Gold exploration on the 'Nanortalik peninsula', South Greenland

Peter W.U. Appel, Mogens Lind
and Jens P. Nielsen

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Ujarassiortut Kalaallit Nunaanni Misissuisoqarfiat
GEOLOGICAL SURVEY OF GREENLAND

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CONTENTS

ABSTRACT 5
INTRODUCTION 6
PREVIOUS WORK 7
REGIONAL GEOLOGY 8
Supracrustal rocks 10
1. Pelitic rocks 10
2. Arkosic rocks 11
3. Volcanic rocks 11
Granites 11
Ultramafic intrusive rocks 12
Metamorphism and deformation 12
MINERAL OCCURRENCES 12
Sulphides 13
REGIONAL GOLD EXPLORATION 13
Stream sediment sampling 14
Heavy mineral concentrates 14
Grab sampling 16
DETAILED GOLD EXPLORATION 17
1. Placer evaluation 17
Lower 'Kirkespirdalen' and Kangikitsoq 18
Upper 'Kirkespirdalen' 21
Iptit kûat 22
Thomsen Havn 22
Discussion 23
2. Chip sampling 24
3. Top talus sampling 25
CONCLUSIONS 27
ACKNOWLEDGEMENTS 28
REFERENCES 28
APPENDIX A. Analytical methods and detection limits 33

List of Tables

Table 1. Heavy mineral concentrates collected by A/S Carl Nielsen 1986-88 35
Table 2. Rock samples collected by Platinova Resources Ltd and Boulder Group 36
Table 3. Grab samples collected by A/S Carl Nielsen 1987-88 37
Table 4. Lower 'Kirkespirdalen' bulk sample data 38
Table 5. Kangikitsoq bulk sample data 41
Table 6. Upper 'Kirkespirdalen' bulk sample data 43
Table 7. Chip sampling across a shear zone 44
Table 8. Chip sampling across a rusty meta-sediment 44
Table 9. Top talus sampling. Gold and scheelite contents in the different fractions 45
Table 10. Top talus sampling. Trace element contents in the different fractions 46

List of figures

Fig. 1. Main geological units in South Greenland 47
Fig. 2. Geological map of the Ketilidian orogen 47
Fig. 3. Toponymic map with location of detailed maps 48
Fig. 4. Geological map of the 'Nanortalik peninsula' and island Amitsoq 49
Fig. 5. Gold contents in stream sediment samples collected by GGU . . 50
Fig. 6. Grains of gold in heavy mineral concentrates from stream sediment samples collected by A/S Carl Nielsen 1986-1988 51
Fig. 7. Gold contents in rock samples. Platinova Resources Ltd & A/S Carl Nielsen 52
Fig. 8. Gold contents in heavy mineral concentrates. Nunaoil A/S 53
Fig. 9. Arsenic contents in heavy mineral concentrates. Nunaoil A/S 54
Fig. 10. Tungsten contents in heavy mineral concentrates. Nunaoil A/S 55

Fig. 11. Bulk sample sites Lower 'Kirkespirdalen' (A) and Kangikitsoq (B) 56
Fig. 12. Flow sheet of reduction methods used by Greenex A/S - Nanortalik Minerals A/S 57
Fig. 13. Denver gold saver flow sheet 57
Fig. 14. Lower 'Kirkespirdalen'. Distribution of gold in the 5-0.2 mm and the minus 0.2 mm fractions 58
Fig. 15. Depth to bedrock, Lower 'Kirkespirdalen' 59
Fig. 16. Depth to bedrock, Kangikitsoq 59
Fig. 17. Upper 'Kirkespirdalen'. Grid and locality map 60
Fig. 18. Sample sites, Ipatit Kûat 61
Fig. 19. Heavy mineral sample sites, 'Kirkespirdalen' 62
Fig. 20. Chip sample sites, 'Kirkespirdalen' 63
Fig. 21. Rock sample sites around Lake 410 64
Fig. 22. Top talus sampling programme, Qaersutsiaup Qaqa 65
Fig. 23. Gold distribution in top talus samples 65
Fig. 24. Scheelite distribution in top talus samples 66
Fig. 25. Arsenic distribution in top talus samples 66

ABSTRACT

Stream sediments collected on the 'Nanortalik peninsula' show gold anomalies. Heavy mineral concentrates collected in some of the major streams frequently yielded visible gold. A bulk sampling programme, however, showed that the possibilities of placer gold deposits are remote. Follow-up stream sediment sampling combined with sampling of soil on the top of talus fans outlined areas with gold mineralisation. Recently visible gold has been found in quartz veins. The largest gold-bearing quartz vein is 800 m long. It locally contain up to 235.3 ppm gold over a width of 1 m and an average grade of 51.45 ppm over 46 cm.

There seems to be a positive correlation between scheelite and gold, a feature which might facilitate further exploration for gold in the area.

INTRODUCTION

The purpose of this report is to summarize all released information on gold-exploration on the 'Nanortalik peninsula' of South Greenland. The report briefly describes the regional geochemical sampling as well as local follow up programmes including heavy mineral sampling, sampling of screes and limited chip sampling. Furthermore a detailed description of an evaluation programme on placer prospects is presented.

This report includes data extracted from various company reports, all of which, except Nunaoil A/S reports are available for inspection at the Geological Survey of Greenland (GGU) in Copenhagen. Copies of released company reports can be ordered from GGU by paying copying costs. Microfiche of the reports are currenctly being made. Included in this report are geochemical data from the gold exploration carried out by Nunaoil A/S in 1990 on the 'Nanortalik peninsula'. These data are still confidential; hence the primary data are not available for inspection.

The study area of this report is situated between the fjords Søndre Sermilik, Sarqâ and Tasermiut (Fig. 1, 2 & 3). It is a mountainous region of alpine character with the highest peaks reaching close to 2000 m. Near vertical slopes are prevailing. The rough topography also means that water is usually only available from large streams in the valley bottoms; only few lakes exist. The district has a relatively mild climate (July temperature average 10°C and January average -5°C) with 2000 to 3000 mm precipitation a year. This gives a dense vegetation in some of the valleys. Due to the mild climate no permafrost exists. The fjords are navigable all year round, although some problems with pack ice may occur during May and June. In a number of the valleys ruins from the Norse settlements are found.

Access to the 'Nanortalik peninsula' is by scheduled airline flights from Copenhagen to Narssarssuaq and then by helicopter. From Nanortalik the area can easily be reached by locally hired motorboats or larger vessels. Nanortalik, meaning the place where the polar bears (Nanok) go ashore, is the southernmost town on the west coast of Greenland, with approx. 1200 inhabitants.

PREVIOUS WORK

Systematic mapping by GGU in South Greenland started in the early 1950s. Geologic maps at 1:100 000 scale have been published for most of the western part released in 1975. The first modern regional description of the Ketilidian belt was made by Allaart (1976), while a recent overview is that by Kalsbeek *et al.* (1990).

A regional uranium exploration project was carried out in 1979-80 in South Greenland including an airborne radiometric survey followed by stream sediment sampling and other types of geochemical sampling. This resulted in publication of 25 coloured geochemical and radiometric maps at a scale of 1:100 000 (Armour-Brown *et al.*, 1982). Landsat satellite images were used in a remote sensing study of the area (Conradsen *et al.*, 1984).

In the early 1960's boulders of a sulphide mineralized peridotite were found by M. Loretan, GGU (Berrangé, 1970). Later Schønwandt (1971, 1972) found sulphide mineralized peridotites. In 1973 the Greenland Mineral Exploration Syndicate (GEMCO) breifly visited and grab sampled the peridotite bodies (Fig. 4) (Karup-Møller, 1974). From 1986 to 1988 Boulder Gold N. L. and Platinova Resources Ltd carried out detailed work on the peridotite intrusions (Turner *et al.*, 1989).

In May 1986 Nanortalik municipality obtained an exploration concession for the Nanortalik area and the company A/S Carl Nielsen (CN) (later Mineral Development International, MDI) was employed as geological consultant.

As a result of promising discoveries of placer potentials in 'Kirkespirdalen' (Fig. 3) the company Nanortalik Minerals A/S was formed and established a joint venture with Greenex A/S (GX-NAN) in order to evaluate the placer potential in the deltas in 'Kirkespirdalen' and Kangikitsoq (Christensen, 1989).

During this project geochemical sampling and mapping was carried out by one of the present authors (J.P.N.) in order to locate the source areas for the gold (Nielsen, 1990).

In 1990 and 1991 Nunaoil A/S carryed out stream sediment sampling and rock sampling. These data are not yet released, but Nunaoil A/S, which has a concession covering part of the 'Nanortalik peninsula', has kindly agreed to release some of their gold exploration data obtained for use in this Open File (Grahl-Madsen & Petersen, 1990; Olsen & Pedersen, 1990).

During field work in 1992 Nunaoil A/S discovered *in situ* gold in 'Kirkespirdalen' (Mining Journal, 1992; GGU, 1993). The discovery is described as gold bearing quartz veins in a package of mafic supracrustal rocks. The largest vein is some 800 m long with a moderate dip and thickness up to 1.66 m. The vein is boudinaged. Channel sampling with 20 metres intervals revealed gold values up to 235.3 ppm over 1 m. The average along the 800 m long quartz vein 51.45 ppm gold over 46 cm. Gold contents down to 2 ppm over widths of 40 cm have been encountered. The gold furthermore occurs in horizons parallel to the veins and is also found disseminated. The veins carry trace of chalcopyrite, arsenopyrite and scheelite.

REGIONAL GEOLOGY

The 'Nanortalik peninsula' is situated within the Ketilidian mobile belt which is divided into 4 zones by Allaart (1976) as shown in Fig. 1. It has been suggested that the mobile belt is a accretion of Proterozoic crust onto an Archaean craton (Kalsbeek *et al.*, 1990).

In the north is the "Northern border zone" in which virtually unmetamorphosed Ketilidian supracrustal rocks rest unconformably on Archaean gneisses. The Archaean gneisses yield Pb-Pb ages between 2800 and 3000 Ma (Kalsbeek & Taylor, 1985).

The central part or "Granite zone" is 90% dominated by Julianehåb granite, that has been divided into "early granites" and "late granites". Early granites have been dated to 1850 Ma and the late granites to 1750 Ma (Kalsbeek & Taylor, 1985). In the granite zone rocks of Gardar age (mid-Proterozoic) are also found. These are dominated by sediments and alkaline to peralkaline intrusions of which Ilímaussaq and Motzfeldt complexes are the best known.

Further to the south is the "Folded migmatite Zone" dominated by supracrustal rocks (Fig. 1). These rocks are thought to be younger than 2200 m.y (Allaart, 1976), but their precise age is not known. Granites intruding the supracrustal rocks have revealed Rb-Sr ages around 1750 Ma (Kalsbeek & Taylor, 1985). Metamorphic grade is amphibolite to granulite facies and the rocks are often strongly migmatised. Most of the rocks described in this report have been metamorphosed and should thus have the prefix meta-, but for simplicity the meta- will be omitted from the text.

