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Sammendrag Området ved Evenesdal og mellom Evenesdal og Balvann er undersøkt geologisk. Hovedvekt er lagt på studier av kyanitt forende ganger og en malmsone i Evenesdal. Dessuten er berggrunnen i Evenesdal korrelert til bergartene i Sulitjelmafeltet. Kun 6-7 kyanittganger ble observert. Bestod av kvarts og kyanitt, 1-2 m mektige. 'Malmsonen' er en grafittskifer - ingen malm-mineraler observert.				

522.144. 005



Report on geological
reconnaissance in
Evenesdal - Balvann area

M. R. Wilson

1969

REPORT ON GEOLOGICAL RECONNAISSANCE IN EVENESDAL-BALVANN AREA:

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Assisted by A.Løyning

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Introduction.

We have investigated briefly the rocks in Evenesdal and the area between Evenesdal and Balvann. We were asked to complete mapping done by Downes and Johannesburg in 1968, to investigate an ore zone and some kyanite-bearing veins, and to correlate the Evenesdal rocks with the succession of rocks in the Sulitjelma area.

A. Kyanite-bearing veins.

Location: -In the immediate vicinity of a bridge over the river in Evenesdal about $3\frac{1}{2}$ km down-stream from the turiststasjon.
Coordinates: - $5170^{\circ}74'257''$.

Abundance: -6 or 7 veins were observed near the bridge. They mainly consisted of quartz and kyanite. Parts of some of the veins were of nearly 100 % kyanite. Their general dimensions were of the order of 1 - 2 m by 0,1 m. In total comprised much less than 1 % of the total volume of rocks in the area. The areas north and south from this locality were visited to ascertain if the veins occurred elsewhere and with what frequency. No veins were seen at all. The ground, however, is very badly exposed.

B. Ore zone in Evenesdal.

Location: -Immediately east of the above described kyanite vein locality $5170^{\circ}74'257''$.

Comments: - A zone of ore-bearing graphitic schist is known from this position. The area north and south along strike was examined by myself and by A. Løyning, but no ore zone could be picked up in the very badly exposed ground. The graphitic schists are present however, as can be seen from the map of Downes. Occasional rusty or sulphurous -weathering zones were seen. A geophysical survey might be of some use.

C. The geology of Evenesdal and its relation to the Sulitjelma ore horizons.

1. Preliminary description.

The area contains a complete section across all the Sulitjelma rocks. It should therefore be possible to divide the rocks up into the groups proposed by Nicholson and Rutland in their N.G.U. memoir no. 260, "A section across the Norwegian Caledonides: Bodø to Sulitjelma.", published 1969.

This succession is as follows:-

- Fauske Marble Group
- Sulitjelma Schist Sequence
- Sulitjelma Amphibolites
- Furulund Group
- Sjønstå Group
- Pieske Marble
- Sparagmite (psammities)
- Granite gneisses of the Pre-Cambrian basement

The boundary of the area on the west may be taken as the approximate base of the Fauske Marble Group. The Pre-Cambrian basement occurs in Kragdal.

The large scale structure of the region is fairly simple. A major monocline, the Vatnfjell antiform trends approximately north-south across the area. The closure of this fold occurs on the west ends of Satertind and Storfjell (the southern of the two Storfjells). To the west of this fold the rocks are more or less vertical with north-south strike while east of the fold rocks are gently dipping. On Satertind the closure of the fold is strightforward, but to the north zone of closure becomes wider and there are many minor folds resulting in a more complicated tectonic pattern.

2. Because only a short time was available for the work it was only possible to describe certain sections across the Evenesdal area and to link up the most important horizons. Two profiles were therefore made across the area, north and south of Evenesdal. These profiles are marked on the 1 : 50 000 map. Certain important horizons were followed as far east as Balvann in order to understand their relationships better.

