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Tittel

Gold Exploration in the Seljord and Hjartdal area of Telemark, Southern Norway

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Gamst, Søren Thomsen, Tonny B	March 1998	Mindex ASA

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Geologi		Bleka Espelid

Råstoffgruppe	Råstofftype
Malm/metall	Au

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Mindex ASA

Gold Exploration in The Seljord and Hjartdal area of Telemark, Southern Norway

By

Stud scient Søren Gamst &
Stud scient Tonny B. Thomsen

March 1998

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Introduction

The Mindex ASA concession of the Hjartdal-Svartdal area in Telemark (fig.1&2), Norway (approx. 15 km²), has over a 3-week period, 8/8-29/8-1997, been geologically prospected and geophysically covered (ground survey mag.).

The objective of these explorations was to locate the gold-copper-bismuth bearing quartz-ankerite veins of the area as grounds for further development of the concession, including the planning of core-drilling.

The basis of the whole project is the Bleka Gruver gold-bismuth mineralisation, that was mined for gold around the change of the century. The gold mineralisation is related to a single WSW-ENE trending quartz-tourmaline-ankerite vein, the Bleka main vein. It is hosted by the Bleka amphibolite, which is a metagabbroic sill complex, part of the low-metamorphic supra-crustals of the southern precambrian province of Norway. More specifically The Bleka amphibolite belongs to the Seljord group of the Telemark suite (Dons, 1960). The Seljord group is lithologically dominated by quartzites, conglomerats, schists and mafic intrusions.

The Bleka main vein has a known strike length of 1100 m and an average thickness of 0.35 m. In addition to the main vein a number of smaller veins with various direction occur in the Bleka area.

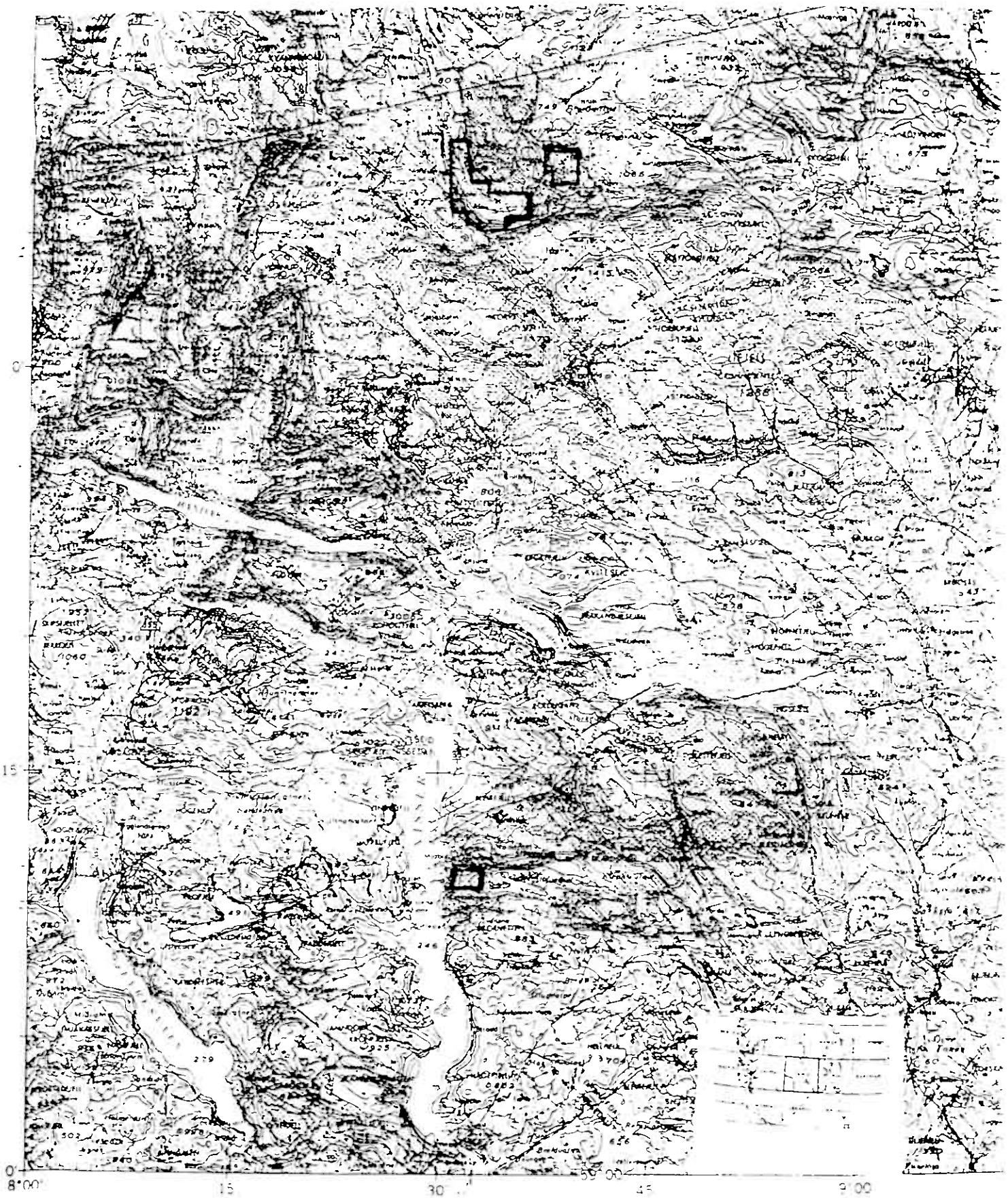

Fig 1. Map of Telemark, southern Norway. The two Mindex ASA concessions in Hjartdal/Svartdal are shown in the top.

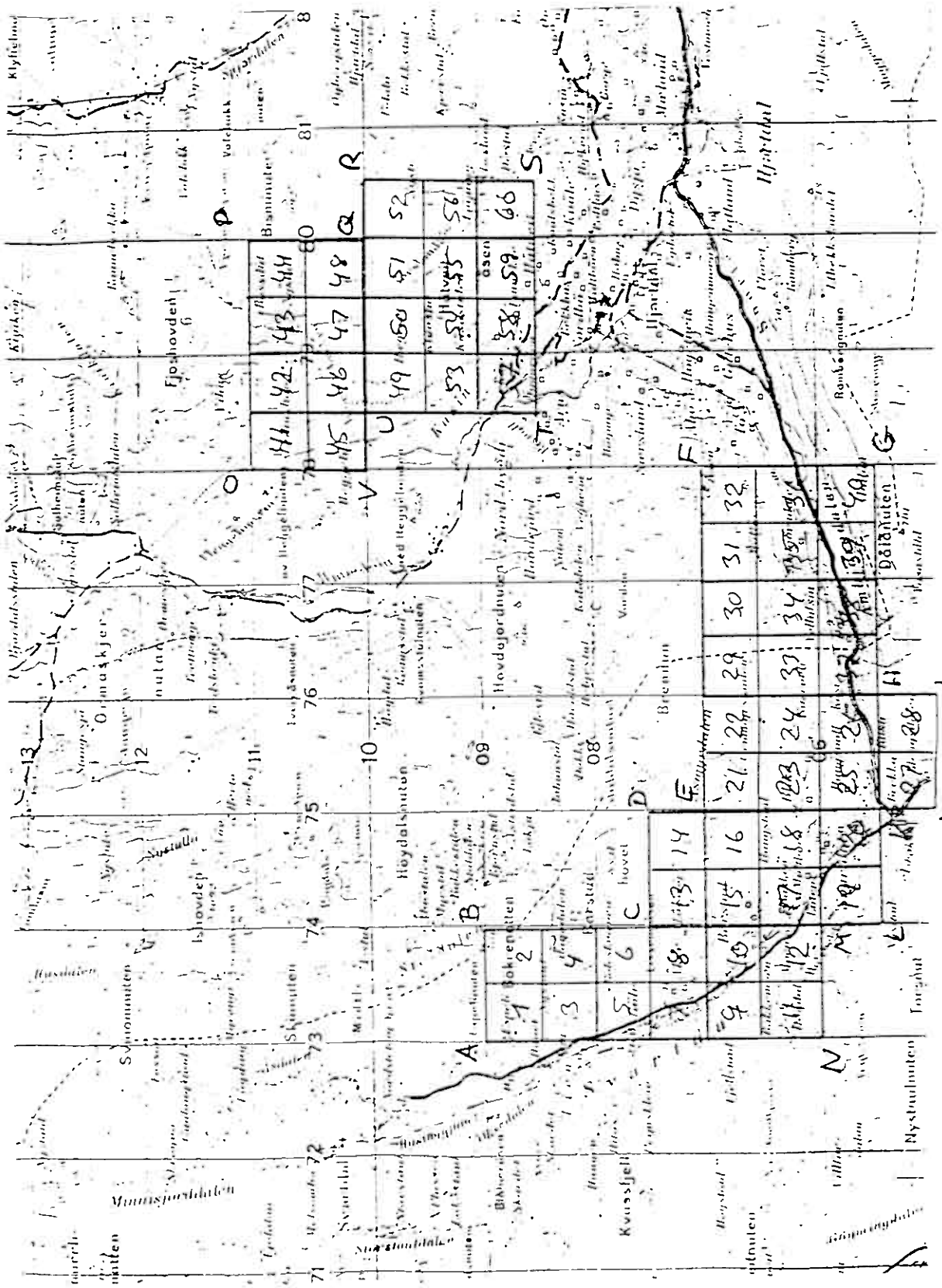

Fig.2. The two concession areas. NGO series 1614-3 1:50000 (Nordic minerals 1996).