The southern part of the Ketilidian mobile belt the "Flat-lying high-grade migmatite complex". Of the 4 zones, this is the least well known. It is dominated by migmatitic gneisses and large mushroom-shaped rapakivi granite intrusions dated between 1774-1786 Ma.

Windley (1991) (Fig. 2) has presented a structural interpretation of the Ketilidian orogeny, interpreting the four zones as follows: The northern zone is a shelf-foredeep which has been thrusted north onto the Archaean foreland. The zone is bordered towards south by a suture zone. The granite zone is suggested to be an Andean-type batholith intruded into an island arc of volcanics, gneissose plutons and noritic gabbros. The zone is bordered towards south by a Back-Arc shear belt. The southernmost part of the area is composed of flat-lying thrust stacks of metamorphosed supracrustals and paragneisses intruded by major rapakivi bodies.

Supracrustal rocks

The supracrustal rocks comprise the following types (Fig. 4):

1. Pelitic rocks
2. Arkosic rocks
3. Volcanic rocks

No major unconformities have been found but conglomerates have been observed in the volcanic rocks and in the arkosic quartzites. According to Escher (1966) and Kalsbeek *et al.* (1990) two generations of volcanic rocks are exposed; one between the pelitic and the arkosic rocks and one above the arkosic rocks. However, one of us (J.P.N.) was not able to distinguish these two series during fieldwork, and in this report they will be treated as one.

1. Pelitic rocks

The pelitic part of the supracrustal succession is composed of three units. At the base is a 550 m thick succession grading from pelitic gneisses (bottom) to pelitic gneissic schists (top), in the upper part amphibolitic horizons up to 8 metres thick occur. Occurrences of sillimanite, cordierite and garnet are common in this unit.

The second unit, 500 metres thick, grades upwards from a black biotite schist to a monotonous sequence of dark grey mica schists. Locally the black schist contains pyritic and graphitic zones each about 3 metres thick.

The third unit is a 450 metres thick dark brown mica schist containing pyritic and graphitic layers. The upper part of this unit is characterised by garnets.

2. Arkosic rocks

On top of, and in direct contact with the pelitic sequence, is an arkosic quartzite unit. This has a variable thickness ranging from 150 to 200 m in the south-west, to more than 1500 metres in the north-east (Allaart, 1976). Many basic sills ranging in thickness from 0.5 to 4 metres occur in the top of the unit. The major minerals are quartz and feldspar with some (10%) biotite. Magnetite, ilmenite, hematite and rutile contribute 3 to 8% of the rocks. Migmatization is distinct.

3. Volcanic rocks

The top of the supracrustal pile is a basic volcanic succession of pillow-lavas, lapilli tuffs and tuffites with sedimentary horizons (mostly quartzites and conglomerates). The observed thickness of the succession is at least 700 metres.

Up to 1 metre thick layers of massive sulphides (pyrite and pyrrhotite), locally with high amounts of graphite have been found. The volcanic rocks are composed of amphibole, pyroxene, biotite, quartz and plagioclase often together with 2-15% disseminated ore minerals (pyrite, pyrrhotite, minor chalcopyrite and arsenopyrite). The volcanic rocks are often intensely seritisized and epidote staining is common.

Granites

The early granites of the Nanortalik area have been dated by Pb-Pb to 1850 Ma (Kalsbeek & Taylor, 1985). The youngest granite is a rapakivi granite, with an age of 1744-1755 Ma (Gulson & Krogh, 1975).

Ultramafic intrusive rocks

Four ultramafic hornblende peridotite intrusions are known from the 'Nanortalik peninsula' and Amitsoq (Fig. 4). The petrology of the Amitsoq intrusion on Amitsoq and Sarqa intrusion on the mainland east of Amitsoq is described by Berrangé (1970).

Grab samples from ultramafic intrusions collected by Platinova Resources Ltd and Boulder Gold N. L. in 1987 showed platinum contents up to 280 ppb and palladium concentrations up to 330 ppb. However, a drilling programme conducted in 1988 yielded maximum values of 10 ppb platinum and 4 ppb palladium (Turner *et al.* 1989).

Metamorphism and deformation

The south-western part of the 'Nanortalik peninsula' was metamorphosed in amphibolite facies, whereas the central and north-western part mainly was metamorphosed under greenschist facies conditions (Escher, 1966). Retrogression has been suggested by Dawes (1970).

At least three major episodes of folding have been recognized in the Nanortalik area (Escher 1966). During the first two phases the rocks were more plastic than during the last phase. Migmatization started during the first phase and culminated during the second.

MINERAL OCCURRENCES

Graphite is widespread on the 'Nanortalik peninsula'. It is found as disseminated flakes in many of the sediments, locally as zones of almost pure graphite (Nielsen, 1987, 1989). An abandoned graphite mine on Amitsoq island produced 6000 tons of ore from 1914 to 1922. The graphite is found as lenses in sheared granitic gneiss containing 20-24% graphite (Ball, 1922). The graphite from the 'Nanortalik peninsula' has recently been reevaluated by CN (Nielsen, 1987, 1988a, b). A detailed account on the graphite potential has recently been presented by Bondam (1992).

Sulphides

Three different types of sulphide mineralization in supracrustal rocks have been recognised by GEMCO (Karup-Møller, 1974).

Type A: Sulphide zones in pelitic to semi-pelitic schists (pyrrhotite, pyrite and rare chalcopyrite). The sulphide zones contain from 2% disseminated to almost massive sulphides.

Type B: Quartzite containing up to 15% pyrrhotite and rare chalcopyrite or conglomerate horizons with small amounts of chalcopyrite and bornite.

Type C: Sparse sulphides disseminated in the volcanic rocks. One boulder from 'Kirkespirdalen' was found to contain 8% pyrrhotite, 5% chalcopyrite and accessory sphalerite.

A copper-bearing zone was observed by Platinova Resources Ltd (Turner *et al.*, 1989) below a rust zone at the Sarqa intrusion. Investigations by Nielsen (1990) in the volcanic units on Qaersutsiaup qáqâ (Fig. 3) revealed zones with up to 5% arsenopyrite/löllingite and minor copper sulphides. Horizons of pyrrhotite and pyrite as massive sulphide benches (up to 0.7 m thick) were found around Lake 410 (Fig. 21). Selected samples have been analysed yielding As contents up to 9417 ppm, gold contents up to 88 ppb and copper contents up to 585 ppm.

REGIONAL GOLD EXPLORATION

The gold exploration has been carried out by stream sediment sampling, by collecting heavy mineral concentrates and by grab sampling.

Stream sediment sampling

In 1979-80 GGU carried out a regional geochemical stream sediment sampling programme in South Greenland (Armour-Brown *et al.*, 1982). 238 samples from the Nanortalik area were later selected for re-analysis. These samples were analysed for gold at X-ray Assay Laboratories, Canada with fire assay and direct current plasma emission spectrometry (DCP) (Steenfelt, 1987). In 1989 the remainder of the samples from the 1979-80 sampling (down to 1 g aliquots) were analysed for gold and 33 other trace elements (Steenfelt, 1990). All these analytical results are shown in Fig. 5 indicating that most of the 'Nanortalik peninsula' is anomalous in gold if a general background gold concentration is considered to be 5-10 ppb (Steenfelt, 1987).

Heavy mineral concentrates

A/S Carl Nielsen collected 57 samples of heavy mineral concentrates (HMC) during 1986-88 (Fig. 6). At each sample site, a volume between 3 and 15 litres of unsieved river or bank sand/gravel was collected and panned. The heavy mineral concentrates were examined visually in the field with a microscope and the number of gold grains counted. None of the samples from 1986 (Table 1) were analysed, but gold grains were found in samples from 'Kirkespirdalen' and close to Thomsen Havn.

Five samples of heavy mineral concentrates from 1987 (Table 1) were analysed by fire assay for Au and Pt and with ICP for several other trace elements (Appendix A). Four of the analysed samples from 'Kirkespirdalen' yielded gold concentrations up to 3000 ppb with 3 samples containing more than 1500 ppb Au. The last sample holding gold was from Tasiussârssuk and held 20 ppb Au. The samples collected in 1987 showed good correlation between, samples with many counted gold grains and, samples with high assay values.

Six samples from 1988 (Table 1) were sent to Becquerel Lab. Inc., Canada and analysed by neutron activation for Au and other trace elements (Appendix

A). Two samples from Ipatit kûat gave 190 ppb and 267 ppb Au; samples from Itivdlerssuaq only gave <3 ppb, 3 ppb and 9 ppb. The results are plotted in Fig. 6.

HMC were collected in Ipatit kûat in 1989 by A/S Carl Nielsen in an attempt to locate Au source areas for the gold placer prospect. Panning of 1-10 litres of sediment from first and second order streams on the southern slope of the valley, and visual registration of the number of gold grains led to a little valley on the south side of Ipatit kûat. Gold was observed in 2 out of 8 HMC samples from this valley. (Nielsen, 1989; Kalvig & Nielsen, 1990). The major rocks in this area are volcanic and like those observed in 'Kirkespirdalen' they are rust stained. Pyrite, arsenopyrite and chalcopyrite are the dominating ore minerals and carbonate veining is also seen. A 100 m thick shear zone dipping shallowly to the south is observed cutting the volcanic rocks in the steep cliffs. No chemical analysis of HMC samples or rock-samples from this valley have been made.

Reconnaissance pan sampling from a small river on the north slope of Tusardluarnâq in the south-west part of the 'Nanortalik peninsula' by GX-NAN (Lind, 1988) revealed an anomalous sample with 222 ppb gold (sample C2357 on Fig. 3). The river drains through a rust-wheathered sheared graphite-bearing schist with up to 5% vol. graphite and minor disseminated pyrite.

Nunaoil A/S collected HMC from 214 stream sediment samples in the 'Nanortalik peninsula'. This area is about 360 km^2 large, yielding a sampling density of about 1 sample for each 2 km^2 (Olsen & Pedersen, 1990). The HMC were analysed for gold plus 33 other trace elements. The maximum content of gold is 1070 ppb (Fig. 8). The arsenic and tungsten distributions in the heavy mineral concentrates are plotted in Figs 9-10 (Olsen & Pedersen, 1990). The histogrammes in Figs 9-10 show the total number of samples collected within the area to be 480. The analytical results on the samples collected outside the 'Nanortalik peninsula' will not be considered in this report.

The gold distribution in the Nunaoil A/S samples (Fig. 8) shows that the Ipatit kûat area is highly anomalous. Gold occurs not only south of the Ipatit kûat valley, but also the area north of the valley. There is some correlation between high gold and arsenic contents in the stream sediments from the area south of the Ipatit kûat valley, whereas little correlation is evident for the area north of the valley (Figs 8 & 9).

Tungsten distribution (Fig. 10) shows a fair correlation with gold contents in the area north of Ipatit kûat, but no correlation is seen in the area south of the valley.

