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Sammendrag

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RAPPORT: GRINDER PROSJEKTET, GRUE KOMMUNE, 1988

Vi oversender herved en kopi av vår rapport fra prospekterings arbeidene i Grue kommune i 1988.

Arbeidene ble utført på oppdrag fra East West Minerals Norway A/S.

Vennligst behandel rapporten som Konfidensiell. Så snart årets program blir fastlagt skal vi få lov å komme tilbake med dette.

Med vennlig hilsen

Boye Flood

Vedlegg

REPORT NO. 89 - 27 - 01

EAST WEST MINERALS NORWAY A/S

Exploration for gold in the Grinder area,

South East Norway, 1988

Geologiske Tjenester a.s.

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R E P O R T NO. 89 - 27 - 01

E A S T W E S T M I N E R A L S N O R W A Y A/S

Exploration for gold in the Grinder area, South East Norway, 1988

Boye Flood & Karl Inge Olsen

Distribution:

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Oslo, January 23, 1989

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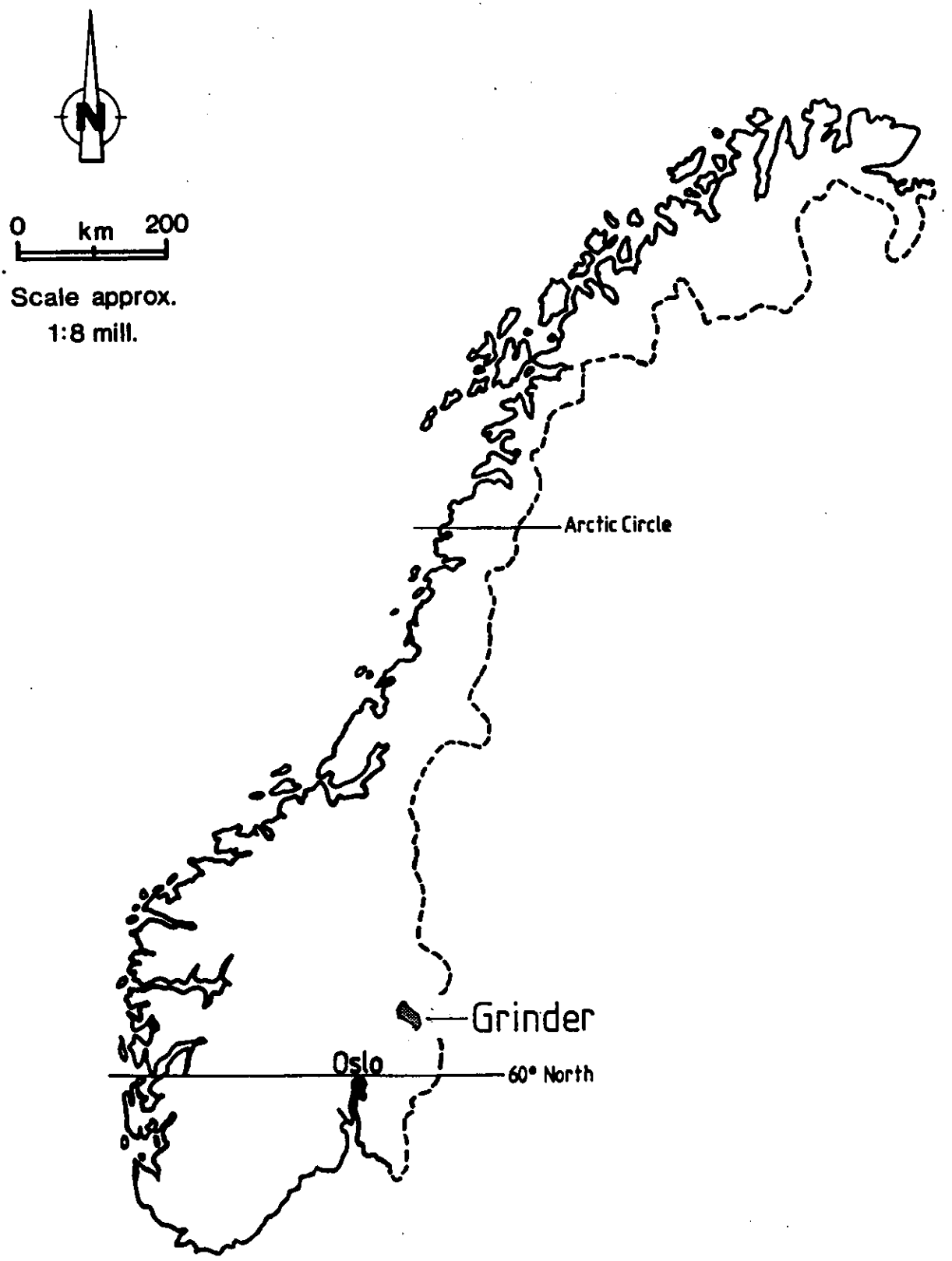


NORWAY
Location Map

Fig. 0 1

EXPLORATION FOR GOLD IN THE GRINDER AREA SOUTH EAST NORWAY

1. INTRODUCTION:

1.1 Locality and infrastructure:

The Grinder area is situated within Grue kommune, Hedmark county in SE Norway. The distance to Oslo by car or train is around 160 km, see fig. 1. The area is covered by the following topographical 1:50.000 map sheets: Brandval 2015 I, Flisa 2016 II and Våler 2016 III.

Highway no. 3 and the railway line along the Glåma river run right through Grinder. Here we find the community center Kirkenær with all necessary facilities. The mainly forested areas to the east and west of the river valley, subject to our investigation, are easily accessable by farm and forestry roads.

1.2 Economic potential:

Previous reconnaissance work had indicated a gold potential for the proterozoic "greenstone belt" in the Grinder area. The assessed potential was based on shearing and favourable alteration of metavolcanics; and elevated gold values from stream sediments, floaters and bedrock samples. Assay values up to 77ppb, 2,5 ppm and 0,4 ppm had been shown respectively.

1.3 Objective:

The objective with the current program was:
1. To locate the bedrock source for the mineralized floaters by mapping, blocktracing and geochemistry.
2. To increase our knowledge of mineralization controle, and to outline economic grades within the altered units by detailed mapping and sampling.

2. GENERAL GEOLOGY AND PHYSIOGRAPY:

2.1 General geology:

The Grinder area belongs to the South-eastern precambrian of Norway, situated between the Oslo region to the west, the cambrian allocton and eocambrian sparagmite nappes to the northwest and north, and the Swedish border to the east and south.

The extension of this complex is almost 300 km N-S and around 80 km E-W. It comprises proterozoic rocks, dominated by different gneisses and intrusives. The oldest metamorphic age

is around 1650 Ma, and the youngest intrusive age 900 Ma. It is structurally complex, but with a prevailing regional strike around NW-SE.

At Grinder itself, greenstone belt lithologies in lenses up to 5x2 km can be followed over a NW-SE extension for at least 35 km. The "belt(s)" are dominated by felsic volcanics and subvolcanics, but also include greenschists, metadiabases and metasediments. Contacts towards the surronding gneisses of varying composition and texture, are partly intrusive, partly controled by shear and fracture zones.

All these lithologies, which probably belong to the oldest rocks of the South-eastern precambrian of Norway, are intruded by younger granites and hyperites.

Alteration, particularly of the felsic volcanics is prominent and dominated by sericite, pyrite and carbonate.

2.2 Physiography:

Grue is a typical east Norway inland kommune. It displays an undulating countryside with relief from 150 m.a.sl. along Glåma river to hilltops of around 400 m. The valleys are mainly cultivated, see fig. 2 and the surrounding hills covered by spruce and pine forrest.

Bedrock is, in the higher parts, covered by till and glacifluvial material, mainly from 0 to 5 m thick. The river valleys are covered with up to 55 m of marine and lacustrine deposits.

Outcrop is estimated to represent between 10 and 20 % of the surface.

The area has a typical inland climate with mean temperatures for January of -5 to -10 C, and for July between 15 and 17 C.

3. PREVIOUS WORK:

3.1 Work pre 1983:

3.1.1 Geology:

Geological bedrock mapping has been done by the Geological Survey of Norway (NGU) and published as two 1:250.000 map sheets. The map Torsby published in colour 1978 covers roughly the area between Glåma river and the Sweedish border, the preliminary map Hamar in black and white, published 1973, covers the western part.

The quartenary geology is shown on the map Oppland 1:250.000 (Holmsen 1954). Later resource mapping by NGU has resulted in the Flisa and Våler water resource maps 1:50.000 from 1979 and 1982; and the Brandval, Flisa and Våler Sand and gravel resource maps, 1:50.000 from 1985.

3.1.2 Geophysics:

The three actual 1:50.000 map sheets were also produced as aeromagnetic maps in 1969 by NGU. The survey was flown in 1964 by fixed wing, linespacing was 500 m and altitude 100 - 150 m. The aeromag data are also produced on the two 1:250.000 maps Torsby and Hamar.

3.1.3 Geochemistry:

During the seventies, Hedmark county was subject to a regional geochemical stream sediment survey by NGU. Sample density was around 1 sample/30 km2. The samples (-80 mesh) were assayed for 18 elemens (NGU report nr. 84.155)

The assays did not include gold and arsenic. Additonal assays on these elements from a selected area were carried out during this program, see 5.5.3

3.2 Work by ARCO Norway during 1983-84:

The Grinder project is the result from reconnaissance work in the South-eastern precambrian of Norway. This resulted in more detailed investigation of the three sub areas Kongsvinger, Grinder and Elverum, rendering Grinder as the most promising.

ARCO's work from this part of Norway, and from Grinder in particular is treated in two company reports (Pedersen 1985 and Flood 1985).

The Grinder area was selected due to road exposures of the altered "green stone belt" lithologies. During the summer 1984 the following work was completed:

- Geological mapping scale 1:50.000 of an area around 45x10 km
- Stream sediment sampling of the same area with sample density of around 1 sample/km2. The samples were assayed for Cu,Pb,Zn,As,Ag,Au.
- Sampling of altered and mineralized floaters and bedrock exposures.
- IP orientation survey accross pyritic units in central part of the area

The result of this work, see 1.2 , led to ARCO placing a number of claims at both sides of the Glåma river. When Atlantic Richfield in 1985 terminated all its mineral exploration activities around the word, ARCO Norway kept its Grinder properties in an attempt to locate other parties interested in continuing the exploration effort.

4. EXPLORATION AGREEMENT 1987.

During the fall 1987 an Exploration Agreement was signed between ARCO Norway Mineraler A/S and East West Minerals Norway A/S regarding further exploration on the Grinder properties with East West Minerals as operator.

East West Minerals Norway A/S, being a wholy owned subsiderary of East West Minerals Inc. of California, U.S.A., was founded to be responsible for the future work at Grinder. The company was formerly registered by the Norwegian authorities August 6, 1988.

5. EXPLORATION PROGRAM 1988

An exploration program with budget and cashflow sheets were presented for management of East West Minerals Inc. during the spring 88. A final assessment of the program was made during Tom Robyn's visit to Oslo in April. Further discussions were held with Andy Border during a review and field visit in early July.

5.1 Cost, program, timing, and personnel:

For 1988, US$ 72.350 = Nkr 450.000 (1$=6.22 kr) was allocated to the Grinder exploration program.

The field program was run over two periods during the fieldseason, allowing for assessment of assayresults in between.

<u>Period I May 25-July 15:</u> The fieldwork during this period included:

- Quarternary geological mapping with emphasis on ice transport, distance and direction (A/S Geoteam subcontracted).
- Bedrock mapping of selected areas (ARCO properties) in scale 1:10.000, and controle of previously mapped areas in scale 1:50.000.
- Block tracing and sampling of mineralized blocks and outcrops.

- Geochemical heavy fraction sampling of moraine and streams.

- Trenching, blasting sampling of bedrock and soil in trenches. (Grue kommune grants)

Period II Sept.27-Oct.7:

- Additional mapping in scale 1:10.000 and sampling.

- Continuation of the trenching program.

During the autumn the following work has been completed:

- Additional assays on Au and As from stream sediment samples collected by NGU.

- Samples delivered for IP parameter tests on mineralized floaters (NGU subcontracted)

The following personnel was hired for the project:

Karl I. Olsen, geologist. PhD student at the University of Oslo, formerly with A/S Prospektering for 8 years.

