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Geological mapping in Evenesdal.

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Sammendrag

Rapport om geologisk kartlegging og undersokelse av tektoniske strukturer i omradet Evenesdal - Vassbotn. Systematiske profiler er tegna med tanke pa senere undersokelser av grafittskifre, mineraliserte lag og magmatiske bergarter. Spredte mineraliseringer av svovel- og kopperkis, dels i grafittskifre, dels i amfibolrik 'feltspatisk~ kvartshorisont er pavist. Kart mangler.

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Geological mapping in Evenesdal

Jan S. Postma

1967

C o n t e n t s:

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Chapter I.

Description of the task.

Mapping of the area situated between: 66° 55' 10"N - 16° 59' 24" N and 15° 19' 18" E. 15° 30' 17" E, that means the study of the different kinds of rocks and their tectonical structure.

Chapter II.

For the situation - see ch. I.

The discription of the landscape.

The landscape has the outlook of a recent post-glacial time, and will because of:

a. The mostly N. shaped forms of the valleys.
b. The tribuazy hanging valleys coming out on the of a higher class.
c. The bad drainage system.
d. Fitting up of morene material, f.i. on the conjuction point of the Vatselva and the Sauelva.
e. The smooth rounded forms.

Because of the coming up of the Scandinavian Continent is there nowaday's to study a strongly influence of recent erosion., so the cutting in of old gletcher vallyes of nearly formed erosion valleys so as f.i. the Evenesdal between Petterheim and Fossen.
The hight varies from 30 m in the Saltdal, near Røkland till ± 800 m on the Storfjellet. With the exeption of the last montain, lies the area beneath the tree borders so that the most of the terrain is covered with growth, which is a bore for a good geological study.
The best exposures are to find in the Evenesdal and around the Vassbotn.

Chapter III.

a. Plan of work.

The intention was: First study the west and make the connection with the already existing map of Steenken.

Second: Making systhematically profils to the east, more or less perpendicular on the strike (which commonly is NNE-SSW), including the following for more securely mapping or may be for later research important layers, so as:

1) The graphitic one's (Geophysical importent in connection with the conductivity of electricity.

2) Layers with a certain mineralisation.

3) The rock's of probable magmatic origin, so as the Serpentine (see g.5). See the list of the followed route.

b) Description of rock kinds and formations.

The dividing in rock formation's on the ground of the metamorfose grade and tectonic's, is so far as it is to check, taken over from Steenken.

1) Amfibolite - Staurolite formation.
The whole western part of the investigated area consists, so far as it is studied, out of this division.

To the east it goes over in the Calciferous-formation, with, on the border, quartsitic graphite layer's, alternating with:

a) Garnet rich schist of a silky luster.

b) Hornblende rich schist.

c) Glimmer schist, generally very weathered.

The most use of this formation consists out of marble, (see maps and photos), with locally bands of biotite or hornblende, but the general picture is a rather pure limestone. At point (25 000 N - 15 500 E on the Map) and on the top of the Selvbergnupen you find a mass up of rather thin layers (2 - 5 m in thickness of resp. amfibolite, garnet glimmer schiefer, (with and without direction less amfibolite cristals, reaching up till 5 cm in length), and quartsites grouped around a almost not schiefered base of a may be fyllitic stone (see sample 240).

Between them is again the lime stone, and farther to the west goes a quartsite layer of 5/6 m in thickness, which is may be the same as used by Steenken as a guide horizon. To the marble is always bound a fine grained compact amfibolite horizon - to observe so well in the west as

in the east. On the east side is a typical banded rock, consisting cut of a alternation of feldspatic glimmer bands and quartz with eye shaped feldspatic knots in them (see sample 108), it disappears in the south and is not found back in the north. This rock is baptised: KNOTEN-SCHIEFER.

In the south-east is between the amfibolite and the KN.S. a Serpentine layer with a zone of typical conduct minerals (alternation of hornblende and glimmer rich bands). See fig. I, II and S.10). Upon the limestone - probable bound to the Serpentine - lies on the east side a hornblendefels - very rich in light green hornblende crystals, grouped without direction in weathered white mass rich in lime - also not found back in the north and southern part.

This whole group of rocks was very keenly studied in the middle (see fig. II 6/m IV) while they were not found back in the north.

Other curiosity: a almost not schiefered gneissic rock, only found in the south (see photo g-5+ fig. IV), while in the S.E. the two observed parts don't fit, may be, because of fault or magmatic origin.

In the S.E. bends the lime stone to the east, while direct upon it lies a very weathered zone - of lime biotiteschist, (fig. 4). Farther to the east comes a alternation of amfibolites and biotiteschists.

In the footwall of this whole complex follows a bank consisting out of glimmer schiefer and lime-stone layers, with along the border of the Sauelva tubes like quartz-feldspatic, sometimes somewhat mineralised parts in it. May be vulcanic bombs. (+ epid.)

This is good to study on the western slope of the Nupen. The western border of the lime-stone is only partly studied.

On point 3, see photo P5, is observed a reduction of bands rich in hornblende and glimmer schiefer. The whole outlook of the slope makes the impression of consisting out of a alternation of bands rich in lime-stone and schiefer. The connecting border of the lime-stone from point 8 to the north is defined by the long distanse method, se that it is not exact.

On the north-side of the Vassbotnelva are observed two separated lime-stone bodies, separated from each by a racket of schist. Only the borders of the eastern one are securely.

The graphitic border horizon of the staurolite-amfiboliteformation.

In the south and in the middle of the field is this complex rather steady in content and thickness (± 500 m.)

Because of a rather high percentage of quarts are these graphitic layers relatively more resistant to the wheathering, than the surronding rocks, with the result that they forms on many places extending ridges, which are easier to study than the surronding rocks, in spite of the dense growth. Even on the photografs are they on some places to find back in that way.

For making a propper mapping of this complex, there was first made a profil in the stream from the Sirivann (see map II, 6-6' and fig. VI), in the Hogndalen (see photograf q-q along route 7-7' (Map II and f.P5) and along the south side of the Vatsbotnvann.

In profil 7-7' a mineralised zone of ± 1,50 m thickness was found on point 161. (See photo q-5).

This layer was followed and mapped so securely as was possible, but the mineralisation was not found back farther on till the Hogndalen, where it is only a layer of about 1,50 m between schists.

The same unit is found back on point 10 in profil 7-7', map II.

Along the side of the Vatsbotnvann is only found a graphitic layer near the bridge on the west side (th. 15 m) and on point 26/50N/16850 E. Between them is a whole complex of glimmer schists of some 700 m in size. On point X^2 of map II is an old digging place of ore in the mineralised graphitic layer. It this is in the same layer as the one studied over the whole field, then there must be something the matter with the tectonic' because the strike (in general) tends to the east in the northern direction.

The Calciferous formation.

a) The complex rich in lime.

Generally, it consists out of biotite-schists with a high lime content, locally these rocks have a greenly outlook probably because of epidot, while the glimmer is missing - this has been seen near Petterheim and Hogndalen.

In the south borders this complex at a glimmer rich none Calciumcarbonat bearing schist, with also some concordant quarts benches in them, where by some of them have well developped clear quarts crystals. In the center of the surveyed area is this structure disturbed by gangs of more or less granitic composition (see sample 224), measuring up till 5 á 6 m in thickness.

The bigger ones has a ± 10°E strike, while the smaller gives in this respect quite a variation. On the contact of these gangs is to be formed a combination of fine grained amfibolitic and biotitic layers with very small bands rich in lime-stone (thickness = ± 1 mm (see sample 226). These rocks are strongly secondary folded, where by the direction of the folding is adjusted to the of the gangs.

To the north and the south, thenumber and size of these gangs dicreases rapidely, which on the Vatsbotn side only relatively few were observed in the south however was found back the same structure, but only extending over a smaller area.

Fixed points of the border:

1) On the south side of the Vatsbotn:

   A complex was observed with some lime content between point 29 000 N/ 18 000 E and point 28 100 N/18 150 E. Then follows a biotite schiefer with a rusty brown appearance of some 100 m in thickness, while on point 28 850 N/18 200 E and point 29 000 N/18 400 E was observed the rock with the lime content again. In this whole unit was observed a variation of the dip from 80° till 40° and the way back, which makes it probable that we have here the offshoot of the anticlinal, mapped in the north.

2) To the west on a place ± 50 m to the east of point 10 (see map II, profile 7-7'), while on point 11, just on the southern-most tip of the Stormoen (see map II) the crossing is to the complex rich in gangs which is described above.

3) Near Petterheim, on the road going down to the Evenesdal is found a section of (from the W/E) a schist rich in epidct and lime, biotite schiefer, with bands very rich in lime and at last a biotite schiefer without lime.

4) Evenesdal. South side, pnt. 12 (see map II)
East border, pnt. 19 (see map II)

5) Profile 7-7'. West border pnt. 182
East border ± 30 m west of pnt. 186
but this was not securely to make out because of the covering (see map II).

List of some loose observations, made farther to the east:

1) On the western slope of the Storfjellet (see map II)
   a. A biotite schist, lime free (n - n4)
   b. A biotite schist, lime free, rich in gangs, pnt. 21.
   c. Amfibolite pnt. 22, which has in the western part a almost direct strike (20°E), but is some 400 m farther to the east strongly folded.

2) A schist, with a graphite content on pnt. 21175 N/18 100 E.

3) Profile 5-5' on the map II:

   a. Pnt. 189, there was found a small layer with some lime content (thickness ± 5 m).

   b. Pnt. 5', on the west side of the stream consists for the grater part out of the biotite schiefer, while the east slope probably consists out of amfibolite. This is not securely studied.

   c. Tectonic's.
   In the middle and the west, the strike is generally N.N.E.-S.S.W. varying from 5° E till 25°E, while the dip is 80° to 95°E, the compass is divided in 400°, instead of 360°, inclusive in the staurolite-amfibolite and in the Calciferous formation.

   The first has a strongly secondary folding in the southern part especially in the graphitic layers. The foldings axis dips here for the most to the N.E. (see list of observations). These folding decreases in intensity to the north.

Secondary folding of imporance is farther observed.

1) In the area rich in graphitic gangs, where the folding seems to be adopted to the direction of a serie of the gangs. Then so on the southern tip of the Fuglvatn just more or less on the border of the formation with the lime content and the gang area.

2) In the middle of the south side of the Vatsbotnvann.

Changing of the general picture of the general tectonical limes is observed on the west-slope of the Storfjellet, ± on point 26 200 N/ 20 400 E - then the rather direct going strike is going to differ strongly because of the rather short folding of the layers.

Along the Vatsbotn, more to the east, the dip becomes less steep. It is not probable that in connection with the Steenken concluded anticline in the Saltdal, we have more to the east a syncline, see profile A,B, but for making conclusions about how the whole tectonical structure is, for that there are not enough observations.

d) Mineralisations. (On the map indicated with a latin figur).

I. In the footwall of the lime stone, bound to the amfibolite is a feldspatic quarts horizon with some Pyrit and some chalcopyrit. See s. 123 and map II, photograf. The metal is very regular and spread over the whole horizon.

II. On point 25 000 N/15 600 E and 25 100 N/15 300 E is found in connection with the already described rock a mineralisation in a rock of silky luster (strongly weathered now) see photo and map II - M_1 and M_{11}. Following the local people, there must also be "an old grube", in the north side of the Sølvtoppen, may in the same layer signed on the map (X).

III. In the known graphitic layer, which is pointed out on the map, (Cp. and Py.).

IV. Also following the local people there must be an old copper mine on pnt. 27 500 N - 18 200 E, but it is not checked. It seems to be in the same graphitic layer.

Informations were given by Jørgen Bensen, who lives in Russånes.

Chapter VI.

a) Table of observations in the field.

There is a sample from the field.

