NGU Report 98.074

The Bleikvassli Project,
Field report 1997

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REPORT

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Summary:

This report presents preliminary results of detailed geological follow-up studies and diamond drilling carried out in the Okstindan Area, Nordland, Norway in the period July to August 1997. Preliminary results from drilling done in November and December 1997 is included in this report.

Field work to the south and at the base of the Okstindan massif along the Kongsfjell/Anders Larsa contact revealed no signs of mineralization. Extensive mineralized zones at Gjetarfjellet to the east of Røssvatnet have been mapped out. Because of weathering, the nature of the mineralizations is not known and further work to expose fresh surfaces is highly recommended. A Cu-Ni mineralization related to ultramafic rocks was found at the border to Sweden. The extent of this mineralization is too small to be economic, judged from the surface exposure. However, geophysics indicate a larger extent at depth and also other anomalies in the area. More field work and ground geophysics is recommended in the area.

Diamond drilling at Grasvatnet confirmed the TFEM anomaly in the area and the presence of weak sulfide mineralizations. The area has a potential for a major sulfide deposit but a large diamond drilling program would be necessary to investigate this potential. Diamond drilling in Brunesbekken has so far revealed the presence of a large area of weak sulfide impregnations. No more work is recommended.

Keywords: Geologisk undersøkelse	Kjerneboring	Geofysikk
Sulfid	Nikkel	Kobber
Gossan		Fagrapport

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INTRODUCTION

This report presents preliminary results of detailed geological follow-up studies and diamond drilling in the Okstindan Area, Nordland, Norway. The fieldwork was done in the period July to August 1997, and is based on previous regional geological, geophysical and geochemical surveys, mainly in the earlier stages of the Bleikvassli Project between 1993 and 1995 (Bjerkgård et al. 1995, Krog 1995 a, b, Dalsegg 1996 a, Elvebakk & Dalsegg 1996, Mogaard & Olesen 1996). Fieldwork was mainly conducted in the area just north of Røssvatnet and at the base of the Okstindan massif (*Figure 1*). In addition, surveys were carried out to investigate mineralizations discovered to the south of Artfjellet by the mine geologist S. Burman from Bleikvassli Gruber (designated Gjetarfjellet and Riksgrensa on *Figure 1*).

Diamond drilling was carried out by NGU at Brunesbekken and Grasvatnet (*Figure 1*) in August and September 1997, and was based on the follow-up work and ground geophysics carried out in 1996 (Bjerkgård & Larsen 1996, Dalsegg 1996 a, b, Elvebakk & Dalsegg 1996, Krog 1997). Drilling was continued in November and December at Brunesbekken on the basis of the results from the first two holes and additional geophysics conducted in the area (Dalsegg 1997).

Geological overview

The Okstindan area comprises four main lithological units; the Mofjellet, Anders Larsa/Lifjell, Kongsfjell and Målvatn Groups (*Figure 1*). All units are dominated by meta-sediments, mainly garnet-mica schists and calcareous mica schists. Calcite and dolomite marbles are abundant in the Anders Larsa and Lifjell Groups, whereas various quartz-feldspar schists are typical of the Målvatn Group. Amphibolites, which are metamorphosed basalts and andesites of probable transitional MORB to island arc affinity (Bjerkgård et al. 1995, 1997), are present in all units. They are particularly abundant in the Kongsfjell Group close to the contacts against the Anders Larsa/Lifjell Groups where they mainly occur between calcareous mica schists and garnet-mica schists. Isolated bodies of ultramafic rocks, partly chromite-bearing, are present within the Målvatn Group, close to the Kongsfjell Group.
Taking into account the geochemistry of the amphibolites and their association with mainly continent-derived sediments, the Okstindan lithologies most probably formed in a crustal spreading regime behind an ensialic (continental) arc (Bjerkgård et al. 1995, 1997).

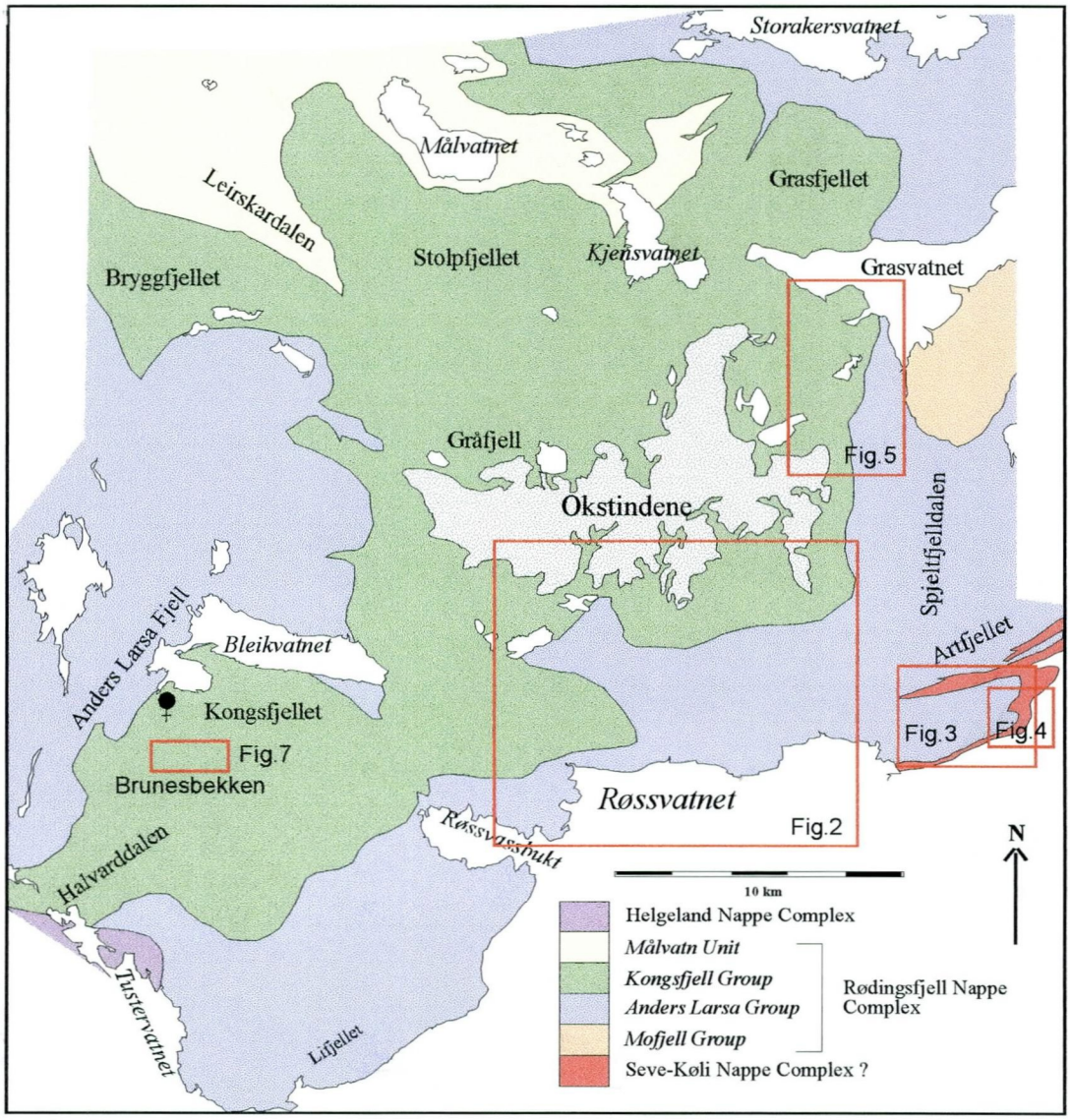

Figure 1: Overview of the main lithological units in the Okstindan area and showing the location of the field areas discussed in the text.

The Bleikvassli deposit is located close to the contact between the Anders Larsa and the Kongsfjell Group and a thick amphibolite unit is situated structurally underneath it. Quartz-feldspar schists representing felsic metavolcanic rocks are also characteristic for the lithologies associated with the Bleikvassli deposit. The Anders Larsa Group is correlated with the lithologies at Lifjellet, which have been followed to the east along Røssvatnet and further to the north along Spjeltfjelldalen to Grasvatnet. Because of interference between the F_4 and F_5 phases of folding which have led to formation of a major dome structure south of Grasvatnet, the Anders Larsa/Lifjell lithologies also strike eastwards into Sweden (see also Bjerkgård et al. 1995). At Grasvatnet, a similar association of rocks as in Bleikvassli has been recognized with a major amphibolite unit and quartz-feldspar schists close to the contact

between Anders Larsa and Kongsfjell Group. A mineralization was recognized in this setting and was tested by drilling this year (see below).

GEOLOGICAL FIELD WORK.

North of Røssvatnet

Follow-up work including reconnaissance for sulfide mineralizations, alteration assemblages and other visual traces of hydrothermal activity including distal facies of mineralizations such as chert and coticules, were carried out in the southern part of the area, just north of Røssvatnet (*Figure 1*). The justification for doing this work is based on the regional mapping in the area and the lithologies associated with the Bleikvassli deposit.

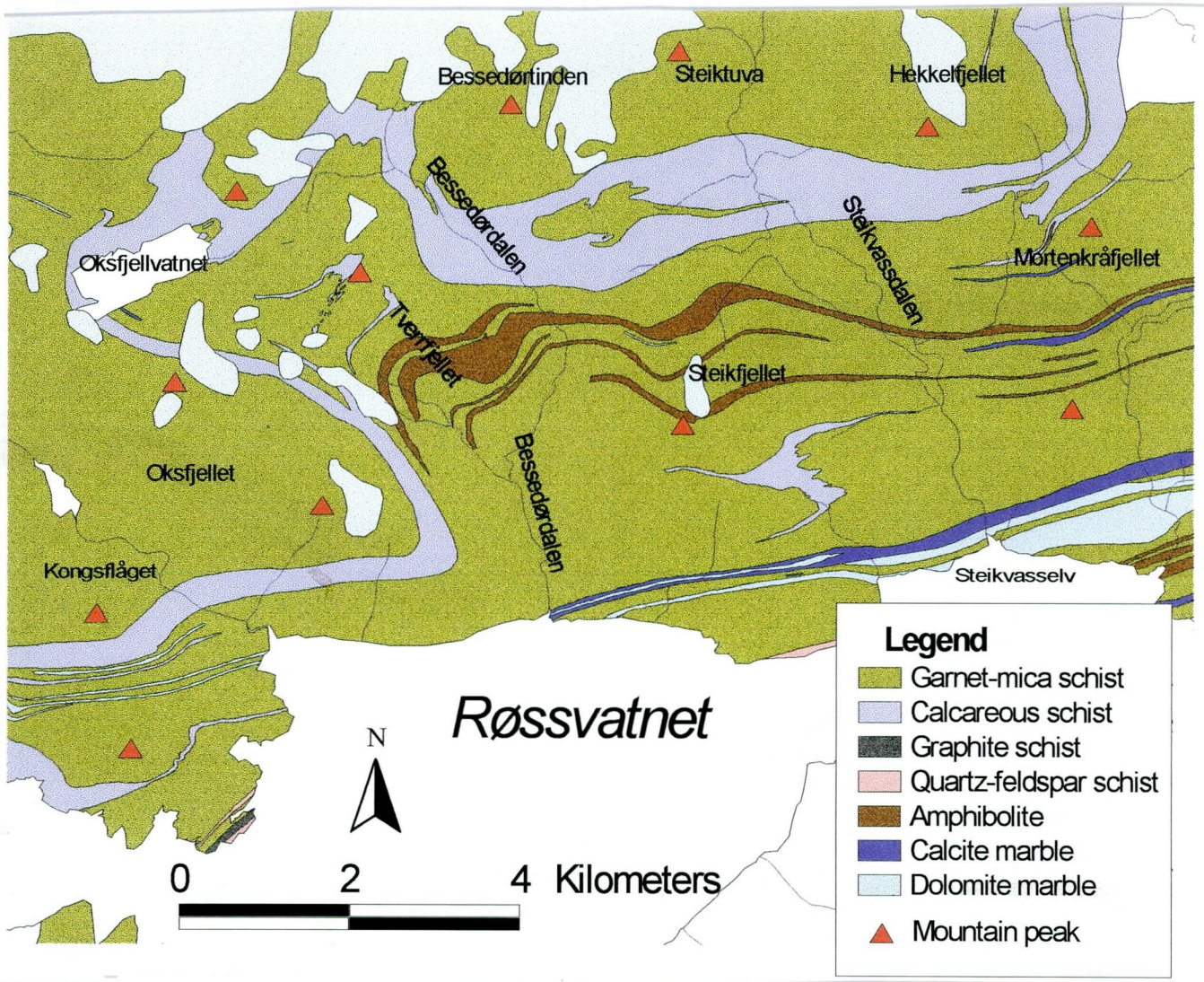

Figure 2: Overview of the main lithologies present in the area north of Røssvatnet.

On the basis of the association between sulfide mineralizations and volcanics close to the contact between the Anders Larsa and Kongsfjell Group at Bleikvassli, it was natural to investigate other places where this association occurred, notably in an area north of Røssvatnet where there are major horizons of amphibolite close to this contact (*Figure 2*). Traverses were carried out in the major valleys Bessedørdalen to Oksfjellvatnet and Steikvassdalen up to the Okstindan glacier and the ridges from Steikfjellet to Bessedørtinden and from Steikvasselv to Mortenkråfjellet, in order to look for mineralizations and signs of hydrothermal activity. The results of this work was negative. Lithologies encountered were mainly garnet-mica schist, calcareous mica schist and amphibolite.

However, an interesting paragenesis was revealed at the top of Tverrfjellet, where the garnet-mica schist in parts had high contents of very coarse-grained (3-4 cm) euhedral garnets. The garnets occasionally showed a «snowball texture», in which the inherited foliation within them has been rotated and folded. An anhedral, bluish-green mineral, whose identity is possibly corundum (sapphire variety) is often seen associated and partly intergrown with the coarse garnet. In some parts of the schist, the modal content of garnet is 50-60 % with sizes 1-3 cm. These garnet-rich parts were associated with 10-15 cm thick quartz-lenses, each a few meters long. Black tourmaline occurred often in thin zones at the contact between the quartz-lenses and garnet-rich schists, at other places black amphibole, chlorite and biotite.

A lens of banded quartzite about 3 m in length and 30 cm thick was also observed at this locality, containing several lenses and bands up to 30-40 cm long and 0.5 mm thick, of a green bladed mineral, probably fuchsite. The garnet-mica schist surrounding the quartzite contain high amounts of garnet in a fine-grained amphibole matrix.