Morten Rostad, field ass. Graduate student at the University of Oslo

5.2 Quarternary geological mapping:

A/S Geoteam of Oslo was contracted for a study of the quarternary geology of the Grinder area. The main objective with this work was to to make an estimate of transport distance and direction for the gold bearing floaters at Skurven.

The work was done by geologist Dag Lundqvist who carried out an aerial photo interpretation prior to the fieldwork. The field examination was terminated May 28, and the report completed by June 8.

The report include 1:50.000 maps with separate between glacial deposits (till), glacifluvial deposits and valley sediments. It's conclusion runs as follows:

"The Quarternary sediments in the area consists of till, glacifluvium and valley sediments. The till is present in the high regions of the surveyed area and the gold containing boulders are located in this area.

The glacifluvial deposits are found mainly near the lakes Huksjøen, Vålmangen and Eidsmangen. The valley deposits are only present in the Glåma valley.

The transporting distance of the boulders with high gold content is believed to be from the north (varying between 340o and 20o). That is the direction of the Glåma valley.

The transport direction of the boulders with high gold is believed to be short. A maximum distance of about 1-2 km is believed to be a close accurate value.

Concerning further geochemical prospecting, till samples can be taken for analysis of heavy mineral content. Since the till may have been affected by melt water, the analysis will give comparable low values, but it will at least give some indications of the concentrations in the area. The till samples should be taken on the northern side of higher hills where the thickness of the till are largest."

5.3 Bedrock mapping and sampling:

The geological mapping was concentrated around the muting areas with the objective of producing maps in scale 1:10.000, see 5.3.2 and 5.3.3.
Since the Grinder II area showed only minor lithological variation and a low mineral potential, the data is compiled on a filed 1:50.000 sheet, and only briefly described below.

5.3.1 Sampling criteria, preparation and assaying:

All mineralized outcrops encountered during mapping and block tracing were chip sampled, the individual samples were collected in 2 kg bags. Sample localities are shown on fig.3, 5 and 7 and the assay results are found in Appendix 1. All the samples contain around 1-5% sulphides, mainly as pyrite. In adition they show one or several of the following features:

Fracturing	Abundance of:	Sericite and/or green mica
Shearing		Chlorite
Quartz veining		Carbonate

In addition systematic rock sampling was done in trenches and along two profiles in the Grinder I area, see fig. 7 and 10 , and 5.6 below.

All together 120 bedrock samples were sent to the laboratory of A/S Olivin where they were crushed, grained and split. One split was thereafter sent to OMAC Laboratories in Ireland for assays on Cu, Pb, Zn, As, Ag, Au. One split of 200g is

retained at A/S Olivin.

Splits from 27 selected samples (incuding 2 blocks) have also been sent to SGAB Analys in Sweden for controle assays of 32 elements, see Appendix 2.

The results are found under the sub areas below, a few sample localities from outside the subareas are discussed here:

Sample no.8806574, 587-589 Raudåsberget: Felsic and intermediate metavolcanics occur in this area. The former resemble the typical Grinder sericite quartzites, the latter locally display a fragmental texture. Pyrite and chlorite alteration is common. The sampeles are anomalous in Pb, Ag and As.

Sample no. 8806801, 898-900 Bjørkåsen: This locality is earlier described in the litterature (Hjelle and Bryn 1960) due the occurence of coal blend in a breccia zone. This breccia, around 6m wide, is well exposed in an old quarry and carry also quartz, fluorspar, carbonate and pyrite. The surrounding rocks, mainly mylonitic gneiss with some amphibolite and quartz-biotite-chlorite schist also show alteration and veining by quartz, carbonate and pyrite, as well as some hematite. The samples taken from different lithologies are only weakly anomalous in Cu and Zn.

Sample no. 8806894-95 Grua: These samples represent a quartz breccia, a few m wide, exposed by a number of old shafts and workings. The breccia zone, which strikes around NW-SE, can be followed for around 200 m. Chalcocite with some bornite and malachite occur in fractures and cavities in the quartz. The show was apparently briefly worked during the eighteen century due to its high silver content. The samples are also anomalous in Au, but show < 100 ppb.

5.3.2 Skurven sub area:

Within this area, se fig. 4 , it has been distinguished between 7 rock types. These are:

1. Hyperites
2. Diabases
3. Granite
4. Granite-/granodiorite porphyry (quartz porphyry)
5. Dacite-/diorite porphyry (feldspar porphyry)
6. Rhyolites
7. Granitic gneiss

Hyperites: These are dark looking, magnetic, medium to coarse grained rocks with a subofitic texture. They occur mainly in elongated bodies, from a few m up to several hundreds of m wide and several km long. The hyperites intrude all the other rock types and appear to be post-tectonic. Outside this

sub-area the hyperites are known to host small magnetite deposits.

Diabases: The diabases are fine to medium grained, mainly massive, but also well foliated with a typical greenschist appearance. They generally, however, display a diabase texture and a graditional decrease in grainsize towards contacts. They are mainly sub-concordant with foliation and may reach 10-15 m in thickness.

Granite: This young granite occurs partly as a coarse porphyric variety, often with blue quartz and grey to red feldspar. It is mostly massive, but may be strongly foliated, especially north of Gjuvberget where it is approaching an augen gneiss texture. It often contains xenoliths of a greyish, intermediate looking rock, probably belonging to the diorite porphyry (5).

The usually homogenous appearance of the granite distinguish it from the fine grained feldspar porphyries. The latter may occur as lenses within this granite, or coarse grained granite dikes may occur within the porphyries. The granite also intrudes the granitic gneiss (see below) and is in places present as a thin zone between the the porphyries and the gneiss.

The porphyries: The quartz porphyries are homogeneous on m- to 100 m scale, massive or, most frequently, foliated. They vary from grey chlorite- rich, medium grained to red felsitic. The quartz phenocrysts appearing as up to 2-3 mm larg blue blebs. The different types may alternate on m scale, but larger areas may be homogenous, especially the grey chlorite rich type, which occupy zones of up to several hundres meters width.

The feldspar porphyries, dacite- to diorite porphyries, are grey to light reddish, fine grained, with feldspar phenocrysts ranging from 0,5-2 mm. But phenocryst free varieties are also frequent. The grey types are relatively strongly magnetic, espcially observed N of Kullblikseter. In contrast, the quartz-porphyries are always observed to be unmagnetic.

The porphyries do not exhibit any banding or lamination, but different types may alternate on m scale. The two main groups dominate in separate areas. A granitic gneiss around 200-300 m wide separate between the two to the north, thinning out towards the south.

The contact between the porphyry and the gneiss is observed several places. It may be sharp with a tectonic appearance, as towards the main gneiss to the west, or showing a "transitional-intrusive" relationship, as along the quartz porphyry/gneiss inlier contact. The latter is characterized

by an up 10 m wide transition zone, where gneiss appears as diffuse xenoliths in the porphyry.

The quartz porphyry may also contain xenoliths of grey, probably diorite-porphyric materiale, or of light fine grained probable rhyolitic materiale. These relations indicate the succession of events and nature of emplacement of the rock units.

So far it is concluded that the majority of the porphyries are of intrusive origin.

The rhyolites: These light grey to pink coloured rocks are identified primarly by the presence of lamination, and to a certain degree by a cherty or cryptocrystaline texture. Reminiscence of welding are somtimes present.

The rhyolites occur as inliers of varying size within the porphyries, displaying sharp sub-concordant contacts.

The granitic gneiss: These gneisses are medium grained and well foliated, showing a homogenous appearance over large areas. Banding may occur, as well as massive varieties close to intrusive contacts. The latter may signify local remobilization and recrystalization.

Along the western contact a thin breccia zone occur, in places mineralized, see below. The gneiss foliation is refolded (kink-folds) towards the contact, and locally, as north of Kullblikkseter, dragfolds are developed.

Alteration, mineralization and sampling: Quartz-sericite alteration +/- disseminated pyrite occur within the area, mainly in two positions:

- Close to the western gneiss/porphyry contact, along shear planes in the gneiss, up tp 2 m from the actual contact. Good exposure is found around 150 m southeast of the Skurven blocks, see fig. 4 , displaying mainly pyritization, see sample 613 and 889, Appendix 1 and 2. Similar features are also found north of Kullblikk-setra with intense silicification and serisitisation, sample no. 634, 685-86.

  Visually the pyritic shear is similar to the Skurven blocks, but assays, althoug similar, does not show any gold and are also higher in K and Ba, but lower in As.

- Within the porphyry along the porphyry/gneiss inlier contact around 400 m southeast of the Skurven blocks. An alteration zone rich in quartz, sericite and pyrite is exposed over a width between 5 and 10 m, strongly resembling similar alteration at Grinder. However, the

samples 890 and 621-627 do not show any gold and appear to be geochemicaly different from the Skurven blocks, see Appendix 2.

5.3.3 Grinder I sub area

This area, Fig. 6 is devided into the same rock units as for Skurven. Minor differences are outlined below.

The hyperites: Apart from a few narrow dikes, the Brattås-berget hyperite is typcal with its lens shaped body, around 1 km long and several hundred m thick. Towards its central part it grades into coarse grained varieties.

The diabases: These are more frequent than at Skurven, both within the gneiss and the porphyry/rhyolites. It often resembles typical greestones as along Kvernbekken and Djupdalsbekken, and may in places be of volcanic origin.

The porphyries may grade into more basic varieties and also show a more frequent alternation between felsic and intermediate members.

The rhyolites occasionaly show lamination. However, the deformation in this area is more intense and primary structures are not well preserved.

The surounding granitic gneiss and the young granite are similar to what is observed in the Skurven area. Young coarse granite, possibly anatectic, intrude the porphyries close to, and along it's western contact.

Tectonics and alteration; The main SE-NW trending strike of the complex is due to later D2 deformation with dextral movements, causing fracture cleavage and transposition, as well as folding and shearing of the earlier foliation F1. This foliation, dominant throughout the area, was caused by an early D1 deformation probably also responsible for a veins/bands of epidote, carbonate +/- pyrite. This banding may in places resemble layering.

Although the transition to a quartz, sericite, pyrite schist +/- carbonate often is complete, both field and microscopic studies indicate a mainly porphyric origin of these rocks. The matrix consist of quartz-sericite +/- feldspar with plagioclase, perthitic microcline and quartz phenocrysts. In extreme cases the latter may recrystallize and the two feldspars get completely altered to sericite. Pyrite is mainly disseminated in the matrix, but may display a semi banding. Further details regarding alteration is shown under X-ray Diffraction Study below.

The sericite-pyrite fabric is clearly refolded and sheared by the F2 foliation.

X-ray diffraction Study: Four samples were collected in the northern part of the quarry, fig. 7 by the Institute of Geology, University of Oslo. This locality represent the most deformed and altered part of the porphyries in the Grinder area. It is characterized by high frequency of quartz veins with vugs and fractures, often filled with hydrocarbons. Green mica is common, and fuchsite occur as shown also by the high cromium content in sample 647, Appendix 2. One sample collected from a 50 cm shearzone in 1984 and sample 647 assayed 0,4 and 0,3 g/t Au respectively.

The X-ray diffraction results, see Appendix 4, confirm the macro and micro studies, apart from detecting the presence of K-feldspar, and show that chlorite, kaolinite and talc also constitute 14-15% of the alteration mineral assemblage. Only the most altered sample show any increase in quartz, the others contain a normal granitic quartz content of 26-28%. Pyrrhotite occur together with pyrite, and magnetite and/or hematite are present in some samples.

This alteration zone is probably the same as was exposed in Trench B along a shear around 250 m to the east, see 5.6

Sampling: The northern part of the quarry was thereafter systematically chipsampled from north to south by 7 samples, 681 to 687, each representing around 5m.

Eleven samples, numbered 688 to 698 were taken from the inner part of the quarry which are less altered , but still showing varying amounts of pyrite, sericite and carbonate.

The assayresults from this sampling and from samples of alteration zones collected during mapping, fig. , are all negative, showing no gold and low basemetal-arsenic values.

The gold anomalous zone encountered in Trench C is described under 5.6

5.3.4 Grinder II sub area:

This area is underlain by a red to grey feldspar porphyry, the phenocrysts varying in size from 1 to 3 mm. A thin sericite alteration zone of limited extension occur close to the road. No sulphides were observed here. The alteration occur close to a fracture zone, which is reflected as a lineament in the topography, running NW-SE. Follow-up of this lineament did not reveal any extension of the alteration.