1. Rocks.

No.	description	place	strike - dip
102/110	Opening (1) See drawing one	See map II and photo 9/5	strike 15°E dip 95°E
102	Amfibolite, bounde to the lime stone.	See map II (I)	strike 15°E dip 94°E
111	Limestone/amfibolite border	S.M.II	limest. str. 385°, dip 90°
112	Glimmer schist	26450 N/18800 E	strike 10°E, dip 90°
113	Amfibolite schist	See photo 9-5	strike 25°E, dip 95°
Mapping in Evenesdal from point 25 800 N - 16 700 E to the north.			
201	Epidroth rich - quartsite stones in lime stone - may be - bombs	25800 N/16700 E	strike °E, h. °E
202	Lime stone	See P5-95 Map II	strike 15°E, dip 95°
203	Gangs in marmor		
204	Kugelfels structure of these gangs- ice 205-206, Cu-kies		
208	100 m to the north-opening under the lime stone 208 A - 208 B - 208 D 208 A - pyriticed-light coloured schiefer. 208 B - green hornblende - gl. schiefer	100 m to the north	
209 (108)	Knoten Schiefer - lime stone in hangende	16700 E/74.26300 N	strike 15°, dip 95°
210	Opening of the lime stone above the road, thickness 7 á 10 m	16800 E/25 600 N	strike 15°, dip 85°
211	Amfibolite with spots- bordering layer-biotite-schist	100 m to the south	
212	Again the reparated knots in the lime stone - with texture and some mineralisation	10/12 m to the south.	
213	Granat gl.schiefer 3 á 4 m of thickness	70 m before the bridge (from the north)	
214	60 m before the bridge, graphitic stones, breccie with mulliet.		
215	Loose graphitic layer	45 m before the bridge	strike 395°
216	Garnet-mica-schist-2 á 3 m in thickness-secondair-calcut	20 m before the bridge	strike 15°, dip 93°

No.	description	place	strike - dip
	gangs with disthern crystals of 3 á 4 cm in size. 15 m before the bridge - again a garnet-schist (Ø 1 cm- th. 1 m).		
217	Calciferous stone - with amfibole	150 m after the bridge.	
218	Garnet-mica schist	180 m after the bridge.	strike 10°, linasj.65° Auss.str. 35°E, dip 65°
	5 m farther on: Syncline strike 35°, dip 55°		
	anticline, strike 150°, dip 35°		

Table of observations in the field.

No.	description	place	strike - dip etc.
9-9-1	Gneisic gangs in the calciferous formation - discordant	See map II	gang: str. 30°, d. 80° rock: str. 15°, d. 70°W
9-9-1^{B}	The same formation	10 m to the south	
9-9-2	Glimmer schiefer-iron in lime	80 á 60 m before the second bridge See photo 9.9.	
9-9-3	Glimmer schiefer, with a graphite content	20 m over the 2nd bridge south side	str. 395°, d. 80°E lineation 165/60 E
	Measurement on pnt.	24200 N/19300 E	str. 0°, d. 80°E
99-4	Gneisic gangs-or granitic	24400 N/19000 E	
X	Glimmer schist	27000 N/19000 E	str. 0°, d. 80°
	X_3) every observation is 10 m X^4) higher to the east. X^4)		
	Compact amfibolite-alternate	26100 N/19500 E	str. 25 E
Opening 2 - 2" along the track (see photo) See drawings.		25050 N/16000 E - 25600 N/16650 E.	
113	Amfibolite + quartsite veins	See photo map	
114	Quartslayer - thickness ± 3 m	Upon the amf.	
115	Glimmer schist	50 m to the S.E. See map I.	
116	Amfibolite with quarts gang - which increases to the E in size	Upon 114	str. 20°, d. 95°
117	Quarts - feldspatic layer with some mineralisation - bound to the amfibolite. Foldings axis in the Knoten schiefer: Str. 45°, dip 85°E	See map and photo. 24900 N/16 300 E	
119	Upon 114 - "liggende" glimmerschiefer with gangs concordant and cordant.		
On point 2' - see map II and fig. II amfibolite - secondary folded.		See drawing fig. V	
	Folding axis: str. 10° dip 85°	2'	
124	Quartsites - glimmerschist. Mineralised-quarts-feldspatic stone.		
121	Amfibolite	0575 N/16700 E	

Table of observations in the field.

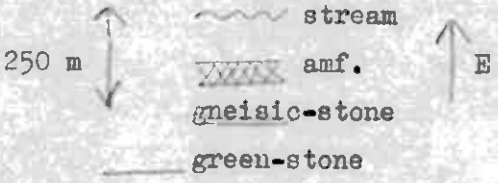
No.	description	place	strike, dip etc.
Opening:	3 see drawing - 24200 N/16000 E.		
135	biotite schist	"Liggende" under the quarts	
136	Quartsite bench-thickness 5 m	see dr. 3	strike 20°
137	Amfibolite	near the river	strike 20°
139	Gneiss like stone - rather rich in glimmer	23200 N/16200 E	
140	Lime stone, thickness 2 á 4 m	23200 N/16200 E	strike 8°, dip 85°E
		see 149	
	The same gneisic stone	see photo 95-Ø	
146	Border zone-upon the lime-stone-glimmer rich bands alternate with hbl. rich bands.	see drawing 4.	
148	Glimmer schist-fine folded with garnet.	see map II.	
Measurement in the river - see drawing 6-6'.			
	Glimmer schiefer-folded rich in quarts	22800 N/16400 E see drawing 6-6'	strike 15°, dip 95°
151^{A}	Graphitic layer-thickness 20 á 30 m.		
150	Mineralised-quarts benches upon 151^{A} - the ± 15 cm		
152	Amf. with conc. and disc. gangs	20 m from 151^{A}	strike 15°
151	Glimmer schiefer		
153	Graphitic-glimmerschiefer	40 m from 151^{A}	
154	Graphitic layer - on the top of the fall-short folded (20 á 30 cm)	in fall one-66'	
151			
155	Glimmer schiefer on the graphitic layer	10 m before the second fall lineation:d.55°	strike 20°, dip 95°E
156	Garnet glimmer schiefer-thres-hold of the 2^{A} fall.	lineation:d.52°E, str. 20°, d. 95°.	
155^{B}	A graph. gl. schiefer under 156		
157	Between 2^{E} f. and 2^{A} - mica schiefer + directionless hornblende crystals.		dip 95°E

Table of observations.

No.	description	place	strike, dip etc.
158	On the top of fall 2[b] quarts-feldspatic glimmer schiefer.	(6-6')	
	In fall 2[b] amfibole rich schiefer-thickness + 10 m	(6-6')	strike 18°E, dip 85°W
159	Graphitic glimmer schiefer str. 20° - thickness 10 á 15 m.	15 m E of 2[b] (6-6')	strike 20°, dip 95°
	upon this layer:		
	Glimmer schiefer	22600 N/16600 E	strike 20°, dip 95° lineasion 50°
	Glimmer schiefer	20 m before the 3° fall (6-6')	strike 25°, dip 95° foldings-
160	Graphite schiefer thickness 5 m.	18 m before the 3° fall (6-6')	axis 70°E dip 45°
	Then follows a glimmer schiefer 5 á 10 m in thickness then again graphitie with a mineralised zone - thickness 20 á 30 m. The ore zone ± 2 m before the threshold of the fall. Farther to the E comes the glimmer schiefer.	see (6-6')	strike 25°E, dip 95° foldings axis: strike 40°, dip 47°
Mapping the graphitic layer with the mineralised zone:			
	800 m to the west, in the graphite	see photo str. 30°, dip 98°	folding axis strike 33°, dip 58°
161	Border between glimmer schiefer and the graphite	see on the back of the photo farther to the north	strike 15°E, dip 88°E f.axis, str. 65° dip 30°
162	Big opening of the graphite with in the middle the mineralised zone	50 m farther on	strike 40°, dip 80° foldings axis 40°E, dip 30°
Measurement in the gl.s. "hengende" graphite layer		23200 N/16800 E	strike 30°, dip 94°E foldings axis str. 35°, dip 50°
163	Graphitic-gl.s. less folded-dipping to the west - so follow for 20 m.	23400 N/16600 E see also photo	strike 20°, dip 93°
164	Graphitic layer	above point 163 23400 N/16650 E see photo	strike 25°, dip 92° foldings axis strike 0°, dip 60°
165	Upon 164 garnet rich schist - 5 á 10 m in thickness - then a garben hbl.schiefer - also a few m's thick.		

Table of observations.

No.	description	place	strike, dip etc.
161	The graphitic layer, the followed one, gives trouble because of the strongly secondary folding in the south-east sector. The strike varies from 10° till 30°, the most probable direction will be 20°. See "liggende" glimmer schiefer.		
161A	The dip varies from 80° till 95°, possible because of the secondary folding.		
Measurement in the graphite just under the gl.s. in liggende.		23600 N/17000 E	strike 15° (20°) dip 92° foldings axis 40°E, dip 60°
170	Compact amfibolite - coming over to the west in a rather coarse amf.	see photo	strike 20°E, dip 87°
	Garnet - glimmer schiefer	24600 N/15 750E	strike 0°, dip 85°W
171	Contact between amfibolite and lime-glimmer schiefer	see photo	strike 15°, dip 90° foldings axis strike 65°E, dip 59°
See	5-5" on the map II.		
180-181	Graphitic layer - 1,5 m thick		
182	Calciferous glimmer schiefer a few metres to the east - granitic gangs - nice contact formation - amf. biotite layers.	see map II	strike 10°, dip 92°E foldings axis 160°E, 85°d.
183	Schiefer, lime free, with disc. quarts layers	see map II	strike 20°, dip 93°E
184	Bench with well develloped quarts crystals in 183 - less schiefered - rather compact.		
186	Glimmer rich rock - with feldspat - also the same quarts crystals - disc. gangs	see map II	strike 390°E, dip 80°
187	Quarts. Epidroth rock - rather not schiefered also besides the road - upon the gl.schist - 2 á 4 m thick	see map II	
189	Rock with a lime content - more to the east-biotite schist with granitic gangs - lime free.	map II	
190	1) Quarts bench 2) Granitic stone may be a 3) Gneissic contact	map II	strike 30°, dip 92°E

Table of observations.

No.	description	place	strike, dip etc.
	7-7' rontes	Map II + photo P.5.	
209	1) Knoten Scheifer 2) Lime stone - 5 m thickness with quarts (+epidooth) parts - maybe vulcanic bombs. 3) Strongly weathered gl.s.	Map II	strike 15°E, dip 95° strike 9° , dip 82°E strike 0° , dip 92°E
221	Glimmer schiefer	photo P.5.	strike 16°E, dip 82°
222	Graphitic layer with quarts disthern gangs - probably the same layer as by the bridge - thickness 10 á 4 m		strike 18°E, dip 88°
	<u>On the bridge:</u>		
	-Garnet gl.s.		
	-Graphitic layer (the ± 2m)	"	
223	-Hard gl.s. with distern quarts gangs	"	strike 15°, dip 98°
	-Just under the second bridge- graphitic layer - thin		strike 16°, dip 96°
	-Gl.s. with garnet		
	-Thickness 15 á 20 m graphitic layer.	P.5.	strike 6°, dip 96°E
	-Fine grained glimmer schiefer		strike 10°,dip 94°E
	-Layer (5) graphitic layer - ± 3 m thickness mineralised.		strike 0°
	-On the border to the lake - quarts bench - 2 m thickn.		
224	-Calciferous gl.schiefer after this point, strongly secondary folding-zone rich in graphitic gangs, nussuring up to 5 m in thickness - with strongly folded conductformationa consisting out of amfibolite biotite schiefer. The smaller gangs have no particular direction - the bigger ones have more or less the general direction. See sample	26300-17850	strike 10°, dip 92° strike 10°E
225	Fine grained gl.s. lime free + garnet	photo P.5. + map II	strike 6°
226	Contact stone with lime rich veins in it. See sample.		

No.	description	place	strike, dip etc.
	Vatsbotn.		
	Biotite schiefer	29000-18400 E	lineasion 205°E, dip 65° strike 375°, dip 92°
	Schiefer with a rusty brown appearance-biotite schiefer	20 m south of the last point 28600-18250 E	strike 395° foldings axis 172°, dip 44°
230	Calciferous graphit	photo P.5.	strike 380°, dip 86°
	Graphite layer	28000 N/17600 E	strike 390°W, dip 82°
	Lime stone	photo P.5	dip 82°
	2 m passing the bridge	see photo P.5	strike 10°, dip 95°
	Graphit layer, thickness 20 m schiefer with a rusty brown appearance	29100 N/18150	
	Calciferous schiefer with guarts gangs	28950 N/18350 E	strike 375°

Table of observations.