Grab sampling

During the gold exploration in 1987-88 A/S Carl Nielsen collected 14 grab samples (Fig. 7) in an attempt to identify which rock types carried the gold mineralization. Four of the grab samples contained gold above detection limit (Table 3). Two samples one quartzitic and one volcanic from 'Kirkespirdalen' contained 30 ppb Au, one quartzitic and one volcanic. A sandstone from Ipatit kûat held 400 ppb and a sandstone from Itivdlerssuaq contained 24 ppb Au; both the later samples carried sulphides.

In 1988 Platinova Resources Ltd and Boulder Gold N. L. collected 38 rock samples on the 'Nanortalik peninsula'. All samples were analysed at X-Ray Assay Laboratories Ltd, Canada by fire assay and DCP for Au and other trace elements (Appendix A). 31 of the samples contained gold above the detection limit with 130 ppb as maximum. Location of samples and their gold concentrations are given in Fig. 7. Generally the rock samples with the highest gold concentrations carried coarse pyrite (sample descriptions in Turner *et al.*, 1989). The highest gold content was in a sample from the west slope of Qaersutsiaup qáqâ; results are given in Table 2.

In 1990 Nunaoil A/S conducted a regional exploration programme in South Greenland (Grahl-Madsen & Petersen, 1990). In the area north of Ipatit Kûat an abundance of quartz-ankerite veinlets often associated with ankerite alteration was found. Between amphibolites and mica schists pyrrhotite-rich zones were found and some of these carried small amounts of chalcopyrite. One sample with massive sulphides yielded 115 ppb gold, 120 ppm arsenic, 1100 ppm zinc and 642 ppm copper. A fine-grained carbonate altered amphibolite contained 57 ppb gold (Grahl-Madsen & Petersen, 1990).

DETAILED GOLD EXPLORATION

Three types of gold exploration have been carried out on the 'Nanortalik peninsula' by GX-NAN and by MDI/CN:

1) Placer evaluation. Bulk sampling of 4 gold placer prospects together with panning of stream sediments in 1'st order streams to locate source areas for the gold.

2) Chip sampling. Favourable zones were chipped and representative rock samples were collected.

3) Top talus sampling. A sampling programme of the upper part of the screes was conducted in order to outline mineralized zones.

1. Placer evaluation

The three large U-shaped valleys Ipatit kûat, Kangikitsoq and 'Kirkespirdalen' all have low gradient floors covered by unconsolidated material. This is made up of glacial deposits and river gravels, the latter forming extensive alluvial plains in the central part of the valleys. The occurrence of visible gold and enhanced analytical gold values in heavy mineral concentrates from the main rivers made these valleys obvious exploration targets for placer gold. The index map (Fig. 3) shows the positions of maps of the investigated areas. It will be noted that 'Kirkespirdalen' holds two prospects - one adjacent to the fjord, the other upstream of a waterfall occurring approximately 5.5 km from the fjord.

Lower 'Kirkespirdalen' and Kangikitsoq

These prospects were investigated in 1988 by GX-NAN (Christensen, 1989). In both valleys bulk sampling was done on 50 m intervals in sample lines across the alluvial plains with the lines at 400 m intervals (Fig. 11). Starting at the high water mark six lines were set out in each valley, thus providing sample coverage of 2 km up each valley. In addition to the valley fill large delta deposits occur at the mouth of the rivers. Due to strong tidal action up to several hundred m wide tidal flats are developed. At both deltas a further line was sampled at low tide conditions approx. 200 m from the high water mark.

A backhoe was used for excavating sample pits. Sample depths of 4 m could be obtained with the equipment used, but a number of pits bottomed at 2.0-3.5 m due to presence of large boulders (+0.2 m^3) or collapse of the pit caused by high ground water table. The sample reduction procedure is illustrated by the flow sheet in Fig. 12. The backhoe loaded sample material onto a grizzly allowing material less than 10 cm to settle in a 0.6 m^3 bin. Fine-grained material attached to the plus 10 cm boulders was washed off and combined with the minus 10 cm fraction. When the bin was filled the depth of the pit was measured. To get a volume estimate of the plus 10 cm fraction the boulders were visually classified into volume groups and counted. This procedure was repeated until the final depth was reached. The pit is thus represented by a number of subsamples (typically 2-4) each characterizing a depth interval. Sample depths and volumes are included in Table 4 (Lower 'Kirkespirdalen') and Table 5 (Kangikitsoq). In summary the sampling comprised:

	Pits	Tot. sample volume (m^3)	Tot. volume -10 cm (m^3)	Sum interval lengths (m)
Lower 'Kirkespirdalen'	50	101.6	74.6	131.2
Kangikitsoq	49	47.8	36.4	114.8

Preconcentrates of the minus 10 cm material were obtained using a Denver Gold Saver - a portable gravity separation device (Fig. 13). Sample material is wet screened in a revolving scrubber and trommel screen with 5 mm openings. Screen oversize material is discarded through a chute. The water suspended undersize fraction is fed to a vibrating riffle table. Heavy particles are entraped by the riffles while light particles enter the tailings overflow. Frequent panning of tailings served as process control, ensuring that coarse gold was not lost. At Caleb Brett International Ltd, UK the Gold Saver concentrates were sieved using a 0.2 mm aperture before heavy liquid separation of the 5-0.2 mm and the minus 0.2 mm fractions. Total gold was determined in both heavy fractions by fire assay. Analytical results are given in Tables 4 & 5. Grade is calculated as g Au/m^3. GX-NAN further calculated grade of pit as an average grade of the pit subsamples weighted according to sample interval lengths.

Analytical results from Kangikitsoq are very low with one sample grading 3 mg Au/m^3, while the remaining samples contains 1 mg Au/m^3 or less.

In contrast the 'Kirkespirdalen' data set demonstrates elevated amounts of gold. Summary statistics are as follows:

	Subsamples		Pits	
Number	131		50	
Min.	0.1	mg Au/m^3	0.1	mg Au/m^3
Max.	32.0	mg Au/m^3	17.3	mg Au/m^3
Average	6.5	mg Au/m^3	6.6	mg Au/m^3
Median	5.0	mg Au/m^3	4.9	mg Au/m^3

To indicate distribution of gold grades within the sampled area the weighted average grade for each of the sampled lines is calculated:

Line	-200	1.8	mg Au/m^3
Line	0	3.7	mg Au/m^3
Line	400	6.4	mg Au/m^3
Line	800	8.9	mg Au/m^3
Line	1200	12.7	mg Au/m^3
Line	1600	7.3	mg Au/m^3
Line	2000	8.8	mg Au/m^3

These numbers show, that the average gold content increases steadily from the fjord to line 1200 from where it decreases slightly to the last line 2 km from the shore. Subsample results (Table 4) does not indicate, that the higher gold values are confined to specific depth intervals in the pit profiles.

Field inspection of the Gold Saver concentrates from 'Kirkespirdalen' using a hand lens revealed that gold occurs as flakes. A range in grain size was observed, with the bulk of the flakes estimated to have a diameter less than 0.1-0.2 mm, but most concentrates did contain some flakes with diameters about 0.5 mm and on a few occasions 1-2 mm flakes were found. From the analytical data given in Christensen (1989) distribution of gold between the 5-0.2 mm and the minus 0.2 mm fractions is illustrated by calculating the average weight of gold in the two fractions for each of the sample lines. The result is presented in Fig. 14, where it can be seen that in the proximal part of the plain from line 2000 to line 800 the plus 0.2 mm fraction is the main carrier of gold. From line 800 to line 400 gold content drops sharply in the coarse fraction and then shows a more gentle decrease to the tidal flat. Gold in the minus 0.2 mm fraction increases gradually from line 2000 to line 400, where it takes over as the main contributor of gold and then decreases rapidly to the tidal flat. The more rugged appearance of the plus 0.2 mm curve probably reflect the greater sensibility to nugget effect of this fraction.

To estimate the depth to bedrock a seismic refraction survey was carried out in both sampled areas (Williams, 1988). Six profiles were surveyed in Lower 'Kirkespirdalen' (Fig. 15) and five in Kangikitsoq (Fig. 16). The overburden thickness is of a similar order of magnitude reaching a maximum of 30 m in 'Kirkespirdalen' and 40 m in Kangikitsoq. A seismic reflection test survey delineated reflectors that might represent different lithological units within the superficial deposits.

With a surface area of approx. 725 000 m^2 and observed alluvial gravels to depths of at least 3.5-4 m the sampled part of the Lower 'Kirkespirdalen' prospect represents an estimated volume of 2½-3 million m^3. From the seismic profiles (Fig. 15) a total of nine million m^3 of unconsolidated material is estimated within the surveyed area. By extrapolating the morphology of line "0" to line -200, another two million m^3 may be included. Further volume contributions might be added from the sub sea level part of the delta.

Upper 'Kirkespirdalen'

This prospect was tested in 1990 by MDI (Kalvig, 1991). Alluvial deposits reach 2½ km upstream from the waterfall (5.5 km from the coast) with a width of 150-200 m. Based on morphological observations a sediment thickness up to 50 m was estimated. Seven hand dug pits were sampled on approx. 200 m intervals along a 1300 m sample line (Fig. 17.). The pits bottomed at the ground water table reaching depths of 0.6-1 m. Four of the pits were sampled at two depth intervals. Each sample consisted of 0.33 m^3 of placer material. An elaborate sample reduction procedure incorporated dry screening to minus 8 mm, splitting of the sample followed by wet sieving to minus 1 mm before preconcentrates were produced by panning. Some sample splits were processed on the Denver Gold Saver. Concentrate splits were magnet separated into a non-magnetic and two magnetic fractions. The concentrates were analyzed by Analabs-Caleb Brett, UK using AAS after pre-roast. Analytical results are presented in Table 6. Summary statistics are as follows:

Number of pits	7	
Min.	0.05	mg Au/m^3
Max.	1.36	mg Au/m^3
Average	0.50	mg Au/m^3

Subsample results indicate that the highest gold contents occur in the top layer of the sediment (Table 6). Results from the magnet separated samples show that gold is mainly confined to the non-magnetic fraction (Kalvig, 1991).

Ipatit kûat

The area was reconnaissance sampled by CN in 1989 (Kalvig & Nielsen, 1990). A total of 35 samples were obtained from four profiles in the outer part of the valley and one profile in the delta (Fig. 18). At each sample site 10 l of sand and gravel were collected from a 1 m deep pit. The material was sieved to minus 5 mm and panned. Gold was determined in the field by visual inspection of the concentrates using a microscope. No analytical programme was carried out. The findings were a disappointing four samples each containing one visible grain of gold. These samples were from the profiles 0, 2, 3 and 4 (Fig. 18).

Thomsen Havn

During technical assessment of a gravel deposit (estimated 1¼ million m^3 clay laminated sand and gravel) at Thomsen Havn (Figs 3 & 6) CN observed a few gold grains in pan samples from local rivers. The deposit is exposed in a 1¼ km wide and up to 25 m high escarpment at the coast (Nielsen, 1987). On a visit to the locality GX-NAN collected 3 10-15 l samples of down washed material at the bottom of the escarpment (samples C2352-C2354 in Fig. 3). The samples were wet sieved to minus 1 mm before panning. Concentrates were treated as described for the Lower 'Kirkespirdalen'. The following results were obtained - C2352: 0.15 mg Au/m^3, C2353: 1.58 mg Au/m^3, C2354: 1.28 mg Au/m^3. Approx. 75% of the assayed gold occurs in the minus 0.2 mm fraction (Lind, 1988).