The continuation of the road up-hill towards the north leads into the granitic gneiss unit, and a graditional contact

towards the porphyries is observed. Alternation between gneiss and porphyries occurs as well as partial remoblization of the former into an augengneiss.

5.4 Block tracing and sampling:

The main objective with this program was to locate other blocks of the gold bearing Skurven type, to establish a block fan and to locate the source. Concurrently other mineralized blocks and outcrops were plotted and sampled.

Before giving a general report on this phase of the work it is pertinent to describe the Skurven blocks and their possible origin.

The Skurven blocks: The geographical position of the blocks are shown on the maps fig. 3-5. The size vary between roughly 1 dm3 to 1 m3, the form irregular. Probably some of the blocks have been blasted when the forestry track was put in.

Macroscopically the blocks comprise a medium to coarse grained quartzo-feldspathic rock. The colour is light grey to pinkish. Thin planes < 1 mm with dark minerals seem to be related to fracture surfaces which sometimes give the rock a semifoliated appearance. The fracturing is in places also apparent by quartz veining. All these blocks contain pyrite, estimated from 1% to 5%. The pyrite occurs as stringers along the fracture surfaces, as aggregates and as individual cubes up to around 2 mm across.

In the microscope the rock shows a porphyric texture with plag. phenocrysts in a finegrained matrix of quartz, feldspar and sericite. The phenocrysts are partly cataclastic. Pyrite cubes and aggregates are set in the matrix, partly enclosing it. A fine net-work of narrow fissures, filled with quartz +/- sericite +/- sphene occur mainly within the matrix, but may also cut the phenocrysts. Along the fissures, grains and aggegates of chalcopyrite are observed, closely associated with the sphene.

A number of assays from individual blocks and bulk assays show gold values from 0,36 to 4,27 ppm Au. Refering to current assayresult (sample no. 891, Appendix 1 & 2) and earlier reports, it is apparent that this rock is anomalous in lead with values generally between 100 and 200 ppm, shows elevated arsenic and molybdenum, but is low in silver with max. value of 1,3 ppm. Other basemetals and pathfinder elements as Sb, Bi and W offer no assistance.

Primarily the blocks were believed to represent subvolcanic plugs assosiated wit the greenstone belt. During the mapping at Skurven, visually similar rocks were found along sheared contacts between porphyries and gneisses, see 5.3.1 above.

These however, did not show any gold, and were generally geochemically different, see Appendix 2.

Hence, other blocks or outcrops with similar mineralization-geochemistry to the Skurven blocks have not yet been found.

Among the typical Skurven blocks we also found one block of a pyritic augen gneiss (around 50cm x 50 cm) which assayed 136 ppb Au (sample 8806804).

The possibility that the provenance of these blocks is to be found within the surrounding gneisses or granites is now considered, see below.

Altogether 36 samples were collected from mineralized blocks encountered during a systematic traversing of the project area. The sampled blocks vary in size from a few kg to more than one ton. In places only a single block have been found, but many samples are bulked from blocks within a limited area.

The samples, each around 2 kg are plotted on fig. and the assayresults shown in Appendix 1. The sampling criteria has been the same as for the bedrock sampling.

The blocks are found, mainly due to their rusty appearance, and represent both the surrounding gneisses (augen gneisses) and the "greenstone belt" lithologies.
The assayresults in Appendix 1 show elevated basemetal values for a number of the blocks. However, beside the additional block sample from Skurven no. 8806891 only two of the block localities are regarded with some interest, the sample numbers are encircled on fig. 3.

<u>Sample no. 8806562 Raudåsen:</u> This is probably a local block. Raudåsen means Red hill and mineralization in outcrops are described on p. 7. This block which is anomalous in Ag, As, and Au, represent a strongly foliated felsic rock (meta rhyolite ?) with pyrite, sericite and minor fuchsite.

<u>Sample no. 8806893 Vålmangen:</u> This sample is taken from a number of similar blocks, possibly a sub outcrop. Near by outcrops show a fine grained pinkish gneiss. The blocks which are strongly foliated and show sericite and pyrite alteration with minor chalcopyrite (malachite), could represent a shear within the gneiss. The blocks are clearly anomalous in Cu and Ag.

5.5 Geochemical sampling:

5.5.1 Moraine, heavy fraction:

Altogether 35 morain heavy fraction samples were collected at two locallities. At the Skurven muting area samples were taken on a 500x500 m grid, and at Gjuvberget (relinquished muting) the sample grid was around 1000x800m. Sample localities are shown on fig. 3 and 5.

The samples (around 6 kg) were taken from the moraine's B-horizon at a depth between 30 and 60 cm, sieved to -1 mm and then panned down to c. 200 g. The panned sample was thereafter sent to OMAC for assays. Assayresults are shown in Appendix 3.

The objective with this program was to find out if the moraine contained any free gold or goldbearing microblocks, particulary around the Skurven block area.

Only two samples (no. 8806983-84 from Gjuvberget) returned gold values > 5ppb. Both samples are located near a transitionzone between augen gneisses and granites, an area also revealing stream sediment Pb-anomalies in 1984.

During the moraine sampling, blocks of a chlorite and pyrite altered augengneiss were sampled at Gjuvberget, see 8806580, Appendix 1, but this sample did not show any anomalous values.

5.5.2 Stream sediment, heavy fraction:

During the moraine heavy fraction sampling, an additional 7 samlpes were panned from creeks within the Grinder Muting blocks, se fig. 7. Only one sample, 8806920 from Grinder II showed 6 ppb Au, see Appendix 3.

5.5.3 Additional assays on NGU's stream sediment samples:

As mentioned under 3.1.3 we got access to stream sediment materiale collected by NGU. Suplementary Au-As assays were made on 74 samples, mainly from Grue, Åsnes and Våler kommuner, see fig.8 and Appendix 3 for assayresults.

The 90%ile (=> 10 ppb Au) and 95%ile (=> 18 ppb Au) anomalies are marked on fig. . Four of these 8 anomalies occur along the Grinder-Elverum greenstone belt or within coarse grained granitic gneisses bordering the greenstone belt to the east.

The 3 anomalous samples to the northeast occur, according to the Thorsby map, within finegrained (839 and 841) and coarse

granitic gneiss (879). The latter giving the max. value of 434 ppb Au !!

The contrast in the As-values are too small to give any meaningful information, see Appendix 3.

5.6 Trenching and blasting:

Trenching was carried out with a backhoe tractor with a capasity of around 3,5 m of overburden. Drilling and blasting in the trenches was often required due to hard ice polished surfaces of the exposed rocks. A portable Cobra rock drill was used for holes averaging around 50 cm, see fig. 10-12. Equipment and personnel were provided by Grue kommune.

Skurven area: The main objective with these trenches was to look for a local origin for the Au-blocks, and to similar blocks in the moraine. Outcrops of similar mineralization or more blocks was not encountered, see trench map fig. 9. Another trench was attempted around 200 m to the north northeast of T.2, but did not reach bedrock due to a concrete like layer of clay.

The equipment was also used 400-500 m to the southeast along the porphyry/gneiss contacts, to obtain better exposures along the mineralized part.

Grinder area: As part of the main alteration zone at Grinder is poorly exposed, 3 trenches were dug around 250 m to the southeast of the quarry, accross Djupdalsbekken (creek), see fig. 6,7 and 13. Concurrent with this trenching, sampling was also done in the quarry, p.11 and across the hill soutwest of the trenches.

The sampled zone show every gradation from weakly pyritic to a strong sericite-pyrite alteration, with or without carbonate and hydrocarbons. The hydrocarbons on the soutwest bank of Djupdals bekken are brobably related to the same shear found in the quarry.

Most of the samples show below detection limit for Au, but the three samples 589-600 assay 139, 46 and 266 ppb respectively. Although not continuousely sampled, this represent an around 5 m wide part of the alteration zone. The two highest Au-values are also associated with high As. Four earlier samples chipped along the creek below the trenches, and representing between 5 and 12 m, assayed from 38 to 115 ppb Au, but with low As values.

Hence it can be concluded that this part of the alteration zone is strongly anomalous in gold.

From the southern end of Trench A, at the base of a well exposed hill, 20 samples no. 660 to 679 were collected by drilling and blasting towards the south. This profile represent around 150 m width of the alteration zone, and mainly correspond to the inner part of the quarry, also confirmed by the assayresults.

Looking both at lithologies and geochemistry, there is a major difference between the general barren quarry and hill profile, and the trenches with the gold anomaly. The two former display a monotonous litholgy exept for the alteration, with a "flat" geochemistry. The trenches show alternating mafic and felsic lithologies with elvated Cu, Zn and As appart from Au.

5.6.1 Soil sampling in the trenches:

Deep soilsamples, around 10 cm above bedrock were collected in the trenches 5 to 12 m appart. Altogether 18 samples will be sent for assays with the objective of testing dispersion from known mineralization. The results will be used when deciding upon eventual future exploration methods (deep soil sampling) in the area.

5.7 IP parameter tests:

During the 1984 program an IP test survey was run across the alteration zone at Grinder. One profile was tested along the main road and one across the quarry. A weak IP response associated with a magnetic low was found on the strongly sericitic and pyritic northern part of the road section, and a strong IP response was received at the quarry. Hence it was concluded that IP would be an useful tool for further prospecting at Grinder.

During this program two samples from the Skurven blocks, one weakly and one strongly pyritic, were sent NGU for parameter tests.

6. CONCLUSION

It is pertinent to devide the conclusion in three parts, Skurven, Grinder and General.

Skurven: The quarternary geological assessment of the gold bearing blocks and the area in general, conclude that the transport has occured from the north and the maximum transport distance is around 2 km.

Bedrock mapping and block tracing in this area has revealed several exposures and blocks displaying iron sulphide

mineralization and alteration, non, however exactly similar to the Skurven blocks. Except for one block, anomalous gold was not found.

This anomalous block , occur right in the middle of the typical Skurven blocks, but its augen gneiss tecture is distinctly different from the others. Still we assume that all these block may have a similar genesis and provenance.

This anomalous block of augengneiss and a new assay from the characteristic Skurven blocks giving 4,27 ppm Au, still render Skurven an attractive target. The provenance may, however, not be limited to the greenstone belt lithologies.

Grinder: This area was initially selected due to the extensive alteration features of the felsic volcanics-subvolcanics.

Except for the stream samples 1984, most of the samples from this area have not returned positive gold values. However, detailed mapping the last field season indicated that the areas most susceptible to sampling, i.e. good exposures, not necessarily have the best combination of lithologies and alteration for gold mineralization.

The trenching program on the covered part (topographic low) of the main alteration zone, supported previous gold anomalous samples from the creek bed of Djupdalsbekken. Expanded sampling from this northeastern border of the alteration zone must await further trenching and/or drilling.

The other alteration zone to the south is also unadequately exposed and sampled.

The mapping and sampling of the Grinder II mutingblock has rendered this one unattractive.

General: As discussed above, the Skurven blocks may have originated from outside the "green stone belt" litologies. The goldassays from the NGU regional stream sediment survey also indicate that the surrounding gneisses and granites may have a potential, probably controled by shearing and pyritization.

By confirming the bedrock anomalies from Djupdalsbekken by trenching, similar alteration zones mapped outside the Grinder area in 1984 could warrant further examination. We are primarily considering the Elverum area (1984) some 45 km to the north, which is also kyanitebearing. This area was only chipsampled during the 1:50.000 mapping in 1984.

7. RECOMMENDATIONS

Skurven: It is recommended that the search for the provenance of the Skurven blocks is continued.

Based on our conclusion from this year, the search should concentrate along the western contact of the porphyries, fig. 4, with extention westwards into the granitic gneisses. The work should cover the region at least up to 3 km north of the presently known blocks, to the Fjøråsen - Rognberget area.

To guide the search for mineralized/altered rockunits or structures we propose to use moveable I.P. combined with magnetics and VLF. While I.P. is a good tool for detecting disseminated sulphides, a magnetic survey provide good assistance in distinguishing between different rockunits, VLF will mainly be used to deliniate shears and fracture zones. A linespacing of 200 m is considered.

Eventual findings will be trenched and sampled in detail.

Grinder: A similar geophysical survey as at Skurven is also proposed for the Grinder area. But since this is a smaller and well defined area, line spacing will be not more than 100 m, and one may use gradient array I.P. with fixed current electrodes.

The geopysical survey should include both the northern and southern alteration zones.

This survey should be followed up by extensive trenching and sampling. Eventual positive trenching results should lead to drilling.