Folding axis

No.	description	place	str., dip etc.
1)	K.S.	(3)S.E. corner	strike 0°N, dip 80°N
2)	Quartsite	(3) to E/ ridge valley	strike 45°, dip 78°S
3)	Glimmer schiefer	22600 N/16500 E	strike 140°E, d. 85°
4)	Glimmer schiefer fine folded.	23300 N/16200 E	strike 320°E, d. 80°
	See profile 6-6'		
1)	Glimmer schiefer	on point (6-6')	strike 110°, d. 80°
2)	Glimmer schiefer fine develloped anticlinal		strike 105°E, d.70°
3)	Amf. schist (152)		strike 110°E, d.60°
4)	Graphitic-gl.s.-small folded	1^{d}fall	strike 104°E, d.77°
6)	Gl.s. upon the graph.s.	upon (164) 23400 N/16650 E	strike 390°E, d.70°
7)	Gl.s. upon graph.schiefer (syncl.-dipping to the north)	23400 N/16950 E	strike 82°E, d.40°
8)	In the graphite 161	200 m to the north	strike 30°E, d.70°
9)	Grapgite	23750 N/16950 E	strike 25°E, d.70°
10)	Alternating, lime-gl.schist and graphite	23700 N/17150 E	strike 375°E, d.45°
1)	Calciferous gl.s. strongly short folded.	24800 N/15750 E	strike 65°E, d.95°
2)	Gl.schist (lime rich) in the gl.rich layer	500 to the west of 24850 N/15000 E	strike 100°E, d.95°
3)	Glimmer schist	24500 N/15500 E	strike 365°, d. 82°
4)	Calciferous gl.s.	24100 N/15100	strike 653°E, d.25°
5)	190	Map II	strike 10°, d. 74°
6)	Fine grained biotite s.	28800 N/18250 E	strike 35°, d.65°

Table of samples from the field.

No.	description	place
161	Graphite layer with the mineralised zone.	see photo 9-9
9-9-4	Stone out of a granitic gang	24 400 N/19 000 E
108	Knoten Schiefer	see map II and photo 9.5 (1)
116	Amfibolite with quartz gangs	see drawing (2) on point (2)
(102	Serpentine)	95 025 N/16 250 E
101	Serpentine	(1)
113	Amfibolite	see photo 9.5
9-9-2	Biotite schiefer	25 650 N/16 975 E.
205	Calcite gang - h.bl. rich - out of the lime stone	25 850 N/16 750 E.
208 B	Stone out of the liggende of the lime	150 m north of (205)
216 A	Gang with Kyanit cristals in the garnet mica-schist.	25 550 N/16 950 E.
216	Garnet mica schist	same as 216 A.
208 B	H.bl.stone in liggende of the lime stone.	
123	Stone with some mineralisation - feldspatic - quartz - for the layer see 2-2', It is bound to the amfibolite. layer.	
118	Glimmer schist	24 950 N/16 250 E.
203	Piece out of the marble.	see (205)
-Y-	h.bl. +	on point 2' of (2-2') - drawing- between KN.S. and L.S.
224 (2)	Granitic gang	see photo P.5.
226	Piece out of the contact with veins rich in lime	also 224
151		see drawing fig.VI
240	See photo 5-5.	
M.1 and M.2.	See photo 9.5.	

Div Saltdal

C o n t e n t s:

022.023

Chapter I.

Description of the task.

Mapping of the area situated between: 66° 55' 10"N - 16° 59' 24" N and 15° 19' 18" E. 15° 30' 17" E, that means the study of the different kinds of rocks and their tectonical structure.

Chapter II.

For the situation - see ch. I.

The discription of the landscape.

The landscape has the outlook of a recent post-glacial time, and will because of:

a. The mostly U. shaped forms of the valleys.
b. The tribuazy hanging valleys coming out on the of a higher class.
c. The bad drainage system.
d. Fitting up of morene material, f.i. on the conjuction point of the Vatselva and the Sauelva.
e. The smooth rounded forms.

Because of the coming up of the Scandinavian Continent is there nowaday's to study a strongly influence of recent erosion., so the cutting in of old gletcher vallyes of nearly formed erosion valleys so as f.i. the Svenesdal between Petterheim and Fossen.
The hight varies from 30 m in the Saltdal, near Røkland till ± 800 m on the Storfjellet. With the exeption of the last montain, lies the area beneath the tree borders so that the most of the terrain is covered with growth, which is a bore for a good geological study.
The best exposures are to find in the Svenesdal and around the Vassbotn.

Chapter III.

a. Plan of work.

The intention was: First study the west and make the connection with the already existing map of Steenken.

Second: Making systhematically profils to the east, more or less perpendicular on the strike (which commonly is NNE-SSW), including the following for more securely mapping or may be for later research important layers, so as:

1) The graphitic one's (Geophysical importent in connection with the conductivity of electricity.

2) Layers with a certain mineralisation.

3) The rock's of probable magmatic origin, so as the Serpentine (see g.5). See the list of the followed route.

b) Description of rock kinds and formations.

The dividing in rock formation's on the ground of the metamorfose grade and tectonic's, is so far as it is to check, taken over from Steenken.

1) Amfibolite - Staurolite formation.
The whole western part of the investigated area consists, so far as it is studied, out of this division.

To the east it goes over in the Calciferous-formation, with, on the border, quartsitic graphite layer's, alternating with:

a) Garnet rich schist of a silky luster.

b) Hornblende rich schist.

c) Glimmer schist, generally very weathered.

The most use of this formation consists out of marble, (see maps and photos), with locally bands of biotite or hornblende, but the general picture is a rather pure limestone. At point (25 000 N - 15 500 E on the Map) and on the top of the Selvbergnupen you find a mass up of rather thin layers (2 - 5 m in thickness of resp. amfibolite, garnet glimmer schiefer, (with and without direction less amfibolite cristals, reaching up till 5 cm in length), and quartsites grouped around a almost not schiefered base of a may be fyllitic stone (see sample 240).

Between them is again the lime stone, and farther to the west goes a quartsite layer of 5/6 m in thickness, which is may be the same as used by Steenken as a guide horizon. To the marble is always bound a fine grained compact amfibolite horizon - to observe so well in the west as

in the east. On the east side is a typical banded rock, consisting out of a alternation of feldspatic glimmer bands and quartz with eye shaped feldspatic knots in them (see sample 108), it disappears in the south and is not found back in the north. This rock is baptised: KNOTEN-SCHIEFER.

In the south-east is between the amfibolite and the KN.S. a Serpentine layer with a zone of typical conduct minerals (alternation of hornblende and glimmer rich bands). See fig. I, II and S.10). Upon the limestone - probable bound to the Serpentine - lies on the east side a hornblendefels - very rich in light green hornblende crystals, grouped without direction in weathered white mass rich in lime - also not found back in the north and southern part.

This whole group of rocks was very keenly studied in the middle (see fig. II 6/m IV) while they were not found back in the north.

Other curiosity: a almost not schiefered gneissic rock, only found in the south (see photo g-5+ fig. IV), while in the S.E. the two observed parts don't fit, may be, because of fault or magmatic origin.

In the S.E. bends the lime stone to the east, while direct upon it lies a very weathered zone - of lime biotiteschist, (fig. 4). Farther to the east comes a alternation of amfibolites and biotiteschists.

In the footwall of this whole complex follows a bank consisting out of glimmer schiefer and lime-stone layers, with along the border of the Sauelva tubes like quartz-feldspatic, sometimes somewhat mineralised parts in it. May be vulcanic bombs. (+ epid.)

This is good to study on the western slope of the Nupen. The western border of the lime-stone is only partly studied.

On point 3, see photo P5, is observed a reduction of bands rich in hornblende and glimmer schiefer. The whole outlook of the slope makes the impression of consisting out of a alternation of bands rich in lime-stone and schiefer. The connecting border of the lime-stone from point 8 to the north is defined by the long distanse method, so that it is not exact.

On the north-side of the Vassbotnelva are observed two separated lime-stone bodies, separated from each by a racket of schist. Only the borders of the eastern one are securely.

The graphitic border horizon of the staurolite-amfiboliteformation.

In the south and in the middle of the field is this complex rather steady in content and thickness (± 500 m.)

Because of a rather high percentage of quarts are these graphitic layers relatively more resistant to the wheathering, than the surronding rocks, with the result that they forms on many places extending ridges, which are easier to study than the surronding rocks, in spite of the dense growth. Even on the photografs are they on some places to find back in that way.

For making a propper mapping of this complex, there was first made a profil in the stream from the Sirivann (see map II, 6-6' and fig. VI), in the Hogndalen (see photograf q-q along route 7-7' (Map II and f.P5) and along the south side of the Vatsbotnvann.

In profil 7-7' a mineralised zone of ± 1,50 m thickness was found on point 161. (See photo q-5).

This layer was followed and mapped so securely as was possible, but the mineralisation was not found back farther on till the Hogndalen, where it is only a layer of about 1,50 m between schists.

The same unit is found back on point 10 in profil 7-7', map II.

Along the side of the Vatsbotnvann is only found a graphitic layer near the bridge on the west side (th. 15 m) and on point 26/50N/16850 E. Between them is a whole complex of glimmer schists of some 700 m in size. On point X^2 of map II is an old digging place of ore in the mineralised graphitic layer. It this is in the same layer as the one studied over the whole field, then there must be something the matter with the tectonic', because the strike (in general) tends to the east in the northern direction.

The Calciferous formation.

a) The complex rich in lime.

Generally, it consists out of biotite-schists with a high lime content, locally these rocks have a greenly outlook probably because of epidot, while the glimmer is missing - this has been seen near Petterheim and Hogndalen.

In the south borders this complex at a glimmer rich none Calciumcarbonat bearing schist, with also some concordant quarts benches in them, where by some of them have well developped clear quarts crystals. In the center of the surveyed area is this structure disturbed by gangs of more or less granitic composition (see sample 224), measuring up till 5 á 6 m in thickness.

The bigger ones has a ± 10°E strike, while the smaller gives in this respect quite a variation. On the contact of these gangs is to be formed a combination of fine grained amfibolitic and biotitic layers with very small bands rich in lime-stone (thickness = ± 1 mm (see sample 226). These rocks are strongly secondary folded, where by the direction of the folding is adjusted to the of the gangs.

To the north and the south, themumber and size of these gangs dicreases rapidely, which on the Vatsbotn side only relatively few were observed in the south however was found back the same structure, but only extending over a smaller area.

Fixed points of the border:

1) On the south side of the Vatsbotn:

   A complex was observed with some lime content between point 29 000 N/ 18 000 E and point 28 100 N/18 150 E. Then follows a biotite schiefer with a rusty brown appearance of some 100 m in thickness, while on point 28 850 N/18 200 E and point 29 000 N/18 400 E was observed the rock with the lime content again. In this whole unit was observed a variation of the dip from 80° till 40° and the way back, which makes it probable that we have here the offshoot of the anticlinal, mapped in the north.

2) To the west on a place ± 50 m to the east of point 10 (see map II, profile 7-7'), while on point 11, just on the southern-most tip of the Stormoen (see map II) the crossing is to the complex rich in gangs which is described above.

3) Near Petterheim, on the road going down to the Evenesdal is found a section of (from the W/E) a schist rich in epidot and lime, biotite schiefer, with bands very rich in lime and at last a biotite schiefer without lime.

4) Evenesdal. South side, pnt. 12 (see map II)
East border, pnt. 19 (see map II)

5) Profile 7-7'. West border pnt. 182
East border ± 30 m west of pnt. 186
but this was not securely to make out because of the covering (see map II).

List of some loose observations, made farther to the east:

1) On the western slope of the Storfjellet (see map II)
   a. A biotite schist, lime free (n - n4)
   b. A biotite schist, lime free, rich in gangs, pnt. 21.
   c. Amfibolite pnt. 22, which has in the western part a almost direct strike (20°E), but is some 400 m farther to the east strongly folded.