It is definitively possible that this paragenesis and varieties of garnet-mica schist are the result of hydrothermal activity. However, investigations of the very well exposed outcrops along strike for several hundred meters, did not reveal any signs of sulfide mineralizations.

Mineralizations south of Artfjellet

During block searching in the area south of Artfjellet, the mine geologist at Bleikvassli, S. Burman discovered mineralizations at Gjetarfjellet and at the Norwegian/Swedish border south of Artfjellet (*Figure 1*). A couple of field days were used to investigate these mineralizations.

Mineralizations at Gjetarfjellet

The sulfide mineralizations at Gjetarfjellet are situated in the Anders Larsa/Lifjell Group, structurally beneath a unit of high-grade gneisses possibly belonging to the Seve-Köli Nappes (*Figure 3*). In this area, the Anders Larsa/Lifjell Group consists of strongly deformed calcite marble, garnet-mica schist, graphite schist and amphibolite. The mineralizations are located within a unit of garnet-mica schist and in outcrop they consist of rusty mica schists, sometimes appearing as gossans. The mineralizations occur in two zones separated by garnet-mica schist. Both can be followed discontinuously for about 2 km along strike and have widths of 50-100 m. Graphite is an abundant component in the southernmost zone.

The gossan which occurred in several parallel but irregular zones was totally devoid of sulfides and it is impossible to tell what type of ore it covers. Less altered sulfide-bearing rocks are garnet and amphibole-rich with light green amphibole occurring in felty aggregates. Otherwise they are typically quartz-rich. This «skarn-like» assemblage is very similar to that which has been reported from Brunesbekken and south of Grasvatnet, associated with copper-rich mineralizations (Bjerkgård & Larsen 1996). Sulfides are typically very fine-grained and are sparsely distributed. The main sulfides are pyrite and pyrrhotite, but chalcopyrite and galena were also observed.

Analyses of samples collected from the less rusty parts of the mineralizations show low contents of base metals as well as iron (Table 1). Two samples of the gossan contained 24.5 % and 53.7 % Fe, respectively, but had even lower content of base metals than the weakly mineralized «skarn-like» rocks.

Figure 3 (next page): The geology of the area south of Artfjellet showing zones with sulfide-bearing garnet-mica schist and "skarn"

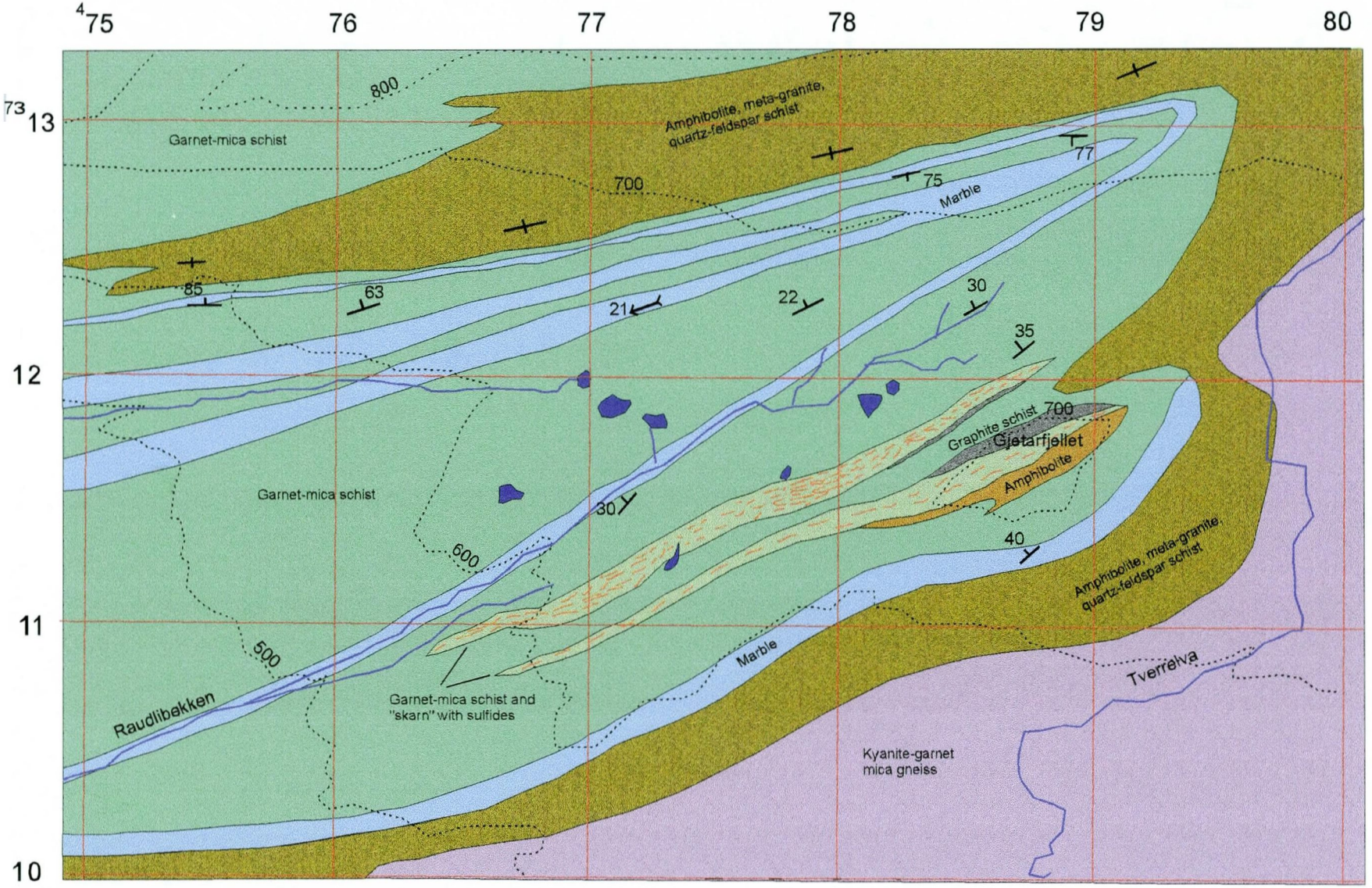
475
76
77
78
79
80
73
13
12
11
10
Garnet-mica schist
800
700
600
500
Amphibolite, meta-granite, quartz-feldspar schist
Marble
77
75
85
63
21
22
30
35
40
Graphite schist
700
Gletarfjellet
Amphibolite
Garnet-mica schist
Garnet-mica schist and "skarn" with sulfides
Raudlibekken
Marble
Amphibolite, meta-granite, quartz-feldspar schist
Tverrelva
Kyanite-garnet mica gneiss

Table 1: ICP analyses (ACME labs) of representative samples of mineralizations south of Artfjellet.

Gjetarfjellet

Sample	Type	Cu	Zn	Pb	Ag	Au	Ni	Co	Fe	Mn	Cr	Mg	Ba	Mo	As	Sr	Cd	Sb	Bi
TB97-005	Skarn	55	356	<3	<0.3	5	84	22	4.87	526	96	1.55	69	3	3	10	0.9	<3	<3
TB97-006	Skarn	39	17	7	<0.3	5	5	1	2.26	191	19	0.28	6	1	2	4	0.2	<3	<3
TB97-007	Skarn	20	34	3	<0.3	3	28	15	4.44	626	35	0.97	2	<1	<2	9	0.2	<3	<3
SB97-002	Skarn	213	37	21	0.4	5	163	120	13.15	59	18	0.1	7	2	<2	43	<0.2	<3	<3
SB97-003	Skarn	40	58	4	<0.3	<2	69	27	6.08	825	146	1.55	3	121	<2	41	<0.2	<3	<3
SB97-004	Skarn	121	25	7	<0.3	8	91	54	9.54	60	19	0.27	24	3	<2	9	<0.2	<3	<3
SB97-005	Skarn	71	19	4	<0.3	<2	77	50	4.55	263	64	0.69	54	4	2	43	<0.2	<3	<3
Gossan1	Gossan	35	4	<3	0.3	5	<1	<1	53.69	17	18	0.02	4	1	<2	1	<0.2	14	<3
Gossan2	Gossan	28	15	<3	0.3	48	16	9	24.54	128	37	0.79	12	<1	<2	12	<0.2	9	<3

Riksgrensa

Sample	Type	Cu	Zn	Pb	Ag	Au	Ni	Co	Fe	Mn	Cr	Mg	Ba	Mo	As	Sr	Cd	Sb	Bi
TB97-008a	Pyroxenite	107	82	5	<0.3	7	149	54	12.73	146	36	0.7	9	1	<2	25	<0.2	<3	<3
TB97-008b	Pyroxenite	1710	41	5	1.0	9	2398	99	7.46	419	570	5.32	4	<1	5	13	<0.2	<3	<3
TB97-008c	Pyroxenite	1069	48	4	0.4	10	2097	108	7.47	536	232	6.34	24	<1	<2	17	<0.2	<3	<3
TB97-009	Gabbro	122	106	4	<0.3	4	91	44	8.65	194	166	3.3	16	2	7	17	0.4	<3	<3
TB97-011	Amphibolite	3744	49	3	0.5	4	1119	70	4.48	287	224	1.5	29	2	4	25	<0.2	<3	<3
TB97-012	Gneiss	1041	23	9	<0.3	9	101	5	1.51	172	23	0.15	18	1	208	38	0.2	<3	<3

All numbers in ppm, except Fe (wt%), Au (ppb)

Mineralization at the border to Sweden (Riksgrensa)

The mineralization at the border is associated with an elongated ultramafic body probably disrupted during deformation and which is situated within the unit of high-grade metamorphic gneisses (*Figure 4*). A unit of metagabbro, partly occurring as amphibolitic schists is associated with the ultramafic body, occurring as an extended horizon running eastwards along strike into Sweden. These lithologies are surrounded by kyanite-garnet-mica gneisses, which are partly silicified close to the ultramafic body.

The ultramafic rock is dominated by green pyroxene, whereas chlorite and amphibole are subordinate and are probably the result of alteration. Pyroxene occur in unoriented laths varying in size from 1-7 mm, which lend a very massive, homogeneous appearance to the rock. Sulfides occur impregnated as 2-3 mm grains and aggregates in irregular lenses and network up to 1-2 m long and 0.5-1 m in width. The sulfides consist mainly of pyrrhotite, with subordinate chalcopyrite, pyrite and probably some pentlandite. At the westernmost end of the ultramafic lens, chalcopyrite and pyrrhotite are also found impregnated in silicified amphibolite and garnet-mica gneiss.

Analyses of the mineralized samples (Table 1) show relatively high contents of Ni (up to 0.24 %) which give support to the presence of pentlandite. The content of Cu is up to 0.37 wt.% in the samples analyzed and Fe up to 12.7 %. Cr concentrations are less than 0.06 %.

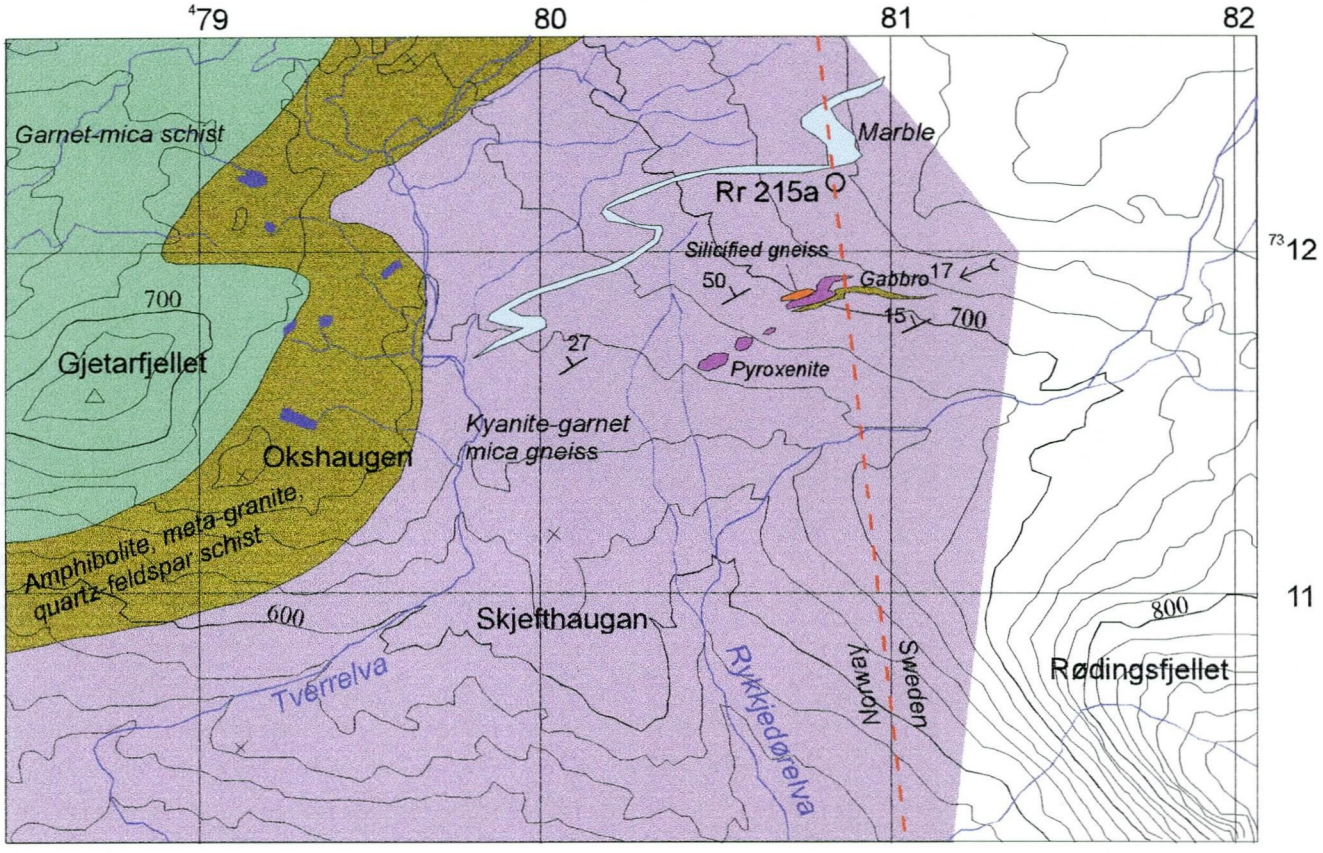

Figure 4: The geology in the area at the Swedish border, showing the Cu-Ni mineralized ultramafic body, situated within the kyanite-garnet-mica gneiss unit.