General: The > 90%ile gold anomalies from the NGU survey, outside the area already investigated by us, should be spot checked. Such a check may include resampling of around 10 closely spaced stream sediment samples.

If this follow up leads to potential localities, we recommend that the rest of NGU's sample materiale from Hedmark county is assayed for gold.

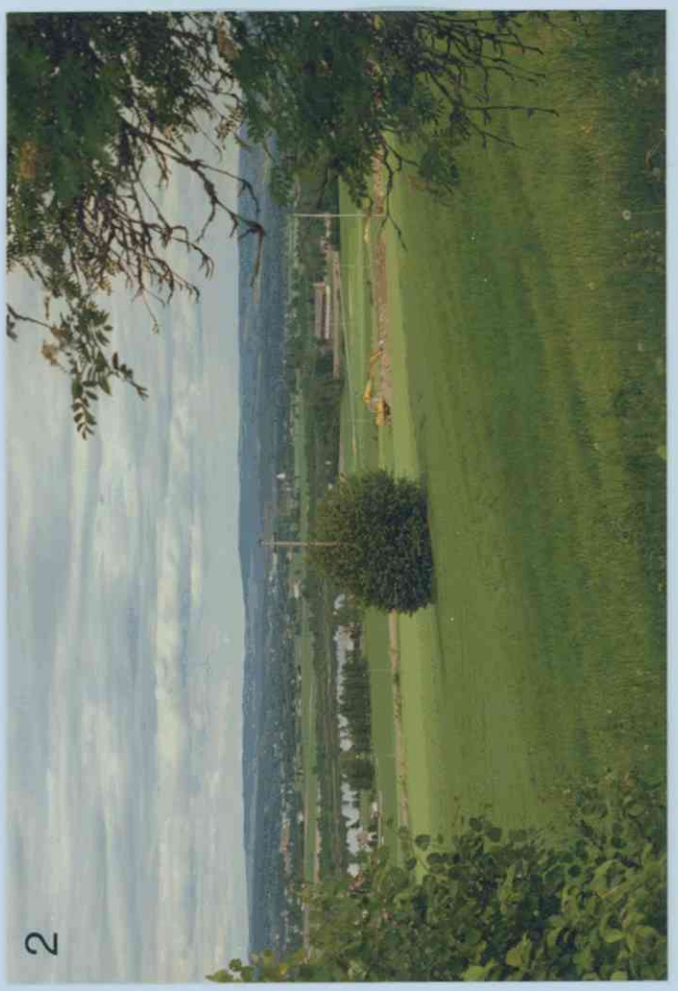
Although the chipsampling of the Grinder type alteration in the Elverum area was negative with regard to gold, a number og gold-arsenic anomalies were encountered here during ARCO's stream sediment survey in 1984. Based on this and the conclusion above, it is recommended that a systematic rock sampling program is carried out in the Elverum area during the 1989 field season.

Fig. 2 Glåma valley seen towards the east. The hills around Grinder to the far right.

Fig. 10 Trenching at Skurven.

Fig. 11 The T.3 trench at Skurven. Note the scarcity of blocks in the moraine.

Fig. 12 Drilling prior to blasting in the Skurven trenches.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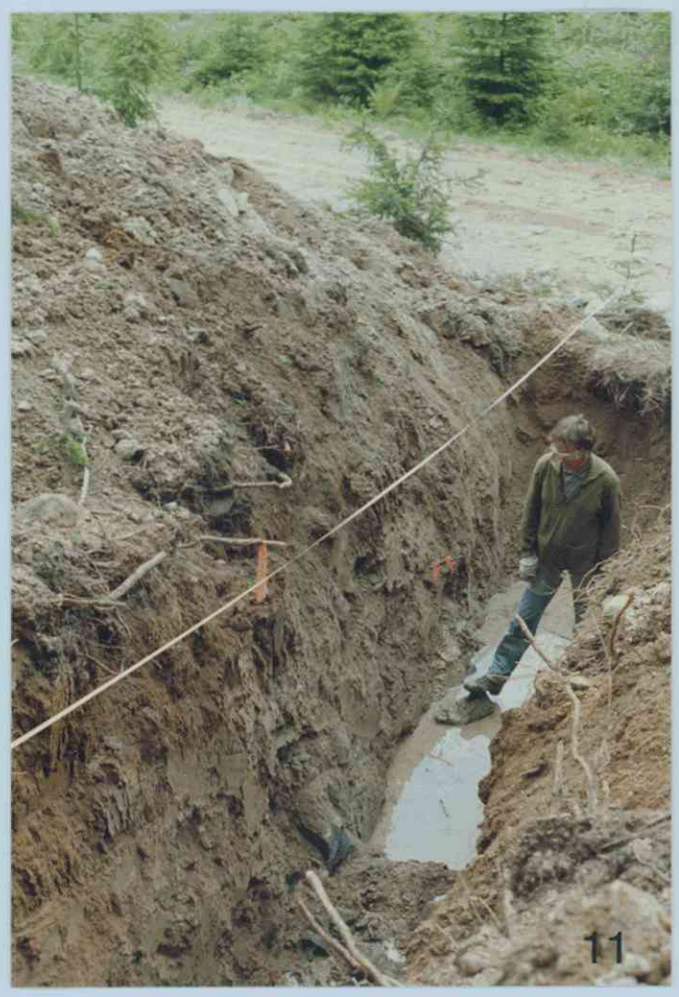
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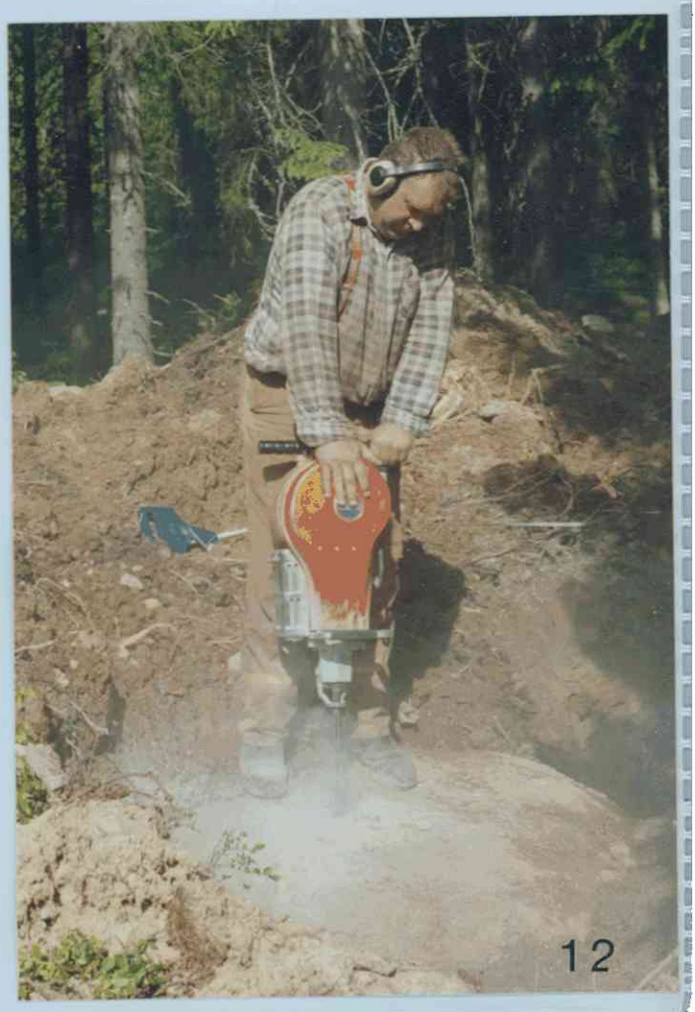
VOLVO BM
10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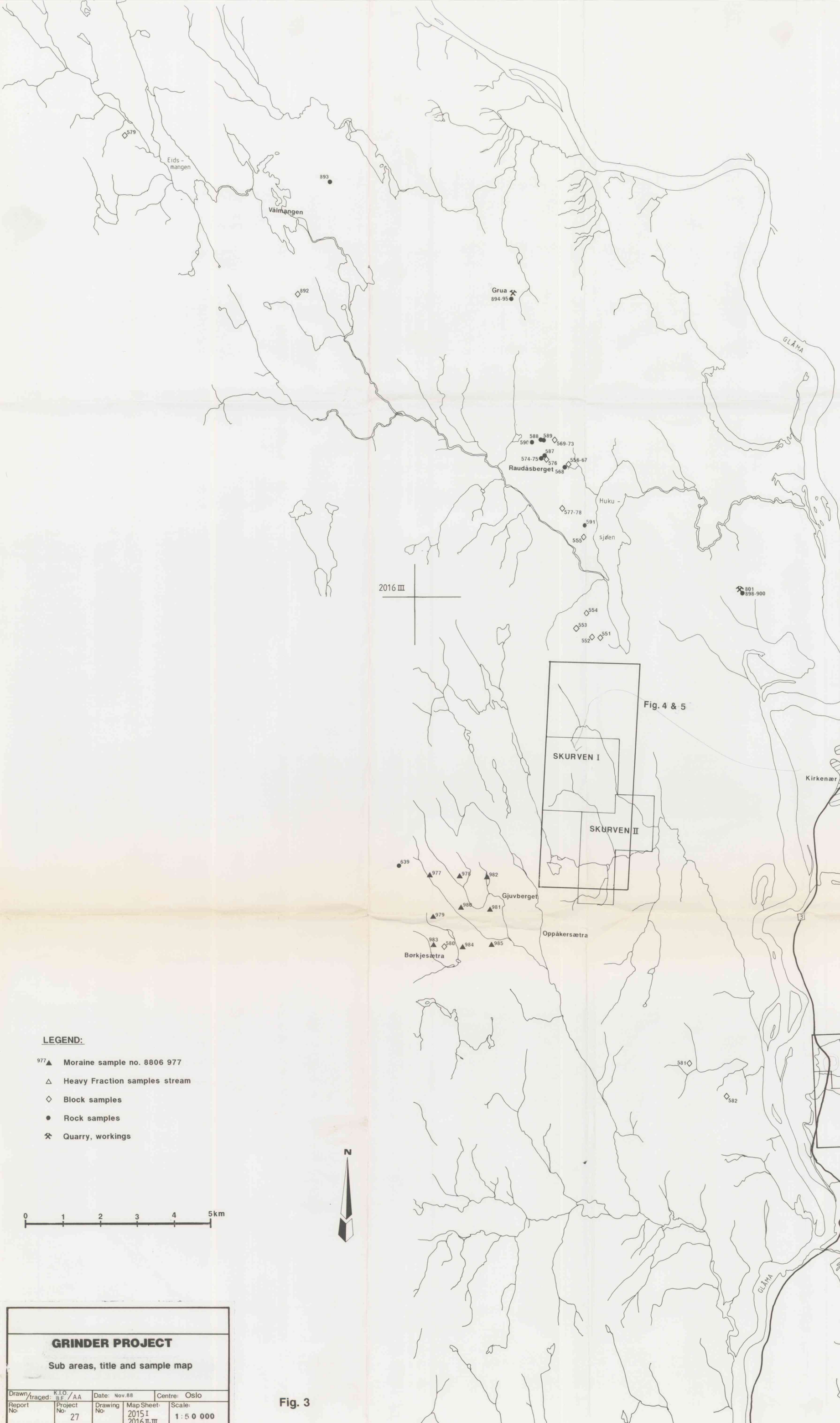


LEGEND:

- 977▲ Moraine sample no. 8806 977
- △ Heavy Fraction samples stream
- ◇ Block samples
- ● Rock samples
- ⚒ Quarry, workings

GRINDER PROJECT

Sub areas, title and sample map

Drawn/traced: K.T.O. B.F. / AA	Date: Nov.88		Centre: Oslo	
Report No:	Project No: 27	Drawing No:	Map Sheet: 2015 I 2016 II-III	Scale: 1:50 000

Fig. 3

278400

68670

HUKUSJØEN

ROGNBERGET

FJØRASEN

SKURVEN

DJUP-
TJERNET

KULLBLIKKSÆTRA

64000

273600

LEMYRA

BYERBERGET

HØGBERGET

STOR-
FLØYTA

DAMKLINTEN

DAMTJERNA

LEGEND:

- Hyperite
- Granite
- Quartz porphyry
- Feldspar porphyry
- Rhyolitic rocks
- Granitic gneiss
- Quartz, pyrite, sericite alteration
- Geological boundaries
- Strike / dip foliation
- Shear zone
- Outcrop