The Bleka Mine

Gold was discovered at Bleka around 1880 by a local farmer. A french company overtook the property and ran the production until 1905, when mining activities stopped.
The mine then reopened in 1933 to produce a flotation concentrate of gold, bismuthinite and chalcopyrite that was sold for further treatment in Germany. This production ran until 1940.
In all approximately 165 kg gold was recovered from 4-5000 t of ore, which corresponds to an average of 30-40 ppm gold.

Previous Work

There is a long list of previous workers in the area, but only the most recent will be taken in to account here.
In 1984 a geological exploration project was conducted by Norsk Hydro A/S in the areas of the abandoned Bleka Mine and Espelid, 3 kilometres further north (Fig 3). The object was to provide information regarding the geological and structural nature of the quartz-vein system of the areas.
The Bleka Main Vein System (fig 4) was found to be veins of quartz-tourmaline-ankerite with minor calcite, dolomite, epidote, muscovite and chlorite. Ore minerals constitutes approx. 1 %, and include chalcopyrite, pyrite, bismuthinite, Bi-sulfosalts, gold, galena and scheelite. Visible gold is observed as grains up to 1mm in the greatest dimension, occuring partly in late quartz veinlets and partly intergrown with toumaline-quartz. In both cases associated with bismuthinite.
The general orientation of the Bleka vein is 71°/73N°. A major shift in orientation occurs ENE of the mine area, which is interpreted as convergence of two "en echelon" fractures.
A hydrothermal alteration zone of approx. 0.5 m (Vogt 1888) is apperant on either side of the veins, causing an increase in muscovite and calcite towards the vein, whereas the feldspar and hornblende contents decrease. This results in a overall bleaching of the rock towards the vein.

The Espelid area was mapped in scale 1:1000 (fig.5). The veins here are smaller than the main vein system, but more numerous. They are considered to be part of a major vein swarm similar to those of the Bleka mine area. The average orientation of the veins is 68°/78°N with most of the veins striking 40-90°.
The veins consists predominantly of quartz and tourmaline with secondary ankerite-sericite-pyrite. The overall sulphur content is lower that of the Bleka main vein. Zones of hydrothermal alteration are similar to those of the Bleka area.
The known vein occurences in the areas of Barstad, Blengsdalen and Gjuv were also briefly investigated.

A conceptual model, proposed for Bleka-type veins in the Bleka fold area, can be seen in fig.6. The veins were emplaced late in geological history of the region, as they are not affected by the deformation and metamorphism of the hosting amphibolite. Economic potential is considered good, especially for the Espelid vein swarm, though Au-values in samples taken are low (20-210 ppb). 5-10 of the mapped veins here exhibit average thickness of up to 3 times larger than the Bleka vein. Plus the Espelid vein swarm represents a much larger hydrothermal system than the Bleka main vein system.

In 1989 a geophysical survey of the Bleka-, Gjuv- and Sverveli areas was carried out by J.P.Larsen of Aarhus university. A variety of instruments and methods were applied. The Bleka main vein was recorded magnetically by the gradient (total-field) method with succes, and it was concluded that this method would give the most precise results in the search for unexposed mineralisations.

K.S.Jensen conducted a geophysical survey of the Sverveli and Bisminuten areas in 1997. A proton-magnometer was used to measure magnetic anomalies, along profilelines. From these measurements trends of anomalous magnetism were drawn, and these can be seen in appendix A3 of this report.

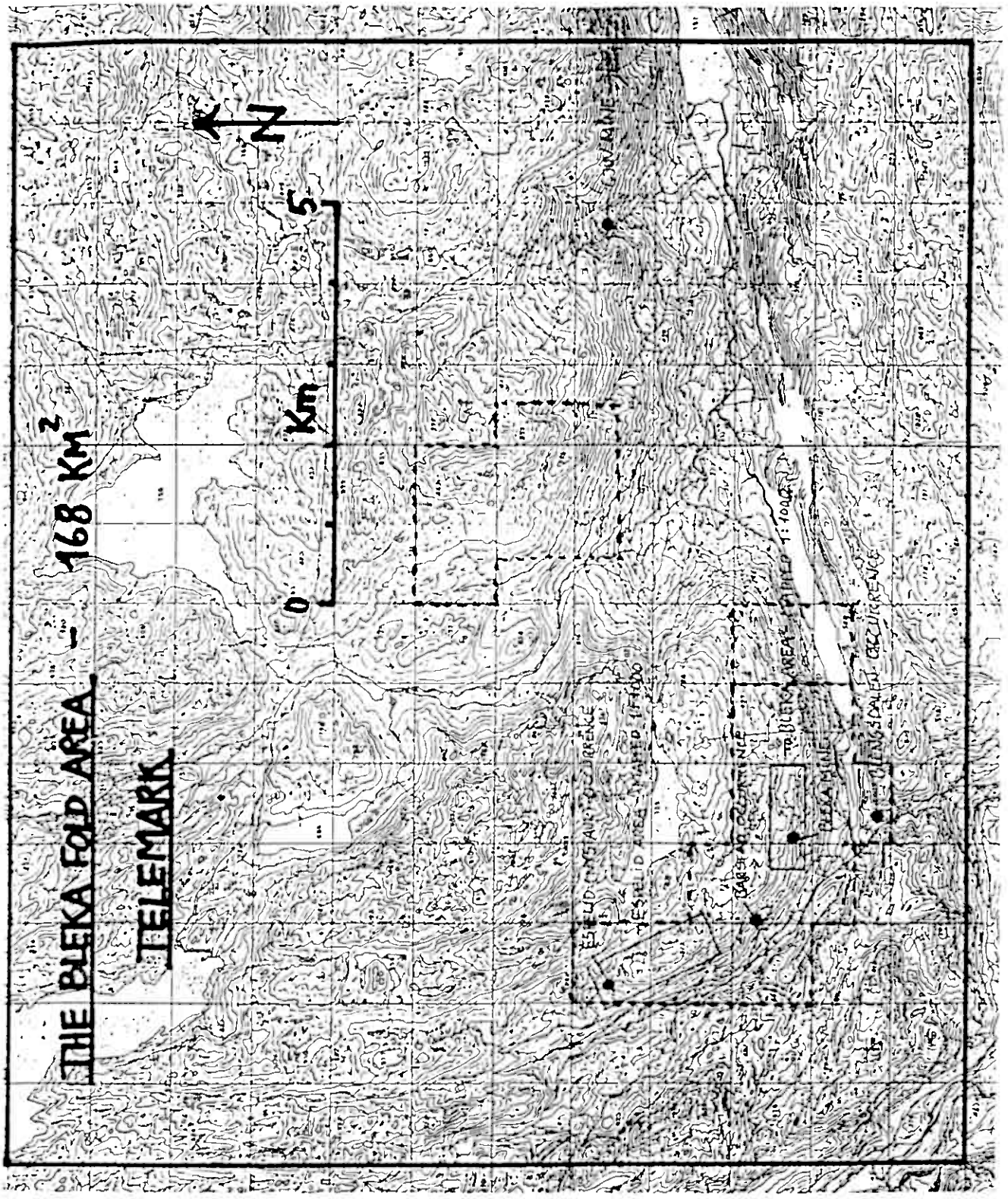

Fig.3. The Bleka fold area. Locality map of O.Harpoth & J.L.Gregersen (1984). The two Mindex ASA concessions are shown.