The presence of impregnated sulfides within the pyroxenite, sulfide minerals present and the enrichment of Cu and Ni together with Fe, strongly indicate that this is an comagmatic mineralization. However, the pyroxenite body is far too small, at least from what can be observed at the surface, to contain mineralization of economic dimensions.

DIAMOND DRILLING

Diamond drilling was conducted in the Grasvatnet and Brunesbekken areas in August and September 1997 on the basis of geophysics, soil geochemistry and detailed geology. The results of the drilling are encouraging in both areas and drilling was continued in Brunesbekken in November on the basis of the first results and additional geophysics.

Grasvatnet

A weak Cu-Pb-Zn mineralization hosted in quartzite and quartzitic schists was found in Rabotsbekken, about 3 km south of Grasvatnet in 1993 (*Figure 5*). The mineralization is located close to the boundary between the Anders Larsa and Kongsfjell Group and structurally above a major lens of amphibolite, which is a setting very similar to the Bleikvassli deposit. Additional work and grab sampling were conducted on the mineralization in 1996 to reveal its nature (Bjerkgård & Larsen 1996). Based on this work it was concluded that it either represented a high-grade exhalite or a low-grade sulfide mineralization. The appearance of the quartzite also bear some resemblance to the quartzites associated with the Bleikvassli deposit.

In the autumn of 1996, TFEM measurements were conducted over the mineralization, and revealed strong anomalies at depths of 75-100 m and 150-200 m west and northwestwards for more than 2 km from the outcrop (Dalsegg 1996 b) at exactly the depths expected if strike and dip of the rocks are extrapolated downwards. However, graphitic schists are associated with this mineralization at outcrop, and it considered possible that the anomalies could be caused by massive graphite.

The only method to reveal the cause of the anomaly, was diamond drilling. The single hole was placed just to the south of Okstindtjønna, to intersect the strongest TFEM anomaly at a depth of 200 m. The geological log with descriptions is shown in the appendix. An E-W profile including the drillhole is shown in *Figure 6* together with a resistivity log, which was measured by E. Dalsegg immediately after the completion of drilling.

Mineralizations comprising weak sulfide impregnations of mainly pyrrhotite with subordinate chalcopyrite and sphalerite and locally some specks of galena, were encountered in a 2.35 m interval from 186.65 - 189.90 m in the drillhole. The mineralization is hosted by a biotite-bearing quartz-muscovite schist containing some graphite. The best section from 189.05 to 189.90 contains 5-15 % sulfides. Geochemical analyses (Table 2) show a content of 2.18 % Cu and 1.29 % Zn in a 0.25 m interval from 189.15 to 189.40 m, whereas the 2.15 m interval from 187.75 m to 189.90 m contain a weighted average of 0.65 % Cu, 0.63 % Zn, 0.34 % Pb and 9.5 ppm Ag. The content of Fe in this interval is only 9.02 %, showing that this is a rather weak impregnation.

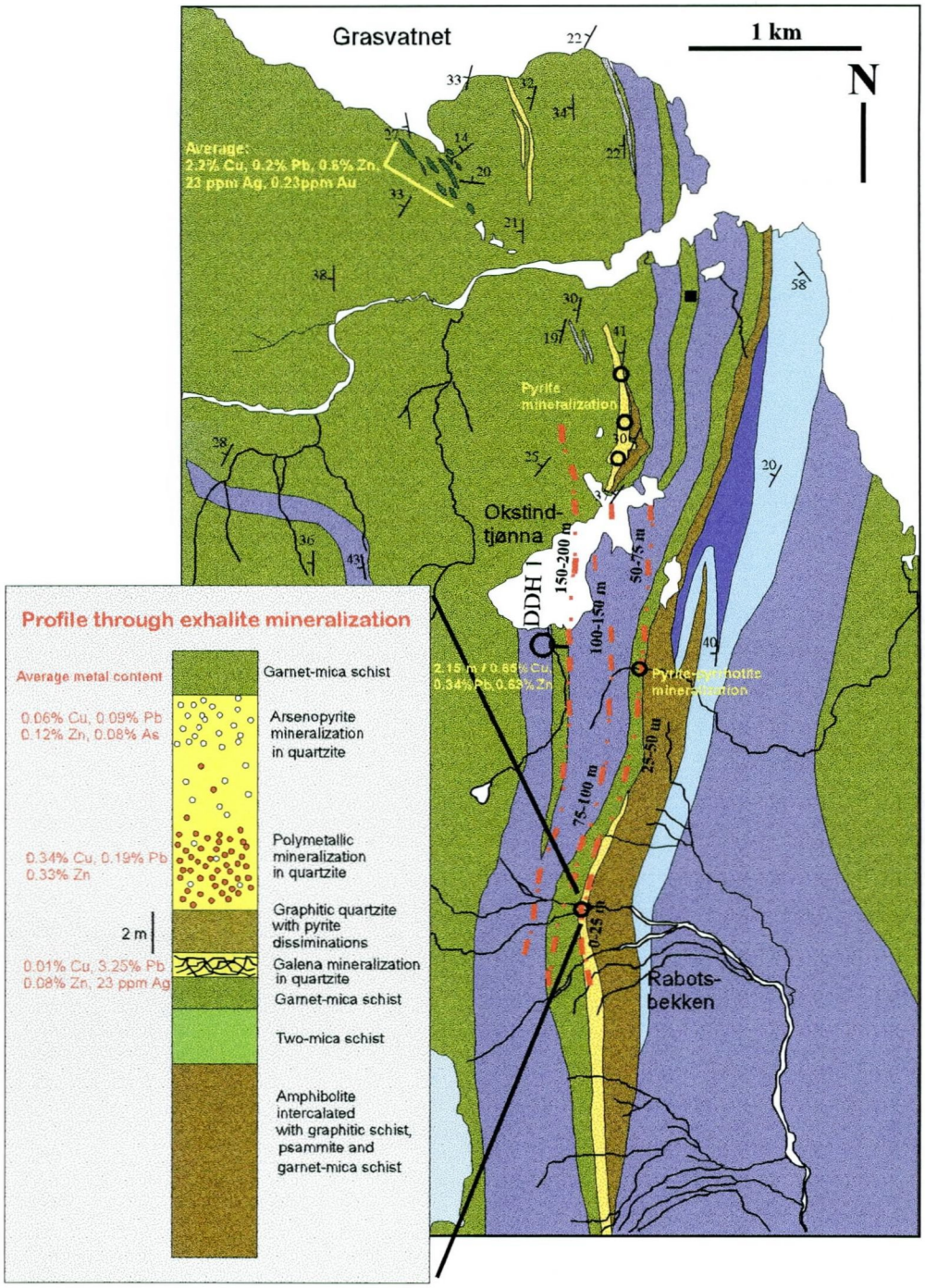

Figure 5: Geology of the area just south of Grasvatnet showing the location of the various mineralizations, the drillhole and the projection of the TFEM anomalies.

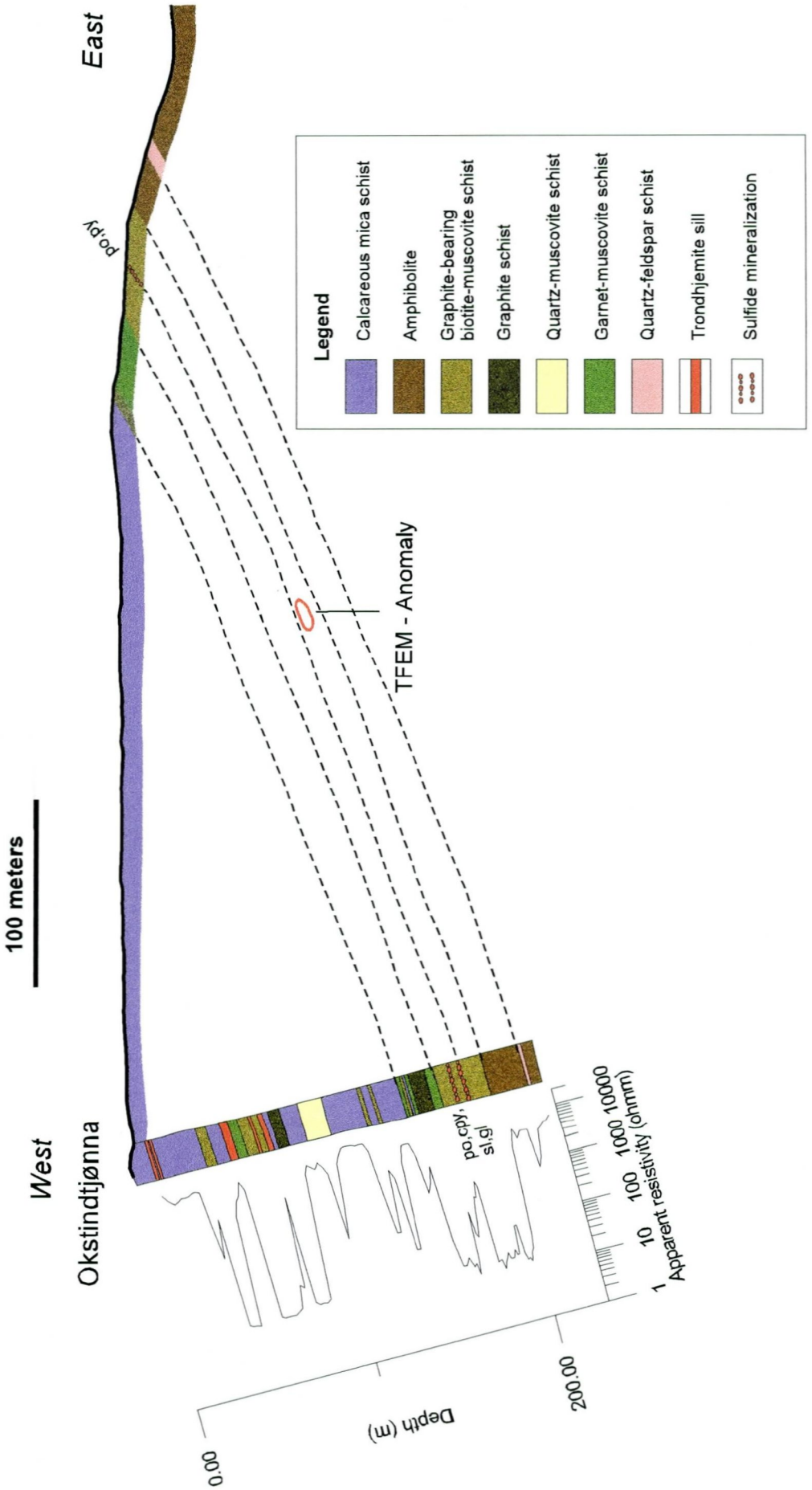

Figure 6: A geological profile in the direction of the drillhole. A resistivity log (measured by E. Dalsegg) and the location of a TFEM anomaly at 100 m depth are also shown (for explanation, see text).

Table 2 a: Analyses drillhole 1 - Okstindtjønna

Top	Bottom	meter	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
181.85	182.00	0.15	1492	1751	5723	3.5	12	13	133	28	68	14.5	13	<3	42	11.67	186
186.85	187.60	0.75	1722	1821	3801	4.3	12	6	58	39	18	6.7	8	110	67	6.94	423
187.75	188.60	0.85	4274	3993	7363	12.9	60	14	80	57	462	12	134	229	53	9.53	617
188.60	189.15	0.55	3242	3646	227	8.7	23	1	50	36	633	0.4	84	124	29	5.53	275
189.15	189.40	0.25	21785	2584	12862	8.3	38	10	106	71	82	22.2	32	79	51	13.87	834
189.40	189.90	0.50	6017	2445	7719	5.4	14	15	77	53	156	12.6	33	75	61	9.56	492
187.75	189.90	2.15	6452	3380	6260	9.5	37	10	75	52	390	10.4	86	149	48	9.02	526

Table 2b: Average data for Rabotsbekken mineralizations (from Bjerkgård & Larsen 1996)

Ore type	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
Arsenopyrite ore	632	949	1158	2.0	51	<2	11	30	803	1.4	6	11	95	4.28	282
Polymetallic ore	3437	1915	3302	2.1	9	3	11	30	7	9.7	<5	22	53	5.37	561
Galena ore	44	32490	863	28.4	47	<2	6	<2	26	8.2	58	41	12	0.53	23

The profile shows that there is a straightforward correlation between the lithologies in the drillhole and the surface exposures. The lithologies dip about 30° towards the west and the mineralized section in the drillhole is correlated with a weak impregnation of pyrite and pyrrhotite in a graphite schist which is outcropping in a creek 500 m to the west of the drillhole.

From the resistivity log it is clear that the cause of the TFEM anomaly at about 200 m depth is caused by the graphite- and sulfide-bearing schists extending from 160 to about 200 m in the drillhole. Interesting is the TFEM anomaly at 100 m depth (see *Figure 6*), which seems to be at the same stratigraphic level as the mineralized schist unit. This anomaly might be caused by a schist with much higher content of graphite or by enrichment of sulfides (see discussion).

Brunesbekken

A weakly mineralized zone was previously discovered in Brunesbekken, about 1.5 km south of the Bleikvassli Mine (*Figure 1*, *Figure 7*). Based on this discovery, and geophysical measurements (SP) in the area, the mineralized zone was drilled in 1987, but without positive results (Rui 1987).

Transient Field EM investigations (TFEM) at the western part of Kongsfjellet in the autumn 1995 revealed a new anomaly at depth, west of Brunesbekken (Elvebakk & Dalsegg 1996). TFEM did not pick up the known mineralizations at the surface, which seemed to indicate that a stronger conductor existed at depth. However, the anomaly could be generated by graphite,

as well as a sulfide occurrence. Based on the outcrop of the mineralized zone, strike and dip of the rocks in the area, the old drillholes and the depth indicated from TFEM, the anomaly was at the same stratigraphic level as the known mineralizations.

Given these results, more detailed investigations of the known mineralization and surrounding lithologies were necessary to try to reveal if the anomaly most likely was caused by graphite or by more massive sulfide mineralizations. Furthermore, detailed structural analysis was a prerequisite for planning of a successful drilling program.