Details of rocks seen on these profiles can be seen on the overlays to the photo-mosaics, and the correlation with the Sulitjelma Succession is on a 1 : 50 000 map. All names are from the 1 : 50 000 AMS map. Also spot-heights and lake heights and co-ordinate positions.

3. Profile from Evenesdal to Kragdal.
The highest rocks seen were marbles presumed to be of the Fauske Marble Group at locality 166260 in the valley section in Evenesdal. Structurally below these rocks, ie. lying to the east, is about 500 m of mainly graphitic shists with marbles an ore zone, kyanite veins (described above) and various coarsegrained schists. (This sequence of rocks could also belong to the Fauske marble Group).

Below these rocks lie some 2 000 m of well-banded calcareous-biotite/semi-pelites rich in quartz segregations and intruded by many small granite veins. Their lower boundary has been traced across the area, and runs north-south just east of the Evenesdal Turiststasjon. At the base is an intermittent polymict conglomerate about 1 - 2 m thick. This can be seen in the section up Mariakselelva leading up to Kalvt. (738 m).

Below the calcareous semi-pelite with its conglomerate at its base is a thick series of rusty-weathering muscovite-biotite schists which can be crossed eastwards from lake 738 more or less as far as Middagselva. The upper part of this series contains two or more bands of fine-grained schistose amphibolite up to 30 m thick. Small granite veins and pegmatites are abundant. The rocks in the neighbourhood of lake 738 are strongly folded (as is indicated diagrammatically on the map of Downes). It would take a considerable amount of time and effort to map this small area in enough detail to understand its structure.

Near (but not at) the base of these rusty-weathering 2 mica semi-pelites is a 50 m band of medium-grained biotite schist very well layered and slightly calcareous. Løyning mapped this zone north-west for me and it appears to widen out becoming quite thick. These rocks are grey-weathering.

Below these biotite schists are some 200 m of fine-grained muscovite-biotite semi-pelites, rusty-weathering in parts fissile, in parts massive.

Below these rocks lie 50 - 100 m of amphibolites. In parts these are well layered, fine-grained and schistose, and parts massive. They are correlated with the Sulitjelma Amphibolites. On this correlation all the overlying rocks belong to the Sulitjelma Schist Sequence.

Below the Sulitjelma Amphibolites is a very thick series of highly calcareous biotite semi-pelites. These closely resemble and are correlated with the Furulund Group, although schistosity surfaces are not quite as fine and smooth as in the Furulund Group around Balvann and Langvann. These rocks form most of the steep north face of Storfjell on the south side of Kragdal. Occasional thin bands of amphibolite within the group stand out as ledges on the hillside. The top of the group has been traced northwest to Særdal by Løyning. To the east the top of the group can be followed on air photographs. I have located the top of the group nearer Balvann where it runs along the stream marked east of Tverfjellet (966 m). It would appear in the field that the top of the group lies at the base of the steep north face of point 1338, the highest point of Storfjell, but I was unable to follow the contact on the ground.

Below these rocks lie massive mica schists, generally non-calcareous and grey weathering which can be correlated with the Sjønstå group. Under these lie marble (Pieske marble) psammite (sparagmite) and granite (basement).

While the succession of rocks along this profile appears to be straight forward the strong folding in the vicinity of lake 738 (210266) mean that the thickness of rocks in the Sulitjelma Schist Sequence at this point cannot be ascertained and that the general attitude of the bedding is indeterminate. As a consequence of this and the bad exposure on the south side of Storfjell it is difficult to tell directly if the Furulund Group outcrops in Evenesdal. It is important to determine this since the main Sulitjelma ores lie at the top of the Furulund Group, as for example at Rauflaaget, south of Særdalen.

4. Profile south of Evenesdal.

The profile east from Storvatn (522) to Galagaldalen and Satertind was examined.

The western half of this profile comprised the well layered calcareous semipelite as seen further north. There are however, in addition, two large bodies of massive muscovite schist, rusty-weathering and forming low hills. These thin out to the north as is shown on the map.