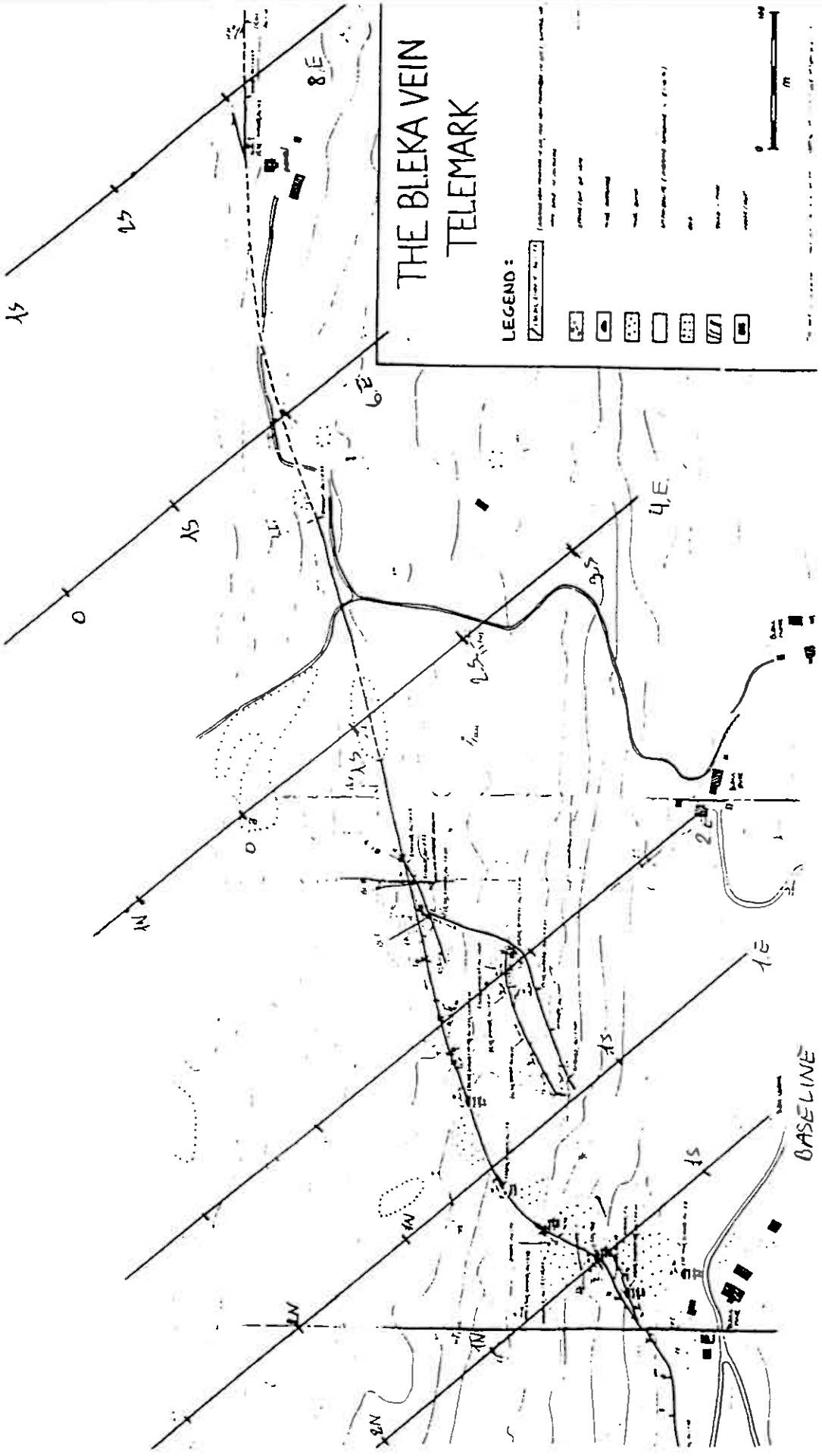

Fig.4. The Bleka main vein. Profilelines are shown.

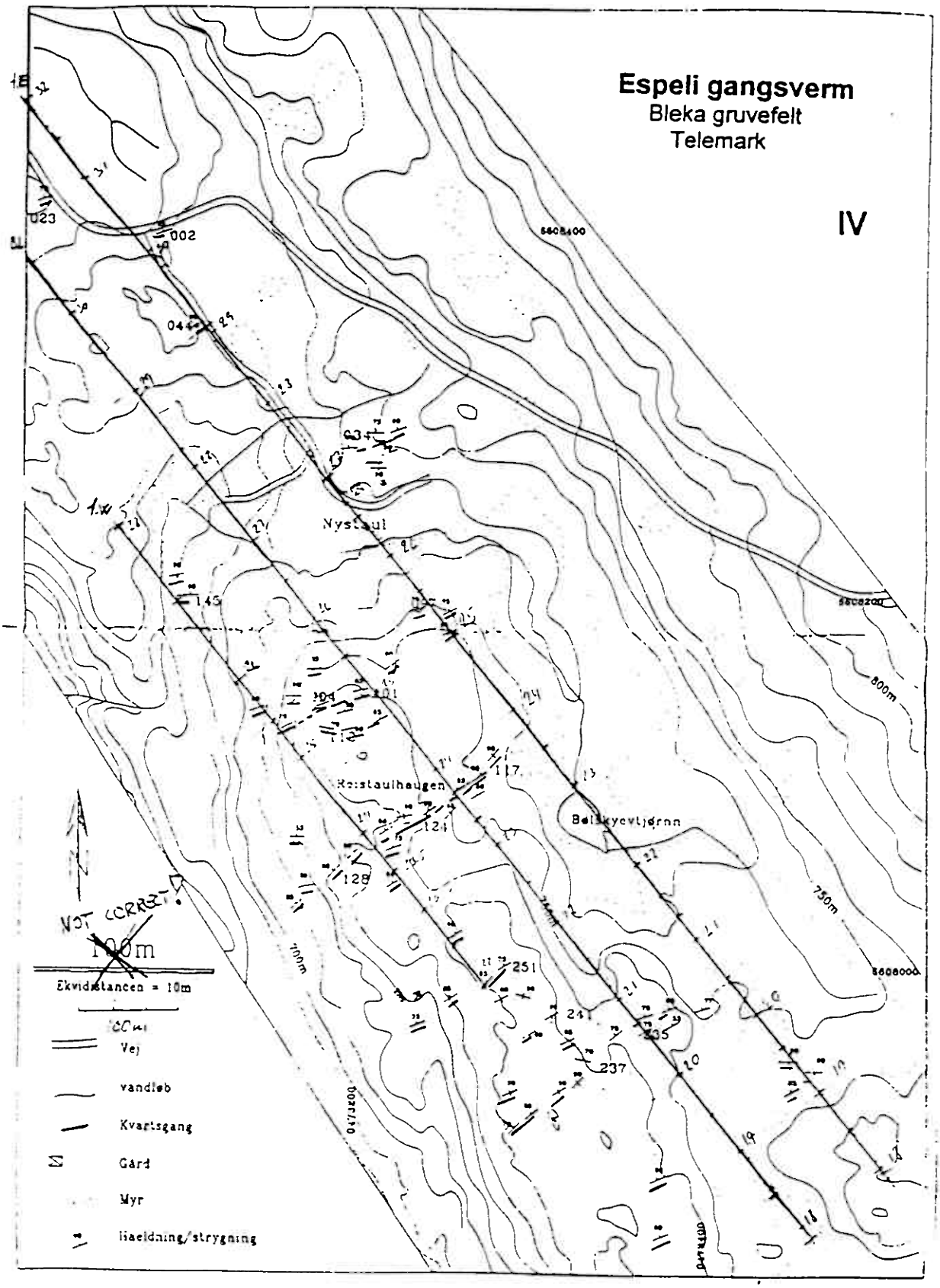

Fig.5. The Espeli veinswarm. Profilelines are shown.

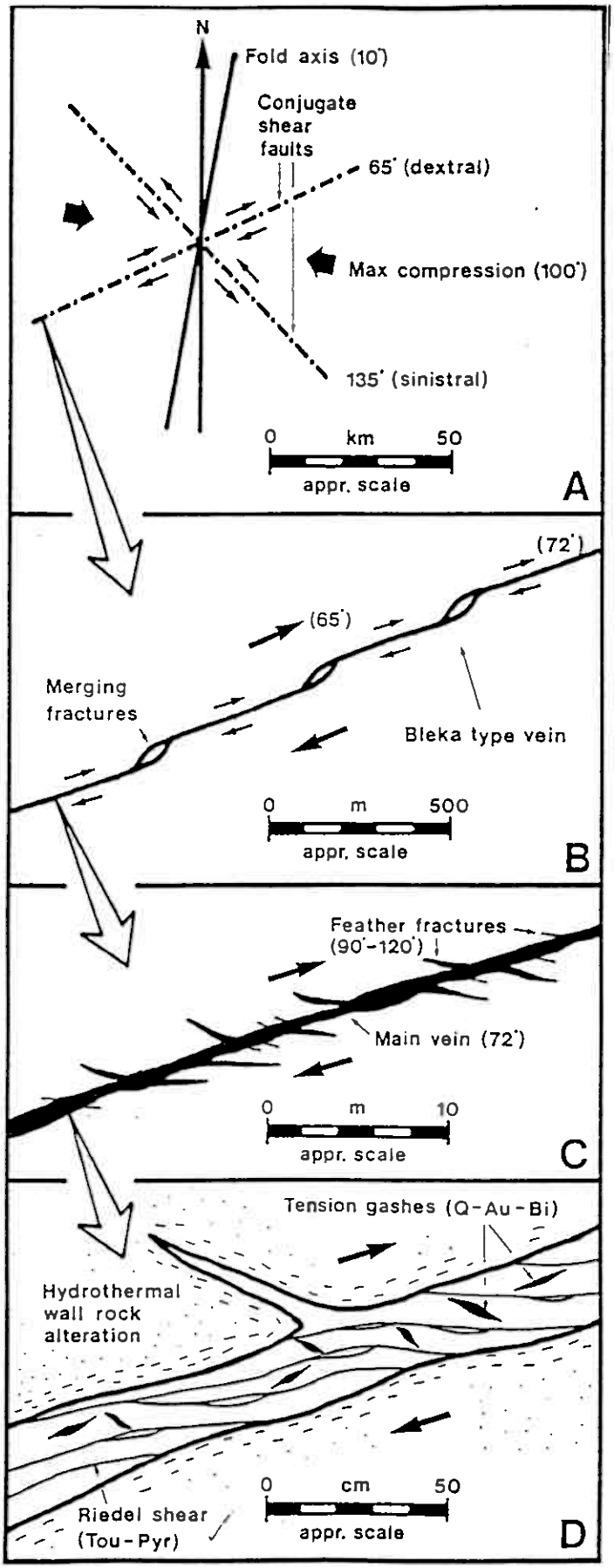

Fig.6. Conceptual model (Harpøth, O. & Gregersen, J.L., 1984). A-D show various scales (The B-drawing is misleading, as the merging fractures are inconsistent with arrow movement – pers.com.).