The field work in the area, conducted in early June 1996, revealed discontinuous mineralizations along the same stratigraphic horizon for a strike length of more than 2 km, from Brunesbekken in the west to Gardsbekken in the east (Bjerkgård & Larsen 1996). The mineralizations are mainly situated at the contact between a garnet-mica schist and a graphite schist, structurally below a thick unit of amphibolite. The amphibolite is the same which structurally underlies the Bleikvassli deposit and these mineralizations are therefore at the same stratigraphic level as in the mine.

In Brunesbekken (*Figure 7*), continuous mineralizations were followed for 250 m along strike, consisting of weak impregnations of chalcopyrite, sphalerite, pyrrhotite and galena. The mineralizations are partly associated with garnet-amphibole-quartz rocks («skarn»), but also with quartz-lenses in biotite-muscovite-rich schists and in carbonate-rich rock. In addition, weak impregnations, mostly of chalcopyrite, occur in the surrounding muscovite-rich garnet-mica schists.

The first two drillholes (drilled in August 1997) were placed in profiles 400 m apart to check the anomalies revealed at about 100 m depth by the TFEM method (*Figure 7*). NW-SE profiles including both the drillholes from the drilling in August as well as the four completed in November and December (3-97 to 6-97) are presented in *Figure 8*. The geological descriptions of all drillholes are presented in the appendix.

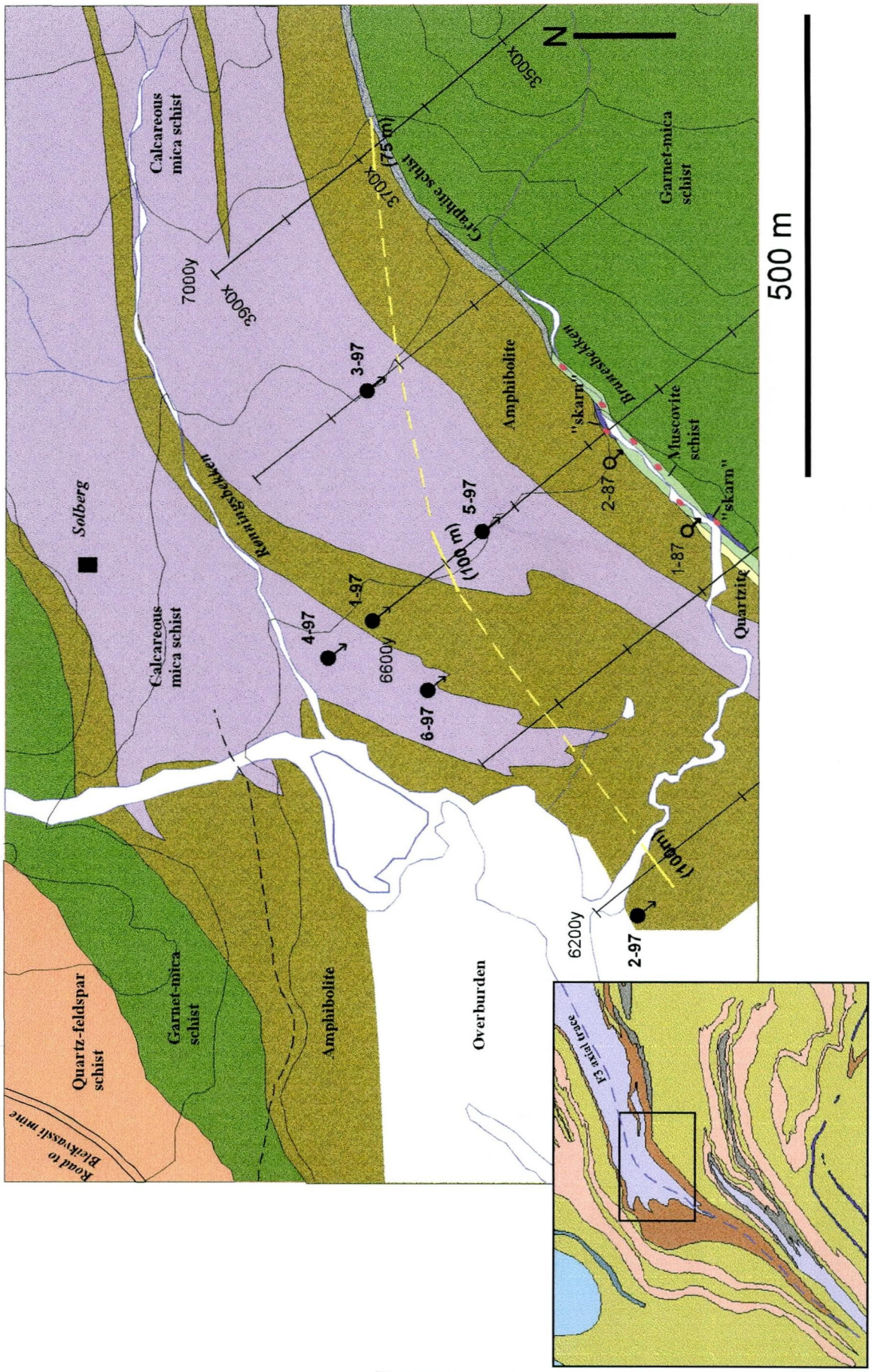

Figure 7: Geology in the Brunesbekken area, based on mapping by Rui (1987) and revised in 1996. The TFEM anomaly is shown superimposed on the geology (yellow dashed lines). Shown are also the locations of the drillholes from 1987 and 1997. The inset is taken from the regional geological map in Bjerkgård et al. 1995, and shows the major F3-fold structure which closes in Halvarddalen.

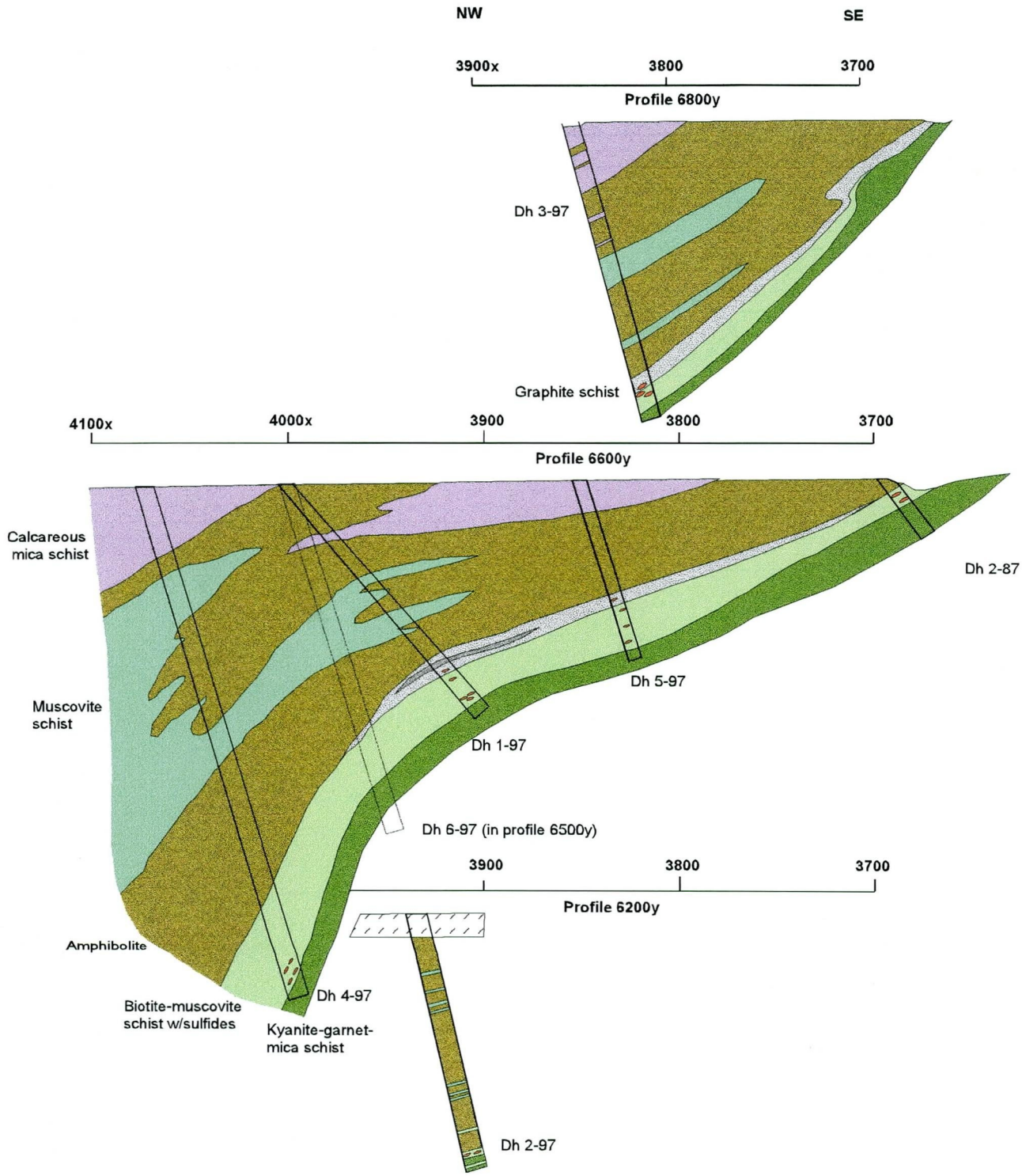

Figure 8: Profiles of the drillholes from 1997. For location of the profiles, see Figure 7. The drillholes 3-97 to 6-97 were logged by O. Bakke and S. Burman at AS Bleikvassli Gruber (see appendix).

Table 3: Analysis of Brunesbekken drillholes 1997, average outcrop Brunesbekken and Bleikvassli ores

Drillhole 1-97:

Top	Bottom	meter	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
123.90	124.90	1.00	3718	842	1537	2.4	10	11	34	19	<2	2.2	<3	25	40	6.54	672
132.50	133.50	1.00	1004	1269	3100	3.7	20	4	21	11	<2	9.5	<3	15	229	2.67	1155
133.50	134.50	1.00	934	773	1624	1.9	16	8	20	9	2	4.8	<3	9	298	2.27	1659
134.50	135.50	1.00	739	279	461	0.9	2	9	56	22	<2	1.4	<3	4	44	4.19	779
135.50	136.50	1.00	3910	600	2202	3.4	37	15	16	7	<2	7.1	<3	13	237	1.97	1607
136.50	137.80	1.30	1139	610	912	1.4	33	5	9	5	<2	3.2	<3	10	177	1.41	1761
137.80	139.00	1.20	7301	1358	6374	5.3	3	23	21	11	<2	19.2	<3	37	63	3.09	1416
139.00	140.00	1.00	9108	1633	4942	6.6	8	39	41	18	<2	15.5	<3	41	33	4.34	1161
140.00	141.50	1.50	5347	1209	3657	4.8	6	43	94	21	<2	13.7	<3	20	23	4.90	760
141.50	142.15	0.65	1050	280	563	1.3	<2	47	122	26	<2	1.4	<3	5	29	5.11	515
142.15	143.50	1.35	4579	2386	3007	4.5	13	42	55	16	<2	9.1	<3	34	54	3.61	1151
143.50	144.50	1.00	1125	2367	3578	4.1	2	32	40	14	<2	16.0	<3	37	171	3.37	1138
144.50	145.50	1.00	2834	2102	4898	3.6	8	52	43	14	5	16.0	<3	26	75	3.19	1379
145.50	146.80	1.30	11232	1530	14480	4.8	9	26	26	20	2	23.5	<3	27	24	4.44	2853
146.80	147.30	0.50	18381	976	19175	7.7	32	9	26	24	<2	32.3	<3	21	16	5.31	1779
147.30	148.30	1.00	16755	904	16200	5.8	23	26	47	30	4	28.4	<3	15	12	6.65	1883
148.30	149.70	1.40	7638	1645	6304	4.6	11	72	43	18	5	13.7	<3	31	28	3.98	1734
150.40	151.40	1.00	498	58	149	0.3	3	10	27	6	2	0.5	<3	<3	103	1.36	209
151.40	152.10	0.70	927	194	241	1.4	<2	21	138	37	4	1.4	<3	6	74	5.09	367

Drillhole 2-97:

Top	Bottom	meter	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
114.40	114.95	0.55	2908	671	1146	1.6	9	23	102	26	4	2.4	<3	21	242	5.74	778
126.10	127.50	1.40	2449	52	439	0.5	13	7	38	28	6	0.7	<3	13	206	6.59	397
127.50	128.33	0.83	5636	6	1327	1.2	100	18	50	56	<2	6.4	<3	68	35	9.27	160
128.33	129.00	0.67	1166	54	368	0.4	12	23	43	29	12	1.5	<3	14	112	6.79	277
129.00	129.57	0.57	1082	49	270	0.5	2	15	47	30	<2	1.5	<3	<3	120	7.33	397
134.17	134.50	0.33	977	68	141	<0.3	3	6	24	25	<2	0.2	<3	<3	323	6.37	334

Drillhole 3-97:

Top	Bottom	meter	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
142.40	144.00	1.60	482	176	1142	1.2	2	17	74	22	3	3.6	<3	76	120	5.02	659
144.00	144.40	0.40	5231	1098	3306	5.9	28	24	50	19	<2	11.1	<3	61	85	5.51	746
144.40	145.60	1.20	385	94	366	0.5	<2	9	50	18	<2	2.9	<3	53	138	4.21	665
148.00	150.00	2.00	2882	675	2533	2.2	14	8	31	15	<2	4.8	<3	50	300	4.13	1017
151.20	151.80	0.60	1156	797	1511	1.3	2	10	32	13	<2	2.2	<3	16	150	4.09	664

Drillhole 4-97:

Top	Bottom	meter	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
256.40	258.95	2.55	2387	127	2260	0.9	10	46	63	21	<2	3.0	<3	79	189	5.80	785
264.10	264.90	0.80	1022	123	702	0.5	5	45	116	18	2	0.9	<3	7	126	4.21	651

Drillhole 5-97:

Top	Bottom	meter	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
60.20	63.00	2.80	2407	1321	3350	3.0	7	20	48	11	5	8.6	<3	13	159	2.97	1299
63.00	66.30	3.30	2248	467	2446	2.4	14	15	29	12	2	7.2	<3	13	264	3.51	1380
71.60	73.50	1.90	1144	47	54	0.6	3	11	31	14	<2	0.4	<3	15	228	3.95	510

Drillhole 6-97:

Top	Bottom	meter	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
57.35	57.55	0.20	190	34	372	0.3	3	1	41	38	15	0.9	<3	11	24	3.61	577

Average outcrop Brunesbekken:	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
	8800	6826	21566	13.0	95	4	15	11	<5	34.4	<5	82	143	7.64	5926

Average Bleikvassli ores:	Cu	Pb	Zn	Ag	Au	Mo	Ni	Co	As	Cd	Sb	Bi	Ba	Fe	Mn
Pyrite ore	1800	34800	73400	49.4	147	-	-	38	231	202.4	105	49	30	18.41	410
Pyrrhotite ore	3900	24000	45500	52.9	202	-	-	26	229	116.7	139	58	62	17.36	836

The profiles show a close correspondence between the lithologies at the surface and the drillholes. The interpretations indicate that the lithologies dip with an angle of 25-30° to the west in drillholes 1 and 2 which increases to about 45° in drillhole 3 in the east. Further eastwards, field observations show that the lithologies become vertical and change dips toward the east. This is due to one of the main F_3 fold structures in the area which closes at Kongsfjellet (e.g. Bjerkgård et al. 1995). The lithologies also dip more steeply further eastwards in profile 6600Y towards drillhole 4-97. This could either be a parasitic fold-structure on the major F_3-fold or a later, more open, F_4-fold. Smaller scale fold structures belonging either to F_2 or F_3 are also evident in the amphibolite in profiles 6600Y and 6800Y.