There is in addition a string of boudins of coarse-grained massive amphibolite, now highly deformed. Johannesburg marked these as a continuous outcrop.

East of Sauvatselva is the base of these rocks and they are underlain by massive rusty-weathering muscovite schists, as seen north of Evenesdal. Towards Galagaldalen these become less massive and more varied and less rusty-weathering. The changes in rock character are gradual and rather subtle. No clear line of change could be quickly picked out. The lowest rocks seen are in Galagaldalen/at co-ordinates 223195 and are well-banded medium to coarse-grained two-mica schists. Between these and the overlying rocks is a band of marble some 2 m thick which occasionally thins out due to tectonism. This is well exposed on the southwest and south faces of Satertind, and must occur on the west side of Galagaldalen but was not seen due to bad exposure.

This marble is also exposed at about 700 m height on the north faces of Satertind. In the folding of the Vatnfjell antiform it must be carried north across Evenesdal and must be accreted somewhere on the west side of Storfjell. It was not exposed.

When the marble is traced to the east it loses height and crosses Evenesdal about 1 km north-west of point 692. It then rises northwards up the north side of the valley as a simple consequence of its gentle eastward dip. We then lost track of the marble but it probably continues east near lake 1053.

In Evenesdal the marble crosses the river downstream from an ore horizon described by Dybdahl in his report on the ore horizon around Skaiti. It therefore lies structurally below this ore zone. When Dybdahl's ore zone is traced east it eventually lies at the top of the Furulund Group (at Balvann). Investigations around the west end of Balvann show that Dybdahl's ore horizon appears to lie at a constant stratigraphic position in the Sulitjelma Schist Sequence. The junction of the Sulitjelma Schist Sequence and the Furulund Group appears to be discordant. A thick series of rusty-weathering rocks which outcrop around lake 1053 in the col between Evenesdal and Balvann thins out to the east. This is shown diagrammatically in the sketch, and on the 1 : 50 000 map.

This would suggest that the marble seen on Satertind and followed across Evenesdal is out against the Furulund Group. Therefore it is quite possible that in Evenesdal and in Galagaldalen there is a considerable thickness of rock between the marble and the top of the Furulund Group (ie the main ore level). On the other hand it is also possible that the thickening does not continue southward and that the Furulund Group and main ore level lie not far below the marble and could even outcrop in Evenesdal. Løyning reported the presence of calcareous semi-pelite in the valley bottom between Satertind and Storfjell, but since lithologies in general are so similar we cannot be sure that this is the Furulund Group.

5. Summary

1. The top boundary of the Furulund Group (the approximate stratigraphic position of the main Sulitjelma ore bodies) has been traced from Balvann to Sjørdalen/Vassbotnfjell. It is probable that the Furulund Group does not outcrop elsewhere in the area, although there is a possibility of an inlier in Evenesdal, east from Storenga.

- 2 The boundary between the Furulund Group and the overlying Sulitjelma Schist Sequence is discordant. Low units within the Sulitjelma Schist Sequence thin out to the east bringing successively higher units into contact with the Furulund Group, as is indicated in a sketch section.
- 3 The ore zone traced by Dybdahl does not lie at the top of the Furulund Group except on the shore of Balvann, but lies at a specific horizon within the Sulitjelma Schist Sequence, this horizon being discordant with respect to the Furulund Group. The ore zone is therefore carried well above the top of the Furulund Group to the south-west.
- 4 No folding/^{was} observed in the west of the whole area which would bring up the Furulund Group and the main Sulitjelma ore zone. All minor folds whose axes were parallel to that of the major Vatnfjell Antiform had a sense of overturn which fitted the major fold.
- 5 The 1 : 50 000 map compiled by the Mine after the work of Downes and Johannesburg is incorrect in many details. The colours are in general quite wrong, not indicating the lithologies correctly. The correlations with the Furulund Group, Sjønstå Group and Pieske Marble Group are incorrect. The mapping around Pettermoen is incorrect. Many of the lithological boundaries are up to 500 m out of place.