N

Scale 1:10000

GRINDER PROJECT

SKURVEN

Geological Map

K.I.O. / A.A. Jan. 89

Fig. 4

278400
68670
64000
273600
HUKUSJØEN
ROGNBERGET
FJØRÅSEN
585
SKURVEN
586
962
956
963
DJUP-
TJERNET
634
964
954
955
KULLBLIKKSÆTRA
897
951
916
897
952
Skurven
blocks
804
891
953
LEMYRA
961
BYERBERGET
616
613
617
807
621-27
605
976
958
957
965
960
959
967
966
HØGBERGET
971
970
975
968
STOR-
FLØYTA
DAMKLINTEN
DAMTJERNA
973
974
969
972
N
Scale 1:10000

LEGEND:

954▲ Heavy Fraction samples - moraine no. 8806 954

△ Heavy Fraction samples - stream

◇ Block samples

● Rock samples

GRINDER PROJECT

SKURVEN

Sample Map

BF / AA Jan. 89

Fig. 5

GRINDER PROJECT

GRINDER

Geological Map

K.I.O. / A.A. 1988

Fig. 6

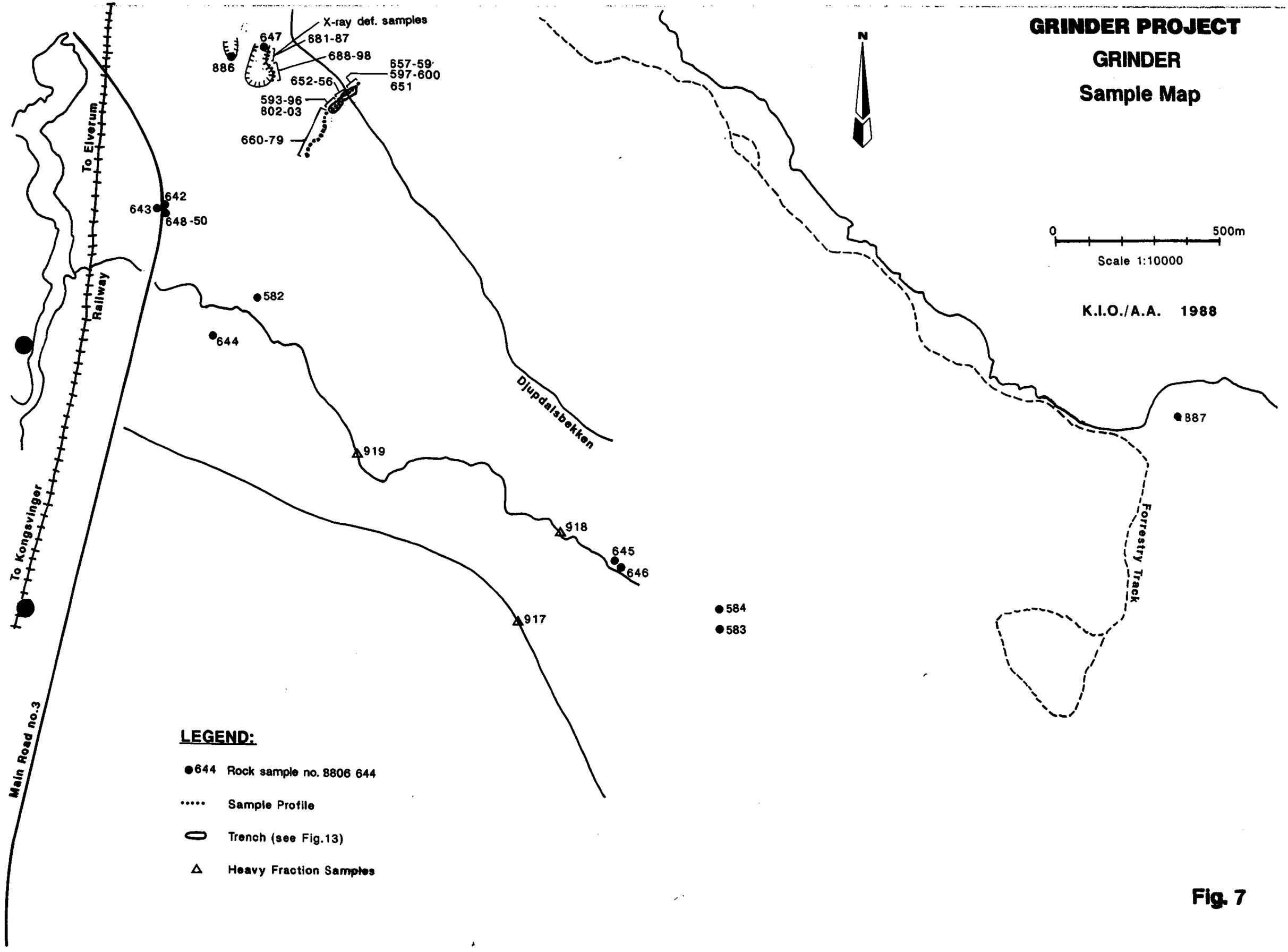
LEGEND:

- Hyperite
- Diabase/greenst.
- Q-ser-py alt.
- Quartz porphyry
- Feldspar porphyry (Dacite/diorite)
- Finegrained, banded, felsic rocks (Rhyolites)
- Homogeneous, interm. rock
- Granitic gneiss
- Pyrite/carbonate alteration
- Exposure
- Strike/dip F_1 fol.
- Strike/dip F_2 fol.
- Shears
- Quarry
- Trench
- Zone with strong development of F_2
- C Hydrocarbons

GRINDER PROJECT

GRINDER

Sample Map



LEGEND:

- ●644 Rock sample no. 8806 644
- ····· Sample Profile
- ⬭ Trench (see Fig.13)
- △ Heavy Fraction Samples

Fig. 7

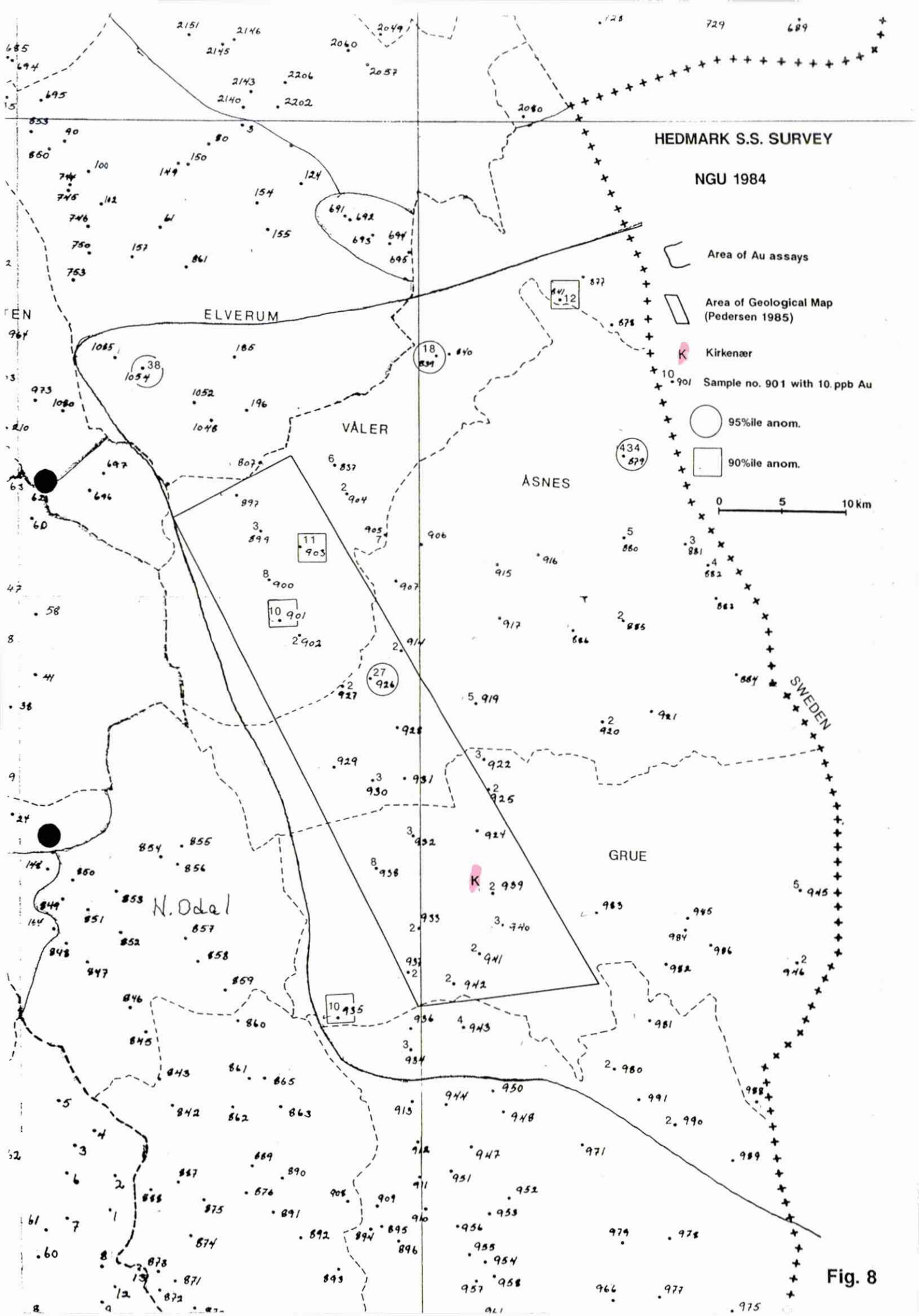
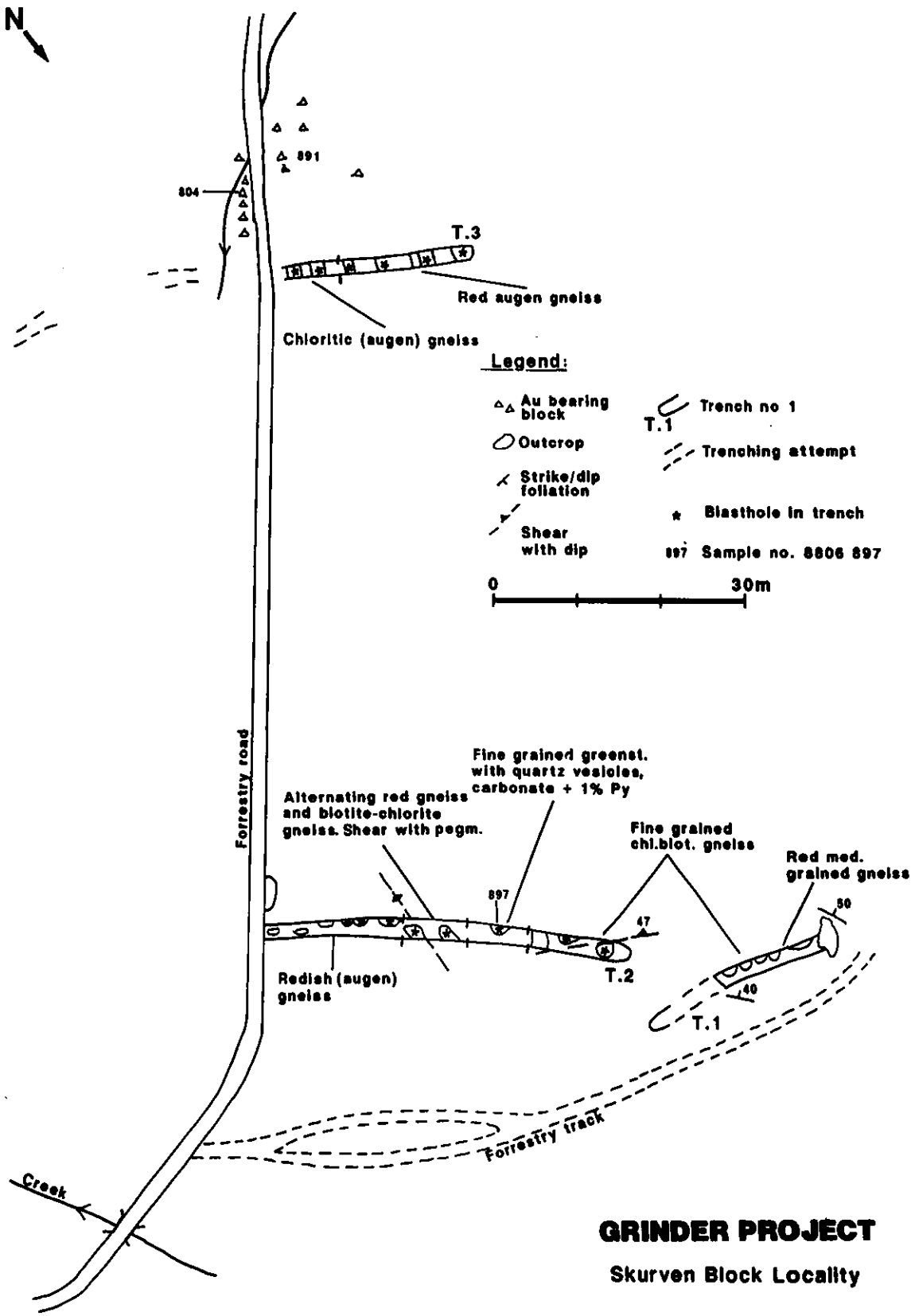