Mineralizations consisting of weak impregnations with pyrrhotite and chalcopyrite and minor pyrite and sphalerite were found in all holes, except 6-97, which contained only weak impregnations of pyrrhotite in the mineralized interval (see logs in appendix). Galena was observed in two drillholes (1 and 3).

The mineralized sections are overlain by graphite-schist and graphite-bearing muscovite-biotite schist. The content of graphite decreases downwards approaching the mineralizations. The mineralizations in the holes are hosted by garnet-mica schists, both biotite and muscovite-rich and also containing variable amounts of porphyroblastic, green amphibole. Garnets are typically fine-grained (mm-scale) and have a characteristic light pink color, indicating a high content of manganese (spessartine). The schists resemble what was found in Brunesbekken, but seems to contain lesser amounts of carbonate and amphibole. Thus, the typical «skarn-like» rocks were not observed in the drillholes.

Geochemical analyses from drillhole 1-97 to 6-97 are presented in Table 3. The data set shows that only drillhole 1 comes up with significant grades of base metals. The best section of 2.8 m (the interval 145.50-148.30 m) in this hole has grades of 1.45 % Cu, 0.12 % Pb and 1.59 % Zn, or alternatively 4.2 m with 1.22 % Cu, 0.14 % Pb and 1.27 % Zn over the interval 145.50-149.70 m. None of the other holes contain more than one percent total base metals. The iron content is below 10 % in all analyzed sections, showing that the mineralization overall is only a weak impregnation rather than massive ore. Contents of silver and gold and other trace elements (As, Sb, Cd, etc.) are also very low in all the holes.

Compared to the main part of the Bleikvassli deposit this mineralization is strongly enriched in copper: the Cu/Cu+Pb+Zn-ratio is 0.46 (best section of 1-97) as opposed to the main ore type in Bleikvassli which comes up with a ratio of 0.02-0.03 (see discussion below).

DISCUSSION AND RECOMMENDATIONS

North of Røssvatnet

The investigations in the area north of Røssvatnet did not reveal any sulfide mineralizations. However, lenses of garnet-tourmaline-quartz (+ corundum?) rocks were found within a unit of garnet-mica schist. These rocks could be a result of hydrothermal activity, but because of the overall disappointing observations in this well exposed area, no more work is recommended.

Gjetarfjellet

The mineralizations found at Gjetarfjellet in the Anders Larsa Group are interesting and should be followed up with more work. In Sweden, there are several Zn-Pb mineralizations in this unit, of which the Gräskovardo mineralization just east of Grasvatnet is the most prominent. Unfortunately, the apparently richest parts of the mineralizations at Gjetarfjellet are totally altered and degraded to gossan. Blasting or pack-sack drilling to reveal fresh samples at localities where the gossan is most pronounced is highly recommended, but the optimal alternative would be to carry out trenching across the mineralized zones, especially across the northern zone around UTM-coordinates 477800 7311500 (*Figure 3*). On the basis of the results from this work it could then be decided whether ground geophysics are necessary. It is also interesting to note that the mineralized zone creates a very strong magnetic anomaly and is also creating a moderate conductor with limited extent (*Figure 9*). Unfortunately, neither the regional soil geochemistry (Krog 1995 a), nor later follow-up soil geochemistry (Krog 1995 b) extend far enough to the south to cover the area.

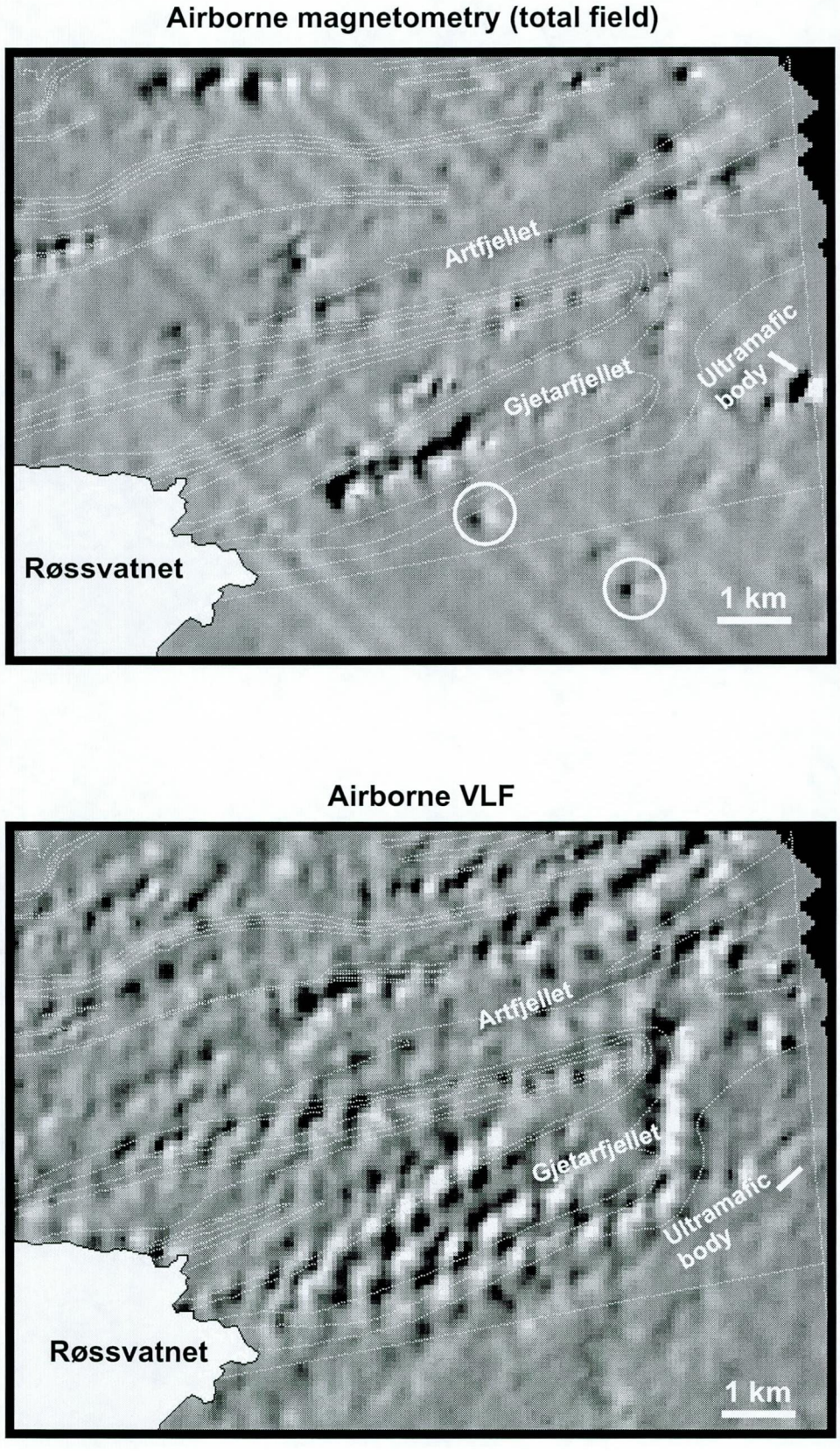

Figure 9: Section of the geophysical maps from the area south of Artfjellet, showing the airborne magnetometry (total field) and VLF (from Mogaard and Olesen, 1996). The geology (from Bjerkgård et al. 1995) is superimposed on the maps with white lines. The circles show interesting magnetic anomalies. For explanation, see text.

Border to Sweden (Riksgrensa)

Cu-Ni mineralizations, probably of comagmatic origin, was discovered for the first time in the area this summer at the border to Sweden (*Figure 4*). On the basis of surface outcrop, the mineralization is too small to be economic. However, the ultramafic body creates a prominent magnetic anomaly, inferring that it could extend below the surface (*Figure 9*). An IP survey is recommended to constrain the size of the mineralization at depth. Samples should also be taken for PGE analysis and also make a few polished sections. The ultramafic body is not a good conductor, as can be seen in *Figure 9*. Other but smaller magnetic anomalies without associated VLF anomalies can be the seen to the south (UTM 477520 7310350) and southeast (UTM 479050 7309620) of Gjetarfjellet (circled in *Figure 9*), and lie within the same kyanite-garnet mica schist unit as the ultramafic body. These should be investigated to see if they are caused by mineralized ultramafic or mafic rocks. Unfortunately, the regional soil geochemistry which could have provided some clues for mineralizations, (Krog 1995 a) does not extend into these areas.

Grasvatnet

The diamond drilling in the Grasvatnet area intersected a weak sulfide impregnation close to Okstindtjønna and has revealed the cause of the TFEM anomaly at 200 m depth (see *Figure 5*). The anomaly seems to be continuous from Rabotsbekken to north of Okstindtjønna, which strongly suggests that the mineralization encountered in the drillhole corresponds to that which outcrops in Rabotsbekken.

A correlation is also supported when comparing metal contents and ratios in the drillhole and the outcrop in Rabotsbekken. The ternary Cu-Zn-Pb plot (*Figure 10*) show that the ratios between these elements are identical for the two places. Moreover, the content of As is anomalously high in both Rabotsbekken and Okstindtjønna and in both places enriched structurally above the polymetallic ore (see Table 2 and *Figure 5*). The mineralized interval in the drillhole show, in addition to high As contents (up to 633 ppm), anomalously high contents of Sb and Bi (up to 134 and 229 ppm, respectively), when compared to other deposits in the area. In comparison, the pyrite ore in the Bleikvassli deposit, contain on average 355 ppm As, 138 ppm Sb and 51 ppm Bi (Bjerkgård 1998). The reason for this could be a greater influence of sediments in the metal source(s) at Grasvatnet. The Cu/Zn-ratio is high in

Okstindtjønna/Rabotsbekken and much higher than in the Bleikvassli deposit as a whole (*Figure 10*). This could indicate that have been found at Grasvatnet so far is a more proximal part of the deposit. A mineralogical study of polished thin sections would certainly provide some answers to these questions.

A weak pyrite-pyrrhotite impregnation was also found in a creek to the east of the hole (*Figure 6*). This means that the mineralization extends for at least 1.5 km along strike and 500 m across strike. A very strong TFEM anomaly is also present at a depth of 100 m (*Figure 6*). Since the TFEM method will always show the upper edge of a conductor (e.g. see theoretical background in Dalsegg 1997), this anomaly must either be caused by a graphite concentration or sulfide enrichment. Drilling is strongly recommended to test this anomaly, preferably in the same section as drillhole 1, because the two drillholes together will provide important information about the structures. Because of the large aerial extent of the mineralization(s) more drillholes are also required to cover the area between the outcrop in Rabotsbekken and drillhole 1. The resistivity log (*Figure 6*) shows that the anomaly is caused by both graphite and sulfides which are associated in the hole. This means that we can not know for sure whether the anomaly along strike is caused by mainly graphite or sulfides.

In conclusion, there is a potential for a major sulfide deposit in the Grasvatnet area. A larger diamond drilling program in the area is therefore recommended with regularly spaced drillholes (e.g. 200 m) between Rabotsbekken and drillhole 1. The extent of the mineralization at depths greater than 200 m should also be tested.

Brunesbekken

Diamond drilling was continued in Brunesbekken in November and December 1997 on the basis of the results from the first holes drilled and more geophysical work (Dalsegg 1997).

Neither the core logs (appendix) nor the analyses give reliable indications to where the chances are the best to find better intersections or if there are any chances of finding an ore body.

Plotting up the average, weighted data from the best sections in the drillholes in the Cu-Zn-Pb ternary diagram (*Figure 10*), show that by going deeper in the mineralized zone in profile

6600Y (from outcrop to br-4) and southwards (br-2), but also northwards (br-3), the Cu-ratio increases. This could indicate a zone of more proximal character in the deeper levels of the mineralization, but should not be taken as firm evidence, because of the limited amount of data. More clear is the high Cu-ratio compared to the Bleikvassli ore (*Figure 10*). The ratio is also quite similar to the Grasvatnet mineralization, but the contents of As and Sb are much lower and contents of Co and Ni are higher (compare Tables 2 and 3). Seen in this light, the reason for the high Cu-ratio in the Brunesbekken mineralization could be that most of the metals in this case come from the metabasalts.

In conclusion, and mainly because of the disappointing results, no more drilling is recommended on this mineralization.