Discussion

Of the investigated prospects only Lower 'Kirkespirdalen' possesses anomalous gold contents with observed grades up to 32 mg Au/m^3 and an indicated average grade of 7 mg Au/m^3 for the uppermost 2½-3 million m^3 of valley fill. In an order-of-magnitude estimate for a viable production Keighley (1988) considered grades of 300 mg Au/m^3 necessary for a dredge operation - or 500 mg Au/m^3 for a floating washing plant fed from the bank by an excavator. As the obtained grades fell too low by a factor of 10-50, GX-NAN accordingly ended the project (Christensen, 1989). For comparison it may be noted, that Richardson (1986) in his paper on gold placer evaluation (assuming a price of $300/troy oz of gold), estimates that large placer mines suitable for dredging with volumetric reserves of several tens of millions m^3 should have minimum grades on the order of 150-200 mg Au/m^3 for commercial operation. Smaller-scale production involving an excavator fed portable separation plant would need minimum grades of 400-500 mg Au/m^3.

A common characteristic of gold placers is a concentration of gold at the interface of alluvium and the basement (Cox & Singer, 1986; Richards, 1988). The sampling programme described here considered the top 25-30 % only of the valley fill without observing substratum for the river deposits (be it moraine or bedrock). Thus a possibility for higher grades at depths below 3-4 m cannot be excluded. Testing of this potential would involve a drilling stage using churn drill or other suitable placer sampling equipment.

A future sampling programme should also consider the recovery of very fine-grained gold, as the analytical results identified important contributions to total gold from the minus 0.2 mm fraction (Fig. 14). The Gold Saver operates on the wet shaking table technology, which according to Richards (1988) is regarded as effective for recovery of heavy minerals in the 2-0.06 mm size range. However reduced recovery rates may result from the natural hydrophobicity of fine gold flakes, allowing such particles to get flushed away with the light minerals. Application of equipment specially designed for processing of heavy minerals in the low micron range - such as centrifugal separators - may enhance recovery of fine-grained gold and control the hydrophobic flotation of fine gold flakes.

2. Chip sampling

In an attempt to locate the rock units hosting the gold mineralisations a chip sampling programme was carried out by GX-NAN in two areas: 'Kirkespirdalen' and Lake 410 area (Figs 20 & 21). In both areas the chip sampling was carried out along profile lines set out to traverse all the rock types in the supracrustal succession (Figs 20 & 21). 67 samples were collected from eight subareas in 'Kirkespirdalen' and 66 samples in the Lake 410 area. Each samples consists of approximately 2 kg chips representing 2 stratigraphic meters. One sample was collected for every 50-75 m with preference for rusty horizons as these were believed to host the gold mineralization.

All samples were analysed for major elements. 42 samples from 'Kirkespirdalen' and 58 samples from the Lake 410 area were also analysed by XRF at Caleb Brett International Ltd, UK for a number trace elements (Appendix A). From 'Kirkespirdalen' and Lake 410 area, 30 samples and 23 samples respectively were analysed for Au by fire assay at the same laboratory.

The analytical results from 'Kirkespirdalen' were very disappointing. Five samples carried gold above detection limit. These are 080 with 32 ppb Au; 176 with 16 ppb Au; 190 with 12 ppb Au; 192 with 88 ppb Au and 195 with 21 ppb Au (sample sites see Fig. 20). These samples are all from the volcanic unit. The same unit has yielded minor trace element anomalies with analytical values up to 758 ppm Cu, 336 ppm Zn, 326 ppm Ni and 114 ppm W (Christensen, 1989).

The location of samples from the area around Lake 410 are shown in Fig. 21. The analytical results were not encouraging with only three samples containing gold above detection limit. These are 335 with 20 ppb Au; 472 with 14 ppb Au and 479 with 27 ppb Au.

During the 1989 (CN) and 1990 (MDI) field seasons carried out detailed chip sampling on the Qaersutsiaup qáqâ (Fig. 22). In 1989 13 chip samples were collected across a large shear zone and analysed by Analabs - Caleb Brett, UK for Au with ICP after Nitric/Perchloric/HF acid attack (results in Table 7). The shear zone showed gold concentrations from 12 ppb to 62 ppb with most values around 20 ppb (Kalvig & Nielsen 1990).

Seven chip samples were taken across a rusty sedimentary horizon in the volcanics on the Qaersutsiaup qáqâ (Fig. 22). These samples were analysed with ICP by Analabs - Caleb Brett, UK. for Au and other trace elements (Appendix A). The seven samples showed Au concentrations from below detection limit to 0.03 ppm (Table 8). The content of As, Cu, Ni and Zn range around 100 to 350 ppm with small variation in the different units in the sediments (graphitic, schist and quartzite). Precise location of the MDI samples can be obtained from detailed maps in the company reports (Kalvig & Nielsen 1990).

3. Top talus sampling

The work carried out in 'Kirkespirdalen' mentioned above indicated that a volcanic unit on the Qaersutsiaup qáqâ could be the source of some of the gold. However, this unit is exposed in a near vertical cliff and thus inaccessible. It was therefore decided by MDI to carry out a programme in which the sediments on top of the active talus were sampled in order to determine their gold contents and in that way narrow down the search for the potential gold-bearing strata. For information on the method the reader may consult Hoffman (1977) and Maranzana (1972). The results have been described in Nielsen (1990).

The sampling on Qaersutsiaup qáqâ was carried out on the east slope of the mountain (Fig. 22). A 1100 m long profile along the limit between solid rock and talus (scree-fan) was divided into approximately 50 m intervals. At three to four sites within each 50 m interval a sample was collected and dry-sieved to -5 mm. One litre of sediment was collected from each 50 m interval. A total of 23 top talus samples were collected.

In the laboratory the samples were wet sieved into two fractions +1 mm and -1 mm. The fraction from 1 mm to 5 mm (called over size, OZ) consisting mainly of small rock chips, was dried, weighed, split, crushed and analysed for gold and other elements. The -1 mm fraction was panned to a heavy mineral concentrate (HMC) fraction and a light mineral fraction (LM). Both fractions were dried, weighed, the LM fraction split, crushed and analysed for gold and other elements. In the HMC fraction the number of scheelite grains were counted and the HMC fractions were analysed for gold.

Twenty three OZ samples were analysed for gold by ICP at Analabs - Caleb Brett International Ltd, UK and the results are shown in Table 6. Two samples contained <3 ppb gold, wheras all other samples in this coarse fraction contained gold with a peak value of 1.9857 ppm gold in one sample (Table 9 and Fig. 23).

Five samples of the light fraction of - 1 mm were analysed by ICP at Analabs - Caleb Brett International Ltd, UK Table 7. The results range from 0.008 to 0.26 ppm gold (Table 9 and Fig. 23). This is a remarkable result in so far as gold normally will be found in the heavy mineral fraction of such sediments. It shows, either that some of the gold is so fine grained that is does not follow the heavy minerals, or that gold is situated as tiny grains in light minerals.

Twenty-three HMC from top talus sediments were analysed for gold by atomic absorption at University of Copenhagen. The results corrected for weight are presented in Table 6 and Fig. 23. The correction means that the analytical result on the heavy mineral fraction is recalculated to the original total weight of the collected sample. The gold contents range from <50 ppb to 0.35 ppm.

In an evaluation of the data it sould be borne in mind that the total number of analysed light fractions is only five, compared to 23 samples of heavy mineral concentrates and OZ samples.

Figure 23 clearly demonstrates that gold is present not only in the HMC, but also in the light fraction, and sometimes even in larger amounts in the light fraction as compared with the HMC. Gold is not abundant in the OZ apart from one sample 516 with 1.99 ppm gold. It is also noticeable that the gold mineralisation, if stratabound, appear to occur south of sample 516. Future investigation should include a sampling programme of the steep cliff above sample sites 501, 511 and 516 (Nielsen, 1990).

The number of scheelite grains were counted in the top talus HMC samples. The results are presented in Table 9 and Fig. 24. It is interesting to note that the gold anomaly at sample 511 corresponds to an equivalent scheelite anomaly at 511. Likewise small scheelite anomalies are found corresponding to the gold anomalies at sites 501 and 516 (Nielsen, 1990).

The arsenic contents in the three fractions are shown in Fig. 25 and Table 10. There appears to be a small As anomaly corresponding to the gold anomaly at site 501, but no arsenic anomalies corresponding to the two other gold anomalies (Nielsen, 1990).

CONCLUSIONS

A good deal of work has been devoted to an evaluation of the placer potential in the 'Nanortalik peninsula'. So far the investigated prospects have proved to be far from economic. One area which has not been evaluated yet is the Tasiussarssuk area (Fig. 3), where river gravel deposits are found. Considering the negative outcome of the other placer evaluations, this should have a low priority.

However, the small but consistant amount of gold found in many of the streams in the 'Nanortalik peninsula' do, show that gold mineralisation must occur in the area. The regional distribution indicates that the gold most likely occurs in supracrustal rocks or in shear zones cutting these supracrustal rocks.

Of highest priority seems to be the Ipatit kûat area. All stream sediment investigations yield positive results, and both the southern and the northern side of the Ipatit kûat valley seems promising. The northern side probably should be given the highest priority as indicated by the stream sediment sampling carried out by Nunaoil A/S.

The 'Kirkespirdalen' area holds definitely a potential for *in situ* gold mineralisation as shown by the stream sediment and the top talus sampling programmes. The difficulty, however is the topography, which is steep. Mountaineers will be required in order to sample the steep slopes. A primary step could be to make a more detailed top talus sampling with 10 m sampling intervals. Another approach would be to do some night lamping with ultra-violet light. The top talus results show that there is a good correlation between gold and scheelite. Thus a night lamping programme might be able to focus in on the mineralised strata. The night lamping could also be done on loose boulders in the scree, in order to determine in which lithologies scheelite occurs.

The lake 410 and Tasuissarssuk areas yielded visible gold in many of the collected stream sediments while the chip sampling programme failed to locate anything significant. However, the investigations carried out so far, cannot be regarded as exhaustive and further detailed geologic mapping should be undertaken.

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Appendix A

Analytical methods and detection limits

Platinova Resources Ltd and Boulder Gold Group had 3 stream sediment samples and 38 rock samples analysed at X-Ray Assay Laboratories Ltd in Canada by fire assay and Direct Current Plasma emission spectrometry (DCP).

Fire assay and DCP			CDP		
Au	1	ppb	Co	1	ppm
Pd	2	ppb	Ni	1	ppm
Pt	10	ppb	Cu	0.5	ppm
			Zn	0.5	ppm
			Ag	0.5	ppm
			Pb	2	ppm

A/S Carl Nielsen had five HMC samples and six rock samples from 1987 analysed at Caleb Brett International Ltd, UK by fire assay for Au and Pt and with ICP.