HEDMARK S.S. SURVEY
NGU 1984
Area of Au assays
Area of Geological Map (Pedersen 1985)
K Kirkenær
10 901 Sample no. 901 with 10 ppb Au
95%ile anom.
90%ile anom.
0 5 10 km
ELVERUM
VÅLER
ÅSNES
GRUE
SWEDEN
N. Odal

Fig. 8



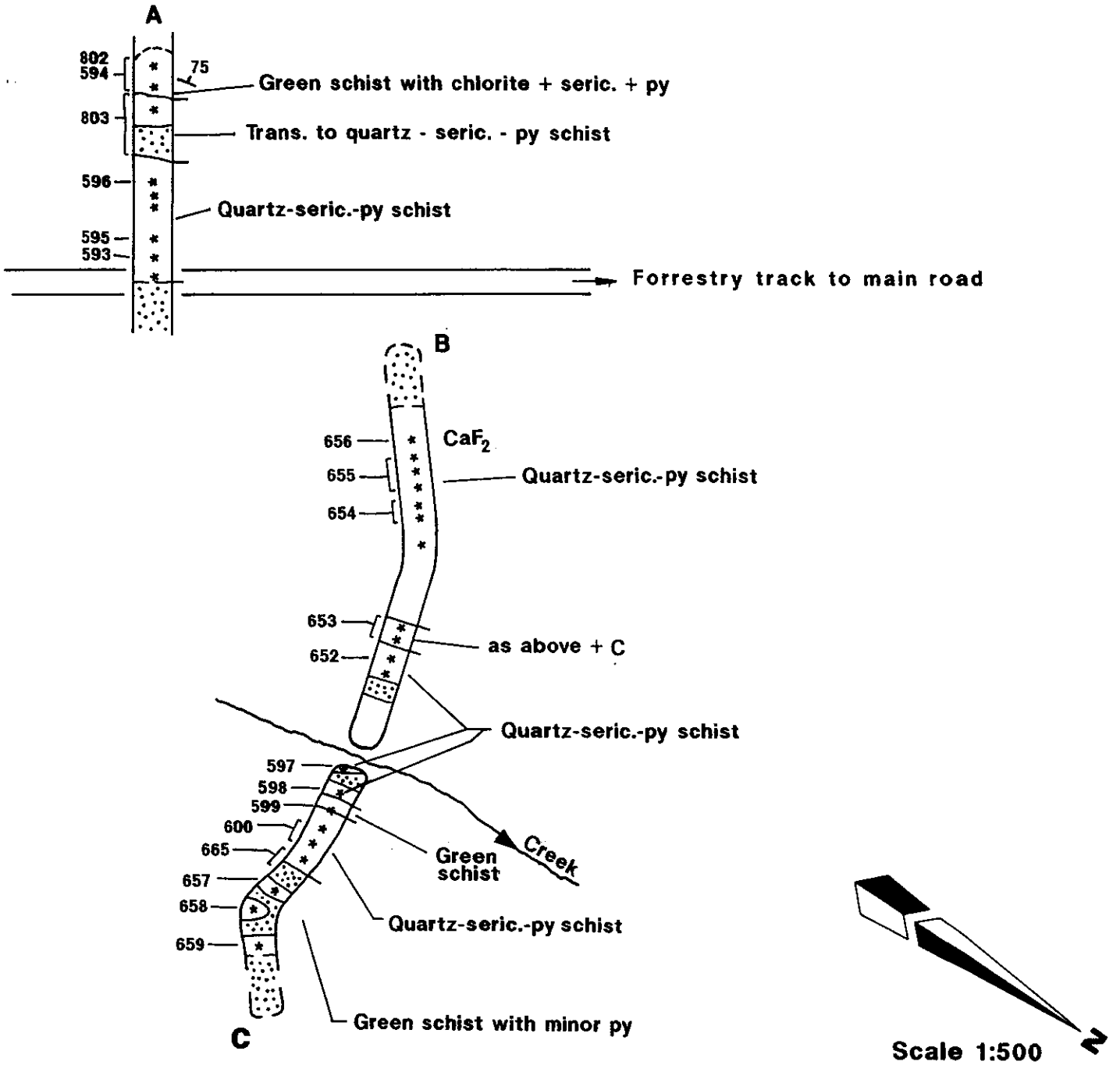
GRINDER PROJECT

Skurven Block Locality

Trench Map

BF/AA Nov.88

Fig. 9



LEGEND:

A	Trench A
	Exposed bedrock with blasthole
	Water / overburden
600	Sample no. 8806 600
C	Hydrocarbons

GRINDER PROJECT

GRINDER

Trench Map

BF / AA Jan. 89

Fig. 13

OMAC Laboratories Ltd,
Athenry Road, Loughrea, Co. Galway, Ireland.
Telephone: 091 - 41741, 41457
Telex: 50985 OMAC EI
Eirmail: EIM 351

CERTIFICATE OF ANALYSIS 4th July, 1988.

TO: Geologiske jenester

ATTN: Boye Flood

CODE: 8806889-8806890

BATCH NO. AR11
NO. SAMPLES 2 Rock

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Asppm	Agppm	Auppb
1	8806889	5	80	6	2	-0.5	-20
2	8806890	6	36	4	1	-0.5	-20

OMAC Laboratories Ltd.,

Athenry Road, Loughrea, Co. Galway, Ireland.
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Telex: 50985 OMAC EI
Eirmail: EIM 351

CERTIFICATE OF ANALYSIS 18th August 1988

TO: Geologiske Tjenester

ATTN: B. Flood

CODE: Project 27

BATCH NO. AT36
NO. SAMPLES 51 Prep

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	Asppm	50gm Auppb	RepAu
1	8806605	2	7	8	-0.5	2	-20	
2	8806613	5	72	12	-0.5	2	-20	
3	8806616	5	8	5	-0.5	-1	-20	
4	8806617	2	2	6	-0.5	-1	-20	
5	8806621	7	36	14	-0.5	-1	-20	
6	8806622	6	62	5	-0.5	-1	-20	
7	8806623	3	33	4	-0.5	-1	-20	
8	8806624	6	69	4	-0.5	-1	-20	
9	8806625	6	5	4	-0.5	-1	-20	
10	8806626	6	43	3	-0.5	-1	-20	-20
11	8806627	4	12	3	-0.5	-1	-20	
12	8806634	5	19	7	-0.5	-1	-20	
13	8806551	34	21	5	-0.5	1	-20	
14	8806552	49	4	153	-0.5	2	-20	
15	8806553	2	4	2	-0.5	-1	-20	
16	8806554	316	5	30	-0.5	2	-20	
17	8806555	5	5	9	-0.5	-1	-20	
18	8806556	4	2	4	-0.5	1	-20	
19	8806557	12	17	3	-0.5	1	-20	
20	8806558	7	5	57	-0.5	2	-20	
21	8806559	216	11	108	-0.5	3	-20	
22	8806560	5	28	20	-0.5	2	-20	
23	8806561	6	14	4	-0.5	3	-20	
24	8806562	13	25	9	0.7	6	24	27
25	8806563	51	197	41	-0.5	1	-20	
26	8806564	9	6	69	-0.5	1	-20	
27	8806565	7	47	4	-0.5	1	-20	
28	8806566	5	4	4	-0.5	2	-20	
29	8806567	16	14	48	-0.5	7	-20	
30	8806568	86	21	228	-0.5	2	-20	
31	8806569	26	6	241	-0.5	1	-20	
32	8806570	5	6	212	-0.5	-1	-20	
33	8806571	50	9	12	-0.5	-1	-20	
34	8806572	13	5	20	-0.5	1	-20	
35	8806573	87	3	74	-0.5	2	-20	

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Telex: 50985 OMAC EI
Eirmail: EIM 351

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	Asppm	Auppb	RepAu
36	8806574	6	131	11	0.5	6	-20	
37	8806575	7	8	22	-0.5	2	-20	
38	8806576	3	9	2	-0.5	-1	-20	
39	8806577	6	8	20	1.0	2	-20	
40	8806578	97	11	68	-0.5	4	-20	
41	8806579	13	49	23	1.0	2	-20	
42	8806886	93	3	102	-0.5	6	-20	
43	8806887	16	21	44	-0.5	5	-20	
44	8806888	102	9	103	-0.5	1	-20	
45	8806891	34	93	12	1.3	6	4275	3610
46	8806892	21	5	2	-0.5	-1	-20	
47	8806893	3690	48	7	6.6	-1	-20	
48	8806894	21900	1860	595	106.3	4	25	24
49	8806895	15800	317	616	81.2	2	74	75
50	8806896	223	297	72	-0.5	1	-20	
51	8806897	45	70	1180	-0.5	-1	-20	

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Eirmail: EIM 351

CERTIFICATE OF ANALYSIS 18th August 1988

TO: Geologiske Tjenester

ATTN: B. Flood

CODE: G008,011,012,013

BATCH NO. AT38
NO. SAMPLES 21 Prep

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	Asppm	50gm Auppb	RepAu
1	8806580	10	6	59	-0.5	-1	-20	
2	8806581	13	11	203	-0.5	-1	-20	
3	8806582	7	9	19	-0.5	2	-20	
4	8806801	11	8	44	-0.5	-1	-20	
5	8806898	121	3	93	-0.5	-1	-20	
6	8806899	293	6	116	-0.5	-1	-20	
7	8806900	3	8	103	-0.5	-1	-20	
8	8806639	86	3	336	-0.5	-1	-20	
9	8806642	2	3	8	-0.5	-1	-20	
10	8806643	2	8	15	-0.5	-1	-20	
11	8806644	3	10	9	-0.5	-1	-20	
12	8806645	5	18	14	-0.5	-1	-20	
13	8806646	4	19	8	-0.5	-1	-20	
14	8806647	23	22	10	5.3	1	325	382
15	8806648	2	7	2	-0.5	-1	-20	
16	8806649	1	3	6	-0.5	-1	-20	
17	8806650	2	22	5	-0.5	-1	-20	
18	8806583	5	32	4	-0.5	-1	-20	
19	8806584	6	23	11	-0.5	-1	-20	
20	8806585	2	3	10	-0.5	-1	-20	
21	8806586	3	2	4	-0.5	-1	-20	

J. McHugh

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Eirmail: EIM 351

CERTIFICATE OF ANALYSIS 23rd December 1988

TO. Geologiske Tjenester

ATTN. D. Flood

CODE: Project 27

BATCH NO. AY83
NO. SAMPLES 64 Prep

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	Asppm	50gm Auppb	RepAu
1	8806587	18	3	96	-0.5	3	-20	
2	8806588	61	23	80	-0.5	6	-20	
3	8806589	44	9	32	-0.5	5	-20	
4	8806590	70	14	47	-0.5	6	-20	-20
5	8806591	116	3	86	-0.5	2	-20	
6	8806592	200	178	71	3.0	1	-20	
7	8806593	61	3	6	-0.5	4	-20	
8	8806594	23	7	249	-0.5	5	-20	
9	8806595	35	3	105	-0.5	3	-20	
10	8806596	7	3	4	-0.5	2	-20	
11	8806597	44	3	5	-0.5	7	-20	
12	8806598	28	3	9	-0.5	92	139	134
13	8806599	293	2	188	-0.5	2	46	
14	8806600	12	2	5	-0.5	19	266	268
15	8806651	2	2	29	-0.5	3	-20	
16	8806652	22	4	5	-0.5	3	-20	
17	8806653	47	12	4	-0.5	5	-20	
18	8806654	38	3	7	-0.5	5	-20	
19	8806655	25	3	11	-0.5	4	-20	
20	8806656	83	3	9	-0.5	9	-20	
21	8806657	78	3	92	-0.5	4	-20	
22	8806658	7	3	226	-0.5	3	-20	
23	8806659	7	2	135	-0.5	3	-20	
24	8806660	9	5	4	-0.5	3	-20	
25	8806661	2	7	7	-0.5	1	-20	
26	8806662	1	8	5	-0.5	2	-20	
27	8806663	10	178	9	-0.5	7	-20	
28	8806664	1	5	4	-0.5	1	-20	
29	8806665	5	7	2	-0.5	1	-20	
30	8806667	2	12	27	-0.5	2	-20	
31	8806668	1	21	28	-0.5	2	-20	
32	8806669	1	20	19	-0.5	3	-20	
33	8806670	2	6	14	-0.5	2	-20	-20
34	8806671	2	19	23	-0.5	3	-20	
35	8806672	1	18	28	-0.5	3	-20	