2) A schist, with a graphite content on pnt. 21175 N/18 100 E.

3) Profile 5-5' on the map II:
   a. Pnt. 189, there was found a small layer with some lime content (thickness ± 5 m).
   b. Pnt. 5', on the west side of the stream consists for the grater part out of the biotite schiefer, while the east slope probably consists out of amfibolite. This is not securely studied.
   c. Tectonic's.
   In the middle and the west, the strike is generally N.N.E.-S.S.W. varying from 5° E till 25°E, while the dip is 80° to 95°E, the compass is divided in 400°, instead of 360°, inclusive in the staurolite-amfibolite and in the Calciferous formation.

   The first has a strongly secondary folding in the southern part especially in the graphitic layers. The foldings axis dips here for the most to the N.E. (see list of observations). These folding decreases in intensity to the north.

Secondary folding of imporance is farther observed.

1) In the area rich in graphitic gangs, where the folding seems to be adopted to the direction of a serie of the gangs. Then so on the southern tip of the Fuglvatn just more or less on the border of the formation with the lime content and the gang area.

2) **In the middle of the south side of the Vatsbotnvann.**

Changing of the general picture of the general tectonical limes is observed on the west-slope of the Storfjellet, ± on point 26 200 N/ 20 400 E - then the rather direct going strike is going to differ strongly because of the rather short folding of the layers.

Along the Vatsbotn, more to the east, the dip becomes less steep. It is not probable that in connection with the Steenken concluded anticline in the Saltdal, we have more to the east a syncline, see profile A,B, but for making conclusions about how the whole tectonical structure is, for that there are not enough observations.

d) Mineralisations. (On the map indicated with a latin figur).

I. In the footwall of the lime stone, bound to the amfibolite is a feldspatic quarts horizon with some Pyrit and some chalcopyrit. See s. 123 and map II, photograf. The metal is very regular and spread over the whole horizon.

II. On point 25 000 N/15 600 E and 25 100 N/15 300 E is found in connection with the already described rock a mineralisation in a rock of silky luster (strongly weathered now) see photo and map II - M_1 and M_{11}. Following the local people, there must also be "an old grube", in the north side of the Sølvtoppen, may in the same layer signed on the map X.

III. In the known graphitic layer, which is pointed out on the map, (Cp. and Py.).

IV. Also following the local people there must be an old copper mine on pnt. 27 500 N - 18 200 E, but it is not checked. It seems to be in the same graphitic layer.

Informations were given by Jørgen Bensen, who lives in Russånes.

Chapter VI.

a) Table of observations in the field.

There is a sample from the field.

1. Rocks.

No.	description	place	strike - dip
102/110	Opening 1 See drawing one	See map II and photo 9/5	strike 15°E dip 95°E
102	Amfibolite, bounde to the lime stone.	See map II I	strike 15°E dip 94°E
111	Limestone/amfibolite border	S.M.II	limest, str. 385°, dip 90°
112	Glimmer schist	26450 N/18800 E	strike 10°E, dip 90°
113	Amfibolite schist	See photo 9-5	strike 25°E, dip 95°.
Mapping in Evenesdal from point 25 800 N - 16 700 E to the north.			
201	Epidroth rich - quartsite stones in lime stone - may be - bombs	25800 N/16700 E	strike °E, h. °E
202	Lime stone	See P5-95 Map II	strike 15°E, dip 95°
203	Gangs in marmor		
204	Kugelfels structure of these gangs- ice 205-206, Cu-kies		
208	100 m to the north-opening under the lime stone 208 A - 208 B - 208 D 208 A - pyriticed-light coloured schiefer. 208 B - green hornblende - gl. schiefer	100 m to the north	
209 (108)	Knoten Schiefer - lime stone in hangende	16700 E/74.26300 N	strike 15°, dip 95°
210	Opening of the lime stone above the road, thickness 7 á 10 m	16800 E/25 600 N	strike 15°, dip 85°
211	Amfibolite with spots-bordering layer-biotite-schist	100 m to the south	
212	Again the reparated knots in the lime stone - with texture and some mineralisation	10/12 m to the south.	
213	Granat gl.schiefer 3 á 4 m of thickness	70 m before the bridge (from the north)	
214	60 m before the bridge, graphitic stones, breccie with mulliet.		
215	Loose graphitic layer	45 m before the bridge	strike 395°
216	Garnet-mica-schist-2 á 3 m in thickness-secondair-calcut	20 m before the bridge	strike 15°, dip 93°

No.	description	place	strike - dip
	gangs with disthern crystals of 3 á 4 cm in size. 15 m before the bridge - again a garnet-schist (Ø 1 cm-th. 1 m).		
217	Calciferous stone - with amfibole	150 m after the bridge.	
218	Garnet-mica schist	180 m after the bridge.	strike 10°, linasj.65° Ause.str. 35°E, dip 65°
	5 m farther on: Synoline strike 35°, dip 55°		
	anticline, strike 150°, dip 35°		

Table of observations in the field.

No.	description	place	strike - dip etc.
9-9-1	Gneisic gangs in the calci-ferous formation - discordant	See map II	gang: str. 30°, d. 80° rock: str. 15°, d. 70°W
9-9-1^{B}	The same formation	10 m to the south	
9-9-2	Glimmer schiefer-iron in lime	80 á 60 m before the second bridge See photo 9.9.	
9-9-3	Glimmer schiefer, with a graphite content	20 m over the 2nd bridge south side	str. 395°, d. 80°E lineation 165/60 E
	Measurement on pnt.	24200 N/19300 E	str. 0°, d. 80°E
99-4	Gneisic gangs-or granitic	24400 N/19000 E	
X	Glimmer schist	27000 N/19000 E	str. 0°, d. 80°
	X_3) every observation is 10 m X_4) higher to the east. X^4)		
	Compact amfibolite-alternate	26100 N/19500 E	str. 25 E
Opening 2 - 2" along the track (see photo) See drawings.		25050 N/16000 E - 25600 N/16650 E.	
113	Amfibolite + quartsite veins	See photo map	
114	Quartslayer - thickness ± 3 m	Upon the amf.	
115	Glimmer schist	50 m to the S.E. See map I.	
116	Amfibolite with quarts gang - which increases to the E in size	Upon 114	str. 20°, d. 95°
117	Quarts - feldspatic layer with some mineralisation - bound to the amfibolite. Foldings axis in the Knoten schiefer: Str. 45°, dip 85°E	See map and photo. 24900 N/16 300 E	
119	Upon 114 - "liggende" glimmer-schiefer with gangs concordant and cordant.		
On point 2' - see map II and fig. II amfibolite - secondary folded.		See drawing fig. V	
	Folding axis: str. 10° dip 85°	2'	
124	Quartsites - glimmerschist. Mineralised-quarts-feldspatic stone.		
121	Amfibolite	0575 N/16700 E	

Table of observations in the field.

No.	description	place	strike, dip etc.
Opening:	3 see drawing - 24200 N/16000 E.		
135	biotite schist	"Liggende" under the quarts	
136	Quartsite bench-thickness 5 m	see dr. 3	strike 20°
137	Amfibolite	near the river	strike 20°
139	Gneiss like stone - rather rich in glimmer	23200 N/16200 E	
140	Lime stone, thickness 2 á 4 m	23200 N/16200 E	strike 8°, dip 85°E
	250 m ↕ ~~~~ stream; XXXX amf.; gneisic-stone; ____ green-stone ↑ E	see 149	
	The same gneisic stone	see photo 95-Ø	
146	Border zone-upon the lime-stone-glimmer rich bands alternate with hbl. rich bands.	see drawing 4.	
148	Glimmer schist-fine folded with garnet.	see map II.	
Measurement in the river - see drawing 6-6'.			
	Glimmer schiefer-folded rich in quarts	22800 N/16400 E see drawing 6-6'	strike 15°, dip 95°
151^{A}	Graphitic layer-thickness 20 á 30 m.		
150	Mineralised-quarts benches upon 151^{A} - the ± 15 cm		
152	Amf. with conc. and disc. gangs	20 m from 151^{A}	strike 15°
151	Glimmer schiefer		
153	Graphitic-glimmerschiefer	40 m from 151^{A}	
154	Graphitic layer - on the top of the fall-short folded (20 á 30 cm)	in fall one-66'	
151			
155	Glimmer schiefer on the graphitic layer	10 m before the second fall lineation:d.55°	strike 20°, dip 95°E
156	Garnet glimmer schiefer-thres-hold of the 2^{A} fall.	lineation:d.52°E, str. 20°, d. 95°.	
155^{B}	A graph. gl. schiefer under 156		
157	Between 2^{E} f. and 2^{A} - mica schiefer + directionless hornblende crystals.		dip 95°E

Table of observations.

No.	description	place	strike, dip etc.
158	On the top of fall 2^b quarts-feldspatic glimmer schiefer.	(6-6')	
	In fall 2^b amfibole rich schiefer-thickness + 10 m	(6-6')	strike 18°E, dip 85°W
159	Graphitic glimmer schiefer str. 20° - thickness 10 á 15 m.	15 m E of 2^b (6-6')	strike 20°, dip 95°
	upon this layer:		
	Glimmer schiefer	22600 N/16600 E	strike 20°, dip 95° lineasion 50°
	Glimmer schiefer	20 m before the 3° fall (6-6')	strike 25°, dip 95° foldings-
160	Graphite schiefer thickness 5 m.	18 m before the 3° fall (6-6')	axis 70°E dip 45°
	Then follows a glimmer schiefer 5 á 10 m in thickness then again graphitie with a mineralised zone - thickness 20 á 30 m. The ore zone ± 2 m before the threshold of the fall. Farther to the E comes the glimmer schiefer.	see (6-6')	strike 25°E, dip 95° foldings axis: strike 40°, dip 47°
Mapping the graphitic layer with the mineralised zone:			
	800 m to the west, in the graphite	see photo str. 30°, dip 98°	folding axis strike 33°, dip 58°
161	Border between glimmer schiefer and the graphite	see on the back of the photo farther to the north	strike 15°E, dip 88°E f.axis, str. 65° dip 30°
162	Big opening of the graphite with in the middle the mineralised zone	50 m farther on	strike 40°, dip 80° foldings axis 40°E, dip 30°
Measurement in the gl.s. "hengende" graphite layer		23200 N/16800 E	strike 30°, dip 94°E foldings axis str. 35°, dip 50°
163	Graphitic-gl.s. less folded-dipping to the west - so follow for 20 m.	23400 N/16600 E see also photo	strike 20°, dip 93°
164	Graphitic layer	above point 163 23400 N/16650 E see photo	strike 25°, dip 92° foldings axis strike 0°, dip 60°
165	Upon 164 garnet rich schist - 5 á 10 m in thickness - then a garben hbl.schiefer - also a few m's thick.		

Table of observations.

No.	description	place	strike, dip etc.
161	The graphitic layer, the followed one, gives trouble because of the strongly secondary folding in the south-east sector. The strike varies from 10° till 30°, the most probable direction will be 20°. See "liggende" glimmer schiefer.		
161A	The dip varies from 80° till 95°, possible because of the secondary folding.		
Measurement in the graphite just under the gl.s. in liggende.		23600 N/17000 E	strike 15° (20°) dip 92° foldings axis 40°E, dip 60°
170	Compact amfibolite - coming over to the west in a rather coarse amf.	see photo	strike 20°E, dip 87°
	Garnet - glimmer schiefer	24600 N/15 750E	strike 0°, dip 85°W
171	Contact between amfibolite and lime-glimmer schiefer	see photo	strike 15°, dip 90° foldings axis strike 65°E, dip 59°
See	5-5" on the map II.		
180-181	Graphitic layer - 1,5 m thick		
182	Calciferous glimmer schiefer a few metres to the east - granitic gangs - nice contact formation - amf. biotite layers.	see map II	strike 10°, dip 92°E foldings axis 160°E, 85°d.
183	Schiefer, lime free, with disc. quarts layers	see map II	strike 20°, dip 93°E
184	Bench with well develloped quarts crystals in 183 - less schiefered - rather compact.		
186	Glimmer rich rock - with feldspat - also the same quarts crystals - disc. gangs	see map II	strike 390°E, dip 80
187	Quarts. Epidroth rock - rather not schiefered also besides the road - upon the gl.schist - 2 á 4 m thick	see map II	
189	Rock with a lime content - more to the east-biotite schist with granitic gangs - lime free.	map II	
190	1) Quarts bench 2) Granitic stone may be a 3) Gneissic contact	map II	strike 30°, dip 92°E

Table of observations.