Field Work

The field work was primarely targeted towards constructing a grid for the geophysical measurements. Secondarily locating, detail-mapping in scale 1:5000 as well as prospecting for, measuring and sampling of the quartz veins and their side wall rocks in the concession area.

Profilelines for the geophysical measurements were drawn in two separate areas; the Espeli-Bleka-Hjartdal area and the Hjartdal-Bisminuten area.
From a baseline trough the old mine-area, lines were drawn with a distance of 100, 200 or 250 meters between them. On every line, gridpoints were pinned for each 50 m. with checkpoints.
In the Espelid-Bleka-Hjartdal area, lines were drawn in the direction 320° with a distance of 100 or 200m. between each line.
Beyond the baseline, lines were tagged east and west, and gridpoints tagged north or south of the zero-point.
In the Hjartdal-Bisminuten area lines were drawn in the direction 50° with a distance of 200 or 250m. between. Here lines were tagged north and south, and gridpoints tagged east and west.
To keep the geophysical measuring in line, groundflags were pinned for every 50 m with inbetween "flagging". 2-3 km's of profileline were measured each day.

In the context of prospecting, recorded magnetic anomalies (areas/points of anomalous magnetism) were pursued to describe further. On location, the direction, inclination and thickness (average and max.) of the quartz-veins were recorded. Size of the alteration-zone and intensity of the alteration was also recorded.
Two particular areas, neglected in previous investigations, were chosen for prospecting; the area east of Sverveli and the Hjartdal-Bisminuten area. Detailed geological information on the Espelid vein-swarm and the Bleka-Sverveli area already exists (Harpoth, O. & Gregersen, J.L., 1984).

Quartz-veins and associated sidewall-alteration zones were sampled as representatively as possible, i.e. channelsampling of the veins and grabsampling of the alteration zones. Rocksamples were put in plastic samplebags, closed with tape and sent to Au 35+ analysis. A reference sample was taken for each analysis sample.

In all 75 samples were taken for chemical analysis in the two concession areas, including grab and chip samples.

Results

Samples 399153 (lab no. 3), 399159 (lab no. 9), 399181 (lab no. 31), 399198 lab no. 48), 399205 (lab no. 55), 399218 (lab no. 67), 399220 (lab no. 69) and 399254 (lab no. 76) all carry anomalous gold. It is however in very small amounts, the largest being sample 399181 at 85 ppb (137 repeated). This sample also carries a surprising 13450 ppm (1.345%) Cu and 33.9 ppm Ag. Bi-enrichment is only encountered in sample 399205, at 49ppm. Thus it seems the Bi-association reported elsewhere is not evident here.

Sample	*Rocktype*	*St./Dip*	*Average*	*Lok*	*Discription*
399-153	Q-VEIN	24/80 E	8 cm	4	Quartz-ankerite vein with minor tourmaline and albite.
399-159	Q-VEIN	29/87 E	2-4 cm	9	Quartz-vein with tourmaline and albite. Sulfides are no observed.
399-181	W-ROCK			36	Wall rock altered amphibolite with pyrite, chalcopyrite, malachite and chlorite ?
399-198	Q-VEIN	268/66 N	2 cm	48	Quartz-tourmaline vein with sulfides and minor magnetite.
399-205	Q-VEIN	143/60	3-3.5 cm	57	Quartz-vein with Fe-Cu-sulphides
399-218	W-ROCK			90	Altered amphibolite with abundant pyrite. Magnetic.
399-220	W-ROCK			73	Grab sample of strongly mineralized alteration zone surrounding the RCH-210 Q-vein
399-254	Si-ROCK		50 cm	103	Albite-altered wall rock amphibolite with calcite, pyrite, chalcopyrite and bismuthinite ?

It seems that enrichement of economic elements is equally distributed in Q-veins and mineralized wall rock.
The type of mineralization is much the same in the enriched samples. Q-veins are mostly associated with tourmaline, ankerite and albite. Sulphides are usually present and, to a minor extent, oxides. Abundant silvery ore minerals, initially taken for bismuthinite, is probably galena and scheelite as Bi-content in most samples is zero. Mineralized wallrocks (amphibolite) are typically strongly altered by introduction of sulphides (pyrite and chalcopyrite) and minor oxides (magnetite). Silicification and albititization is common.

Orientation of Q-veins varies greatly. It seems however, that orientation clusters around two overall directions: 20-50°N (approx.perpendicular to direction of

profilelines) and 280-330°N (approx.parallel to profilelines). Direction of dip of Q-veins is in many cases uncertain due to difficulties in determining from a small outcrop, nearing a dip angle of 90°.

Most Q-veins are between 1 and 10 cm. Only a few reaches 20 cm, which probably reflects that this is a larger hydrothermal system. This is also evident from the large number of altered/mineralized zones in the amphibolite. No attempt has been made to structurally connect the Q-veins, as the size and extension of the majority of the veins is limited.

Unfortunately one imortant locality is lost, loc.90 (399218) as the locality map containing this was sent prematurely to Oslo. Still, it would not make a big difference, as the Bisminuten area was fiercely neglected. Only a few samples were taken here. It seems however, that this area too is rich in zones of mineralization and Q-veins.

Discussion

It seems, as far as gold is concerned, that only minor amounts are present.
Though this fact may seem discouraging, it is worth considering the relatively few samples taken and the very limited time of exploration. Some amphibolite outcrops encountered are very mineralized indeed, and enriched in gold (ex.399181). A Q-vein revealed i this environment may carry gold in profitable amounts.
In relation to the geophysical trends proposed by K.S.Jensen, it seems they are outlined mainly by Au-barren mineralizations. At least when comparing with the Au-anomalous samples; they all strike more or less parallel to the profilelines, or show no peak in measurements. Whereas the samples taken in trend-zones are barren.
The Bleka vein itself outlines a trend, but by no means a clear one. In places it is completely indistinguisable and the question is if it could be mapped on geophysical data alone. It is however still possible that one or more of the trends outlines a unexposed zone of profitable character.

For the Bisminuten area, things are very uncertain and no discussion will be attempted.

Recommendations

The basis for recommending further investments, such as coredrilling, in the area is a little shallow. It would take a more focussed effort on detail mapping, channelsampling and structural investigations of the entire area, in which mineralized veins occur, to recommend coredrilling.

Recommendations for the briefly explored areas of Sverveli and Bisminuten, are as follows:

1) Follow up on the geophysical trends proposed by K.S. Jensen (1997) in order to make a thorough geological explanation of these trends.

2) Sampling in a much greater scale of mineralized amphibolite outcrops and Q-veins.

3) Structural investigations of the Q-veins, to provide a more complete pattern. This may imply a geophysical survey of profilelines in the direction 50°N to construct a complete rectangular grid.

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List of References

Larsen, J.P., 1989; Geofysisk feltarbejde i Hjartdal, Telemarken. Lab. For geofysik, Aarhus Universitet.

Nordic minerals, 1996; Bleka gold project, Hjartdal, Telemark District, South Norway.

Harpøth, O. & Gregersen, J.L., 1984; Gold exploration in the Bleka fold area. Telemark. Norsk Hydro A/S.

Jensen, K.S., 1997; Geophysical groundsurvey in the Telemark district. Mindex ASA

Appendix

A1: Map of localities in the Sverveli area.

A2: Map of strike-direction and dip-direction of Q-veins in the Sverveli area.

A3: Map of samples taken in zones of geophysical trend in the Sverveli area.

A4: Map of localities in the Bisminuten area.

A5: List of samples including fielddiscription and chemical analysis.

Encircled localities represent samples of anomalous Au-values.

A1.