Fire assay			ICP semi-quantitative scan								
gold	20	ppb	Al	0.01	%	Ti	0.01	%	K	0.01	%
Pt	20	ppb	Fe	0.01	%	Na	0.01	%			
			Zn	1	ppm	Ba	1	ppm	Cu	1	ppm
			Ag	5	ppm	Cr	2	ppm	Sn	25	ppm
			Cd	2	ppm	Mn	10	ppm	Li	1	ppm
			Se	20	ppm	Sb	10	ppm	Zr	2	ppm
			Pb	75	ppm	V	2	ppm	Sr	10	ppm
			P	30	ppm	W	20	ppm	As	20	ppm
			Ni	5	ppm	Be	1	ppm	Co	5	ppm
			Mo	10	ppm	Nb	10	ppm			

A/S Carl Nielsen had six HMC samples from 1988 analysed at Becquerel Lab. Inc. in Canada by neutron activation. Not all detection limits are reported.

Au	0.1	ppb	Sb	As	Ba	Br	Cd	Ce	Cs	Cr	Co
Ir	100	ppb	Eu	Hf	Fe	La	Lu	Mo	Ni	Rb	Sm
Se	10	ppm	Na	Sc	Ta	Te	Tb	Th	W	U	Yt
Sn	200	ppm	Zn	Zr							
Ag	5	ppm									

A/S Carl Nielsen had eight selected rock samples from 1988 analysed by Caleb Brett International Ltd, UK. Method is not reported.

Au	10	ppb	Cu	Pb
Ag	1	ppm	Co	Zn
Mo	5	ppm	Ni	

A/S Carl Nielsen had seven chip samples from the Qaersutsiaup Qâqâ 1989 analysed with ICP after Nitric/Perchloric/HF acid attack by Analabs-Caleb Brett, UK for the following elements.

Au	10	ppb	Ag	5	ppm	As	20	ppm	Bi	20	ppm	Cd	2	ppm
Co	5	ppm	Cr	2	ppm	Cu	1	ppm	Ga	10	ppm	Li	1	ppm
Mo	10	ppm	Ni	5	ppm	Pb	50	ppm	Sb	20	ppm	Se	20	ppm
Te	20	ppm	Tl	20	ppm	V	2	ppm	Zn	1	ppm	Hg	10	ppm
Fe	0.01	%	Mg	0.01	%	Na	0.01	%	K	0.01	%	Mn	0.01	%

MDI had 9 of their samples from the Upper "Kirkespirdalen" placer prospect analysed by Analabs-Caleb Brett, UK for gold (10 ppb) with AAS after pre roast, and 9 samples with XRF on powder tablets, for the following elements (detection limits not reported).

Cu	Pb	Zn	Ag	As	Sb	Ni
Co	Fe	Ba	S	Mo	W	Sn
V						

MDI had the rock chip samples collected in 1990 analysed for Au by AAS and a number of elements by XRF at Analabs-Caleb Brett, UK detection limits is not reported.

Cu	Pb	Zn	Ag	Sb	Ni	Co
Fe	Ba	S	Mo	W	Sn	

Greenex A/S - Nanortalik Minerals A/S had all HMC samples from the "Kirkespirdalen" and the Lake 410 area analysed by XRF at Caleb Breet International Ltd, UK for the following elements.

Ag	1 ppm	As	1 ppm	Ba	8 ppm	Bi	1 ppm	Cd	1 ppm
Co	2 ppm	Cu	1 ppm	Mo	1 ppm	Ni	2 ppm	Pb	2 ppm
Sb	1 ppm	Se	1 ppm	Te	2 ppm	Tl	1 ppm	U	1 ppm
W	2 ppm	Zn	3 ppm	Mn	0.01 %				

Greenex A/S - Nanortalik Minerals A/S had 42 rock chip samples from the "Kirkespirdalen" and 58 from the Lake 410 area analysed by XRF at Caleb Brett International Ltd, UK for the following elements.

SiO_2 Al_2O_3 TiO_2 Fe_2O_3 MgO CaO Na_2O K_2O MnO P_2O_5

Ag	1 ppm	As	1 ppm	Ba	8 ppm	Bi	1 ppm	Cd	1 ppm
Co	2 ppm	Cu	1 ppm	Mo	1 ppm	Ni	2 ppm	Pd	2 ppm
Sb	1 ppm	Se	1 ppm	Te	2 ppm	Tl	1 ppm	U	1 ppm
W	2 ppm	Zn	3 ppm	Mn	37 ppm	Ta	2 ppm		

Table 1. Heavy mineral concentrates collected by A/S Carl Nielsen 1986-88 (cf. Fig. 6).

Samp. Year	Samp. no.	Vol. l	Grain no.	HM wei. g	Au ppb	Comments
1986	2201	15	4	17.4	-	3-2.5-2-1½ mm
1986	2202	15	1	12.6	-	Lower that 2201
1986	2221	3	-	1.4	-	Zircon,garnet,epidote magnetite,rutile
1986	2222	6	-	8.4	-	Coast
1986	2223	5	1	6.7	-	30 meters inland
1986	2224	5	-	5.0	-	30 meters inland
1986	2225	5	-	7.5	-	45 meters inland
1986	2227	5	-	16.5	-	
1986	2228	5	-	5.4	-	
1986	2235	50	1	8.7	-	
1986	2236	5	1	0.4	-	
1986	2237	10	1	2.3	-	
1986	2238	10	-	3.4	-	
1986	2239	15	-	0.8	-	Pointbarre, distal
1986	2240	15	1	4.0	-	Pointbarre, proximal
1986	2251	5	-	0.2	-	Silvergray mineral
1986	2252	5	-	1.1	-	Two silvergray minerals, 5 scheelite
1986	2253	5	1	3.9	-	
1986	2254	5	-	0.8	-	
1986	2255	5	-	3.8	-	
1986	2256	5	-	1.4	-	Mostly fine material
1986	2267	15	-	7.8	-	Three silvergray minerals, sulphides
1986	2268	15	3	0.9	-	Three silvergray minerals, sulphides
1987	2306	6	1	-	-	
1987	2310	-	1	-	-	
1987	2311	-	-	-	-	
1987	2320	-	-	-	-	
1987	2335	10	-	-	-	
1987	2336	10	1	-	-	
1987	2337	4	2	-	-	
1987	2339	3	2	-	-	
1987	2340	-	-	-	-	
1987	2341	-	1	-	-	
1987	2342	6	2	-	-	170 meters ab.seal.
1987	2344	-	1	-	20	
1987	2380	4	-	-	-	Pointbarre, proximal
1987	2381	3	-	-	1510	Pointbarre
1987	2382	-	6	-	3000	Sediment from traps
1987	2383	-	-	-	-	Sand and gravel
1987	2384	3	-	-	<20	
1987	2385	3	-	-	-	
1987	2386	3	6	-	-	
1987	2387	3	5	-	-	
1987	2392	-	10	-	2230	
1987	2393	-	-	-	-	
1987	2394	-	-	-	-	
1988	2403	15	-	-	-	Other sample from same place 3 grains
1988	2404	10	-	-	-	Active stream
1988	2405	10	2	-	-	0.2 mm grains
1988	2406	10	3	230.0	267	Large heavy fract.
1988	2410	4	2	91.0	190	1 mm + 0.2 mm grains
1988	2456	15	-	-	-	Old GGU anomali
1988	2457	10	-	-	-	From delta
1988	2460	10	-	-	-	
1988	2462	10	-	83.0	3	
1988	2463	10	-	61.0	<1	Strong current
1988	2464	10	-	54.0	9	
1988	2470	15	-	101.0	1	From delta

Note. Grain no. = number of gold grains
HM = heavy minerals

Table 2. Rock samples collected by Platinova Resources Ltd and Boulder Group (cf. Fig. 7).

Sample	Au ppb	Co ppm	Ni ppm	Cu ppm	Zn ppm	Pd ppb	Ag ppm	Pt ppb	Pb ppm
23.7.2	2	86	470	560.	23.0	--	<0.5	--	4
23.7.3	12	41	180	270.	360.	--	0.5	--	<2
23.7.4	80	67	360	710.	90.0	--	1.0	--	<2
23.7.5	8	26	150	45.0	300.	--	<0.5	--	<2
23.7.6	3	69	330	370.	450.	--	1.5	--	
CB0723.1	<1	9	22	46.0	45.0	--	<0.5	--	<2
CB0723.2	<1	1	2	14.0	19.0	--	<0.5	--	<2
CB0723.3	8	59	74	280.	85.0	--	<0.5	--	<2
CB0723.4	<1	1	1	8.5	7.0	--	<0.5	--	4
24.7.7	6	16	54	86.0	52.0	--	<0.5	--	<2
24.7.8	130	14	33	95.0	27.0	--	<0.5	--	<2
24.7.9	19	69	430	360.	2200.	--	1.0	--	8
24.7.10	<2	32	190	240.	1100.	--	0.5	--	10
24.7.11	17	43	240	890.	1300.	--	0.5	--	16
24.7.12	7	53	160	640.	32.0	--	0.5	--	<2
24.7.13	<1	9	32	300.	11.0	--	1.0	--	<2
24.7.14	<2	31	220	410.	350.	--	1.0	--	14
CB0724.8	6	20	13	12000.	44.	--	3.0	--	<2
CB0724.11	15	54	110	800.	24.0	--	1.0	--	<2
CB0724.12	16	66	200	1000.	39.0	--	1.5	--	6
CB0724.13	12	33	97	320.	58.0	--	<0.5	--	<2
25.7.1	12	20	69	190.	130.	--	<0.5	--	4
25.7.2	7	27	150	250.	1200.	--	0.5	--	<2
25.7.3	13	20	76	160.	150.	--	<0.5	--	<2
25.7.4	40	1	2	12.0	4.5	--	<0.5	--	<2
25.7.7	4	17	48	190.	240.	--	<0.5	--	<2
25.7.8	6	5	8	17.0	3?.0	--	<0.5	--	<2
25.7.9	17	39	63	430.	110.	--	0.5	--	<2
25.7.10	3	2	1	5.5	9.0	--	<0.5	--	8
CB0727.1	4	18	38	330.	210.	--	1.5	--	8
27.7.2	2	2	3	45.0	56.0	--	0.5	--	6
27.7.4	1	29	37	83.0	27.0	--	0.5	--	<2

Table 3. Grab samples collected by A/S Carl Nielsen 1987-88 (cf. Fig. 7).

