)	(78.5)	—	0.66	4.69	0.14	0.20	—
TOTAL	342.1'	100	12.61	16.83	0.74	6.79	—

SECTIONS 25 A29

	Width	%	Pb(Tot) %	Zn(Tot) %	Pb/Zn	Ag oz/t	Cd %
Massive Sulphides	27.0'	33	18.28	19.92	0.91	10.70	0.13
Quartz and Sulphides	8.9'	11	12.13	9.79	1.23	5.27	———
Quartz and Sulphides brecciated	6.6'	8	9.60	9.96	0.96	5.26	———
Gouge	27.7'	33	14.20	17.14	0.82	6.84	0.21
Dolomitic breccia (internal)	12.3'	15	1.36	1.91	0.71	0.66	———
Dolomitic breccia (external)	(44.9')	———	2.51	5.65	0.44	1.06	———
TOTAL	82.5'	100	13.02	14.41	0.90	6.88	———

SECTIONS 30 A 32

	Width	%	Pb(Tot) %	Zn(Tot) %	Pb/Zn	Ag oz/t	Cd %
Massive Sulphides	2.8'	12	4.21	10.27	0.41	2.21	0.07
Quartz and Sulphides	———	———	———	———	———	———	———
Quartz and Sulphides brecciated	———	———	———	———	———	———	———
Gouge	12.2'	53	5.96	9.05'	0.65	2.38	———
Dolomitic breccia (internal)	8.0'	35	0.35	1.65	0.21	0.14	———
Dolomitic breccia (external)	(22.2')	———	2.11	5.56	0.37	0.91	———
TOTAL	23.0	100	3.79	6.62	0.57	1.58	———

SECTIONS 2 A 29

	Width	%	Pb (Tot) %	Zn (Tot) %	Pb/Zn	Ag oz/t	Cd %
Massive Sulphides	169.9'	31	17.67	24.23	0.73	9.74	0.15
Quartz and Sulphides	114.4'	21	11.47	8.39	1.36	5.06	—
Quartz and Sulphides brecciated	110.1'	20	8.32	9.33	0.89	4.31	—
Gouge	70.8'	13	11.83	15.00	0.78	6.49	—
Dolomitic breccia (internal)	78.3'	15	4.11	7.30	0.56	1.68	—
Dolomitic breccia (external)	(171.6')	—	1.39	4.89	0.28	0.50	—
TOTAL	543.5'	100	11.75	14.23	0.82	6.07	—

V - 1.4. Zone 3 potential tonnage.

The vein upper limit is constituted by limestone level North; part South the structure ends-up by a Stockwerk of Strike N150°E.

The lower part is constituted by a faulting causing the adjusting fracture where the vein is.

Mineralization was divided in three horizontal slices, corresponding to the works density (see index table):

- Type A is estimated by underground works and framed by drillings.
- Type B is estimated by 5 drillings on a 1450' (435m) distance.
- Type C is the blocks not intersected by consistent drilling.

Dip vein variations are indicated on the plan. The average dip is 65°E but varies from 53° to 73°.

For the tonnage calculation, we supposed the division, studied level with underground trace is the same for the entire vein. Drillings are used for the vein strength calculation.

We find results in the following table:

	Volume (m3)	d	Tons short	%Pb	%Zn	Oz.Ag/ton
Type A	173.211	3.6	687.389			
Type B	53.998	3.6	214.278			
Type C	118.634	3.6	427.081			
Total	345.845	3.6	~~1,372.438~~ 1,328,748	11.75	14.23	6.07

To this we can add 0.1% cadmium, which is 1015t to this contained metal.

Besides, a calculation on samplings containing more than 0.35% copper, shows that 48% of mineralization contains 0.84% copper, which gives 4094t copper for the entire material. This copper is related to tetraedrite recovered because of its silver component. Galena contains approximately 1Kg silver per ton: quantity of valuable metal contained in the material and related to galena is of 120.000Kg. And there is 210.000Kg silver: more than 40% of this metal is related to grey coppers.

To give a more exact idea of the location of contained metal, the following table indicates the division of Type A:

	Volume (m3)	d	Tons short	Pb Tons short	Zn Tons short	Oz.Troy Ag
xc 2 to 8	36.562	3.26	131.385	11.063	8.710	444.52
xc 9 to 24	116.459	3.71	476.262	60.057	80.155	3,222.65
xc 25 to 29	20.243	3.68	82.115	10.691	11.832	562.82
Total	173.264		689.762	81.811	100.697	4,229.99

There is approximately 0.1% cadmium when the value is 13% zinc.