A1

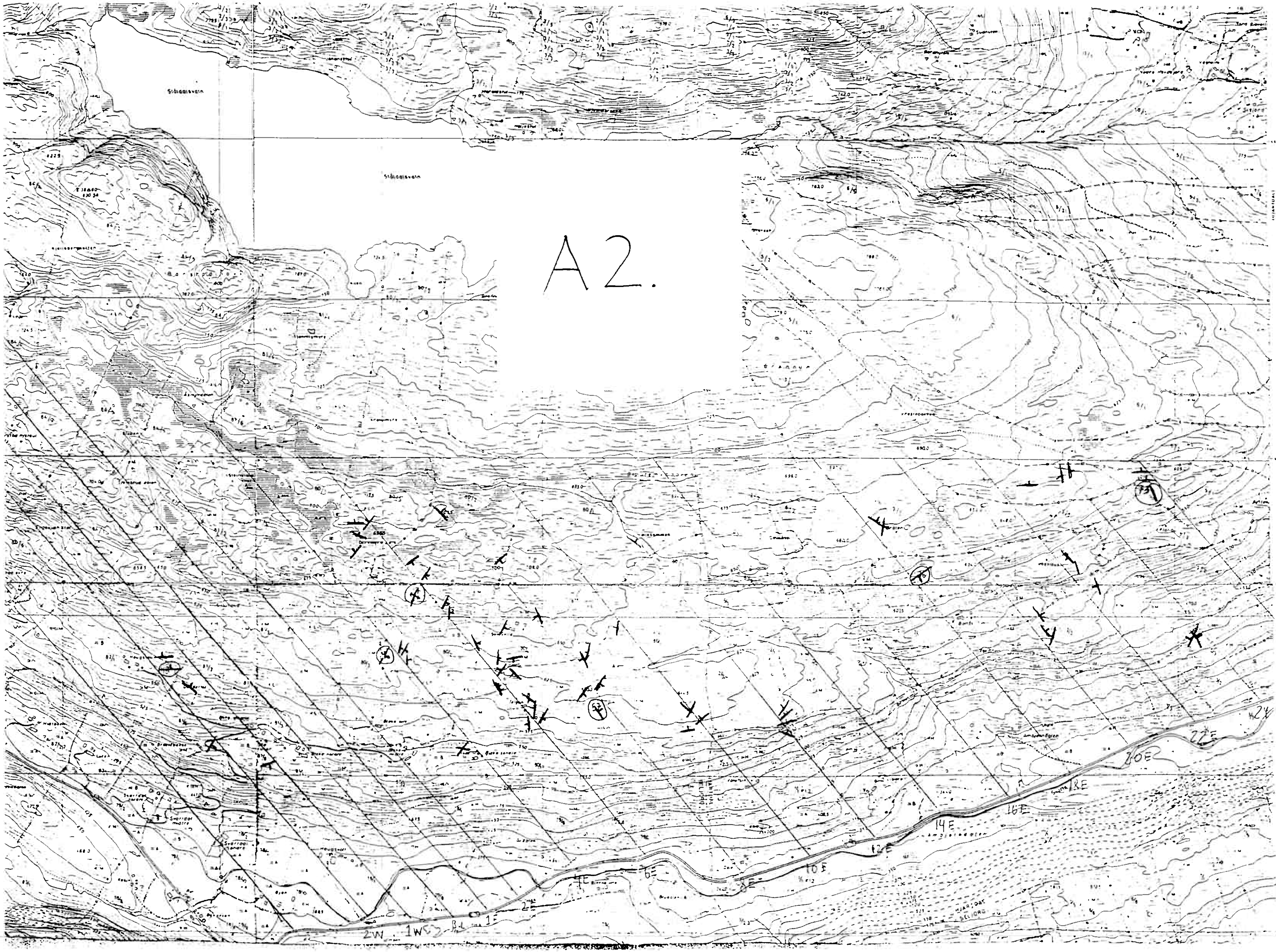

A2.
2W
1W
1E
2E
4E
6E
8E
10E
12E
14E
16E
18E
20E
22E
24E

Fig 9

A3-1

BLEKA - ESPELID - GOLD – MINES

Interpretation of Magnetic Anomalies

KEY:

STRONG ANOMALY

MODERATE ANOMALY

BLEKA GOLD VEINS

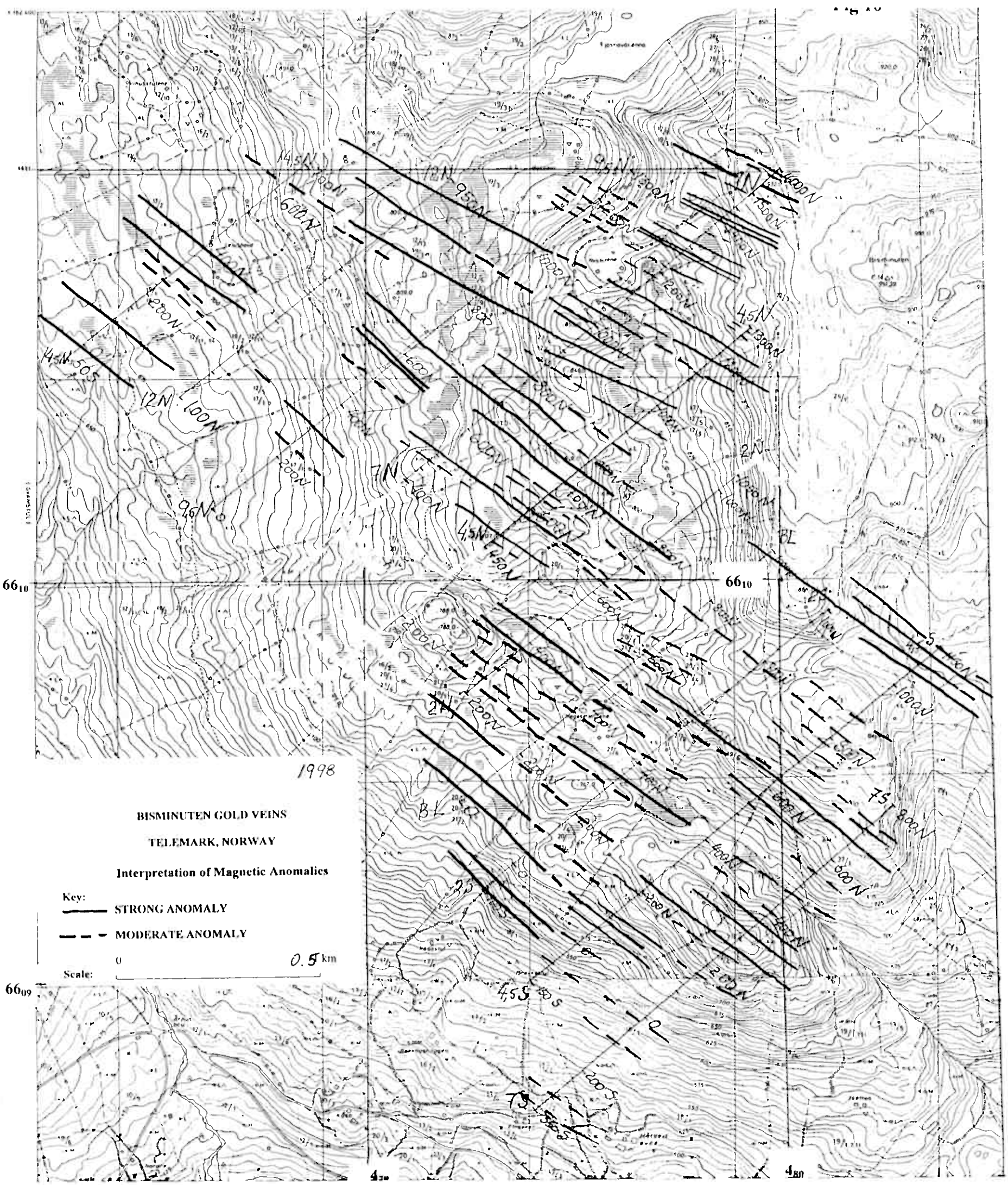
Scale: 0 — 1 km

1998

N

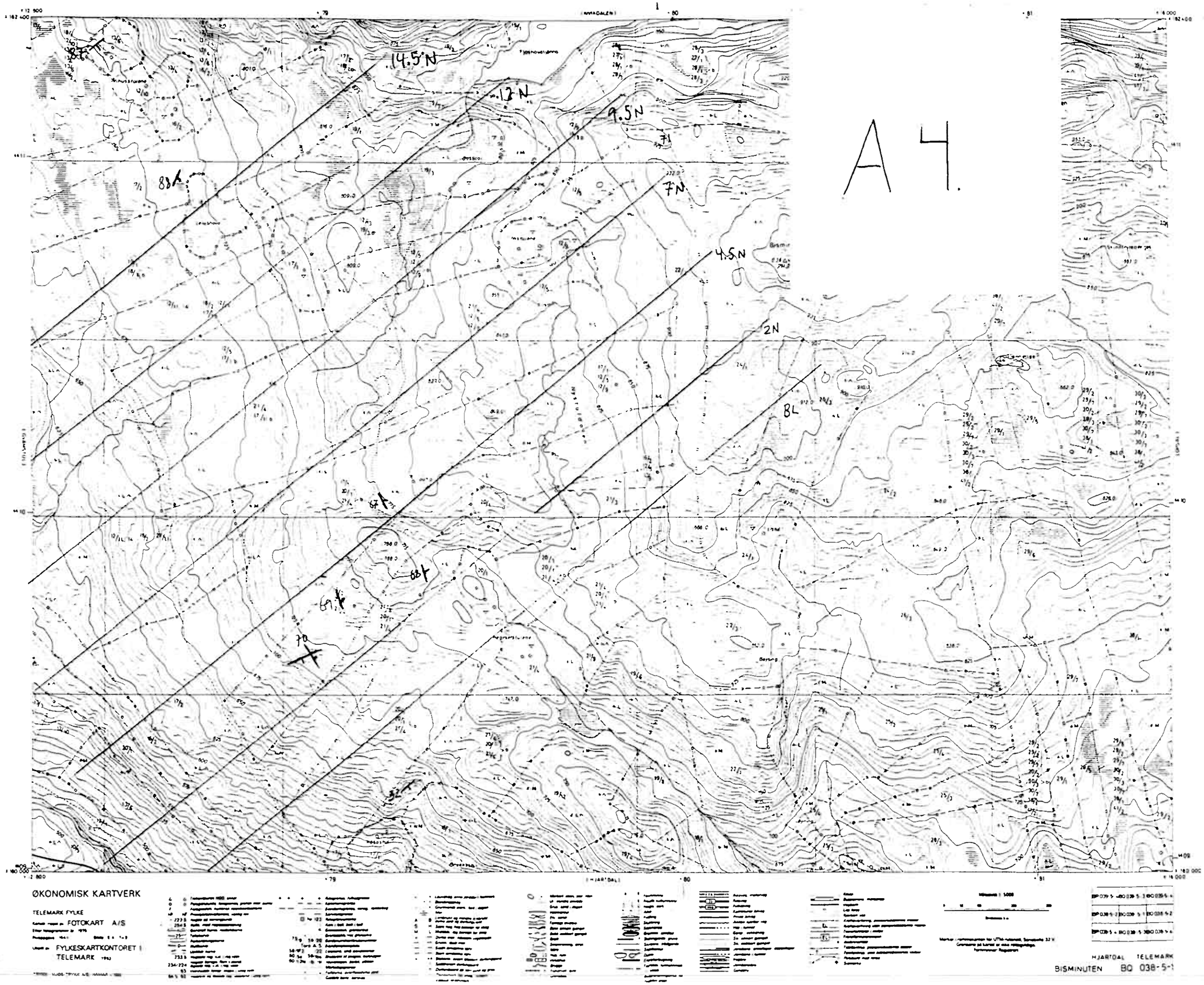
SVERVELID

BLEKA


66 10
66 09
4 70
4 80
1998
BISMINUTEN GOLD VEINS
TELEMARK, NORWAY
Interpretation of Magnetic Anomalies
Key:
STRONG ANOMALY
MODERATE ANOMALY
Scale:
0
0.5 km

A 3-2

A 4.


14.5N
12N
9.5N
7N
4.5N
2N
BL
88
68
70
72
ØKONOMISK KARTVERK
TELEMARK FYLKE
FOTOKART A/S
FYLKESKARTKONTORET I TELEMARK
HJARTDAL TELEMARK
BISMINUTEN BO 038-5-1

A4

A 5.

Sample list -Bleka ´97

Number	Area	Type	North	West	Alt	Rock	Strike/dip	Width (av.)	Width (max.)	Loc. no.	Description
399-151	BLE	RCH	6606397	475446	32V	Q-VEIN	36/86 SE	2-3 cm	5 cm	2	Quartz-tourmaline-vein with minor sulfides.
399-152	BLE	RCH	6606416	475424	32V	Q-VEIN	11/86 E	3 cm	8 cm	3	Quartz-tourmaline-vein with pyrite and chalcopyrite. Sample from 2 veins next to each other.
399-153	BLE	RCH	6606381	475367	32V	Q-VEIN	24/80 E	8 cm	10 cm	4	Quartz-ankerite vein with minor tourmaline and albite.
399-154	BLE	RCH	6606381	475367	32V	W-ROCK			ca. 100 cm	4	Wall rock altered amphibolite with pyrite, chalcopyrite and
399-155	BLE	RCH	6606522	475542	32V	Q-VEIN	0/90 E	1-3 cm	15 cm	5	Quartz-tourmaline-albite-vein with minor sulfides. No wall rock alteration. Several small, crossing, E-W striking, barren veins is often seen.
399-156	BLE	RCH	6606550	475563	32V	Q-VEIN	206/69 W	2-3 cm	6 cm	6	Quartz-tourmaline-vein with minor sulfides. No wall rock alteration.
399-157	BLE	RCH	6606554	475478	32V	Q-VEIN	204/84 W	5 cm	15 cm	8	Quartz-tourmaline-vein with sulfides (pyrite). Wall rock alteration.
399-158	BLE	RCH	6606554	475478	32V	W-ROCK				8	Wall rock altered fine-grained amphibolite with pyrite and chalcopyrite.
399-159	BLE	RCH	6606515	475483	32V	Q-VEIN	29/87 E	2-4 cm	6 cm	9	Quartz-vein with tourmaline and albite. Sulfides is not observed.
399-160	BLE	RGB	6606515	475483	32V	W-ROCK		5 cm	20 cm	9	Silica-albite (?) altered wall rock amphibolite with pyrite.
399-161	BLE	RCH	6606580	475486	32V	Q-VEIN	35/84 SE	3-4 cm	6 cm	8	Quartz-tourmaline vein with minor sulfides. Small (1-2 cm), barren cross-veins striking 142/90 SW is present. Wall rock alterated amphibolite with fine-grained sulfides.
399-162	BLE	RCH	6606757	475287	32V	Q-VEIN	280/63 S	2.5 cm	5 cm	13	Quartz-vein with minor tourmaline and sulfides.
399-163	BLE	RCH	6606757	475287	32V	W-ROCK			10 cm	13	Wall-rock alterated fine-grained amphibolite with minor pyrite.
399-164	BLE	RCH	6606345	475777	32V	Q-VEIN	150/80 SW	5 cm	15 cm	17	Quartz-albite-vein with minor sulfides.
399-165	BLE	RCH	6606345	475777	32V	Q-VEIN	154/85 SW	5 cm	20 cm	17	Quartz-albite-calcite-vein with pyrite and bismuth-minerals ?
399-166	BLE	RCH	6606345	475777	32V	W-ROCK				17	Silicifed wall-rock amphibolite with minor pyrite.
399-167	BLE	RCH	6606233	475809	32V	Q-VEIN	122/90 S	15-20 cm	20 cm	21	Quartz-tourmaline-ankerite-vein with pyrite.
399-168	BLE	RCH	6606233	475809	32V	W-ROCK				21	Wall-rock alterated amphibolite with pyrite and chalcopyrite.
399-169	BLE	RCH	6606233	475809	32V	Q-VEIN	189/36 W	5-6 cm	8 cm	22	Quartz-vein with tourmaline-albite and pyrite.
399-170	BLE	RCH	6606233	475809	32V	W-ROCK				22	Silica-albite-calcite-altered wall rock amphibolite with pyrite and chalcopyrite. Satelite-veins with different strike.
399-171	BLE	RCH	6606042	475854	32V	Q-VEIN	26/80-90 E	15-17 cm	22 cm	24	Quartz-tourmaline-albite-vein with pyrite.
399-172	BLE	RGB	6606015	475780	32V	AMPHI.		20-30 cm	50 cm	25	Fine-grained amphibolite with pyrite and chalcopyrite.
399-173	BLE	RCH	6606042	475854	32V	W-ROCK	265/45 N			24	Albite-altered wall rock amphibolite with calcite, pyrite and chalcopyrite.

399-174	BLE	RCH	6608786	478925	32V	Q-VEIN	189/?	3 cm	5 cm	27	Quartz-tourmaline vein with sulfides.
399-175	BLE	RCH	6608786	478925	32V	Q-VEIN	190/66 W	7-8 cm	8 cm	28	Quartz-tourmaline vein with sulfides and magnetite. Several satelite-veins with sulfides is seen with similar strike.
399-176	BLE	RGB	6606469	477830	32V	Q-VEIN	208/44 W	2-3 cm	5 cm	33	Quartz-albite-vein with tourmaline, pyrite and magnetite. Fine-grained wall rock amphibolite with minor pyrite. Satelite veins present.
399-177	BLE	RGB	6606469	477830	32V	W-ROCK				33	Fine-grained wall rock amphibolite with pyrite.
399-178	BLE	RCH	6606469	477830	32V	Q-VEIN	324/88 NE	1-2 cm	3 cm	34	Quartz-tourmaline-vein with pyrite. Pyrite and magnetite is present in altered wall rock amphibolite. Chip sample of vein + wall rock.
399-179	BLE	RCH	6606474	477377	32V	Q-VEIN	314/79 NE 190/66 W	1 cm	4 cm	35	Quartz-tourmaline-albite-veinlets with pyrite and hematite ? Chlorite-altered wall rock amphibolite. Grab sample of vein + wall rock.
399-180	BLE	RGB	6606650	477033	32V	Q-VEIN				36	Quartz-tourmaline vein with pyrite, chalcopyrite and epidote. Satelite veins striking 90/80-90 S. Wall rock alteration.
399-181	BLE	RGB	6606650	477033	32V	W-ROCK	50/?, 90/?			36	Wall rock altered amphibolite with pyrite, chalcopyrite, malachite and chlorite ?
399-182	BLE	RGB	6606581	476874	32V	AMPHI.	16/82 ESE 295/69 N	< 1 cm	< 1 cm	37	Amphibolite with pyrite-veinlets. Slickensides (87/8 E). Dextral shear-faulted quartz-tourmaline-albit veins (barren) is present.
399-183	BLE	RGB	6606695	477302	32V	AMPHI.				38	Fine to medium-grained amphibolite with pyrite.
399-184	BLE	RGB			32V	AMPHI.				39	Fine-grained amphibolite with pyrite and green epidote.
399-185	BLE	RGB	6606898	477749	32V	W-ROCK	272/64 N	20 m	30 m	41	Fine-grained amphibolite with sulfide-veinlets, mainly of pyrite and bismuthinite ?
399-186	BLE	RGB	6606898	477749	32V	W-ROCK	281/62 N			41	Fine-grained amphibolite with sulfide-veinlets, mainly of pyrite and bismuthinite ?
399-187	BLE	RGB	6606945	477731	32V	W-ROCK	285/54 N			42	Altered amfibolit with 3-6 % pyrite and minor chalcopyrite. The sulfides is often seen in small vein-like sheet. Biotite-veins is present.
399-188	BLE	RCH	6606945	477731	32V	Q-VEIN	144/84 SW	1 cm	3 cm	41	Quartz-tourmaline vein with minor sulfides. No associated wall-rock alteration is seen. Slickensides (107/30 E) is common present.
399-189	BLE	RCH	6606889	477528	32V	Q-VEIN	347/70 E	2-3 cm	5 cm	43	Quartz-tourmaline vein with minor pyrite. No wall rock alteration. Several thin (< 1 cm) veins of pure tourmaline is present with similar strike/dip.
399-190	BLE	RCH	6606883	477504	32V	Q-VEIN	168/78 W	1 cm	3 cm	44	Quartz-tourmaline vein with minor sulfides. No wall rock.