No.	description	place	strike, dip etc.
	7-7' rontes	Map II + photo P.5.	
209	1) Knoten Scheifer 2) Lime stone - 5 m thickness with quarts (+epidooth) parts - maybe vulcanic bombs. 3) Strongly weathered gl.s.	Map II	strike 15°E, dip 95° strike 9° , dip 82°E strike 0° , dip 92°E
221	Glimmer schiefer	photo P.5.	strike 16°E, dip 82°
222	Graphitic layer with quarts disthern gangs - probably the same layer as by the bridge - thickness 10 á 4 m		strike 18°E, dip 88°
	<u>On the bridge:</u>		
	-Garnet gl.s.		
	-Graphitic layer (the ± 2m)	"	
223	-Hard gl.s. with distern quarts gangs	"	strike 15°, dip 98°
	-Just under the second bridge- graphitic layer - thin		strike 16°, dip 96°
	-Gl.s. with garnet		
	-Thickness 15 á 20 m graphitic layer.	P.5.	strike 6°, dip 96°E
	-Fine grained glimmer schiefer		strike 10°,dip 94°E
	-Layer (5) graphitic layer - ± 3 m thickness mineralised.		strike 0°
	-On the border to the lake - quarts bench - 2 m thickn.		
224	-Calciferous gl.schiefer after this point, strongly secondary folding-zone rich in graphitic gangs, nussuring up to 5 m in thickness - with strongly folded conductformations consisting out of amfibolite biotite schiefer. The smaller gangs have no particular direction - the bigger ones have more or less the general direction. See sample	26300-17850	strike 10°, dip 92° strike 10°E
225	Fine grained gl.s. lime free + garnet	photo P.5. + map II	strike 6°
226	Contact stone with lime rich veins in it. See sample.		

No.	description	place	strike, dip etc.
	Vatsbotn.		
	Biotite schiefer	29000-18400 E	lingasion 205°E, dip 65° strike 375°, dip 92°
	Schiefer with a rusty brown appearance-biotite schiefer	20 m south of the last point 28600-18250 E	strike 395° foldings axis 172°, dip 44°
230	Calciferous graphit	photo P.5.	strike 380°, dip 86°
	Graphite layer	28000 N/17600 E	strike 390°W, dip 82
	Lime stone	photo P.5	dip 82°
	2 m passing the bridge	see photo P.5	strike 10°, dip 95°
	Graphit layer, thickness 20 m schiefer with a rusty brown appearance	29100 N/18150	
	Calciferous schiefer with guarts gangs	28950 N/18350 E	strike 375°

Table of observations.

Folding axis

No.	description	place	str., dip etc.
1)	K.S.	(3)S.E. corner	strike 0°N, dip 80°N
2)	Quartsite	(3) to E/ ridge valley	strike 45°, dip 78°S
3)	Glimmer schiefer	22600 N/16500 E	strike 140°E, d. 85°
4)	Glimmer schiefer fine folded.	23300 N/16200 E	strike 320°E, d. 80°
	See profile 6-6'		
1)	Glimmer schiefer	on point (6-6')	strike 110°, d. 80°
2)	Glimmer schiefer fine develloped anticlinal		strike 105°E, d.70°
3)	Amf. schist (152)		strike 110°E, d.60°
4)	Graphitic-gl.s.-small folded	1^{d}fall	strike 104°E, d.77°
6)	Gl.s. upon the graph.s.	upon (164) 23400 N/16650 E	strike 390°E, d.70°
7)	Gl.s. upon graph.schiefer (syncl.-dipping to the north)	23400 N/16950 E	strike 82°E, d.40°
8)	In the graphite 161	200 m to the north	strike 30°E, d.70°
9)	Grapgite	23750 N/16950 E	strike 25°E, d.70°
10)	Alternating, lime-gl.schist and graphite	23700 N/17150 E	strike 375°E, d.45°
1)	Calciferous gl.s. strongly short folded.	24800 N/15750 E	strike 65°E, d.95°
2)	Gl.schist (lime rich) in the gl.rich layer	500 to the west of 24850 N/15000 E	strike 100°E, d.95°
3)	Glimmer schist	24500 N/15500 E	strike 365°, d. 82°
4)	Calciferous gl.s.	24100 N/15100	strike 653°E, d.25°
5)	190	Map II	strike 10°, d. 74°
6)	Fine grained biotite s.	28800 N/18250 E	strike 35°, d.65°

Table of samples from the field.

No.	description	place
161	Graphite layer with the mineralised zone.	see photo 9-9
9-9-4	Stone out of a granitic gang	24 400 N/19 000 E
108	Knoten Schiefer	see map II and photo 9.5 (1)
116	Amfibolite with quartz gangs	see drawing (2) on point (2)
(102	Serpentine)	95 025 N/16 250 E
101	Serpentine	(1)
113	Amfibolite	see photo 9.5
9-9-2	Biotite schiefer	25 650 N/16 975 E.
205	Calcite gang - h.bl. rich - out of the lime stone	25 850 N/16 750 E.
208 B	Stone out of the liggende of the lime	150 m north of (205)
216 A	Gang with Kyanit cristals in the garnet mica-schist.	25 550 N/16 950 E.
216	Garnet mica schist	same as 216 A.
208 B	H.bl.stone in liggende of the lime stone.	
123	Stone with some mineralisation - feldspatic - quartz - for the layer see 2-2', It is bound to the amfibolite. layer.	
118	Glimmer schist	24 950 N/16 250 E.
203	Piece out of the marble.	see (205)
-Y-	h.bl. +	on point 2' of (2-2') - drawing- between KN.S. and L.S.
224 (2)	Granitic gang	see photo P.5.
226	Piece out of the contact with veins rich in lime	also 224
151		see drawing fig.VI
240	See photo 5-5.	
M.1 and M.2.	See photo 9.5.	

22.023

L E G E N D A.

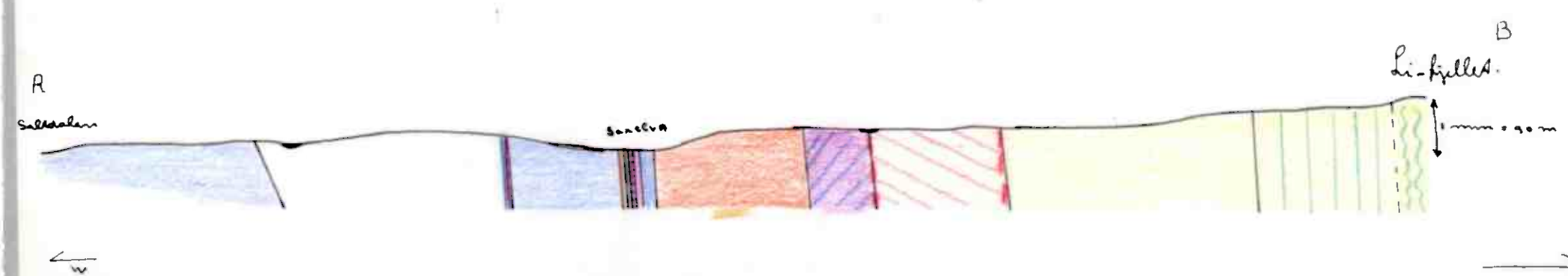
999/	160	Marmor
999/	59	Knoten schiefer
101/	23	Amfibolite
101/	21	Mineralized layer
999/	110	Glimmerschiefer
101/	6	Serpentine
999/	5	Grafite Schiefer
999/	30	Formation with grafitic layers and schists
999/	110	Glimmer schists with a lime content
101/	5	Area with many granitic like gangs
101/	5	Glimmer rich schist, lime free
101/	5	Amfibolite
101/	5	Amfibolite, stranly folded

LEGENDA.

- Marmor.
- Knoten Schiefer.
- Amfibolitte
- Mineralized layer.
- Glimmer Schiefer.
- Serpentine.
- Grafitte Schiefer.
- Formation with grafitic layers and schists.
- Glimmer schist with a lime content.
- area with many granitic like gangs.
- glimmer rich schist, lime free.
- amfibolite.
- amfibolite, strongly folded.

PROFILE; A-B.

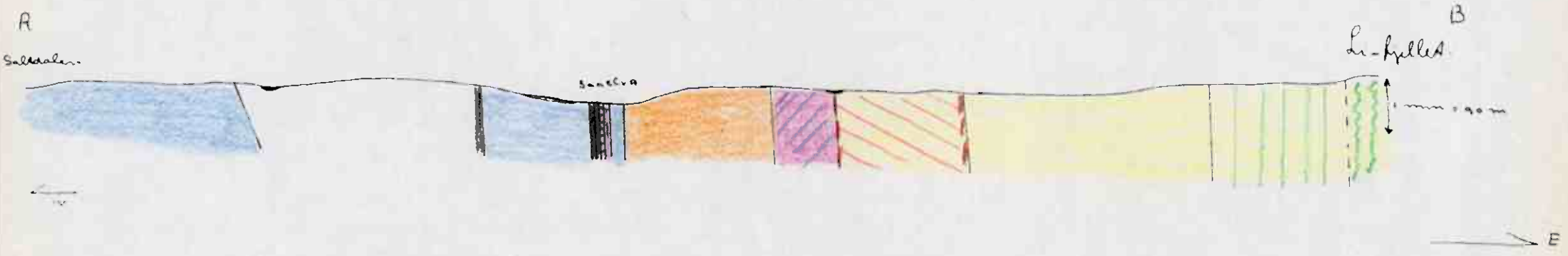
See Map I.



Schaal : 1 : 25.000

PROFILE, R-B.

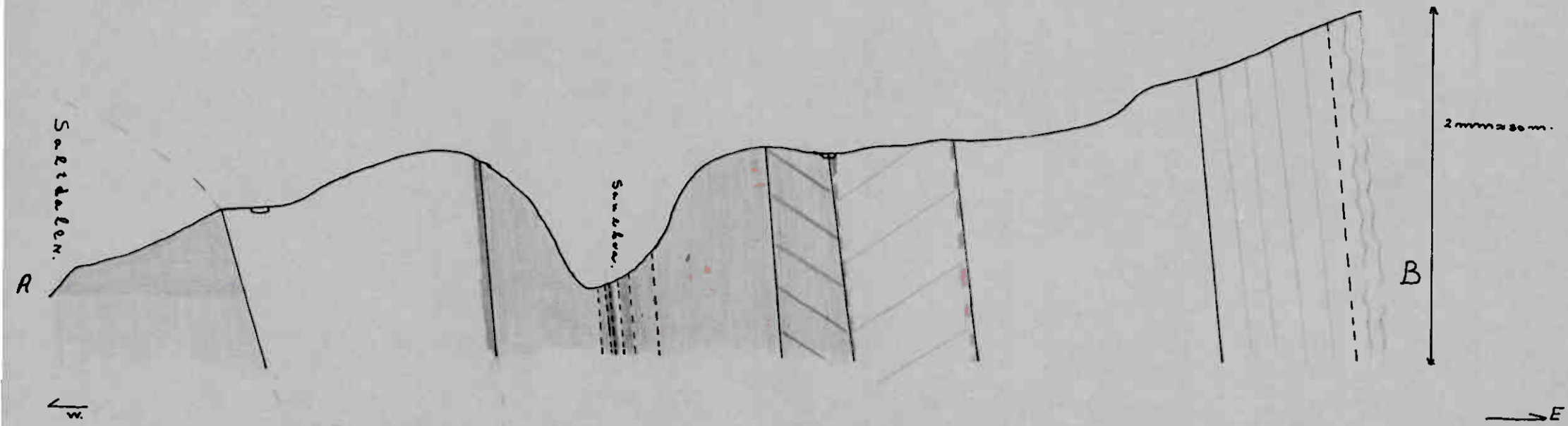
See Map I



Schaal : 1 : 25 000

PROFILE A-B.