D. Suggestions regarding the conduct of student mapping in future.

1. Field observations should be marked on an overlay on the 1 : 16 000 mosaics during field-work. These would then consist of outcrop maps of the area with the exact location of observations evident.
2. The students should only be asked to describe the rocks in terms of their lithological character (eg: "biotite-schist"), not in terms of the main units (eg "Furulund Group"). Such correlations should be made after consultation between the geologist in charge of all the mapping and the student concerned. In an area like Evenesdal it is virtually impossible to make such correlations without first tracing in the contacts of the main stratigraphic units from outside the area.
3. 1 : 50 000 maps prepared by students should only be regarded as summary maps. The detailed information should be plotted on the air-photo mosaic overlays, at 1 : 16 000.
4. The present colour code should be revised. The code is a mixture of stratigraphic terms and lithological descriptions. While it is certainly impossible to have a quite fool-proof code (since there is such a variety of rocks) it is very clear that the present code is virtually unworkable for the Evenesdal/^{area} at least. I suggest that it might be best to use one colour code for the 1 : 50 000 summary maps this code indicating the main stratigraphic units ("Sjønstå group etc), adopting the groups defined in Nicholson & Rotland 1969, N.G.U. 260, and a second code be used for the detailed 1 : 16 000 map this being to show the lithological character of the rocks. It should be possible to devise some scheme to indicate most of the following characters of normal schists:

Calcareous or non-calcareous
 Rusty-weathering or grey weathering
 Massive or fissile
 Main mica Biotite or Muscovite or both
 Grain size
 Well layered or not layered
 Porphyroblasts present

Obviously on colour scheme could indicate alle the possibilities, indedd the main failing of the present code is that there are too many colours and it is difficult to tell the colours apart. About 6 colours are sufficient. More details must be indicated by writing.

I suggest (following geological conventions)

Blue (thin blue line)	Marble (if dolomite write "d")
Green	Amphibolite (specify type in words)
Red	Granites (" " " ")
Light Blue (as an area)	Calcareous schists
Yellow	Biotite schist
Brown	Muscovite bearing schist

Large areas of marble would have to be dark blue to distinguish from calcareous schist.

Porphyroblasts could be indicated as at present by cross-hatching, though in general indication of porphyroblasts is not always very useful.