399-191	BLE	RCH	6606864	477396	32V	Q-VEIN	278/60 N	10-12 cm	15 cm	45	Quartz-tourmaline vein with pyrite and chalcopyrite.
399-192	BLE	RCH	6606864	477396	32V	W-ROCK		ca. 50 cm		45	Ankerite-alteration in wall rock amphibolite containing pyrite and chalcopyrite.
399-193	BLE	RCH	6606447	477447	32V	Q-VEIN	204/74 W	4-5 cm	8 cm	46	Quartz-veins with minor tourmaline and sulfides. Several quartz-veins in different directions is present.
399-194	BLE	RCH	6608609	479461	32V	Q-VEIN	222/59 N	3 cm	5 cm	31	Quartz-vein with tourmaline and sulfides. Extensive ankerite-alteration in wall rock amphibolite.
399-195	BLE	RGB	6608609	479461	32V	W-ROCK	92/65 S			31	Altered wall rock amphibolite with 5-10 % pyrite, minor bismuthinite and chalcopyrite. Biotite-sericite alteration zones is present. Seen next to extensive ankerite-alterated wall rock amphibolite containing minor sulfides.
399-196	BLE	RCH	6608609	479461	32V	Q-VEIN	252/49 N	4 cm	5 cm	31	Quartz-albite vein with minor chalcopyrite and tourmaline.
399-197	BLE	RCH	6606376	474656	32V	Q-VEIN	266/64 N	2 cm	2 cm	47	Quartz-tourmaline-ankerite vein with pyrite.
399-198	BLE	RCH	6606376	474656	32V	Q-VEIN	268/66 N	2 cm	5 cm	48	Quartz-tourmaline vein with sulfides and minor magnetite.
399-199	BLE	RCH	6606209	474751	32V	Q-VEIN	300/46 NE	1 cm	1 cm	49	Coarse-grained quartz and calcite vein in silicified amphibolite with pyrite, chalcopyrite, pyrrhotite and magnetite.
399-200	BLE	RGB	6606209	474751	32V	Si-ROCK		50 cm	100 cm	50	Silica-calcite altered amphibolite with pyrite. Slightly magnetic.
399-201	BLE	RCH	6606479	475708	32V	Q-VEIN	210/48	2 cm	5 cm	51	Quartz-vein with tourmaline. No sidewall alteration
399-202	BLE	RCH			32V	Q-VEIN	140/70	3 cm	4 cm	54	Quartz-vein with sulphides. Limonite-coated and weakly magnetic sidewall rock.
399-203	BLE	RCH			32V	Q-VEIN	195/ca 60	2.5 cm	3 cm	54	Same system as 202. Vein runs 20-30 cm from 202.
399-204	BLE	RCH	6606269	475975	32V	Q-VEIN	230/?	3 cm	4 cm	55	Quartz-vein with magnetite and tourmaline.
399-205	BLE	RCH	6606269	475975	32V	Q-VEIN	143/60	3-3.5 cm	5 cm	57	Quartz-vein with Fe-Cu-sulphides
399-206	BLE	RCH			32V	Q-VEIN	304/63	22 cm	24 cm	62	Quartz-ankerite vein.
399-207	BLE	RCH			32V	Q-VEIN	220/60	2 cm	4 cm	65	Quartz-ankerite-tourmaline-vein
399-209	BLE	RCH	6606718	477546	32V	Q-VEIN	336/70	5 cm	6 cm	72	Quartz-vein with sulphides.Wall rock-alteration
399-210	BLE	RCH	6606900	477768	32V	Q-VEIN	150/85	1 cm	2.5 cm	73	Quartz-tourmaline-vein with pyrite. Alteration zone 20-30 cm., rich in pyrite. Grab-sample of wall rock (RGB 220).
399-211	BLE	RGB	6606440	476978	32V	W-ROCK				77	Strongly altered zone (max. few meters) in Fe-Cu-mineralized amphibolite. Hornblende megacrysts (> 1cm), pyrite, chalco-pyrite, magnetite and bismuthinite ? is present.
399-212	BLE	RCH	6606605	477585	32V	Q-VEIN	160/80	5 cm	10 cm	86	Weakly mineralized Quartz-vein. Pyrite is present in altered wall rock

399-213	BLE	RCH	6611324	478275	32V	Q-VEIN	220/68	10 cm	15 cm	87	Quartz-tourmaline-vein with Fe- and Fe-Cu-sulphides. Ankerite zone with pyrite and chalcopyrite is present 0.5-1 m each side of the vein.
399-214	BLE	RCH	6610938	478552	32V	Q-VEIN	200/60	3 cm	4 cm	88	Quartz-tourmaline vein with abundant pyrite and chalcopyrite
399-215	BLE	RCH	6611324	478275	32V	Q-VEIN	205/45	4 cm	6 cm	87	Quartz-tourmaline vein with pyrite, placed in the same zone as RCH-213.
399-216	BLE	RGB	6611324	478275	32V	Q-VEIN	220/68	10 cm	15 cm	87	Grab sample of the RCH-213-vein
399-217	BLE	RGB	6606412	476683	32V	W-ROCK				74	Altered amphibolite with pyrite, chalcopyrite and bismuthinite?
399-218	BLE	RGB			32V	W-ROCK				90	Altered amphibolite with abundant pyrite. Magnetic.
399-219	BLE	RGB	6606625	477031	32V	W-ROCK				80	Alteration zone, strongly mineralized with pyrite and chalcopyrite.
399-220	BLE	RGB	6606900	477768	32V	W-ROCK				73	Grab sample of strongly mineralized alteration zone surrounding the RCH-210 Q-vein
399-221	BLE	RGB			32V	W-ROCK				92	Limonite-ankerite zone in amphibolite. Few meters wide. Pyrite and chalcopyrite is present. Strongly magnetic.
399-222	BLE	RGB	6606376	476720	32V	W-ROCK				75	Mineralized zone in regular medium-coarse grained amphi-bolite. Pyrite and chalcopyrite is present.
399-251	BLE	RCH	6606108	474807	32V	Q-VEIN	230/72 N	2 cm	7 cm	101	Quartz-tourmaline vein with pyrite and chalcopyrite.
399-252	BLE	RGB			32V	Si-ROCK		7 m	10 m	102	Brecciated silica-altered amphibolite with black, vein-like amphibolite containing pyrite and chalcopyrite.
399-253	BLE	RGB	6606025	474969	32V	Si-ROCK	74/76 S	50 cm	100 cm	103	Quartz-albite-calcite vein-zone with pyrite and bismuthinite ? in albite-altered wall rock amphibolite. Fracture zone.
399-254	BLE	RGB	6606025	474969	32V	Si-ROCK	74/76 S	50 cm	100 cm	103	Albite-altered wall rock amphibolite with calcite, pyrite, chalcopyrite and bismuthinite ?