Copper division is:
- cross-cut 2 to 8 : value less than 0.35% Cu.
- cross-cut 9 to 24 : for 58% ore, value: 0.85% Cu; or 2130t.
- cross-cut 25 to 29 : for 71% ore, value: 0.82% Cu; or 933t.

In summary vein of zone 3 contains approximately 1Mt ore with the following component: 11,75% Pb; 14,23% Zn; 208g/t Ag; 0,1% Cd and 0.40% Cu.
Proportion of oxided ore is not yet known due to contradictory analyses of laboratories.
We can add 11000t ore containing 3000t lead (zone 2); and a bit more important tonnage for drift 2 North veins, this is Type C.

V - 2. Zone 7.

Continue and regular vein (table 30).
A channel sampling was made in 1969 under direction of Dr. Ross. Samplings were taken every 25' (8m). Lead and silver values are clearly superior to the ones of drillings. There seems to be an enrichment in the upper part (table 31). Comparative values table:

	Width	Pb%	Zn%	Cu%	oz/t Ag g/t
Trenches	6.9'	16.2	10.6	0.41	7.57 259
7-B-1	3.8'	9.07	9.44	0.15	2.88 98
7-D-2	2.8'	9.26	10.90	0.25	4.74 162
7-D-5	1.8'	9.76	3.40	0.10	2.80 95

Index table shows location of possible potential tonnage. Vein length 690' (207m), downdip 264' (70m) and average strength 4' (1,2m). Mineralized volume is 728,640 cb ft or 20.628m^3. According to the adopted mineralogic composition, this zone metal component can carry from simple or double. Table below gives results of both calculations:

	Density	Tons short	Pb (ton short)	Zn (ton short)	Ag (oz/Troy)
Trenches	3.78	85.950	14.301	9.111	649.3
Drillings	3.38	76.855	7.147	7.762	264.5

Zone 7 contains approximately 60000 to 70000t ore, major part of which is oxided. But the possible component metal varies from simple to quadruple.

V - 3. Zone 8.

Surface outcrops of this zone show that the mineralization is not continuous and divides itself in three lenses along a shear-zone.

The most important is the center one; but we notice that width variations are very fast (tables 32 and 33).

The mineralization is striped in quartz and also very oxided. We notice cerusite colloform concretions (table 33).

The sampling was made in 1969 (see index table); but the spacing of trenches is irregular. Certificates of analyse of drillings 8-B.1 and 8-B.3 have not been found: values given in documentation seem very exaggerated in comparison with the showing samplings.

The following table gives the average of values for surface trenches and for drillin (except drillings 8-B.1 and 8-B.3).

	Width	Pb%	Zn%	Cu%	Ag oz/t g/t
Trenches	6.4'	14.7	16.1	0.34	7.03 241
Drillings	7.5'	4.5	7.4	0.11	1.79 61

The first line is probably optimistic since non-mineralized zones have been less frequently sampled than mineralized zones.
The second line is pessimistic since the ore is very oxided and drillings recoveries are very bad.

According to these observations, the following calculation gives alternatives:

	Volume (m^3)	d	Tons short	Pb (ton short)	Zn (ton short)	Ag oz/Troy
Trenches	61.172	3.81	256.908	37.766	41.361	1805.8
Drillings (2)	71.686	3.06	241.009	10.844	17.834	428.8

There is approximately 220 000t of very oxided ore in this zone. But the possible metal content varies from simple to quadruple.

V - 4. Zones 9, 10, 11 and 12.

From observations made of these zones, but without any finite measurements or values to support, we can only assume the possible potential of this area. For this a figure of 150 000 tons short of Type C is inferred.

V - 5. Summary of indicated reserves.

In summary from the preceding chapters, the indicated mineral inventory at Prairie Creek is as follows:-

	Tons short	% Pb	% Zn	% Cu	Oz/T Ag
3 Zone	1372.398	11.75	14.23	0.4	6.07
7 Zone	85.950	12.75	10.35	0.29	5.53 *
8 Zone	256.908	9.6	11.75	0.23	4.41 *
9 to 12 Zones	150 000	No values assigned			
Total	1865.256				

1328,748 X

1821,606 X

With an average grade of:

- 11.48 % Lead
- 13.65 % Zinc
- 0.3 % Copper
- 5.81 oz. per ton Silver

* Arithmetic averages

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