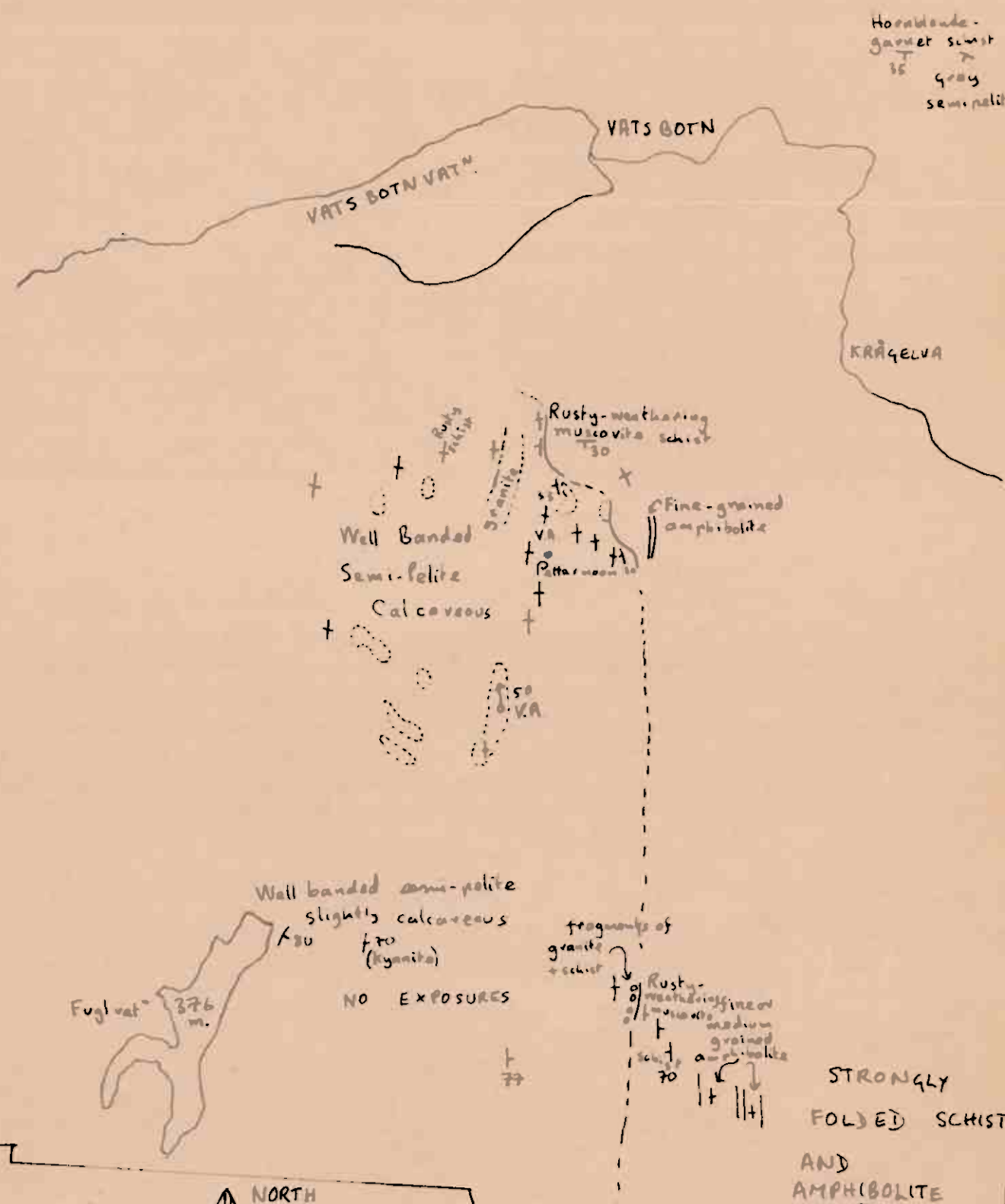
Please note that the above are only suggestions - not a comprehensive scheme!

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POTHUS
BRIDGE AT
RØKLAND

⑪
KARLSBRU



KEY

^ ATTITUDE OF BEDDING AND SCHISTOSITY f (vertical)