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Bilag VII

CERTIFICATE OF ANALYSIS 21/1/98

TO: Mindex ASA, INVOICE: Same

ATTN: J. Petersen

CODE: 399151 to 399293

BATCH NO. EA86
NO. SAMPLES 103 Rock

OK	LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	As%	Sbppm	Bippm	Moppm	Au1 Geochem Auppb	Repeat Au1 Geochem Auppb	
	1	399151	196	183	107	0.5	0.001	-5	-5	5	-3		
	2	399152	90	148	170	0.4	0.001	-5	-5	7	-3		
4	3	399153	25	38	17	0.6	0.001	-5	-5	6	44	44	(25.00g)
	4	399154	49	8	176	0.2	-0.001	-5	-5	3	-3		
	5	399155	92	16	87	0.3	0.002	-5	-5	-2	-3		
	6	399156	30	13	25	0.2	0.001	-5	-5	-2	-3		
	7	399157	16	7	87	0.3	0.001	-5	-5	-2	-3		
	8	399158	57	7	182	0.3	0.003	-5	-5	-2	-3		
7	9	399159	37	30	140	1.5	0.001	-5	-5	93	17	9	(25.00g)
	10	399160	54	5	235	-0.2	0.003	-5	-5	7	-3		
	11	399161	17	7	146	-0.2	-0.001	-5	-5	15	-3		
	12	399162	22	12	74	-0.2	-0.001	-5	-5	-2	-3		
	13	399163	36	5	107	-0.2	-0.001	-5	-5	2	-3		
	14	399164	20	11	34	-0.2	-0.001	-5	-5	3	-3		
	15	399165	17	18	43	0.4	-0.001	-5	-5	-2	-3		
	16	399166	46	21	75	0.4	-0.001	-5	-5	-2	-3		
	17	399167	11	8	29	0.3	-0.001	-5	-5	-2	-3		

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LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	As%	Sbppm	Bippm	Moppm	Au1 Geochem Auppb		Repeat Au1 Geochem Auppb	
18	399168	35	17	142	0.3	0.001	-5	-5	-2	-3			
19	399169	19	10	43	0.3	-0.001	-5	-5	-2	-3			
20	399170	63	8	135	0.2	-0.001	-5	-5	-2	-3			
21	399171	32	53	42	0.2	-0.001	-5	-5	-2	-3			
22	399172	46	17	80	0.3	-0.001	-5	-5	-2	-3			
23	399173	26	13	117	-0.2	-0.001	-5	-5	6	-3			
24	399174	21	14	36	0.2	-0.001	-5	-5	3	-5	*(20.00g)*		
25	399175	20	22	27	0.2	-0.001	-5	-5	4	-3			
26	399176	58	6	42	-0.2	-0.001	-5	-5	-2	-3			
27	399177	54	7	37	0.2	-0.001	-5	-5	-2	-3			
28	399178	75	11	94	0.3	-0.001	-5	-5	25	-3			
29	399179	54	7	66	0.2	-0.001	-5	-5	2	-3			
30	399180	1380	24	33	6.5	-0.001	-5	-5	-2	-3			
36 31	399181	3450	17	132	33.9	0.001	-5	-5	-2	85		137	*(25.00g)*
32	399182	1940	2	114	4.7	0.001	-5	-5	2	-3			
33	399183	238	1	91	0.5	-0.001	-5	-5	2	-3			
34	399184	142	2	116	0.3	-0.001	-5	-5	3	-3			
35	399185	150	3	76	0.4	-0.001	-5	-5	-2	-3			
36	399186	64	1	82	0.2	-0.001	-5	-5	2	-3			
37	399187	105	1	110	-0.2	-0.001	-5	-5	-2	-3			
38	399188	127	6	53	0.3	-0.001	-5	-5	-2	-5	*(22.00g)*		
39	399189	58	10	24	0.2	-0.001	-5	-5	-2	-3			
40	399190	36	9	25	0.3	-0.001	-5	-5	-2	-6	*(23.00g)*		
41	399191	560	5	15	1.6	-0.001	-5	-5	-2	-3			
42	399192	90	1	118	0.4	-0.001	-5	-5	-2	-3			
43	399193	49	4	29	0.2	-0.001	-5	-5	-2	-3			
44	399194	13	5	36	-0.2	-0.001	-5	-5	-2	-3			
45	399195	79	4	73	-0.2	-0.001	-5	-5	-2	-3			
46	399196	39	28	56	0.2	-0.001	-5	-5	-2	-3			
47	399197	26	5	14	0.2	-0.001	-5	-5	-2	-3			
MIN. → 48	399198	730	10	55	0.8	-0.001	-5	-5	16	8		12	*(25.00g)*
8 49	399199	72	50	77	1.1	-0.001	-5	-5	3	-3			
50	399200	62	15	137	-0.2	-0.001	-5	-5	2	-3			
51	399201	24	10	43	0.3	-0.001	-5	-5	5	-5	*(32.00g)*		
52	399202	36	8	43	0.2	-0.001	-5	-5	-2	-3	*(43.00g)*		
53	399203	351	14	52	0.6	-0.001	-5	-5	-2	-11	*(14.00g)*		

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02/03/98 15:36
02-MAR-1998 16:48 FRA MINDEX ASA TIL 0045861392248 S.04/05

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	As%	Sbppm	Bippm	Moppm	Au1 Geochem Auppb	Repeat Au1 Geochem Auppb	
54	399204	86	11	36	0.4	-0.001	-5	-5	-2	-3		
55	399205	222	273	34	5.6	0.002	-5	49	20	18	49	(25.00g)
56	399206	75	14	15	0.7	-0.001	-5	-5	-2	-3		
57	399207	36	22	56	0.4	-0.001	-5	-5	-2	-6	(25.00g)	
58	399209	47	7	50	0.2	-0.001	-5	-5	-2	-3		
59	399210	54	8	57	0.3	-0.001	-5	-5	-2	-4	(41.00g)	
60	399211	305	3	145	0.6	-0.001	-5	-5	-2	-3		
61	399212	116	5	127	0.6	-0.001	-5	-5	-2	3		
62	399213	93	6	84	0.4	-0.001	-5	-5	-2	-3		
63	399214	27	20	102	-0.2	-0.001	-5	-5	-2	-3		
64	399215	30	7	46	-0.2	-0.001	-5	-5	-2	-3		
65	399216	46	5	13	0.2	-0.001	-5	-5	-2	-3		
66	399217	39	14	47	0.2	-0.001	-5	-5	-2	-3		
67	399218	218	-1	134	0.6	-0.001	-5	-5	-2	6	3	(25.00g)
68	399219	253	3	83	0.9	0.001	-5	-5	-2	-3		
69	399220	97	55	72	0.6	0.001	-5	-5	-2	10	-3	(25.00g)
70	399221	47	9	200	0.2	-0.001	-5	-5	-2	-3		
71	399222	119	9	87	0.3	-0.001	-5	-5	-2	-3		
72	399228	34	-1	47	-0.2	-0.001	-5	-5	-2	-3		
73	399251	64	51	101	0.6	-0.001	-5	-5	-2	-3		
74	399252	34	13	65	-0.2	-0.001	-5	-5	-2	-3		
75	399253	20	31	175	-0.2	-0.001	-5	-5	-2	-3		
76	399254	78	660	159	1.6	-0.001	-5	-5	10	5	11	(25.00g)
77	399255	12	8	7	0.2	-0.001	-5	-5	-2	-3		
78	399256	148	-1	20	0.2	-0.001	-5	-5	-2	-3		
79	399257	85	2	33	0.2	-0.001	-5	-5	-2	-3		
80	399258	9	-1	19	-0.2	-0.001	-5	-5	-2	-3		
81	399259	87	2	45	-0.2	-0.001	-5	-5	-2	4		
82	399260	54	-1	24	0.2	-0.001	-5	-5	-2	-3		
83	399262	1560	-1	11	0.9	-0.001	-5	-5	-2	10	7	(25.00g)
84	399265	182	-1	14	-0.2	-0.001	-5	-5	-2	-3		
85	399266	5900	-1	46	2.2	-0.001	-5	-5	-2	53	55	(25.00g)
86	399267	385	2	10	0.2	-0.001	-5	-5	-2	3		
87	399268	382	-1	34	0.3	-0.001	-5	-5	-2	-3		
88	399270	54	-1	22	0.2	-0.001	-5	-5	-2	-3		
89	399271	10	-1	22	-0.2	-0.001	-5	-5	-2	-3		

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02-MAR-1998 16:48 FRA MINDEX ASA TIL 0045861392 48 S.03/05

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	As%	Sbppm	Bippm	Moppm	Au1 Geochem Auppb	Repeat Au1 Geochem Auppb
90	399272	165	-1	46	-0.2	-0.001	-5	-5	-2	-3	
91	399273	(860)	-1	33	0.5	-0.001	-5	-5	-2	(12)	(12) (25.00g)
92	399274	32	-1	73	0.3	-0.001	-5	-5	-2	-3	
93	399275	11	-1	58	0.3	-0.001	-5	-5	-2	-3	
94	399278	10	-1	45	0.3	-0.001	-5	-5	-2	-3	
95	399279	10	5	49	-0.2	-0.001	-5	-5	-2	5	
96	399281	60	2	58	-0.2	-0.001	-5	-5	-2	-3	
97	399282	7	-1	66	-0.2	-0.001	-5	-5	-2	(21)	(-3) (25.00g)
98	399283	4	1	22	-0.2	-0.001	-5	-5	-2	-3	
99	399286	21	-1	23	-0.2	-0.001	-5	-5	-2	-3	
100	399287	23	4	41	-0.2	-0.001	-5	-5	-2	-3	
101	399288	201	-1	26	-0.2	-0.001	-5	-5	-2	-3	
102	399292	24	2	37	-0.2	-0.001	-5	-5	-2	-3	
103	399293	22	8	28	-0.2	-0.001	-5	-5	-2	-3	

Au analysis weight is 50gm except where indicated otherwise in brackets.

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02/03/98 15:35
02-MAR-1998 16:48 FRA MINDEX ASA TIL 004586139248 S.02/05