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LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	Asppm	Auppb	RepAu
36	8806673	1	21	24	-0.5	2	-20	
37	8806674	1	13	7	-0.5	2	-20	
38	8806675	2	12	17	-0.5	2	-20	
39	8806676	1	11	15	-0.5	2	-20	
40	8806677	1	3	10	-0.5	2	-20	
41	8806678	1	4	24	-0.5	2	-20	
42	8806679	1	12	18	-0.5	2	-20	
43	8806681	3	13	6	-0.5	3	-20	
44	8806682	2	3	4	-0.5	2	-20	
45	8806683	2	4	6	-0.5	2	-20	
46	8806684	5	6	5	-0.5	2	-20	
47	8806685	9	43	13	-0.5	3	-20	-20
48	8806686	5	23	41	-0.5	2	-20	
49	8806687	5	32	38	-0.5	3	-20	
50	8806688	5	19	25	-0.5	2	-20	
51	8806689	5	14	15	-0.5	2	-20	
52	8806690	5	39	18	-0.5	2	-20	
53	8806691	4	8	9	-0.5	2	-20	
54	8806692	5	13	12	-0.5	2	-20	
55	8806693	5	24	41	-0.5	3	-20	
56	8806694	6	22	20	-0.5	2	-20	
57	8806695	5	29	56	-0.5	2	-20	
58	8806696	6	24	37	-0.5	3	-20	-20
59	8806697	7	26	35	-0.5	3	-20	
60	8806698	9	21	44	-0.5	4	-20	
61	8806802	19	8	171	-0.5	5	-20	
62	8806803	18	3	88	-0.5	3	-20	
63	8806804	18	12	29	-0.5	2	136	115
64	8806807	88	8	86	-0.5	3	-20	

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UTSKRIFTSDATUM 1988-09-13

BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 4813

PLATS : A/S OLIVIN PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HClO4

LAB NR	MÄRKNING	~ SiO_2 %	AL2O3 %	FE2O3 %	MNO %	TIO2 %	MGO %	CAO %	K2O %	NA2O %	P2O5 %	AS PPM	BA PPM	BE PPM
016773	8806613		18.6	3.09	0.035	0.274	0.234	0.129	11.7	3.26	0.193	7.4	1123	0.10
016774	8806621		14.9	2.39	0.039	0.169	0.629	0.725	6.39	2.54	0.133	<2.0	1039	1.4
016775	8806622		14.6	2.06	0.019	0.125	0.363	0.104	7.70	2.01	0.120	2.7	1188	2.0
016776	8806623		13.7	1.92	0.014	0.118	0.301	0.134	5.72	3.36	0.136	5.6	909	1.1
016777	8806624		14.4	1.63	0.015	0.134	0.422	0.102	8.47	2.36	0.123	3.5	1191	0.94
016778	8806625		15.0	2.01	0.025	0.213	0.346	0.321	7.55	2.82	0.117	9.4	957	2.5
016779	8806626		14.6	2.21	0.014	0.204	0.234	0.211	8.03	2.74	0.134	<2.0	1202	1.5
016780	8806627		15.4	2.05	0.010	0.100	0.222	0.088	7.46	2.31	0.146	12	1151	0.55
016781	8806647		5.39	26.3	0.011	0.068	0.427	<0.010	2.62	0.040	0.241	7.2	17	<0.04
016782	8806891	70	15.0	2.80	<0.010	0.185	0.193	0.150	6.66	4.53	0.101	20	466	0.17
016783	8806894		0.726	0.942	0.013	<0.010	0.187	0.280	0.280	0.063	0.052	<2.0	49	<0.10

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UTSKRIFTSDATUM 1988-09-13

BESTÄLLARE INSÄNDARE

INTYG NR

GEOLOGISKE TJENESTER

4814

PLATS : A/S OLIVIN PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HClO4

LAB NR	MÄRKNING	CO PPM	CR PPM	CU PPM	LA PPM	LI PPM	MO PPM	NI PPM	PB PPM	RB PPM	SC PPM	SN PPM	SB PPM
016773	8806613	1.7	13	15	19	4.6	4.5	7.2	116	122	4.0	3.9	<6.8
016774	8806621	5.2	6.4	13	24	16	2.5	4.7	50	<30	2.3	2.7	<7.0
016775	8806622	4.0	3.4	14	7.0	13	<0.41	3.5	77	155	0.48	2.4	<7.1
016776	8806623	3.5	6.1	10	8.4	11	0.88	5.3	55	112	1.3	<2.0	<7.1
016777	8806624	2.4	7.8	13	7.5	8.2	0.86	13	82	123	1.4	2.9	<6.9
016778	8806625	1.3	5.3	14	29	11	1	4.8	32	177	3.3	4.8	<6.9
016779	8806626	2.1	5.2	12	27	7.0	4.3	5.4	86	318	1.8	6.0	<7.0
016780	8806627	2.6	4.1	11	12	6.7	<0.40	4.7	56	265	0.84	2.3	<7.0
016781	8806647	341	465	38	10	9.9	5.6	1941	63	96	12	2.2	<6.9
016782	8806891	5.2	7.2	29	11	5.1	7.0	8.9	97	182	2.5	5.7	<7.1
016783	8806894	12	8.0	19927	3.3	6.3	1.3	6.9	1606	<30	0.83	<2.0	<6.9

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UTSKRIFTSDATUM 1988-09-13

BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 4815

PLATS : A/S OLIVIN PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HClO4

LAB NR	MÄRKNING	SR PPM	V PPM	Y PPM	ZN PPM	ZR PPM	U PPM	TH PPM	W PPM
016773	8806613	133	21	13	27	134	<20	18	7.9
016774	8806621	130	30	13	29	157	<20	<5.0	17
016775	8806622	130	15	9.9	14	140	<20	12	29
016776	8806623	109	18	6.9	11	123	<20	8.2	21
016777	8806624	104	17	7.5	11	145	<20	11	17
016778	8806625	154	22	24	15	131	<20	9.6	17
016779	8806626	139	17	21	12	165	<20	5.6	13
016780	8806627	93	21	6.7	12	135	<20	6.7	16
016781	8806647	2.9	82	114	28	14	<20	<4.9	16
016782	8806891	73	9.9	17	14	99	<20	16	11
016783	8806894	13	6.6	1.9	621	<0.49	<20	<4.9	17

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BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 6467

PLATS : PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HC104

LAB NR	MÄRKNING	AL203 %	FE203 %	MNO %	TIO2 %	MGO %	CAO %	K20 %	NA20 %	P205 %	AS PPM	BA PPM	BE PPM
024410	8806 587	14.6	17.9	0.288	1.77	5.57	8.31	0.740	3.39	0.564	<2.0	211	<0.04
024411	8806 590	20.0	8.18	0.177	0.623	3.43	8.10	1.69	4.68	0.302	<2.0	664	<0.04
024412	8806 593	19.7	9.03	0.011	0.645	0.497	1.02	4.84	1.00	0.240	<2.0	224	<0.04
024413	8806 594	19.9	9.57	0.175	0.361	5.36	2.20	2.52	0.762	0.256	<2.0	581	<0.04
024414	8806 598	21.8	7.39	0.022	0.094	0.541	0.499	4.24	1.76	0.435	48	229	<0.04
024415	8806 599	19.9	8.08	0.191	0.093	4.22	0.483	3.78	0.590	0.445	<1.9	977	<0.04
024416	8806 600	21.7	4.78	<0.010	0.059	0.058	0.363	2.06	3.04	0.338	<2.0	272	<0.04
024417	8806 653	22.3	3.53	<0.010	0.053	0.076	0.332	3.30	1.96	0.331	<2.0	282	<0.04
024418	8806 661	12.0	1.10	<0.010	0.015	0.016	0.013	0.915	0.055	0.050	<2.0	1039	0.14
024419	8806 667	14.3	1.05	0.106	0.176	0.337	0.410	5.89	3.30	0.057	<2.0	409	2.1
024420	8806 674	14.9	1.13	0.146	0.186	0.391	0.899	5.11	3.57	0.063	<2.0	395	2.4
024421	8806 679	15.1	1.23	0.061	0.156	0.348	0.741	5.09	4.35	0.071	<2.0	779	2.2
024422	8806 684	14.6	1.61	<0.010	0.113	0.217	0.022	4.33	0.490	0.033	<2.0	515	1.8
024423	8806 687	14.8	1.16	0.056	0.181	0.429	0.350	5.35	3.34	0.035	<2.0	383	2.5
024424	8806 691	15.2	1.11	0.060	0.172	0.538	0.171	5.70	3.02	0.036	<2.0	359	2.5

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UTSKRIFTSDATUM 1989-01-19

BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 6466

PLATS : PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HC104

LAB NR	MÄRKNING	AL203 %	FE203 %	MNO %	TIO2 %	MGO %	CAO %	K20 %	NA20 %	P205 %	AS PPM	BA PPM	BE PPM
024425	8806 804	17.3	2.16	0.037	0.263	0.510	0.481	5.56	5.12	0.080	<2.0	495	0.77

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BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 6469

PLATS : PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HClO4

LAB NR	MÄRKNING	CO PPM	CR PPM	CU PPM	LA PPM	LI PPM	MO PPM	NI PPM	PB PPM	SC PPM	SN PPM	SR PPM	V PPM
024410	8806 587	44	68	18	2.5	19	<0.39	47	5.6	45	<2.0	273	460
024411	8806 590	39	38	74	20	14	<0.40	23	<5.1	19	<2.0	1233	203
024412	8806 593	58	21	66	8.3	13	<0.41	17	<5.1	14	<2.0	169	178
024413	8806 594	43	86	27	17	60	<0.40	69	<5.0	24	<2.0	394	214
024414	8806 598	70	11	28	23	17	<0.40	25	<4.9	20	<2.0	296	145
024415	8806 599	55	14	349	19	30	<0.39	23	<4.8	19	<1.9	99	171
024416	8806 600	105	11	14	27	16	0.69	30	<4.9	14	<2.0	475	134
024417	8806 653	58	13	62	20	13	<0.40	9.1	<5.0	1.4	<2.0	102	112
024418	8806 661	60	1.2	4.1	46	20	2.4	4.5	<5.0	1.0	<2.0	250	8.2
024419	8806 667	35	1.3	3.8	38	18	<0.40	3.6	<5.0	1.5	<2.0	70	7.8
024420	8806 674	35	1.8	5.3	44	16	<0.39	4.4	<4.9	1.7	<2.0	93	7.9
024421	8806 679	52	2.6	3.7	40	5.8	<0.41	3.7	<5.1	0.98	<2.0	176	14
024422	8806 684	59	3.8	8.3	49	4.7	2.1	3.5	<4.9	2.3	2.5	27	9.7
024423	8806 687	61	1.4	4.7	40	14	<0.39	4.5	8.5	1.6	<2.0	66	7.3
024424	8806 691	53	1.5	4.7	43	20	<0.40	4.4	<5.1	1.8	<2.0	44	8.2

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BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 6470

PLATS : PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HClO4

LAB NR	MÄRKNING	CO PPM	CR PPM	CU PPM	LA PPM	LI PPM	MO PPM	NI PPM	PB PPM	SC PPM	SN PPM	SR PPM	V PPM
024425	8806 804	55	5.7	24	43	18	0.50	6.8	<5.0	6.1	2.8	77	24

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BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 6471