∩ ATTITUDE OF FOLD AXIS

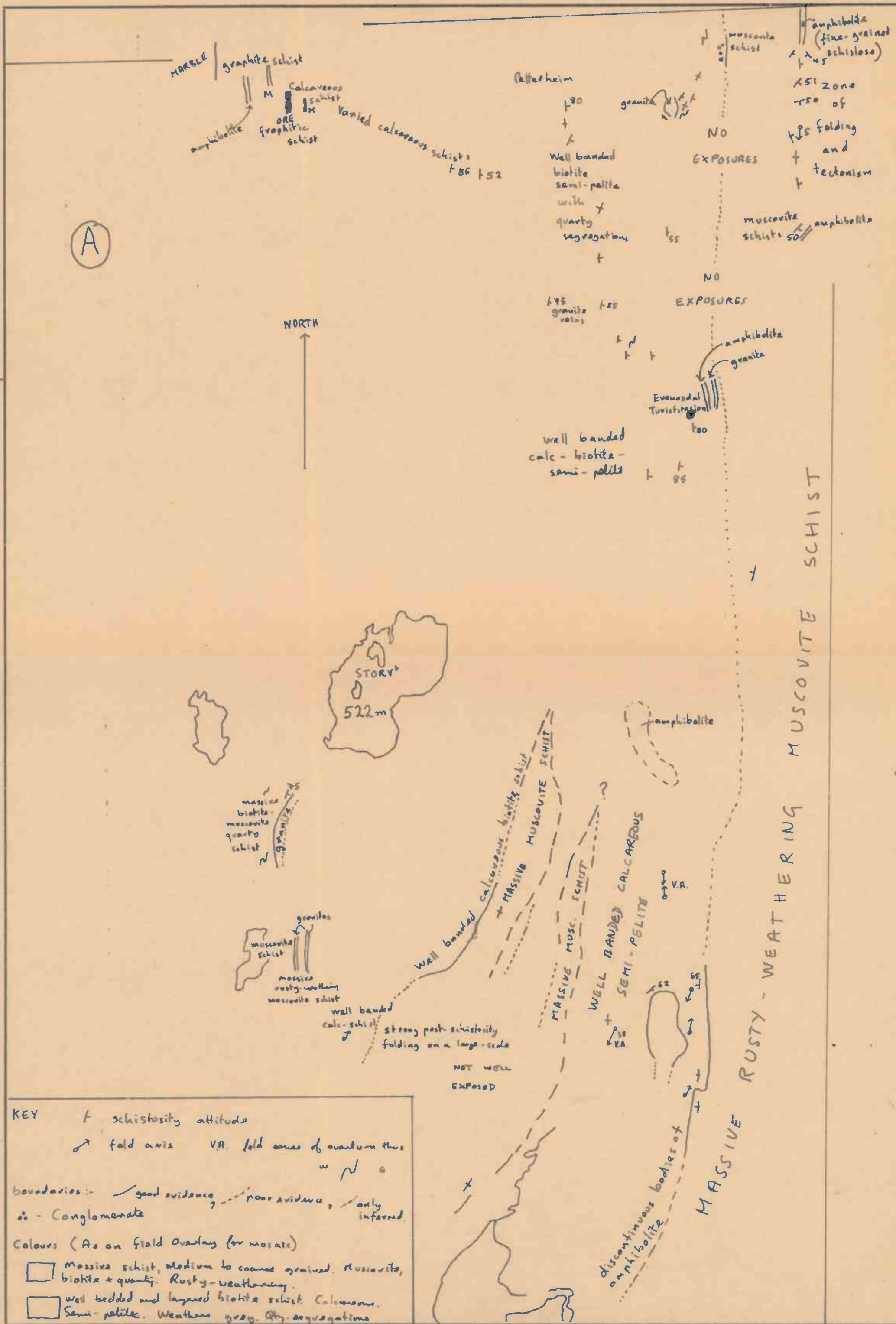
V.A. : Here is a fold with sense of overturn which agrees with Vatnfjell Antiform
ie. Profile of fold W ∩ E

○ Area of outcrop (where schistosity not measured)
○○ Conglomerate

GEOLOGICAL OBSERVATIONS IN
THE AREA AROUND
PETTERMOEN

SCALE 1:16,500
OVERLAY FOR PHOTO-MOSAIC
2128 IV D (NORTH PART)

Målestokk	Tegn.
	Trac.
	Kfr.
Erstattet for:	
H.R. WILSON Ph.D. 18/7/69	
Erstattet av:	



A GEOLOGICAL INVESTIGATIONS IN AREA AROUND EUNESDAL TURISTSTASJON OVERLAY FOR PHOTO-MOSAIC 2128 IV (D) Scale 1:16,500	Målestokk	Tegn.	
		Trac.	
		Klr.	
B Sketch-Diagram to illustrate discordance between Furulund Group and Sulitjelma Schist Sequence at West end of Balvat.	Erstatning for:		
	M.R. WILSON Ph.D.		
	18/7/69		
	Erstatet av:		