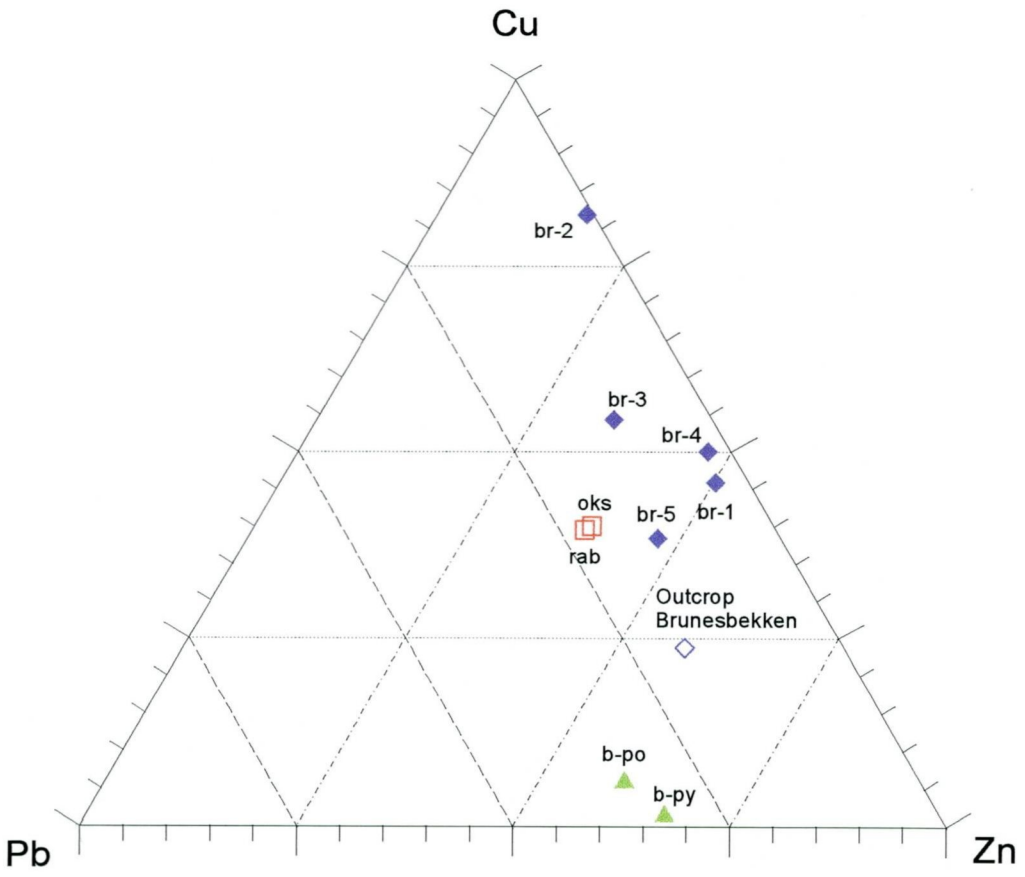

Figure 10: Ternary Cu-Zn-Pb plot comparing the main ore types in the Bleikvassli deposit, drillholes and outcrop samples from Brunesbekken and the outcrop and drillhole in the Grasvatnet area. b-po and b-py = pyrrhotite and pyrite ore in Bleikvassli, br-1 to br-5 = drillhole 1 to 5-97 in Brunesbekken, outcrop = average of samples from outcrop in Brunesbekken, oks = drillhole Okstindtjønna, rab = outcrop in Rabotsbekken. All data are presented in Tables 1 to 3.

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APPENDIX

Lithological logs (in Norwegian) from diamond drillholes 1 to 6-97 in Brunesbekken and 1-97 in the Grasvatnet area (Okstindtjønna).

Borhull 1-97 Brunesbekken
Koordinater: 4000X - 6600Y (Geofysisk grid 1995)
Azimut: N138° Ø Vinkel 55° Lengde 155.00 m
Logget 16-17.08-97 av Terje Bjerkgård, NGU

0.00- 1.00: ***Overdekning.***

1.00-35.40: ***Amfibolitt.*** Finkornet med 1-1.5 mm mørkegrønne amfibolnåler og opptil 1mm korn av feltspat. Noe kalsitt (syretestet). Slirer og årer av kvarts og/eller kalsitt 25-40-35.40. Homogen 1.00-9.90. Spredt granat 11.60-35.40, mest hyppig 25.15-29.20.

35.40-41.80: ***Kalkglimmerskifer.*** mm- til cm-skala laminert mellom kvarts-kalkspatdominerte og muskovitt-biotittdominerte lamina. Spredte 1-5 mm store uregelmessige granater. Innslag av lyst grågrønt mineral, sannsynligvis epidot eller diopsid.

41.80-64.90: ***Amfibolitt.*** Båndet på cm-skala med uregelmessige amfibol +/- biotittbånd og kvarts-feltspat +/- kalsittbånd. Særlig biotittrik 44.80-47.80 og 53.60-55.25. Generelt finkornet, men noe mer grovkornet enn 1.00-35.40. Linser og slirer med kvarts +/- kalsitt, dels med noe epidot.

64.90-67.40: ***Granat-glimmerskifer.*** mm- til cm-båndet biotitt-muskovittskifer med hyppige 1-5 mm store, uregelmessige granater, ellers kvarts og feltspat. Muskovitt dominerer over biotitt. Amfibolrik slire 65.50-65.55. 66.02-66.50: Uregelmessig kvartsåre med slirer av av lys rosa finkornet granat (spessartinrik?), magnetitt (dels massiv) og enkelte opptil 5mm store uregelmessige aggregater av pyritt og kobberkis. Anrikning av amfibol i overkant og granat i underkant av åren.

67.40-69.20: ***Amfibolitt.*** Båndet (som 41.80-64.90). Bånd rike i epidot.

69.20-70.03: ***Glimmerskifer.*** (som 64.90-67.40). Svært få granater.

70.03-70.40: ***Amfibolitt.*** (som over).

70.40-71.10: ***Granat-glimmerskifer.*** Biotittrik, og med linser og slirer av epidot. Granat opptrer lokalt i finkornede slirer med tydelig rosa farge (spessartinrik?). Magnetittholdig.

71.10-75.30: ***Amfibolitt.*** Sliret til båndet med epidot og kvarts-feltspatiske mm-tykke bånd. Ellers varierende innhold av biotitt og relativt finkornet med 1-2 mm mørkegrønne amfibolnåler. 1 cm tykt bånd med finkornet rosa granat (spessartinrik?) 75.15.

75.30-89.95: ***Muskovittskifer.*** mm-laminert mellom muskovitt +/- biotittrike og kvarts-feltspatrike lamina. Spredte 1-2 mm store granater, men generelt granatfattig. Generelt magnetittrik (0.5-3 % magnetitt i følge susp. målinger). Kvartslinse

med noe biotitt og magnetitt 78.70-78.80 og 79.95-80.00. Epidotrik og biotittrik i uregelmessige, cm-tykke slirer 80.65-81.70.

89.95-96.10: ***Epidot-amfibolskifer.*** Svært uregelmessig sliret på cm-skala med variasjon i innhold av epidot, mørkegrønn amfibol, kvarts og biotitt. Mer felsisk og lys biotitt-muskovittskifer 92.40-93.35 og 95.30-96.00.

96.10-105.90: ***Granat-glimmerskifer.*** Slirer og linser av muskovitt med noe biotitt i veksling med kvarts +/- feltspatslirer på 0.5- 1 cm skala. 1-10 mm store granater i assosiasjon med glimmer. Staurolitt opptrer i opptil 5 mm anhedrale brune korn, særlig fra ca. 99 m. Magnetittrik 96.10- ca. 100.00 (ca. 1 %) og magnetittfattig ca. 100.00-105.90.

105.90-110.75: ***Amfibolitt.*** mm-sliret, relativt homogen og finkornet. Lokalt tynne soner med noe biotitt. Bånd og slirer på mm-skala med epidot. Enkelte slirer anriket på kalsitt.

110.75-111.45: ***Granat-glimmerskifer.*** 1-3 mm granat, ellers biotitt og muskovitt, vekslende med kvarts og feltspat på mm-skala.

111.45-123.35: ***Amfibolitt.*** 1-5 mm sliret, dels med biotitt, dels med kalsitt. Enkelte mer felsiske soner anriket på epidot.

123.35-125.05: ***Grafittholdig biotittskifer.*** Grafittholdig med slirer av grafitt og lyse bånd på cm til dm skala anriket på kvarts og kalsitt. Meget svak impregnasjon av magnetkis i form av tynne streker. Kobberkis i opptil 0.5 cm store aggregater 123.90-123.95 og 124.35-124.90, også mer biotittrik og hyppige 1-3 mm store granater i de kobberkisrike sonene.

125.05-131.20: ***Grafittskifer.*** Særlig grafittrik 130.50-131.20, ellers grafitt i slirer. Enkelte kvarts-slirer. Granater 128.30-129.60.

131.20-132.50: ***Grafittholdig granat-biotittskifer.*** Granatrik (1-2 mm korn) og biotittrik. mm til cm tykke slirer/linser av grå kvarts og av grafitt.

132.50-135.85: ***Grafittholdig amfibol-biotittskifer.*** Avtakende grafittinnhold med dypet. Partier anriket på grovkornet mørkegrønn amfibol (opptil 1 cm store aggregater og krystaller). Meget svak impregnasjon av kobberkis og magnetkis. Spor av sinkblende.

135.85-149.70: ***Granat-amfibol-biotittskifer.*** Som 132.50-135.85, men ikke grafitt. Slirer og linser opptil 5 cm tykke med kvarts og/eller kalsitt. Enkelte slirer med finkornet, lys rosa granat (spessartin?). Lokalt granatrik med mm-store korn, ellers biotittrik og med grønn kloritt og grovkornet amfibol i partier. Svak impregnasjon av magnetkis og kobberkis med underordnet sinkblende og pyritt. Enkelte korn av blyglans fra 142.35. Impregnasjonen blir sterkere mot dypet til 148.35, hvoretter avtakende. Rikeste sone mellom 146.50-148.35 med opptil 2-3 cm store, uregelmessige slirer med kobberkis, magnetkis og sinkblende. Underordnet blyglans og pyritt.

149.70-155.00: ***Kyanitt-granat-glimmerskifer.*** Vekslende uregelmessige 0.1-1 cm grå kvartsrike og biotittrike slirer. Kyanittrik med lyseblå 1-3 mm listeformede krystaller. Ellers hyppige 1-3 mm store granater. Inneholder underordnet mm-store korn av gulbrun staurolitt. 150.40-152.05: Hyppige kvartsslirer med relativt grovkornet fuchsitt. Sulfider ikke synlig.

155.00: ***SLUTT***

Borhull 2-97 Brunesbekken (Mellamyra)
Koordinater: 3935X - 6178Y (Geofysisk grid 1995)
Azimut: N135° Ø Vinkel 76° Lengde 136.60 m
Logget 22.08-97 av Terje Bjerkgård, NGU

0.00-10.70: ***Overdekning.*** (Silt).

10.70-15.10: ***Amfibolitt.*** Båndet på mm- til cm-skala, uregelmessig sliret til båndet med epidotrike bånd og lokalt med anrikning av biotitt. Enkelte uregelmessige linser av kvarts. Sleppesoner parallell kjerneakse 12.35-12.50 og 13.95-14.40.

15.10-16.40: ***Årekvarts*** med linser av biotitt. Amfibolitt-linse dels epidotrik 15.10-15.65.

16.40-31.15: ***Amfibolitt.*** (som 10.70-15.10). Kvarts og biotittrik 24.60-29.40. Kloritt og epidotrik 29.40-30.35. Knusningssone 30.00-30.10 og kjernetap 30.10-30.18.

31.15-31.45: ***Kjernetap.***

31.45-33.95: ***Amfibolholdig muskovitt-biotittskifer.*** Kvartsrik, dels i form av cm-tykke slirer. Noe epidot og enkelte finkornede granater (< 1 mm). Kjernetap 31.90-31.95.

33.95-34.43: ***Amfibolitt.*** epidot- og biotittrik, uregelmessig sliret.

34.43-34.62: ***Kjernetap.***

34.62-42.55: ***Amfibolitt.*** Vekslende fra homogen, finkornet med mm til cm streker av plagioklas og amfibolnåler til båndet og sliret. Noe kalsitt. Epidotrik 34.62-35.05 og 42.45-42.55.

42.55-43.30: ***Muskovitt-biotittskifer.*** Kvartsrik og epidot- og amfibolholdig. 1-2 mm korn av grønn amfibol. 1 cm kalsitt-kvartsåre med små aggregater med sinkblende og kobberkis.

43.30-47.70: ***Amfibolitt.*** (som 34.62-42.55).

47.70-49.25: ***Biotitt-muskovittskifer.*** Epidotholdig, særlig i øvre og nedre del av sekvensen. Generelt kvartsrik. Enkelte opptil 1-2 cm tykke feltspat-slirer.

49.25-50.15: ***Amfibolitt.*** (som 34.62-42.55). 3 cm tykk kvartsslire i topp av sekvensen.

50.15-52.80: ***Muskovitt-biotittskifer.*** Kvarts- og epidotrik. Spredte aggregater med granat (≤ 1.5 cm). Spor av spredt kobberkis 51.60-52.75. Epidot opptrer i spredte uregelmessige < 0.5 cm slirer. Også enkelte større kvartsslirer, men ellers relativt homogen.

52.80-91.55: ***Amfibolitt.*** Vekslende i mineralogi, kornstørrelse og tekstur fra homogen, finkornet plagioklas-amfibol-dominert til uregelmessig sliret kvarts, epidot, og dels biotittrik. Spredte, uregelmessige pyritt-streker. Enkelte kvarts-kalsitt-slirer. Tynne, 0.5-1 cm tykke breksje-soner fylt med kvarts, kalsitt og kloritt ved 64.85, 67.60, 87.55.

91.55-93.75: ***Epidot-biotittskifer.*** Dels amfibolholdig til amfibolrik.. Spredt 1-4 mm granat. Ellers hyppige 1-3 mm tykke kvarts-slirer. Meget epidotrik 93.00-93.75.

93.75-94.40: ***Amfibolitt.*** mm-laminert og biotittrik. Hyppige ≤ 0.5 cm tykke kvartsbånd 93.75-94.05.

94.40-95.35: ***Epidot-biotittskifer.*** dels amfibolholdig (som 91.55-93.75). Spredt pyritt med noe assosiert kobberkis og spor av sinkblende.

95.35-97.10: ***Amfibolitt.*** Relativt homogen og finkornet (~ 2 mm). Spredt pyritt med spor av kobberkis.

97.10-98.30: ***Biotitt-muskovittskifer.*** mm til cm-tykke kvartsslirer. Spredte 1-5 mm store granater. Enkelte streker av pyritt og kobberkis. 1-5 mm tykk slire av rosa granat (spessartinrik?) ved 97.80.

98.30-100.20: ***Amfibolitt.*** (som 95.35-97.10). Epidotsliret 99.70-100.20. Spredt pyritt.

100.20-103.35: ***Biotitt-amfibolskifer.*** dels amfibolitt. Epidotholdig. Meget finkornet (≤ 1 mm) granat 101.45-101.55. Enkelte pyritt- og kobberkis-streker.

103.35-113.75: ***Amfibolitt.*** Homogen og finkornet 103.35-108.50. Dels biotittrik 103.35-104.95 og mer skifrig, laminert på mm-skala. Mer sliret og epidot og biotittrik fra 108.50.