PLATS : PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HC104

LAB NR	MÄRKNING	Y PPM	ZN PPM	ZR PPM	AG PPM	W PPM
024410	8806 587	34	168	23	<0.49	5.1
024411	8806 590	13	83	44	<0.51	85
024412	8806 593	13	17	38	<0.51	264
024413	8806 594	12	253	10	<0.50	159
024414	8806 598	17	20	127	<0.49	286
024415	8806 599	9.7	222	64	<0.48	274
024416	8806 600	9.1	7.3	152	<0.49	284
024417	8806 653	3.5	12	13	<0.50	228
024418	8806 661	3.6	17	71	<0.50	142
024419	8806 667	28	46	93	<0.50	254
024420	8806 674	30	37	92	<0.49	242
024421	8806 679	13	27	79	<0.51	363
024422	8806 684	18	19	113	<0.49	496
024423	8806 687	27	57	101	<0.49	442
024424	8806 691	28	32	98	<0.51	377

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UTSKRIFTSDATUM 1989-01-19

BESTÄLLARE INSÄNDARE

GEOLOGISKE TJENESTER

INTYG NR 6472

PLATS : PROSJEKT 27

Anm : Analysmetod: ICP Upplösningsmetodik: HF/HC104

LAB NR	MÄRKNING	Y PPM	ZN PPM	ZR PPM	AG PPM	V PPM
024425	8806 804	29	43	119	<0.50	387

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CERTIFICATE OF ANALYSIS 31st August 1988

TO: Geologiske Tjenester

ATTN: B. Flood

CODE: Project 27

BATCH NO. AT35
NO. SAMPLES 18 Heavy Fraction

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	Asppm	Auppb	RepAu
1	8806951	5	5	11	-0.5	2	2	
2	8806952	4	4	12	-0.5	-1	-2	
3	8806953	5	3	12	-0.5	-1	-2	
4	8806954	6	3	17	-0.5	1	-2	
5	8806955	6	4	20	-0.5	-1	-2	
6	8806956	5	5	16	-0.5	-1	-2	
7	8806957	4	3	9	-0.5	1	-2	
8	8806958	7	4	14	-0.5	-1	-2	
9	8806959	3	4	5	-0.5	-1	-2	
10	8806960	5	5	13	-0.5	1	-2	
11	8806961	5	3	10	-0.5	1	-2	
12	8806962	5	5	9	-0.5	-1	-2	
13	8806963	5	4	12	-0.5	-1	-2	
14	8806964	5	4	15	-0.5	-1	-2	
15	8806965	5	4	17	-0.5	-1	-2	
16	8806966	6	5	17	-0.5	1	-2	
17	8806967	3	4	5	-0.5	-1	3	-5
18	8806968	10	5	19	-0.5	1	-2	

Morraine

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CERTIFICATE OF ANALYSIS 31st August 1988

TO: Geologiske Tjenester

ATTN: B. Flood

CODE: Project 27

BATCH NO. AT37
NO. SAMPLES 24

Heavy Fraction

LAB. NO.	SAMPLE NO.	Cuppm	Pbppm	Znppm	Agppm	Asppm	Auppb	RepAu
1	8806916	4	5	12	-0.5	-1	-2	
2	8806917	4	7	10	-0.5	1	-2	
3	8806918	3	7	13	-0.5	1	-2	
4	8806919	4	8	18	-0.5	-1	-2	
5	8806920	4	6	13	-0.5	-1	6	-5
6	8806921	4	6	15	-0.5	2	-2	
7	8806922	3	13	20	-0.5	3	-2	
8	8806969	4	4	10	-0.5	1	-2	
9	8806970	5	5	11	-0.5	1	-2	
10	8806971	6	6	12	-0.5	1	-2	
11	8806972	6	8	13	-0.5	3	-2	
12	8806973	3	5	5	-0.5	1	-2	
13	8806974	7	4	19	-0.5	2	-2	
14	8806975	3	2	4	-0.5	-1	-2	
15	8806976	4	4	10	-0.5	1	-2	
16	8806977	8	3	17	-0.5	2	-2	
17	8806978	9	7	31	-0.5	-1	-2	
18	8806979	8	7	19	-0.5	2	-2	
19	8806980	4	4	5	-0.5	2	-2	
20	8806981	11	5	33	-0.5	2	-2	
21	8806982	8	6	18	-0.5	3	-2	
22	8806983	6	6	13	-0.5	1	6	-5
23	8806984	7	7	15	-0.5	1	18	5
24	8806985	6	5	18	-0.5	1	3	

Stream

Moraine

NGU stream sediment samples

See Fig. 8

						Au	As
1494	938BS	176/88	54	2001	23.1	8	1
965	1048BS	176/88	54	2002	30.0	-2	3
1494	907BS	176/88	54	2003	30.0	-2	1
1494	932BS	176/88	54	2004	30.0	3	1
965	1085BS	176/88	54	2005	27.4	-2	3
1494	939BS	176/88	54	2006	30.0	2	1
965	1052BS	176/88	54	2007	30.0	-2	1
1494	985BS	176/88	54	2008	21.0	-2	1
1494	935BS	176/88	54	2009	17.0	10	1
1494	937BS	176/88	54	2010	30.0	2	1
1494	900BS	176/88	54	2011	14.4	8	2
1494	934BS	176/88	54	2012	30.0	3	2
1494	919BS	176/88	54	2013	30.0	5	1
1494	807BS	176/88	54	2014	30.0	4	3
1494	925BS	176/88	54	2015	30.0	2	2
1494	840BS	176/88	54	2016	29.0	-2	1
1494	982BS	176/88	54	2017	27.2	-2	2
1494	884BS	176/88	54	2018	23.4	-2	2
1494	906BS	176/88	54	2019	12.4	-4	2
1494	931BS	176/88	54	2020	21.1	-2	2
1494	897BS	176/88	54	2021	23.1	-2	1
1494	885BS	176/88	54	2022	30.0	2	1
1494	915BS	176/88	54	2023	13.7	-4	1
1494	841BS	176/88	54	2024	16.5	12	3
1494	880BS	176/88	54	2025	10.0	5	1
1494	877BS	176/88	54	2026	12.0	-4	1
1494	904BS	176/88	54	2027	30.0	2	-1
1494	902BS	176/88	54	2028	30.0	2	1
1494	922BS	176/88	54	2029	20.0	3	1
1494	983BS	176/88	54	2030	30.0	-2	1
1494	928BS	176/88	54	2031	18.0	-3	2
1494	882BS	176/88	54	2032	12.8	4	2
1494	916BS	176/88	54	2033	17.3	-3	2
1494	945BS	176/88	54	2034	13.0	5	2
1494	981BS	176/88	54	2035	30.0	-2	1
1494	878BS	176/88	54	2036	10.3	-5	2
1494	886BS	176/88	54	2037	13.1	-4	1
1494	920BS	176/88	54	2038	27.4	2	-1
1494	914BS	176/88	54	2039	30.0	2	1
1494	936BS	176/88	54	2040	26.0	-2	1
1494	839BS	176/88	54	2041	30.0	18	2
1494	940BS	176/88	54	2042	30.0	3	2
1494	946BS	176/88	54	2043	24.0	2	2
1494	941BS	176/88	54	2044	30.0	2	1
1494	917BS	176/88	54	2045	30.0	-2	1
1494	185BS	176/88	54	2046	25.1	-2	-1
1494	905BS	176/88	54	2047	30.0	7	1
1494	927BS	176/88	54	2048	30.0	2	2
1494	942BS	176/88	54	2049	26.0	2	1
1494	943BS	176/88	54	2050	30.0	4	1
1494	990BS	176/88	54	2051	30.0	2	2
1494	989BS	176/88	54	2052	30.0	-2	1
1494	991BS	176/88	54	2053	30.0	-2	1
1494	933BS	176/88	54	2054	30.0	2	-1

						Au	As
1494	924BS	176/88	54	2055	30.0	-2	1
1494	901BS	176/88	54	2056	30.0	10	2
1494	929BS	176/88	54	2057	20.1	-3	1
1494	903BS	176/88	54	2058	24.5	11	2
1494	984BS	176/88	54	2059	16.2	-3	1
1494	881BS	176/88	54	2060	30.0	3	1
1494	921BS	176/88	54	2061	14.1	-4	1
1494	899BS	176/88	54	2062	19.6	3	1
1494	837BS	176/88	54	2063	20.0	6	3
1494	930BS	176/88	54	2064	19.0	3	1
1886	255BS	176/88	54	2065	10.1	-5	-1
1494	883BS	176/88	54	2066	30.0	-2	-1
1494	926BS	176/88	54	2067	30.0	27	2
965	1054BS	176/88	54	2068	30.0	38	1
1494	879BS	176/88	54	2069	15.0	434	1
1494	986BS	176/88	54	2070	23.0	-2	1
1494	196BS	176/88	54	2071	16.1	-3	3
1494	980BS	176/88	54	2072	30.0	2	1
1494	988BS	176/88	54	2073	29.0	-2	2
1886	251BS	176/88	54	2074	18.1	-3	-1

X-ray Diffraction Study

The mineralogical composition of four rock samples are determined by using a quantitative x-ray powder diffraction methods "Bristol's method" (Bristol,1967 and Hooton and Giorgetta,1977).This is an internal standard method with metallic Cu as reference material.

Procedure

To 1.00gm of each sample 0.05gm fine metallic Cu is added and mixed thoroughly.X-ray preparates are made by filling a Philps rotating sample holder and x-ray measurements are made for each sample twice. All the rock samples are subjected to bulk analyses by PW1700 Automated Powder Diffractometer System(Institute of Geology,Oslo University),scanning speed 1/min and peak angle range 2-60°,2θ(Cu k_1 radiation).The measured intensities of the selected reflections of the minerals(See,Bristol,1967, Hooton and Giorgetta,1977)are divided by the intensity of the reflection ofCu standard.By using standard determinative graphs(Bristol,1967)and the intensity ratio($I_{i(hkl)}/I_{Cu(111)}$),the composition of the rock samples are obtained.

Result

The modal mineralogical compositionof the rock samples are given in Table 1 and 2. The samples are represented a dominantly quartz zone (quartz-sericite-albite+carnonate+chlorite).From Fig.1, it is clear that quartz,albite,muscovite are more abundant in this samples,and sulphide (pyrite & pyrrhotite) ,magnetite,hematite,talc and calcite are widespread minor phases.Sulphide may be increase with increasing albite which seem to be restricted to practicular places?(cf.S.2).
Sulphide minerals are representing by pyrite ,pyrrhotite with minor amount of chalcopyrite.

Analyst:H.Z.Harraz

Table 1:Results, of X-ray diffraction quantitative analysis

Wt %	S.1	S.2	S.3	S.4	Average
quartz	33.00	26.00	28.00	26.00	28.25
muscovite	31.00	25.00	15.00	17.00	22.00
plagioclase (Albite)	12.00	31.00	16.00	20.00	19.75
pyrite	3.00	3.80	2.50	2.70	3.00
pyrrhotite	1.00	2.00	1.00	2.00	1.50
siderite	–	1.00	–	–	0.20
calcite	4.00	4.25	10.00	13.50	7.94
kaolinite	3.00	2.65	4.00	2.90	3.14
chlorite	8.00	2.80	17.70	7.00	8.88
epidote	0.50	1.50	–	–	0.50
magnetite	2.50	–	–	1.00	0.88
hematite	–	–	2.00	1.00	0.75
talc	3.50	2.00	4.40	–	2.48
chalcopyrite	–	0.50	0.60	0.50	0.40
malachite	–	0.20	–	0.90	0.23

Table 2:Results of X-ray diffraction quantitative analysis (the figures represent percentages).

+++ = 30% + = 5 -10% TR = 1%

++ = 30 - 10% ACC = 1 - 5%

	S.1	S.2	S.3	S.4	Average
quartz	+++	++	++	++	++
muscovite	+++	++	++	++	++
plagioclase	++	+++	++	++	++
pyrite	ACC	ACC	ACC	ACC	ACC
pyrrhotite	ACC	ACC	TR	ACC	ACC
siderite		TR			TR
calcite	ACC	ACC	+	++	+
kaolinite	ACC	ACC	ACC	ACC	ACC
chlorite	+	ACC	++	+	+
epidote	TR	ACC			TR
magnetite	ACC			ACC	TR
hematite			ACC	TR	TR
Talc	ACC		ACC		ACC
chalcopyrit			TR	TR	TR
malachite				TR	TR

Fig.1:Modal mineralogy,based on X-ray diffraction analysis.