Sample	Rock-type	Mineralization	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Co ppm
1987-Kirkespirdalen								
2388	Amphibolite	Pyrite	<20	110	<75	46	66	35
2389	Quartzite	Pyrite	30	349	<75	53	131	18
2390c	Conglomerate	Pyrite	<20	672	<75	25	51	11
2390d	Conglomerate	Pyrite	<20	35	<75	24	28	<5
2391a	Metavolcanic		<20	75	<75	66	38	7
2391d	Metavolcanic		30	336	<75	138	64	30
1988-Ipatit kûat								
2408	Sandstone	Pyrite,chalco-	<10	78	10	268	65	15
2409	Metavolcanic	pyrite and	<10	89	12	240	37	11
2418	Sandstone	limonite	400	27	8	56	7	4
1988-Itivdlerssuaq								
2467	Sandstone	Sulphides	24	49	8	10	41	22
1988-Sermilik								
2415a	Schist	Pyrite,	<10	418	8	142	197	54
2415b	Schist	pyrrhotite	<10	117	24	692	128	23
2415c	Schist	and	<10	202	4	73	122	33
2416	Schist	chalcopyrite	<10	75	8	25	286	55

Table 4 Lower "Kirkespirdalen" bulk sample data

Coordinates W-E	N-S	No.	Depth m	Vol. -10cm m3	Number of boulders in volume classes 11	21	41	61	81	101	Vol. +10 l	Gold g	Grade g/m3	Grade of pit g/m3
-200	-100	2327	0.0-1.4	0.35	10	6	2		2		12	0.000188	0.0005	0.0005
-200	-50	2326	0.0-1.4	0.50	17	5	2					0.000463	0.001	0.001
-200	0	2325	0.0-1.0	0.40	13	7	4	1	1			0.000892	0.002	0.002
-200	50	2328	0.0-1.5	0.60	12	3	1					0.000546	0.001	0.001
-200	100	2329	0.0-1.5	0.60	4	2						0.000049	0.0001	0.0001
-200	200	2331	0.0-0.9	0.50	3		1					0.001139	0.002	0.002
-140	225	2469	0.0-0.8	0.25	45	47	10	1				0.001495	0.003	0.003
-130	250	2332	0.0-1.5	0.30	14	1						0.001109	0.004	0.004
-130	300	2334	0.0-1.8	0.30	17	7						0.000684	0.002	0.002
-130	350	2333	0.0-1.5	0.30	13	2						0.001024	0.003	0.003
-65	-100	2320	0.3-1.7	0.60	4	4						0.000137	0.0002	0.004
-65	-100	2321	1.7-3.0	0.60	31	14	9	7	3	2	20	0.006026	0.008	
-65	-100	2322	3.0-3.6	0.20	18	13	5	7	5			0.00087	0.003	
-40	-50	2323	0.0-2.0	0.60	28	11	5	2	1	2	20	0.001131	0.002	0.002
-40	-50	2324	2.0-2.5	0.60	49	21	11	2	1	1	75	0.002228	0.003	
0	0	2451	0.5-1.5	1.20	135	61	26	7	2	1	25	0.0016	0.001	0.007
0	0	2453	1.5-2.0	0.60	28	17	6	11		3	15	0.002285	0.003	
0	0	2454	2.0-3.0	0.60	40	22	11	6	1	3	50	0.011708	0.014	
0	0	2455	3.0-3.5	0.60	31	36	10	7	7	3		0.006178	0.007	
0	50	2456	0.5-1.5	0.60	62	31	18	2	3	2	30	0.003943	0.004	0.005
0	50	2457	1.5-2.3	0.60	50	37	14	3		2		0.005326	0.007	
0	50	2458	2.3-2.8	0.60	57	52	26	8	3	1	15	0.003642	0.004	
0	50	2459	2.8-3.4	0.60	68	31	11	4	3	1	35	0.004814	0.006	
0	100	2460	0.3-1.3	0.60	53	34	13	3	4	1	27	0.005672	0.007	0.004
0	100	2461	1.3-1.8	0.60	31	31	8	4	1	1		0.003225	0.004	
0	100	2462	1.8-2.3	0.60	49	38	12	1	3			0.00221	0.003	
0	100	2463	2.3-2.7	0.60	24	25	6	3	3	2		0.002102	0.003	
0	100	2464	2.7-3.3	0.60	57	23	15	3	3	1		0.001865	0.002	
0	160	2465	0.0-0.8	0.60	20	97	26	10	1	2	15	0.00175855	0.002	0.003
0	160	2466	0.8-1.6	0.60	33	40	11	3	2	1	30	0.001548	0.002	
0	160	2467	1.6-2.3	0.60	80	40	19	8	5	1	90	0.002507	0.002	
0	160	2468	2.3-3.2	0.60	55	63	23	8	2	1	15	0.006299	0.007	
0	190	2470	0.2-1.5	0.60	38	25	7	3	3	2	114	0.00122863	0.001	0.002
0	190	2471	1.5-2.2	0.60	50	18	4	3	1	1		0.001938	0.003	
0	190	2472	2.2-3.0	0.6	74	49	20	8	5	1	15	0.002118	0.002	
0	190	2473	3.0-3.4	0.60	74	49	20	8	5	1	15	0.001677	0.002	
0	190	2474	3.4-3.7	0.60	49	64	24	18	8	6	60	0.00079	0.001	
0	250	2475	0.2-1.0	0.60	31	20	14	3	3	3	30	0.00220902	0.003	0.004
0	250	2476	1.0-1.4	0.60	23	27	19	13	5	4	30	0.002718	0.003	
0	250	2477	1.4-2.0	0.60	47	55	22	9	5	2	45	0.002148	0.002	
0	250	2478	2.0-2.7	0.60	34	48	16	13	5	4	75	0.006412	0.006	
0	250	2479	2.7-3.1	0.60	34	25	20	13	5	3	30	0.003059	0.003	
110	300	2480	1.0-1.9	0.60	16	12	9	4	1		30	0.00256	0.003	0.004
110	300	2481	1.9-2.5	0.60	40	30	15	5	3	1	15	0.000719	0.001	
110	300	2482	2.5-3.1	0.60	44	49	24	13	5	3	30	0.01189	0.012	
110	300	2483	3.1-3.7	0.60	59	24	25	12	3	2	45	0.001458	0.002	
110	350	2484	0.3-1.5	0.60	35	9	1	1		1	30	0.000116	0.0002	0.0002
400	-200	2422	1.1-2.2	0.60	23	27	6		1	1	15	0.007355	0.010	0.011
400	-200	2423	2.2-2.7	0.60	21	17	5	4	2		20	0.009289	0.013	
400	-150	2419	0.6-2.3	0.60	69	31	15	9	7		27	0.004677	0.005	0.004
400	-150	2420	2.3-2.8	0.60	27	27	16	7	2	3	15	0.001904	0.002	
400	-150	2421	2.8-3.4	0.60	25	26	15	9	3	2		0.002758	0.003	
400	-95	2416	0.8-2.1	0.60	32	20	9	3	2	2	95	0.008487	0.010	0.014
400	-95	2417	2.1-3.0	0.60	9	15	3			1		0.013612	0.021	
400	-95	2418	3.0-3.3	0.60	38	30	14	4	2	2	51	0.006929	0.008	
450	75	2408	0.1-1.6	0.60	46	40	20	5	7			0.010095	0.011	0.008
450	75	2409	1.6-2.6	0.60	50	40	18	8	6	3	15	0.007743	0.008	
450	50	2410	2.6-3.6	0.60	66	61	39	24	9	5	90	0.001633	0.001	
400	100	2404	0.1-1.5	0.60	46	31	15	7	1		20	0.003796	0.005	0.009
400	100	2405	1.5-2.2	0.60	45	15	14	4	1	2	12	0.005471	0.007	

Table 4 Lower "Kirkespirdalen" bulk sample data

Coordinates		No.	Depth	Vol. -10 cm	Number of boulders in volume classes						Vol. +10 l	Gold	Grade	Grade of pit
W-E	N-S		m	m3	11	21	41	61	81	101		g	g/m3	g/m3
400	100	2406	2.2-3.1	0.60	28	23	8	4	2	3		0.014388	0.019	
400	100	2407	3.1-3.4	0.60	28	20	8	5	1	1	30	0.004732	0.006	
400	150	2401	1.3-1.9	0.60	26	22	10	4	2			0.005601	0.007	0.005
400	150	2402	1.9-2.7	0.60	36	30	8	3	3	1	45	0.004299	0.005	
400	150	2403	2.7-3.3	0.60	52	31	15	4			44	0.005989	0.007	
400	150	2500	0.2-1.3	0.60	47	21	5	1				0.002471	0.003	
400	200	2492	0.3-1.5	0.60	24	6	4	1		1		0.002846	0.004	0.004
400	200	2493	1.5-3.0	0.60	16	14	13	4	2	1	15	0.002846	0.004	
400	200	2494	3.0-3.5	0.60	10	13	2	1		2		0.001941	0.003	
400	200	2495	3.5-4.3	0.60	18	10	1	3	1		15	0.00251	0.004	
400	250	2496	0.1-0.9	0.60	6	8	2	2			15	0.000398	0.001	0.005
400	250	2497	0.9-1.7	0.60	4	3	1	1	3			0.002211	0.003	
400	250	2498	1.7-2.6	0.60	31	19	4	2	3		15	0.007382	0.010	
400	250	2499	2.6-2.8	0.60	26	12	7	1	1		50	0.003411	0.005	
400	300	2488	0.6-1.6	0.60		1						0.000507	0.001	0.002
400	300	2489	1.6-2.7	0.60	7	3	1					0.001472	0.002	
400	300	2490	2.7-3.2	0.60	25	10	9	4	2	1	15	0.003647	0.005	
400	300	2491	3.2-3.6	0.60	22	14	7	2	3	1	15	0.002992	0.004	
400	340	2485	0.2-1.5	0.60	29	24	14	5	2	1		0.000503	0.001	0.004
400	340	2486	1.5-3.1	0.60	30	25	13	4	2	2		0.006544	0.008	
400	340	2487	3.1-4.0	0.60	17	12	3	3				0.001795	0.003	
434	0	2411	0.1-1.7	0.60	43	22	6	2			30	0.011191	0.015	0.011
434	0	2412	1.7-2.5	0.60	30	30	12	12	4	3	30	0.004384	0.005	
434	0	2413	2.5-2.7	0.60	47	30	12	12	4	3	30	0.004598	0.005	
440	-50	2414	0.0-1.5	0.60	24	17	4					0.001859	0.003	0.003
440	-50	2415	1.5-2.0	0.60	23	15	4					0.000982	0.001	
780	-50	2434	0.1-1.7	0.60	45	40	13	2	2	1	30	0.008863	0.010	0.009
780	-50	2435	1.7-2.8	0.60	35	18	4	2	3	3	200	0.006077	0.006	
780	-50	2436	2.8-3.3	0.6	59	30	15	8	6	6	50	0.009952	0.010	
800	-250	2432	0.4-2.6	0.60	63	33	12	7	3	3	39	0.002177	0.002	0.002
800	-250	2433	2.6-3.3	0.24	15	5	3					0.00075	0.003	
800	-200	2430	1.3-2.8	0.60	19	35	11	9	5	5	27	0.00732	0.008	0.009
800	-200	2431	2.8-4.0	0.60	41	16	11	5	2	1		0.008147	0.011	
800	-150	2427	0.2-1.6	0.60	31	30	17	4	3	1	12	0.008715	0.011	0.017
800	-150	2428	1.6-2.7	0.60	62	40	9	8	7		27	0.024573	0.027	
800	-150	2429	2.7-3.2	0.60	45	34	20	5	2		39	0.010235	0.012	
800	-100	2424	0.1-1.9	0.60	37	31	22	12	5	5	15	0.00437	0.005	0.006
800	-100	2425	1.9-2.6	0.60	23	40	15	4	5	2	15	0.006769	0.008	
800	-100	2426	2.6-3.6	0.60	29	30	17	8	4	4		0.006041	0.007	
800	0	2437	0.1-1.9	0.60	37	25	15	14	7	3	55	0.009952	0.010	0.010
800	0	2438	1.9-2.4	0.60	26	32	19	11	4	4	100	0.020217	0.020	
800	0	2439	2.4-3.2	0.60	26	17	19	15	10	5	50	0.005167	0.005	
1200	-250	2445	0.2-2.4	0.60	21	21	19	14	6	4	200	0.013656	0.012	0.012
1200	-250	2446	2.4-2.9	0.60	19	28	19	10	4	3	140	0.014419	0.014	
1200	-250	2447	2.9-3.0	0.15	1	2	1				50	0.000633	0.003	
1200	-200	2443	0.1-1.5	0.60	3	1		2			20	0.013527	0.021	0.016
1200	-200	2444	1.5-3.4	0.60	29	33	20	11	7	3	150	0.012745	0.012	
1200	-150	2440	0.2-1.7	0.60	39	19	11	5	1	1	30	0.00468	0.006	0.007
1200	-150	2441	1.7-3.8	0.60	32	27	10		1	3	30	0.00636	0.008	
1200	-150	2442	3.8-4.1	0.10	3	2		1		2	30	0.000882	0.005	
1200	-100	2448	0.6-2.3	0.60	22	11	6	2	1			0.014789	0.021	0.017
1200	-100	2449	2.3-3.5	0.60	39	12	5	2				0.008448	0.012	
1500	-150	2308	0.4-2.1	0.60	7	8	4	2	1			0.004289	0.007	0.005
1500	-150	2309	2.1-3.2	0.60	26	32	16	7	3	3		0.003188	0.004	
1500	-150	2310	3.2-3.7	0.10	20	20	5		1		35	0.00014	0.001	
1550	-100	2305	0.1-1.7	0.60	33	17	5	3	2	1		0.002491	0.003	0.006
1550	-100	2306	1.7-3.3	0.60	33	17	8	3	1		50	0.005259	0.007	
1550	-100	2307	3.3-3.7	0.60	37	24	6	5	2	1	15	0.013371	0.017	
1600	-50	2304	2.1-3.0	0.60	39	38	15	9	1	2		0.013166	0.015	
1600	-50	2303	0.4-2.1	0.60	40	30	11	9	4	3	75	0.014289	0.015	0.015