113.75-115.05: ***Granat-kvarts-biotittskifer.*** Økende granatinnhold mot dypet, men med gradvis mindre kornstørrelse (2-4 mm - ≤ 1 mm). Tynne amfibolitt-linser 113.97-114.07 og 114.35-114.40. Svak kobberkis-magnetkis impregnasjon 114.40-114.95 med 1-2 % sulfider. Mest kobberkis.

115.05-126.00: ***Amfibolitt.*** Relativt homogen, men med noe variasjon i kornstørrelse og biotitt-innhold. Enkelte linser med kalsitt og kvarts. Meget finkornet (< 1 mm) granat 115.05-116.10 og avtakende innhold nedover i sekvensen men noe økende kornstørrelse. Spredt granat også fra 119.95. Kvarts-kalsitt-kloritt breksjesoner < 1 cm tykke 119.30, 119.50, 120.15 og 122.35.

126.00-129.60: ***Granat-biotitt-muskovittskifer.*** Hyppige kvarts-slirer, stedvis gråaktige, noe som antyder grafitt. Tynn grafittsone 128.60-128.70. Granatrike soner 126.95-127.05 og 127.50-128.33, som inneholder 1-2 mm grønne korn av amfibol. Svak impregnasjon (1-2 %) av kobberkis og magnetkis i mm- til cm-store

slirer. Større sulfidanrikning i de granatrike sonene (2-5 %, opptil 10 %). 128.15-128.22: Massiv magnmetkis assosiert med kvartslinse.

129.60-134.17. ***Kyanitt-granat-glimmerskifer.*** Forholdsvis rik på gulbrun staurolitt som opptrer i 1-2 mm korn. Ellers 1- 10 mm blå kyanitt og 1-3 mm granat. Teksturelt veksling mellom uregelmessige grå kvarts-slirer og biotittslirer på 0.1-1 cm skala.

134.17-134.70: ***Muskovitt-biotittskifer*** (som 126.00-129.60). Mindre granat. Svakt (1-2 %) pyritt-magnetkis impregnert. Kvartslinse 134.50-134.70.

134.70-136.60: ***Kyanitt-granat-glimmerskifer*** (som 129.60-134.17) Staurolittholdig og med grovkornet staurolitt 135.65-135.80.

136.60: ***SLUTT:***

Borhull 3-97 Brunesbekken
Koordinater: 3850X - 6795Y (Geofysisk grid 1995)
Azimut: N139° Ø Vinkel 75° Lengde 157.80 m
Logget 14.11-97 av Olav Bakke, Bleikvassli Gruber

0.00- 2.00: ***Overdekning.***

2.00-12.60: ***Granatglimmerskifer.*** Striper med epidot, 10.20-10.60. Store mengder lyserøde (Mn-rike?) granater, siste 2 meter.

12.60-17.00: ***Amfibolitt.*** Kalkspatholdig. Striper med noe pyritt, 15.10-15.70.

17.00-17.10: ***Årekvarts.***

17.10-21.80: ***Granatglimmerskifer.*** Amfibolitt med årekvarts, 20.60-21.20

21.80-23.90: ***Amfibolitt.***

23.90-36.50: ***Granatglimmerskifer.*** Striper med amfibolitt, 24-60-25.00. Striper med epidot, 31.80-33.50. Mindre innhold av granat fra 32.00.

36.50-49.20: ***Amfibolitt.*** Hyppige striper av epidot, sprekkefyllinger av kalkspat. Glimmerrike partier 41.20-42.20.

49.20-52.60: ***Granatglimmerskifer.*** Lavt innhold av granat, 49.20-50.90

52.60-62.30: ***Amfibolitt.*** Massiv og foldet. Sprekker fylt med kalkspat.

62.30-62.45: ***Granatglimmerskifer.***

62.45-62.90: ***Amfibolitt.***

62.90-63.75: ***Granatglimmerskifer.***

63.75-70.10: ***Amfibolitt.***

70.10-70.30: ***Grafittskifer.*** Svak impregnasjon av pyritt, magnetkis.

70.30-76.45: ***Granatglimmerskifer.*** Staurolitt og kyanittholdig. Stedvis svak impregnasjon av kobberkis og pyritt. Grafittiske striper med kobberkis og magnetkis, 74.00-75.40.

76.45-77.80: ***Amfibolitt.***

77.80-80.80: ***Glimmerskifer.*** Spredt granat

80.80-82.70: ***Glimmerskifer.*** Epidotrik. Sprekker fylt med kalkspat.

82.70-84.70: ***Glimmerskifer.*** Lys, med enkelte tynne, lyserøde granatbånd (Mn-rik?), siste 0.5 meter.

84.70-86.90: ***Granatglimmerskifer.*** Lys, spor av pyritt.

86.90-113.60: ***Amfibolitt.*** Epidotrik. Striper med pyritt v/88.00, 88.20, 88.50, 99.10, 99.90, 101.60 og 110.15. Sprekker fylt med kalkspat. Striper med lyse granater og noe glimmer. Boring dels parallell foliasjon.

113.60-115.80: ***Glimmerskifer.*** Granatholdig og svakt pyritt-impregnert.

115.80-118.40: ***Granatglimmerskifer.***

118.40-133.40: ***Amfibolitt.*** Mye sprekker fylt med kalkspat.

133.40-142.40: ***Muskovitt-biotittskifer.*** Striper og bånd med grafittskifer. Noe kyanitt og spredt granat. Svak pyritt-impregnasjon med spor av kobberkis.

142.40-145.60: ***Kyanitt-granat-glimmerskifer.*** Finkornet lys granat. Svak kobberkis-impregnasjon, rikest 144.00-144.40. Enkelte grafittiske partier.

145.60-147.50: ***Grafittskifer***. Magnetkis-impregnasjon.

147.50-148.00: ***Glimmerskifer og grafittskifer.*** Magnetkis-impregnasjon.

148.00-150.00: ***Glimmerskifer.*** Mye finkornet granat fra 148.50. Svak impregnasjon av kobberkis, sinkblende og blyglans, rikest 148.50-149.20.

150.00-151.20: ***Muskovittskifer.*** Spredt granat.

151.20-151.80: ***Glimmerskifer.*** Mye finkornet granat fra 148.50. Svak impregnasjon av kobberkis og magnetkis.

151.80-157.80: ***Kyanitt-granat-glimmerskifer.*** Staurolittholdig. Spor av pyritt og magnetkis.

157.80: ***SLUTT:***

Borhull 4-97 Brunesbekken
Koordinater: 4075X - 6600Y (Geofysisk grid 1995)
Azimut: N139° Ø Vinkel 75° Lengde 272.40 m
Logget 08.12-97 av S. Burman, Bleikvassli Gruber

0.00- 3.00: ***Overdekning.***

3.00- 4.10: ***Glimmerskifer.*** Striper med epidot, 10.20-10.60. Store mengder lyserøde (Mn-rike?) granater, siste 2 meter.

4.10- 4.90: ***Granatglimmerskifer.*** Finkornet, med amfibolittisk preg.

4.90-35.00: ***Kalk-glimmerskifer.*** Granat-førende.

35.00-40.00: ***Granatglimmerskifer.*** Foldet amfibolittbånd 39.20-39.50.

40.00-47.00: ***Granatglimmerskifer.***

47.00-50.50: ***Granatglimmerskifer.*** Grovkornet granat (5-10 mm). Foldet.

50.50-54.00: ***Glimmerskifer.*** Hornblende-førende bånd. mm-tykke granatbånd.

54.00-57.50: ***Granatglimmerskifer.*** Grovkornet granat (5-10 mm). Enkelte hornblende-rike bånd.

57.50-60.20: ***Hornblendeskifer.*** Spredt granat.

60.20-74.80: ***Granatglimmerskifer.*** Dels foldet.

74.80-80.70: ***Glimmerskifer.***

80.70-88.50: ***Amfibolitt.*** Enkelte kvarts-slirer. Noe granat. magnetkis-kobberkis anriking, 84.10.

88.50-88.90: ***Knusningssone.*** Anriking kobberkis og magnetkis 88.50-88.60.

88.90-121.00: ***Amfibolitt.*** Opptil cm-tykke kalkspat og kvartsbånd.

121.00-126.20: ***Amfibolitt.*** Vekslende med glimmerskifer som har et stort innhold av finkornet, lys granat. Antakelig en foldeombøyning.

126.20-135.50: ***Glimmerskifer.*** Vekslende granatførende og biotittrike bånd. Granatførende bestående av meget finkornet nesten «chert»-aktig granat.

135.50-144.30: ***Glimmerskifer.*** Hornblendeførende vekslende med finkorent granatførende skifer. Spredte opptile cm-tykke kvarts og kalkspatbånd.

144.30-166.80: ***Amfibolitt.*** Finkornet, med kvarts og kalkspatbånd.

166.80-171.80: ***Granatglimmerskifer.*** Relativt grovkornet granat, dels med corona-tekstur.

171.80-174.80: ***Amfibolitt.*** Spredt granat.

174.80-184.60: ***Granatglimmerskifer.*** Epidotbånd fra 179.50.

184.60-190.00: ***Glimmerskifer.*** Spredte kvarts- og kalkspatbånd.

190.00-207.30: ***Amfibolitt.*** Enkelte kvarts- og kalkspatbånd.

207.30-210.30: ***Glimmerskifer.*** Spredt granat.

210.30-212.50: ***Amfibolitt.***

212.50-216.10: ***Granatglimmerskifer.*** Relativt grovkornet granat og enkelte kvartsbånd.

216.10-218.00: ***Biotittskifer***. Hyppig finkornet granat. Spor av magnetkis og kobberkis.

218.00-222.50: ***Granatglimmerskifer.*** Grovkornet granat med corona-tekstur. I siste del hornblendeførende og småfoldet. Spor av kobberkis v/222.10.

222.50-225.20: ***Amfibolitt.***

225.20-252.80: ***Granatglimmerskifer.*** Dels hornblendeførende og med staurolitt. I begynnelsen svært finkornet granat og kyanitt. Grafittskiferbånd, 231.50-231.60 og 239.70-239.80 med streker av magnetkis.

252.80-256.40: ***Muskovitt-biotittskifer.*** Spredt granat.

256.40-258.95: ***Biotittskifer.*** Granatførende med svært finkornet granat. Svakt impregnert av kobberkis, sinkblende og pyritt.

258.95-264.10: ***Muskovitt-biotittskifer.*** Kvartsrik, spredt granat.

264.10-264.90: ***Biotittskifer.*** Granatførende. Svakt impregnert av kobberkis, magnetkis og pyritt.

264.90-267.60: ***Muskovitt-biotittskifer.*** Spredt granat.

267.60-272.40: ***Kyanitt-granat-glimmerskifer.***

272.40: ***SLUTT:***

Borhull 5-97 Brunesbekken
Koordinater: 3850X - 6600Y (Geofysisk grid 1995)
Azimut: N139° Ø Vinkel 75° Lengde 100.00 m
Logget Des.-97 av S. Burman, Bleikvassli Gruber

0.00-21.30: ***Kalkglimmerskifer.*** Hornblendeførende. Slepper og bånd med kalkspat.

21.30-23.00: ***Glimmerskifer.*** cm-tykke kvartsbånd.

23.00-37.70: ***Glimmerskifer.*** Hornblendeførende partier, epidot-slirer. Foldet og muligens ombøyning.

37.70-41.70: ***Kalk-glimmerskifer.*** Hornblendeførende. Slepper og bånd med kalkspat.

41.70-43.90: ***Granatglimmerskifer.***

43.90-60.20: ***Amfibolitt.***

60.20-66.30: ***Muskovitt-biotittskifer.*** Enkelte hornblendeførende bånd. Svak impregnasjon av kobberkis, blyglans, sinkblende og pyritt.

66.30-71.60: ***Granatglimmerskifer.*** Spor av kyanitt og staurolitt i begynnelsen.

71.60-73.50: ***Granatglimmerskifer.*** Staurolittførende og med spredt kyanitt. Svak impregnasjon av kobberkis.

73.50-78.80: ***Granatglimmerskifer.*** Staurolittførende og med spredt kyanitt. Svak impregnasjon av kobberkis og magnetkis, 78.00-78.10.

78.80-80.00: ***Granatglimmerskifer.*** Staurolitt og kyanittførende.

80.00-98.30: ***Granatglimmerskifer.*** Vekslende staurolitt og kyanittførende. Småfoldet, med spor av kobberkis.

98.30-100.00: ***Granatglimmerskifer.*** Staurolitt og kyanittførende. Relativt biotittrik.

100.00: ***SLUTT:***

Borhull 6-97 Brunesbekken
Koordinater: 4000X - 6500Y (Geofysisk grid 1995)
Azimut: N139° Ø Vinkel 75° Lengde 182.40 m
Logget des.-97 av S. Burman, Bleikvassli Gruber

0.00- 1.70: ***Overdekning.***

1.70- 3.00: ***Glimmerskifer.***

3.00- 8.00: ***Granatglimmerskifer.*** Vekslende med hornblendeførende skifer. Finkornet granat. Foldet.

8.00-13.80: ***Amfibolitt.*** Relativt grovkornet. I begynnelsen, finkornet granat i matriks.

13.80-18.00: ***Glimmerskifer.*** Vekslende med amfibolittiske bånd inneholdende slirer av lyserosa, finkornet granat (Mn-rik?). Foldeombøyning ved 14-15 m.

18.00-40.30: ***Amfibolitt.*** Båndet. Foldeombøyning ved 19-21 m.

40.30-47.30: ***Glimmerskifer.*** Spredt granat og spor av pyritt. Meget finkornet lys granat i matriks v/33.40-33.60.

47.30-88.40: ***Amfibolitt.*** Relativt grovkornet. Båndet med glimmerskiferbånd, tynne kalsittbånd. Spredt granat. Foldet ved 54.50-56.40 og 67.50-68.00. Spor av pyritt og kobberkis stedvis (mobilisater), og magnetkis v/63.30. Bergarten har skarn-preg stedvis.

88.40-102.70: ***Granatglimmerskifer.*** Grovkornet granat (5-10 mm), dels mantlede (corona-tekstur).

102.70-105.20: ***Amfibolitt.*** Homogen og finkornet.

105.20-105.30: ***Årekvarts.***

105.30-111.00: ***Granatglimmerskifer.*** Mantlede granater. Spredt staurolitt. Noe foldet.