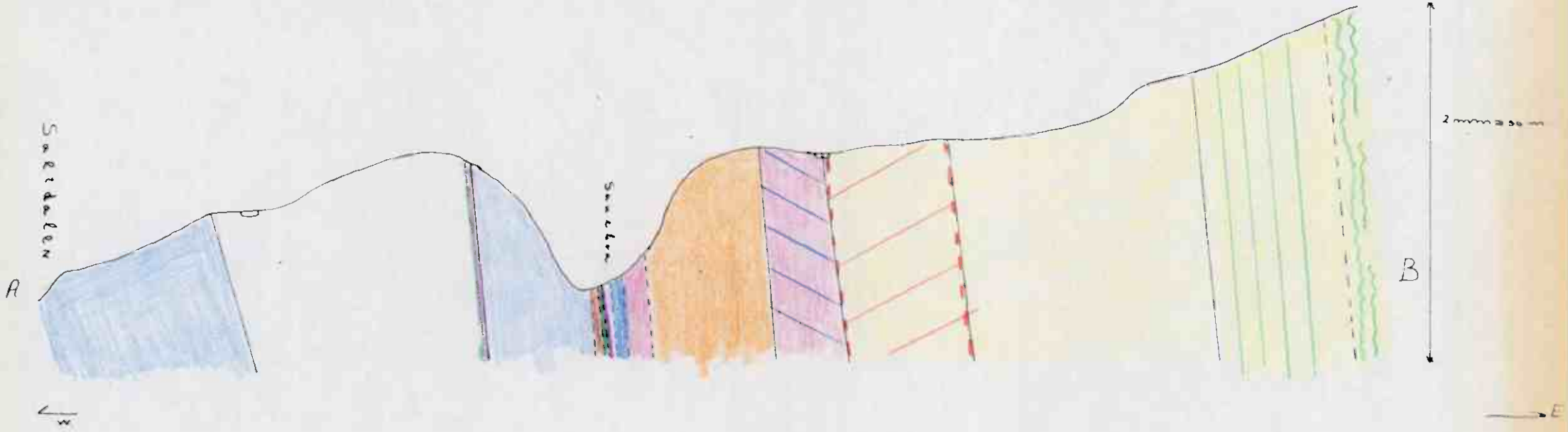
See; MAP; I



Schaal; 1: 25000.

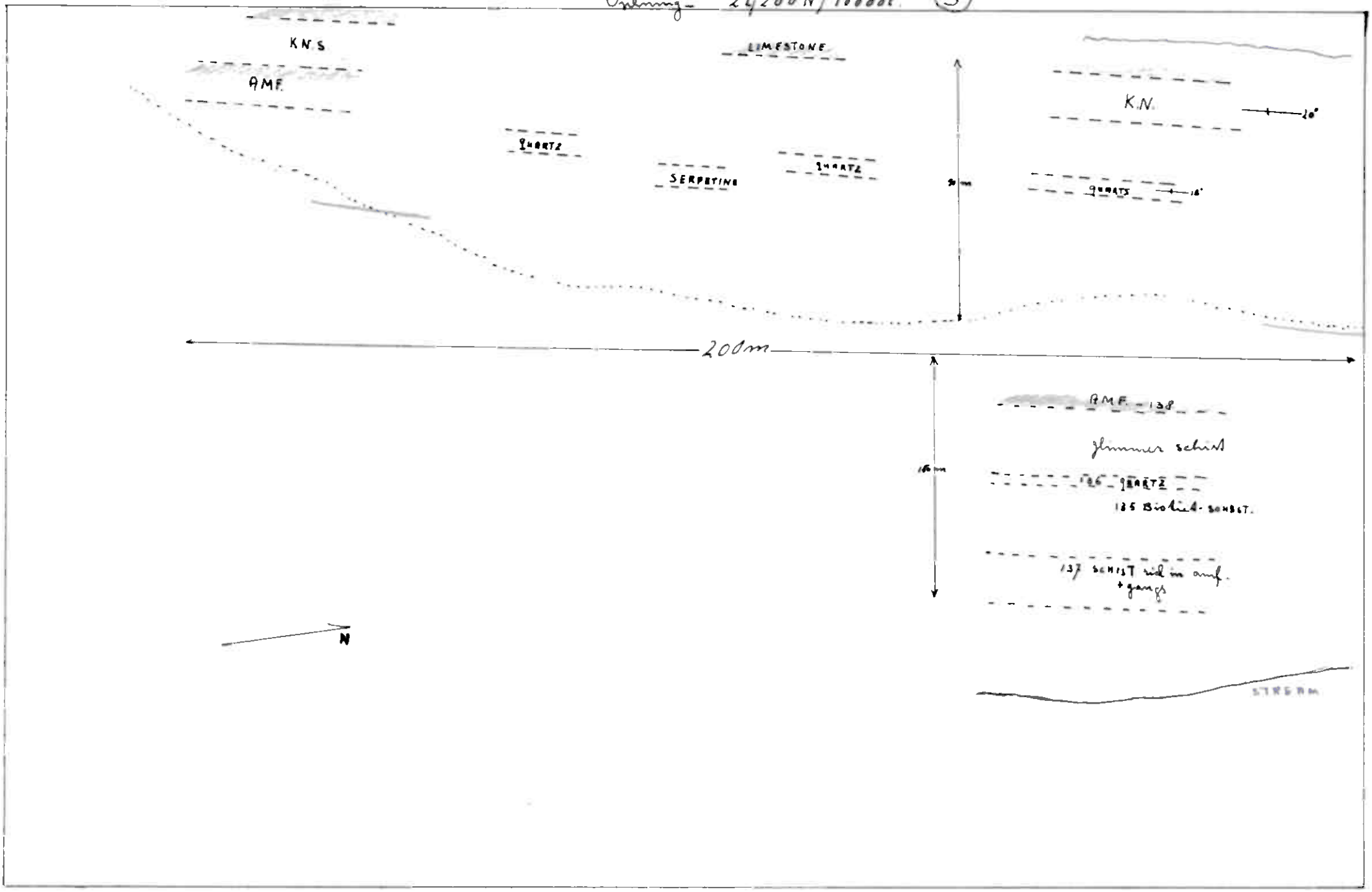
PROFILE A-B.

SEE: MAP, I

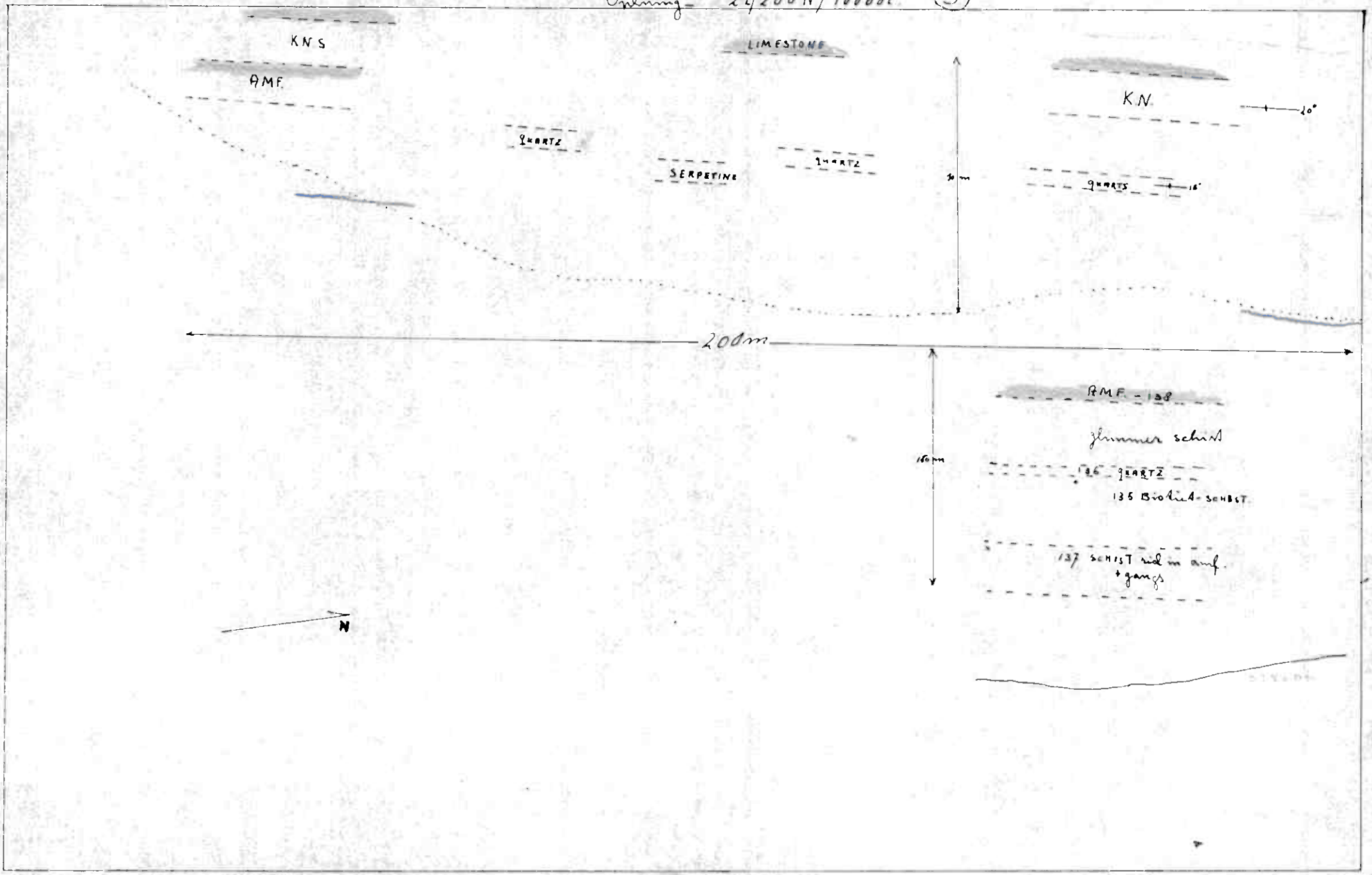


Schaal ; 1 : 25000

Opening - 24200N/16000E (3)