Table 4 Lower "Kirkespirdalen" bulk sample data

Coordinates W-E	N-S	No.	Depth m	Vol. -10 cm m3	Number of boulders in volume classes 11	21	41	61	81	101	Vol. +10 l	Gold g	Grade g/m3	Grade of pit g/m3
1600	-15	2302	1.8-2.7	0.40	6	3	1					0.003282	0.008	0.004
1600	-15	2450	0.0-1.8	0.60	17	16	5	1				0.001023	0.002	
1980	35	2311	0.5-3.1	0.60	44	22	2		1		30	0.004074	0.006	0.006
1980	35	2312	3.1-3.4	0.60	54	20	3	1	2	2	20	0.005413	0.007	
2000	-100	2318	0.0-2.0	0.60	38	13	7	4	1			0.00621	0.009	0.010
2000	-100	2319	2.0-2.6	0.60	19	11	4	2	1			0.008501	0.013	
2000	-40	2315	0.2-1.4	0.60	10	6	1				15	0.015874	0.025	0.014
2000	-40	2316	1.4-3.4	0.60	22	11	6	5	1	2	65	0.003422	0.004	
2000	-40	2317	3.4-3.7	0.30	20	9	6	4	1		30	0.013605	0.032	
2000	0	2313	0.4-2.6	0.60	30	9	5					0.001338	0.002	0.005
2000	0	2314	2.6-3.7	0.60	15	4	1					0.00758	0.012	

Table 5 Kangikitsoq bulk sample data

Coordinates W-E	Coordinates N-S	No.	Depth m	Vol. -10 cm m3	Number of boulders in volume classes 11	21	41	61	81	101	Vol.+10 l	Gold g	Grade g/m3	Grade of pit g/m3
-200	-750	8831	0.0-1.7	0.30	1							0.000049	0.000	0.000
-200	-700	8830	0.0-1.8	0.40	2							0.000061	0.000	0.000
-200	-650	8829	0.0-1.5	0.45	4							0.000089	0.000	0.000
-200	-600	8828	0.0-1.5	0.35	2							0.000019	0.000	0.000
-200	-550	8832	0.0-1.8	0.35	5							0.00018	0.001	0.001
-200	-500	8833	0.0-1.5	0.25	3							0.000061	0.000	0.000
-200	-450	8834	0.0-1.5	0.25	6							0.000081	0.000	0.000
-200	-400	8835	0.0-1.5	0.20	9	2						0.000037	0.000	0.000
-200	-350	8836	0.0-1.5	0.25	38	17	1					0.000094	0.000	0.000
0	-750	2334	0.0-1.5	0.60	0	0	0	0	0	0	0	0.000684	0.001	0.001
0	-700	2340	0.0-1.5	0.60	3							0.000188	0.000	0.000
0	-650	2341	0.0-2.2	0.50	5	2						0.000124	0.000	0.000
0	-600	2338	0.0-1.8	0.50	7	3						0.000071	0.000	0.000
0	-550	2337	0.0-1.8	0.60	19	10		1				0.000218	0.000	0.000
0	-500	2335	0.0-2.3	0.60	73	37	12	2	2	1		0.000316	0.000	0.000
0	-500	2336	2.3-2.8	0.60	61	23	8	2	1			0.000354	0.000	
0	-450	2342	0.0-2.0	0.60	83	52	23	12	3	1		0.001119	0.001	0.001
0	-450	2343	2.0-2.4	0.30	53	25	15	3	1			0.000023	0.000	
0	-400	2344	0.0-2.1	0.60	52	27	12	1				0.000382	0.001	0.001
0	-400	2345	2.1-2.5	0.60	54	22	7	2	1			0.000584	0.001	
0	-350	2346	0.0-1.8	0.60	82	27	12	2	1	1		0.00086	0.001	0.001
0	-350	2347	1.8-2.5	0.60	53	32	11	3	3	1		0.00037	0.000	
0	-300	2348	0.0-2.0	0.60	92	49	17	7	2			0.000296	0.000	0.000
0	-300	2349	2.0-2.5	0.60	85	43	15	7	2	2		0.000084	0.000	
0	-250	2350	0.0-2.1	0.60	64	24	5					0.000197	0.000	0.000
0	-250	22452	2.1-2.3	0.08	10	4	2					0.000045	0.000	
0	-200	22453	0.1-2.2	0.60	36	25	3	1				0.000479	0.001	0.001
0	-200	22454	2.2-2.8	0.55	60	30	15	5	2	1	20	0.000456	0.001	
0	-150	22455	0.2-2.1	0.60	57	37	9	6	3	1		0.000165	0.000	0.000
85	-100	22456	0.1-2.0	0.60	55	17	2	2				0.00062	0.001	0.001
85	-100	22457	2.0-3.4	0.60	95	35	5	5	2	3	35	0.000441	0.000	
85	-50	22458	0.0-2.2	0.60	35	12	3	1				0.000292	0.000	0.000
85	-50	22459	2.2-2.4	0.10	22	9						0.000053	0.000	
85	0	22460	0.2-2.5	0.50	13	4	1					0.000042	0.000	0.000
400	-305	22473	0.1-2.0	0.60	55	18	12	6	3		15	0.000053	0.000	0.000
400	-305	22474	2.0-2.5	0.10	5	1	1	1				0.000056	0.000	
400	-250	22471	0.0-2.2	0.60	52	20	5	4	2	1	20	0.000416	0.001	0.000
400	-250	22472	2.2-3.1	0.25	54	23	7	6		1		0.000021	0.000	
400	-200	22469	0.0-2.4	0.60	103	31	32	8	7	2	12	0.000897	0.001	0.001
400	-200	22470	2.4-3.2	0.45	60	45	11	3	1	3	80	0.000183	0.000	
400	-150	22467	0.2-2.3	0.60	60	20	10	4	5	3		0.00063	0.001	0.001
400	-150	22468	2.3-3.1	0.50	58	18	8	4	3	1		0.000216	0.000	
400	-100	22466	0.1-2.0	0.60	60	32	16	5	4	3		0.000205	0.000	0.000
400	-50	22464	0.0-2.0	0.60	57	27	9	3	4	3		0.000198	0.000	0.000
400	-50	22465	2.0-2.5	0.30	26	16	7	1	3	1	12	0.000391	0.001	
400	0	22462	0.1-2.3	0.60	40	23	8	5	1	1	35	0.000728	0.001	0.001
400	0	22463	2.3-3.4	0.60	62	47	19	8	5	3	55	0.000185	0.000	
400	50	22461	0.0-1.0	0.20	40	12	1	1				0.000134	0.000	0.000
785	110	8811	0.4-2.5	0.60	59	22	4	7	4	2		0.000208	0.000	0.001
785	110	8812	2.5-3.8	0.40	38	12	3	2				0.000593	0.001	
800	-150	8801	1.8-2.8	0.60	43	11	4	3		1	70	0.000369	0.000	0.000
800	-150	8802	2.8-4.0	0.64	36	4	1					0.000082	0.000	
800	-150	22475	0.0-1.8	0.60	49	15	11	2	1	1	40	0.000139	0.000	
800	-105	8803	0.0-2.2	0.60	75	23	12	2	2	3		0.000328	0.000	0.000
800	-105	8804	2.2-3.1	0.60	56	20	9	5	2	1		0.000283	0.000	
800	-50	8805	0.0-1.8	0.45	86	25	5	8	3	2	20	0.0002	0.000	0.000
800	0	8806	0.2-2.2	0.60	103	34	11	1	2		32	0.000407	0.000	0.000
800	0	8807	2.2-2.5	0.40	45	9	11	3	1		12	0.000171	0.000	
800	50	8808	0.0-2.5	0.60	85	24	3	5	2	1		0.000663	0.001	0.001
800	50	8809	2.5-3.3	0.60	64	33	16	3	1			0.000142	0.000	