111.00-124.50: ***Amfibolitt.*** Enkelte opptil cm-tykke kalkspatbånd. 124.40-124.50: skarn-preg.

124.50-126.10: ***Grafittskifer.*** Vekslende med glimmerskifer. Spor av magnetkis og pyritt.

126.10-130.00: ***Amfibolitt.*** Finkornet, enkelte opptil 0.5 cm-tykke kalkspatbånd.

130.00-135.00: ***Glimmerskifer.*** relativt finkornet og biotittrik. Enkelte amfibolittbånd.

135.00-137.00: ***Amfibolitt.***

137.00-158.20: ***Grafittskifer og glimmerskifer.*** Vekslende sekvenser. Grafittskifer med svak magnetkis-impregnasjon, glimmerskifer er biotittrik, dels grafittførende med finkornet granat og spor av kyanitt. Småfoldet fra 145.00.

158.20-160.40: ***Granatglimmerskifer.*** Dels staurolittførende med spor av kyanitt.

160.40-182.40: ***Granatglimmerskifer.*** Biotittrik og dels også rik i kyanitt. Enkelte kvartsbånd. Noe foldet.

182.40: ***SLUTT:***

Borhull 1-97 Okstindtjønna
Koordinater: 1730X-3315Y (Geofysisk grid 1996)
Azimut: N90°Ø Vinkel 75° Lengde 227.70 m
Logget 09-10.09-97 av Terje Bjerkgård, NGU

0.00- 1.00: ***Casing*** i oppsprukket kalkglimmerskifer

1.00- 10.00: ***Kalkglimmerskifer.*** Sliret til båndet på mm - cm-skala mellom kvarts-kalkspatrike og biotitt-diopsid-epidotrike bånd. Spredt granat. Enkelte hvite, cm-tykke slirer og bånd av kvarts +/- kalkspat. Svært oppsprukket 1.00-2.40. Kjernetap 1.60-1.70, 1.75-1.80, 1.85-1.90, 2.15-2.25 og 2.30-2.40. CA 10-15°, suscept. 0.10-0.17.

10.00- 11.20: ***Trondhjemitt.*** mm- til cm-kornet. Spredte røde granater, biotitt og muskovitt. Skjærer foliasjonen i kalkglimmerskifer. Suscept. 0.03-0.08.

11.20- 12.00: ***Kalkglimmerskifer.*** (som 1.00-10.00).

12.00- 12.90: ***Trondhjemitt.***

12.90- 39.35: ***Kalkglimmerskifer.*** (som 1.00-10.00). Noe mer granatrik. Trondhjemitt 24.10-24.40. CA 10°, suscept. 0.12-0.20.

39.35- 40.00: ***Muskovitt-biotittskifer.*** Grafittholdig, finkornet, relativt homogen. Tynne < 0.5 mm tykke streker av magnetkis opptrer hyppig. Suscept. 0.26-0.46.

40.00- 41.45: ***Kalkglimmerskifer.*** Uregelmessig sliret, noe grafittholdig, ellers spredt granat og magnetkis-streker. Grafitt opptrer i mm til cm-tykke bånd med mer hyppige streker av magnetkis. Suscept. 0.11-0.16. CA 5-7°.

41.45- 45.30: ***Grafittskifer og grafittholdig muskovitt-biotittskifer.*** (som 39.35-40.00, men dels mer grafittrik). Særlig grafittrik 43.30-45.00 og finkornet, homogen med streker og slirer av magnetkis. Noe kalkspat stedvis. Foldeombøyning ved 45.20. Kjernetap 44.60-44.85. Suscept. opptil 2.67 i de grafittrikeste sonene.

45.30- 52.80: ***Kalkglimmerskifer.*** Uregelmessig oppsprukket og fylt med kalsitt i mm-tykke sprekker 45.30-46.00, ellers noe mer uregelmessig sliret enn 1.00-10.00. Enkelte spredte, tynne grafittlinser/bånd. CA 10° v/ 46.80, CA 25° v/49.80 og CA 20° v/52.20. Suscept. 0.16-0.24.

52.80- 56.95: ***Trondhjemitt.*** Middelskornet. Noe muskovitt og enkelte mm korn av magnetkis. Suscept. 0.05-0.10.

56.95- 60.20: ***Granatglimmerskifer.*** mm til cm-båndet mellom kvarts-feltspatiske og muskovittrike bånd. Enkelte grafittrike bånd. Hyppige 0.5-1 cm granater. Muskovittrik. CA 30° v/ 59.45.

60.20- 63.50: ***Granatglimmerskifer.*** Grafittholdig med hyppige slirer med grafitt med streker av magnetkis. Svært granatrik med mm-store granater 60.20-60.90. Suscept. 0.36-2.19.

63.50- 63.95: ***Grafittskifer.*** Homogen, finkornet med hyppige magnetkis-streker.

63.95- 66.25: ***Granatglimmerskifer.*** Grafittholdig (som 60.20-63.50). Hyppige granater og få grafitt-slirer. Suscept. 0.24.

66.25- 68.75: ***Biotitt-muskovittskifer.*** Grafittrik med hyppige cm-tykke grafittbånd i veksling med muskovittrike bånd. Spredt granat. Streker av magnetkis i grafittbåndene. Suscept. 0.63-0.70. CA 15° v/ 67.80.

68.75- 69.85: ***Trondhjemitt.*** Middelskornet med 1-2 mm kvarts- og feltspatkorn. Noe mm-store flak av biotitt og muskovitt.

69.85- 73.05: ***Biotitt-muskovittskifer.*** Grafittrik (som 66.25-68.75). Lite magnetkis, kun spredte streker. Kvartslinse med grovkornet muskovitt og enkelte røde granater 71.85-71.95. CA 10° v/ 71.00. Suscept. 0.52-1.71.

73.05- 76.80: ***Trondhjemitt.*** Middelskornet. Dels gjennomskåret av senere kvartsårer. Granatglimmerskifer 73.20-73.45, kalkglimmerskifer 74.10-74.55. Suscept. 0.03-0.06.

76.80- 78.60: ***Kalkglimmerskifer.*** Som over, men enkelte grafittrike slirer. Kvartslinse med noe muskovitt 77.45-77.90. Suscept. 0.55-0.83.

78.60- 86.30: ***Grafittskifer.*** Dels homogen og finkornet, dels båndet med muskovitt-biotittbånd på mm-cm-skala. Streker av magnetkis. Suscept. 1.21-2.71 i 78.60-80.00 og 0.30-1.64 i 80.00-86.30.

86.30- 95.05: ***Kalkglimmerskifer.*** Som 1.00-10.00. Stedvis relativt muskovittrik. Suscept. 0.05-0.15. CA 15°.

95.05-109.95: ***Kvarts-muskovittskifer.*** Lys, felsisk, mm- til cm-båndet til laminert. Lokalt noe biotitt og grønnlig farge som antyder kloritt. Biotittholdig særlig 103.60-103.80 og 104.90-105.45. Hyppige 1-3 cm kvartslinser i hele sekvensen. Suscept. 0.05-0.15. CA 10° v/ 99.00 og CA 10° v/ 109.00.

109.95-129.30: ***Kalkglimmerskifer.*** Som 1.00-10.00, men synes mer kalkrik. Enkelte tynne grafittrike bånd (1-3 cm) fra 129.00. CA 15° v/ 119.00. Suscept. 0.12-0.22.

129.30-131.70: ***Grafittskifer*** og ***grafittholdig biotitt-muskovittskifer.*** (som 66.25-68.75). Sistnevnte er båndet. Streker av magnetkis sammen med grafitt. Suscept. 1.07-1.77.

131.70-136.00: ***Kalkglimmerskifer.*** Som 109.95-129.30. CA 25° v/ 136.00. Suscept. 0.14-0.58.

136.00-138.55: ***Biotitt-muskovittskifer.*** Grafittholdig. Båndet (som 66.25-68.75). Suscept. 0.13-0.42. Grafittskifer 137.60-138.00 med suscept. 2.82-3.01.

138.55-150.80: ***Kalkglimmerskifer.*** Uregelmessig sliret. Grafittholdig og streker av magnetkis 138.55-140.00. mm-korn av kyanitt opptrer hyppig, spredte 1-2 mm granater. CA 25° v/ 141.95. Suscept. 0.13-0.22.

150.80-153.00: ***Granatglimmerskifer.*** uregelmessig sliret og muskovittrik. Grafittrik sone 150.80-150.90 med hyppige streker av magnetkis. Svært granatrik med 1-3 mm granater 151.95-152.60. Suscept. 0.28-0.38.

153.00-154.00: ***Biotitt-muskovittskifer.*** Grafittholdig med streker av magnetkis. Suscept. 0.09-0.19.

154.00-156.50: ***Kalkglimmerskifer.*** Spredte opptil cm-store granater. Enkelte cm-tykke grafittholdige bånd. Suscept. 0.14-0.19.

156.50-159.40: ***Granatglimmerskifer.*** Enkelte cm-tykke grafittbånd. Hyppige opptil cm-store granater. Sliret til båndet på mm-cm-skala. Mest muskovitt, men også bånd rike på biotitt. Enkelte korn av kyanitt assosiert med granat. CA 15° v/ 157.00. Suscept. 0.17-0.39.

159.40-160.25: ***Biotitt-muskovittskifer.*** Grafittholdig og båndet til sliret på 0.5-1.0 cm skala. mm-streker av magnetkis. Suscept. 0.29-0.63.

160.25-162.05: ***Grafittskifer*** til ***grafittrik muskovittskifer.*** mm-laminert. Særlig grafittrik 160.50-161.15. Knusningssone 160.25-160.50. Trondhjemitt 161.70-161.80.

162.05-162.35: ***Kvartslinse.***

162.35-162.90: ***Trondhjemitt.***

162.90-163.10: ***Sericittisk skifer.*** Svakt grafittholdig.

163.10-163.55: ***Kvartslinse.***

163.55-164.30: ***Sericittisk skifer.*** svakt grafittholdig (som 162.90-163.10).

164.30-167.00: ***Grafittskifer*** og ***grafittholdig granatglimmerskifer.*** Gradvis overgang. Båndet og muskovittrik 164.30-165.00, med bånding på mm-cm-skala. Dels ren grafitt i tynne soner 165.00-166.10, med grafittspeil på kløvflater, ellers noe muskovitt. Streker og slirer med magnetkis. Kjernetap 165.20-165.40, 165.47-165.60, 165.80-166.10. Suscept. 0.62-3.96.

167.00-173.00: ***Granatglimmerskifer.*** Noe grafitt i tynne bånd (< 1cm) i øvre del. Spredte granater, hyppige mm-korn av kyanitt, ellers relativt biotitt-rik. Økende muskovitt-innhold i nedre del og særlig fra 172.50. Suscept. 0.20-0.65. CA 40° v/ 167.80, CA 15° v/ 169.80, CA 75° v/ 172.80.

173.00-173.35: ***Trondhjemitt.***

173.35-184.90: ***Biotitt-muskovittskifer.*** Svakt grafittholdig, med assosiert magnetkis-streker. Enkelte granater og mm-korn av kyanitt i glimmerrike partier. cm-skala båndinq. Svært muskovittrik 181.55-181.85. 2 massive slirer 0.5 og 1 cm med magnetkis 181.90-181.93 med noe kobberkis. og sinkblende. Ellers svak impregnasjon med magnetkis 181.85-182.00. Magnetkis-impregnasjon i grafittrik skifer 182.20-182.35 og 182.75-182.90 (m/ kobberkis). Enkelte magnetkis-kobberkis streker 183.00-184.90. CA 45° v/ 174.70, CA 25° v/ 179.90, CA 15° v/ 184.45. Suscept. 0.13-0.52.

184.90-186.65: ***Kvarts-feltspatåre*** med enkelte aggregater med magnetkis. Trondhjemitt 185.30-185.50.

186.65-189.90: ***Biotitt-muskovittskifer.*** Grafittholdig, som 173.35-184.90, men mer felsisk og muskovittrik. Varierende grafittinnhold, men generelt lavt. Rik impregnasjon med magnetkis og noe kobberkis og sinkblende 186.85-186.95. Impregnasjon med magnetkis og noe kobberkis og sinkblende 187.40-187.50. Nærmest massiv magnetkis med 1 cm nesten massiv sinkblende i øvre del og 1.5 cm nesten massiv kobberkis i nedre del 187.65-187.75. Blyglans assosiert med sinkblende. Svak impregnasjon med magnetkis, kobberkis og sinkblende 187.60-187.65. Mellom 186.65 og 187.60 2-3 mm uorienterte korn med porfyroblastisk amfibol, spredt magnetkis, sinkblende og kobberkis. Massive slirer med magnetkis med noe sinkblende og kobberkis 187.85-187.95. Spredte korn 1-3 mm av magnetkis, kobberkis, sinkblende og lokalt blyglans 187.95-189.05. relativt rik impregnasjon av magnetkis med noe kobberkis, sinkblende og blyglans, 189.05-189.90, men særlig 189.15-189.40, med 10-15 % sulfider, ellers ca. 5%. CA 20° v/ 190.00. Suscept. 1.53-7.45.

189.90-199.50: ***Biotitt-muskovittskifer.*** Grafittholdig fra 192.50 med streker av magnetkis i de mest grafittrike sonene. Finbåndet, laminert på mm-cm skala. Lokalt noe kalsittholdig. Suscept. 0.58-1.26. mest magnetisk i dypeste del, hvor også mest grafitt. CA 25° v/ 192.20 og CA 15° v/ 196.90.

199.50-220.20: ***Amfibolitt.*** Båndet på cm til dm skala mellom kalsitt-feltspat+/-kvartsrike bånde og amfibol+/-biotittrike bånd. 1-2 mm granater i de amfibolrike båndene. Lokalt mer homogene partier på opptil 20 cm med finkornet grønn amfibol. Enkelte lyse bånd består stort sett av kalsitt og de dominerer 210.10-210.45, 212.70-213.50 og 213.85-214.40. CA 15° v/ 202.90, CA 20° v/ 217.00. Suscept. 0.21-0.83.

220.20-220.95: ***Kvarts-feltspatisk skifer.*** Finkornet med spredte svært finkornede (< 1mm) granater. Suscept. 0.32-0.36.

220.95-227.70: ***Amfibolitt.*** (Som over). Spredte kuber og streker av pyritt. treker med kobberkis. CA 15^{o} v/ 221.00 og CA 35^{o} v/ 227.00. Suscept. 0.32-0.83.

227.70: ***SLUTT***