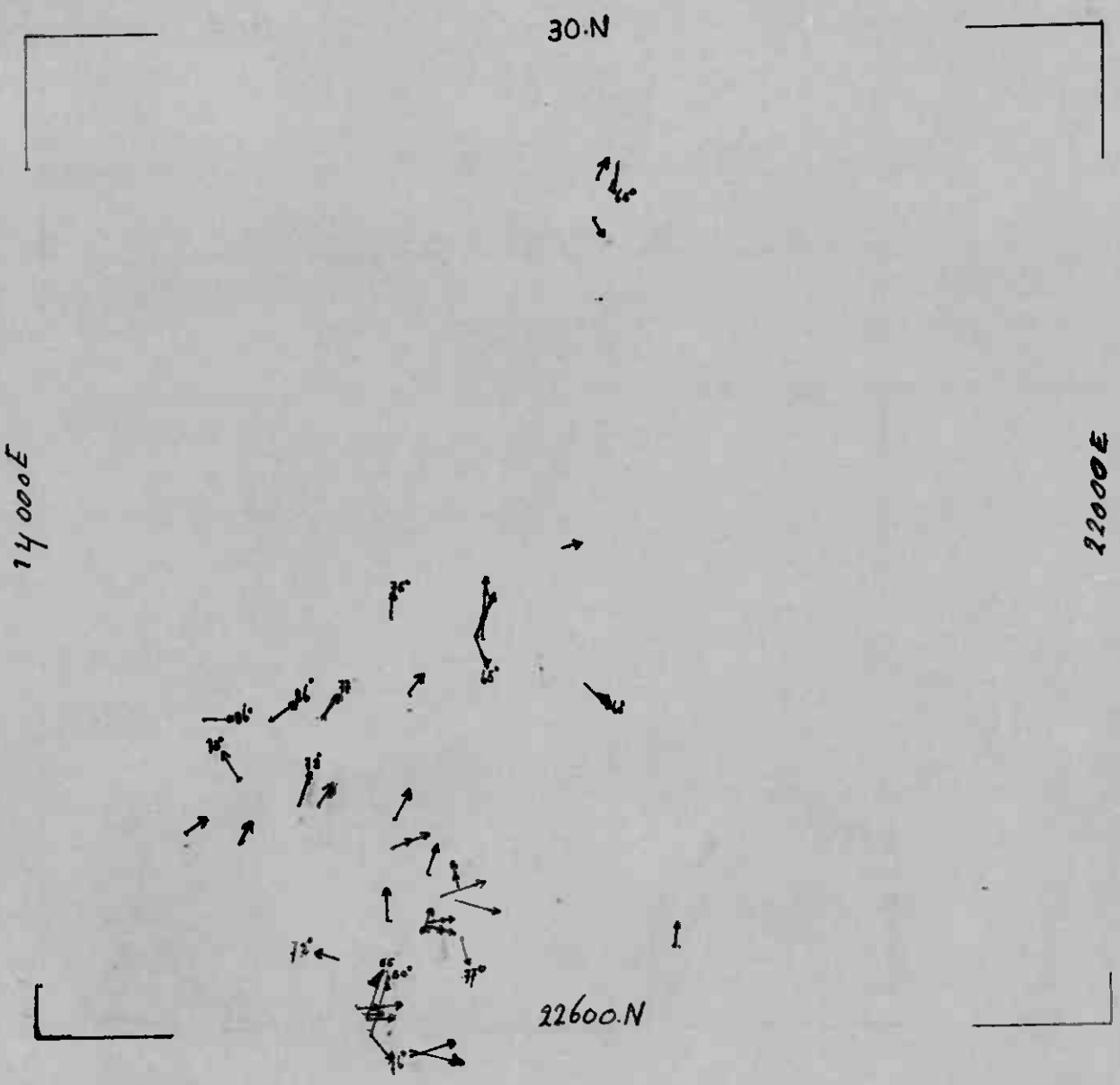


Opening - 24200N/16000E (3)



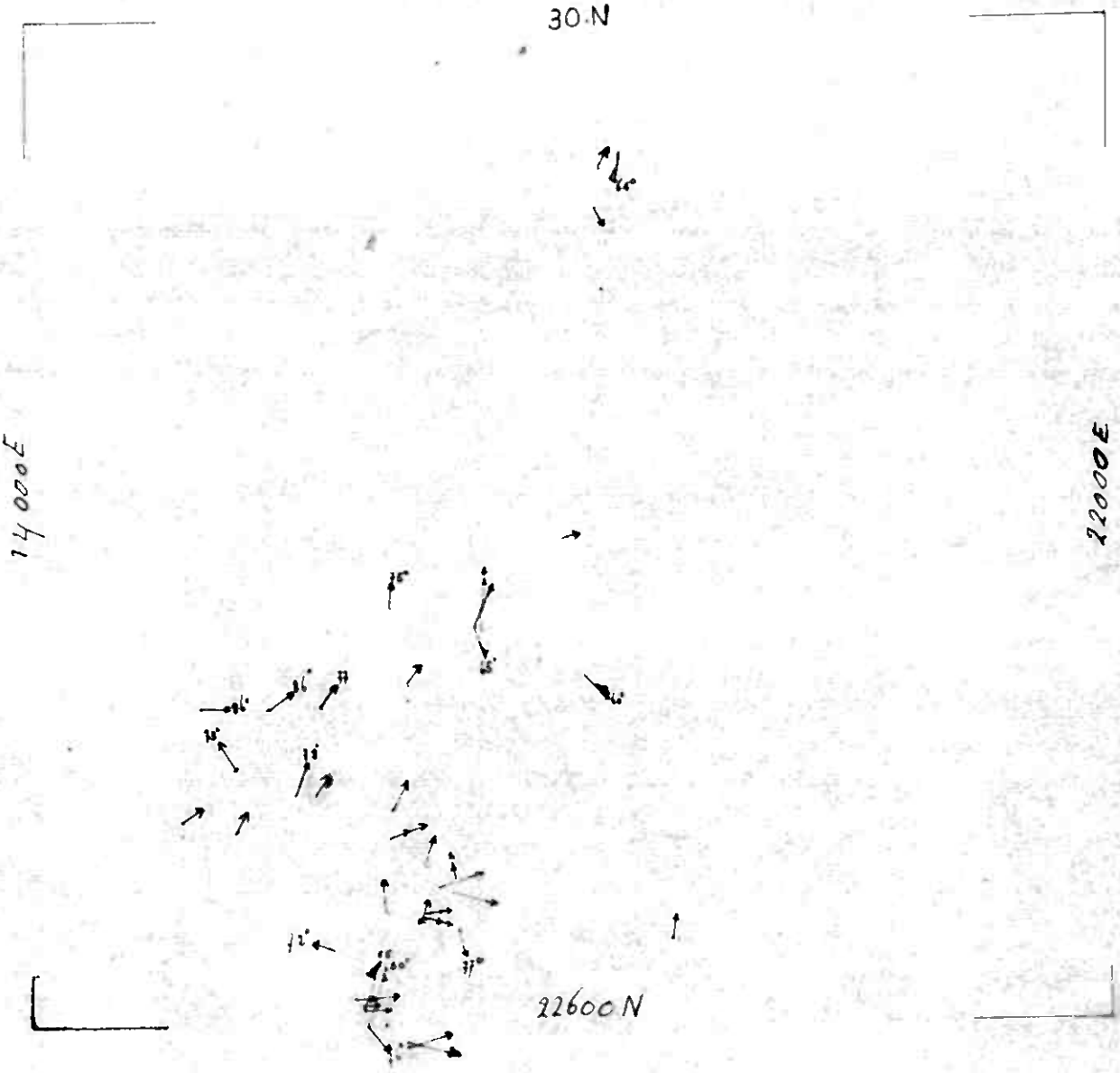
JUNKERDAL

FOLDINGS AXIS

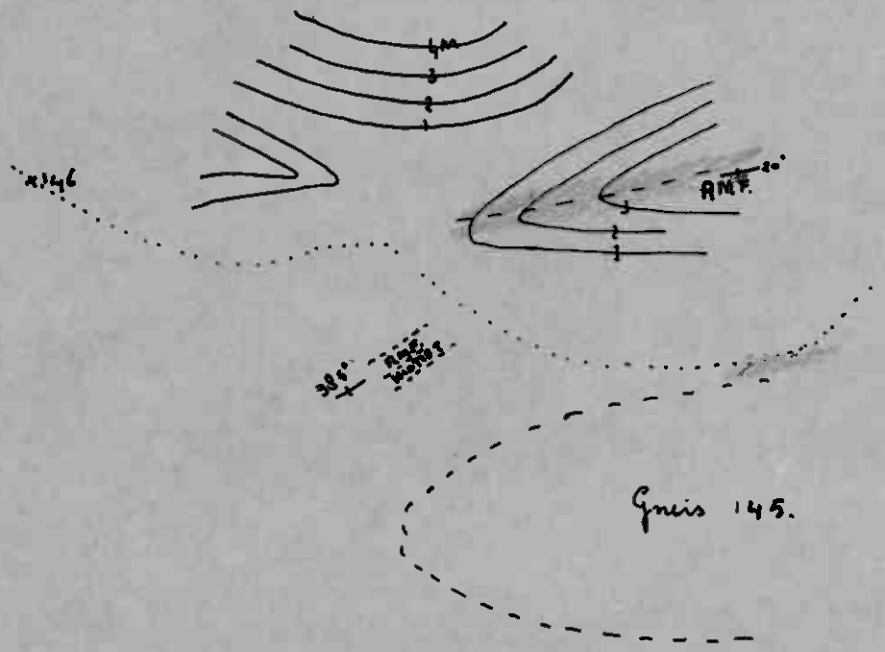


JUNKERDAL

FOLDINGS AXIS



Opening (4) 2259ON-1615OE.



BANDED SCHIST. STRONGLY-WETHERED.

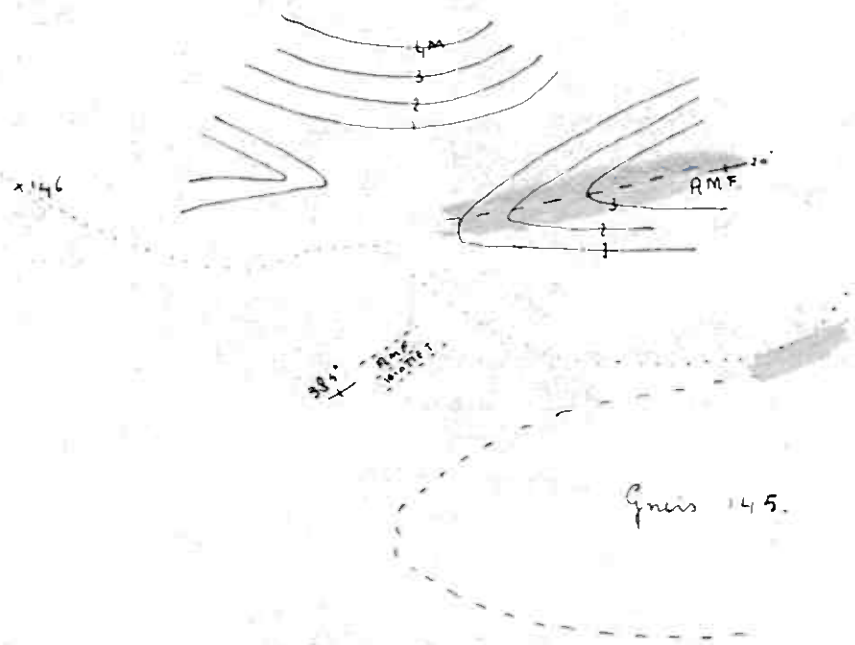
N.

144.

AMF. 35°
147.

100m

Opening (4) 2259ON-1615OE



BANDED SCHIST - STRONGLY-WETHERED

N

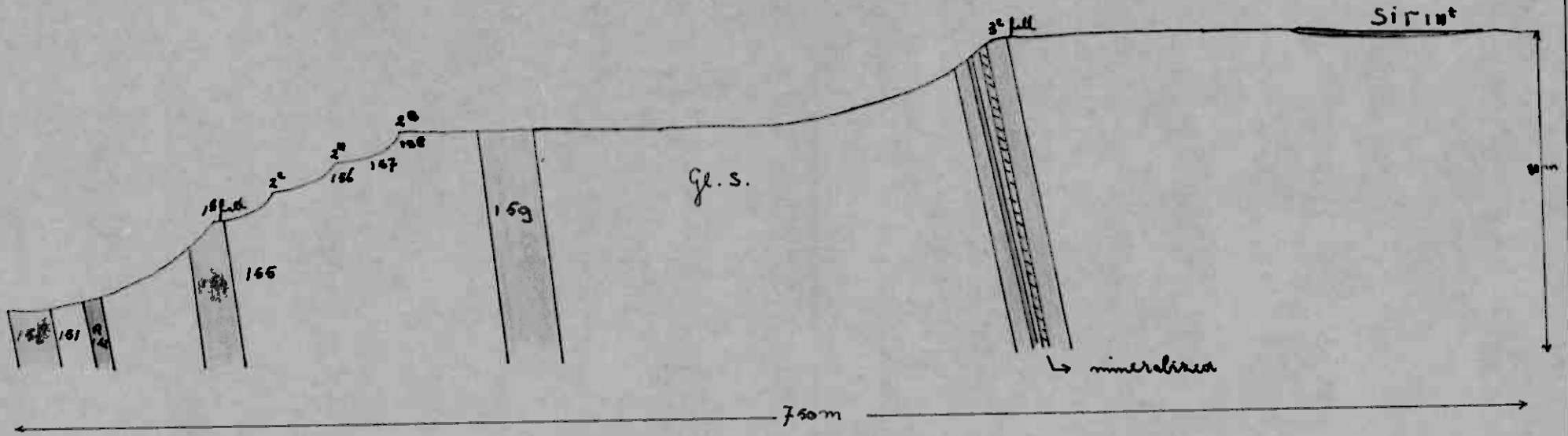
144.

AMF 35°

147.

100m

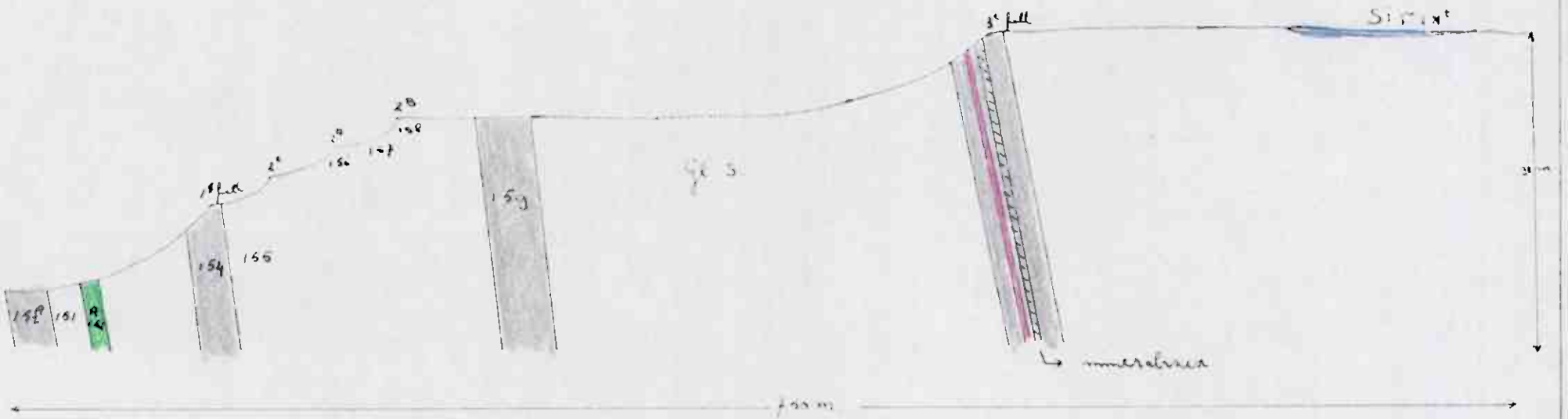
KVANDRLSELVA from grid. 22300 N / 16400 E till Sirint. 6-6'



Grafiet.

FIG; VI.

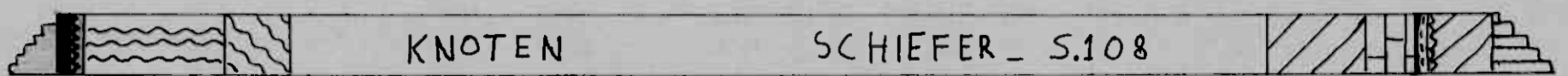
KVANDALSELVA from prof 22300 N / 16400 E till Svint 6-6'



Grafitt

FIG. VI

FIG; I
(VERTICAL)



E

W

1 CM. = 1 M

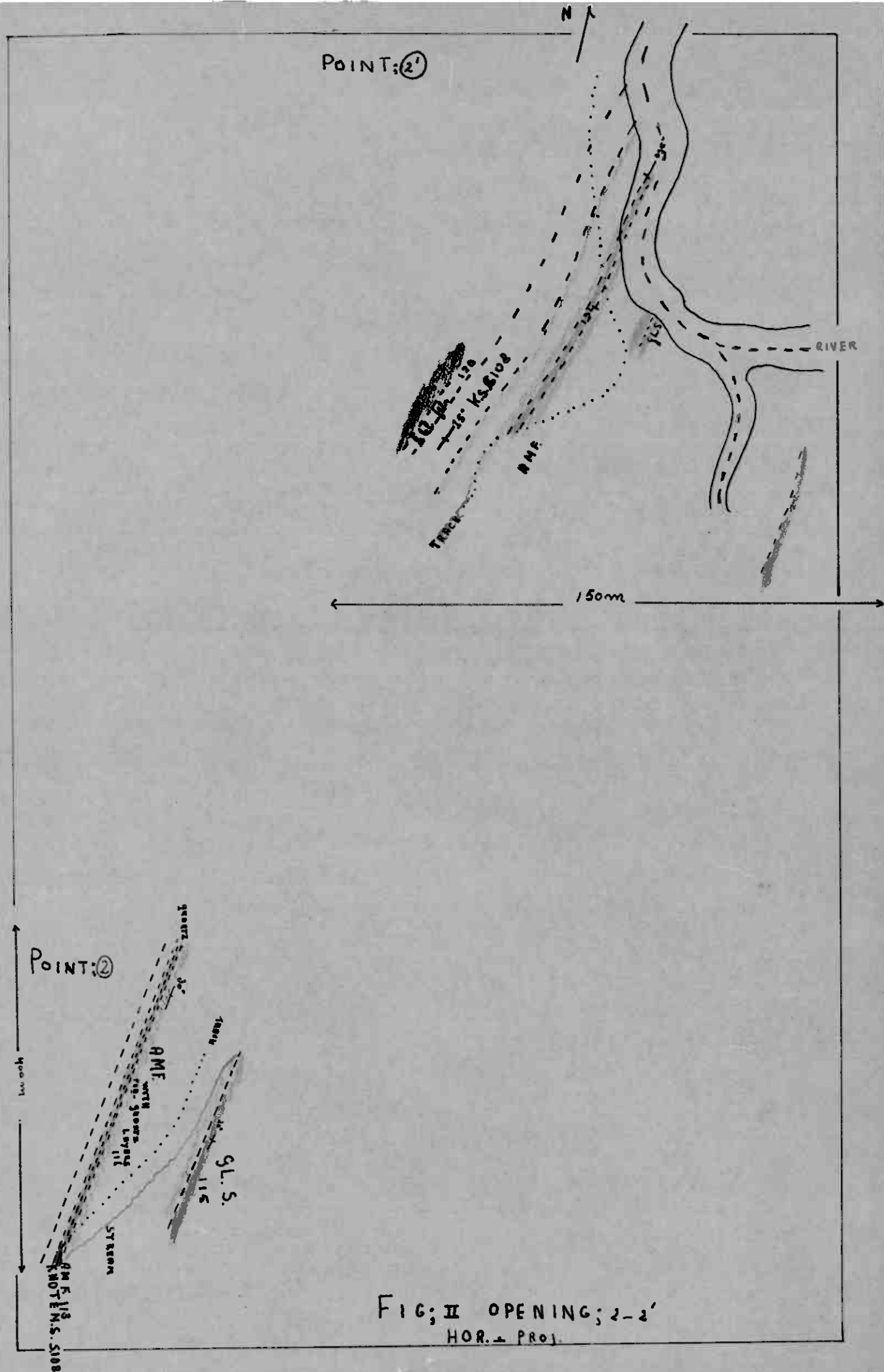
- Serpentine (101)
- amfibolite
- hornblende fels_103
- asbest
- marmor
- very compact marmor
- glimmer schist.
- banded Mica_ schist.
- Schefered Serpentine.

FIG; I
(VERTICAL)

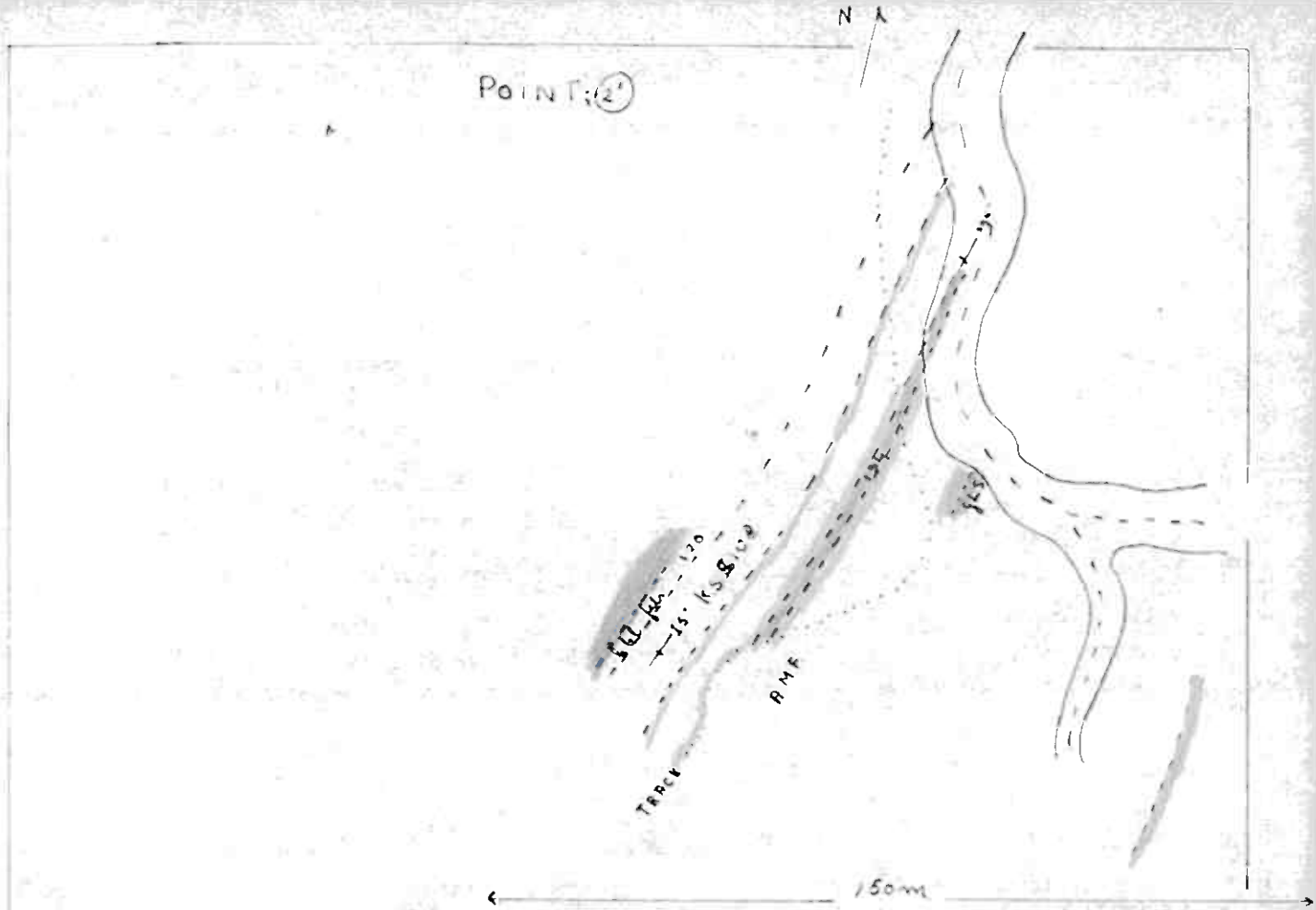
E ← W

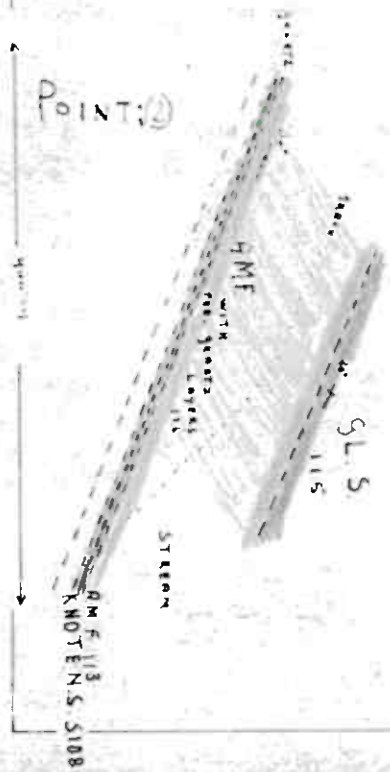
1 CM = 1 M

- Serpentine (103)
- amfibolite
- hornblende fels_103
- asbest
- marmor
- very compact marmor
- glimmer schist
- banded mica_ schist
- Schistered Serpentine



FIG; II OPENING; 2-2'
HOR. & PROJ.





FIG; II OPENING; 2-2'
HOR - PROJ