Table 5 Kangikitsoq bulk sample data

Coordinates W-E	Coordinates N-S	No.	Depth m	Vol.-10 cm m3	Number of boulders in volume classes 11	21	41	61	81	101	Vol.+10 l	Gold g	Grade g/m3	Grade of pit g/m3
800	50	8810	3.3-3.7	0.20	26	7	1	2				0.000078	0.000	
1200	-100	8818	0.0-2.3	0.55	65	33	16	6	4	1		0.000085	0.000	0.000
1200	-60	8816	0.0-2.5	0.60	77	20	9	3	2	2	70	0.000438	0.000	0.000
1200	-60	8817	2.5-3.1	0.10	3	5	3	1				0.000009	0.000	
1200	0	8813	0.1-2.5	0.60	69	8	2	1	1	2		0.00031	0.000	0.000
1200	50	8814	0.2-2.0	0.60	28	10	2	3	1			0.002244	0.003	0.003
1200	50	8815	2.0-2.6	0.10	7	1	1		1			0.000033	0.000	
1600	-140	8821	0.2-2.4	0.60	65	17	8	6		1	15	0.000115	0.000	0.000
1600	-140	8822	2.4-3.0	0.20	25	12	4	3	1			0.000036	0.000	
1600	-100	8820	0.2-2.6	0.60	109	21	7	4	3	2	15	0.00033	0.000	0.000
1600	-50	8819	0.4-2.2	0.50	68	21	3		2		12	0.000098	0.000	0.000
1970	-15	8825	0.0-2.4	0.60	55	20	9	6	2	1	90	0.000429	0.000	0.000
1970	-15	8826	2.4-3.2	0.35	35	16	5	5	1		15	0.000243	0.000	
2000	-60	8827	0.0-2.0	0.45	51	16	13	5	2	1		0.000194	0.000	0.000
2000	50	8823	0.4-2.3	0.60	29	8	1		1	1		0.000754	0.001	0.001
2000	50	8824	2.3-3.5	0.30	20	5	2		1			0.00027	0.001	

Table 6. Upper 'Kirkespirdalen' bulk sample data (from Kalvig, 1991) (cf. Fig. 17).

Locality	Depth m	Recovered Au mg	Grade of pit mg Au/m^3
50	0.0 - 0.6	1.11	1.4
	0.6 - 1.0	0.25	
52	0.0 - 0.6	0.115	0.1
	0.6 - 1.0	0.03	
53	0.6 - 1.0	0.018	0.1
55	0.0 - 0.5	0.024	0.1
	0.5 - 0.8	0.027	
62	0.0 - 0.6	0.074	0.1
63	0.0 - 0.6	0.78	1.2
64	0.0 - 0.3	0.4	0.6
	0.3 - 0.6	0.0007	

Table 7. Chip sampling across a shear zone (Kalvig & Nielsen, 1990) (cf. Fig. 22).

Rock sample no.	Width	Cumulated width	Au ppb
992	1.8	1.8	0
991	2.0	3.8	0
990	3.2	7.0	21
989	1.0	8.0	15
988	3.0	11.0	62
987	2.0	13.0	15
986	4.7	17.7	15
985	4.0	21.7	13
984	5.4	27.1	21
983	2.9	30.0	30
982	3.6	33.6	12
981	2.3	35.9	46
980	0.5	36.4	12

Table 8. Chip sampling across a rusty meta-sediment (Kalvig & Nielsen, 1990) (cf. Fig. 22).

Rock sample Nr.	Rock type	Au ppb	As ppm	Co ppm	Cr ppm	Cu ppm	Li ppm	Mo ppm	Ni ppm	Pb ppm	V ppm	Zn ppm
561	volc.rustzone	21	245	47	112	263	72	0	68	0	299	149
560	volc.rustzone	<10	202	65	10	343	14	11	29	0	234	22
559	metavolcanic	<10	117	29	5	140	9	0	34	0	32	25
550	graphite	<10	325	37	83	271	4	107	7	80	2520	76
548	graphite	25	249	58	67	194	9	64	0	61	1440	83
547	quartz zone	21	121	84	28	73	14	29	16	0	339	111
546	volc.rustzone	23	43	55	174	56	8	0	80	0	288	107
Avg		13	186	54	68	191	19	30	33	20	736	82
Std		11	90	17	56	100	22	38	28	32	843	43
Min		<10	43	29	5	56	4	0	0	0	32	22
Max		25	325	84	174	343	72	107	80	80	2520	149

Table 9. Top talus sampling. Gold and scheelite contents in the different fractions (cf. Fig. 22).

Talus sample number	Weight HMC	Weight over-size	Weight light min.	Weight total sample	Obser. gold grains	Obser. scheelite grains	HMC gold	HMC weight corr. gold	Oversize gold
	g	g	g	g			ppm	ppm	ppm
523	8.896	410.0	686.9	1105.80	1	54	2.98	0.0240	0.0440
522	7.369	463.4	619.7	1090.47	0	21	0.00	0.0000	0.0400
521	5.416	570.6	761.8	1337.82	0	29	2.59	0.0105	0.0200
520	2.419	380.1	768.2	1150.72	0	65	3.11	0.0065	0.0260
519	2.562	653.2	606.1	1261.86	0	38	1.95	0.0040	0.0180
518	5.206	262.0	661.2	928.41	0	23	0.67	0.0038	0.0250
517	4.203	393.4	822.7	1220.30	0	32	2.74	0.0094	0.0190
516	6.201	246.2	649.1	901.50	0	34	1.77	0.0122	7.2710
515	2.547	319.8	697.7	1020.05	3	75	95.41	0.2382	0.0310
514	3.015	465.4	764.0	1232.42	1	54	23.72	0.0580	0.0330
513	3.401	740.4	534.3	1278.10	1	23	8.67	0.0231	0.0340
512	3.310	564.1	739.3	1306.71	3	39	67.37	0.1707	0.0240
511	3.008	418.5	794.9	1216.41	1	221	80.29	0.1985	0.2030
510	1.464	710.6	410.5	1122.56	0	14	0.00	0.0000	0.0240
509	4.281	485.8	647.9	1137.98	0	46	0.00	0.0000	0.0000
508	6.246	507.9	628.6	1142.75	0	25	1.36	0.0074	0.0000
507	4.785	304.4	687.2	996.39	0	27	3.03	0.0146	0.0900
506	10.369	400.7	797.4	1208.47	3	163	40.51	0.3476	0.0400
505	9.505	500.0	500.0	1009.51	1	161	9.31	0.0877	0.0250
504	6.061	407.3	599.8	1013.16	0	63	1.73	0.0103	0.0260
503	9.442	405.9	571.7	987.04	2	51	8.79	0.0841	0.0330
502	7.374	404.8	539.0	951.17	2	46	29.84	0.2313	0.0270
501	4.586	663.2	461.0	1128.79	1	76	44.60	0.1812	0.0140
Avg.	5.290	464.2	650.0	1119.49	1	60	18.71	0.0749	0.0362
Std.	2.498	132.4	110.0	123.31	1	51	27.51	0.0986	0.0403

Table 10. Top talus sampling. Trace element contents in the different fractios (cf. Fig. 22).

Talus sample number	Oversize Weight corr.gold	Lightmin. gold	Lightmin. Weight corr.gold	Weight corrected total	OZ As	LM As	HMC As	OZ Co	LM Co	HMC Co	OZ Cr
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
523	0.0163			0.0403	46			62			195
522	0.0170			0.0170	38			53			212
521	0.0085			0.0190	43			61			237
520	0.0086	0.0120	0.0080	0.0231	31	45	4	58	54	44	224
519	0.0093			0.0133	40			60			168
518	0.0071			0.0108	81			59			173
517	0.0061			0.0156	57			58			164
516	1.9857			1.9979	226		3	56		24	117
515	0.0097	0.0990	0.0677	0.3157	157	283	13	52	51	32	128
514	0.0125			0.0705	213			60			155
513	0.0197			0.0428	810			61			150
512	0.0104			0.1810	348		32	56		36	159
511	0.0698			0.2684	317		12	46		22	185
510	0.0152			0.0152	55			50			111
509	0.0000	0.0280	0.0159	0.0159	215	425		52	61		200
508	0.0000			0.0074	195			53			186
507	0.0275			0.0420	144			55			174
506	0.0133	0.3950	0.2606	0.6215	442	594	37	56	58	17	186
505	0.0124			0.1000	337		64	49		19	148
504	0.0105			0.0208	289			52			161
503	0.0136			0.0977	222		13	44		17	123
502	0.0115			0.2428	207		17	36		18	114
501	0.0082	0.2260	0.0923	0.2817	229	337	15	38	44	18	125
Avg.	0.0140	0.1520	0.0889	0.1119	179	337	21	53	54	25	165
Std.	0.0135	0.1430	0.0915	0.1486	117	180	18	7	6	9	35

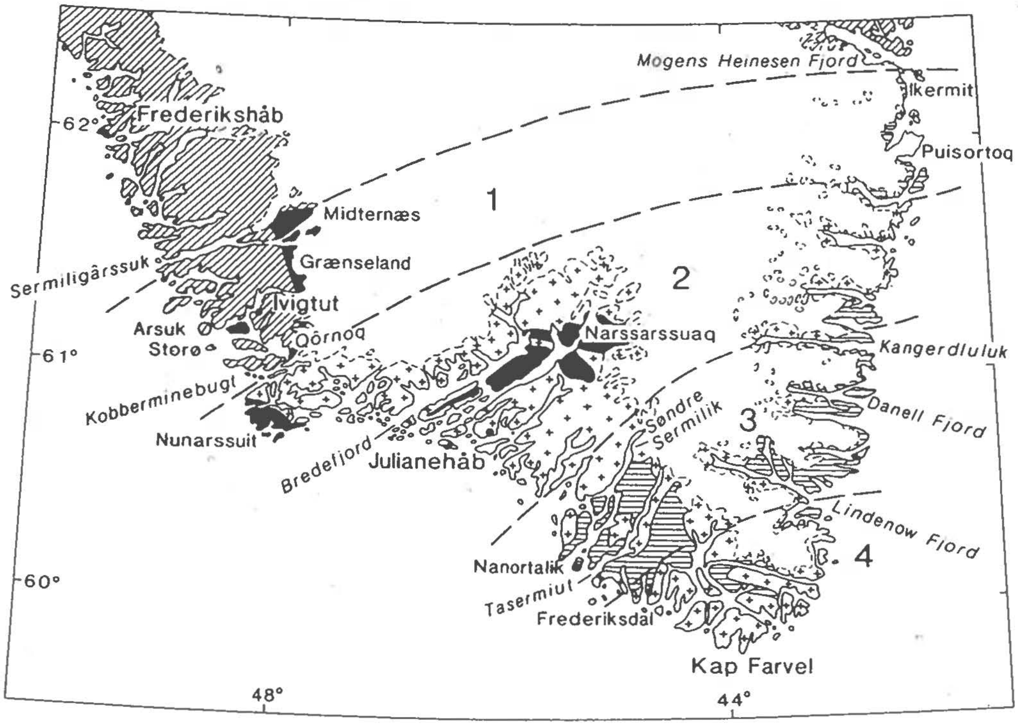


Fig. 1. Main geological units in South Greenland. 1. Northern border zone. 2. Granite zone. 3. Folded migmatite zone. 4. Flat-lying high-grade migmatite complex. Reproduced from Kalsbeek et al. (1990).

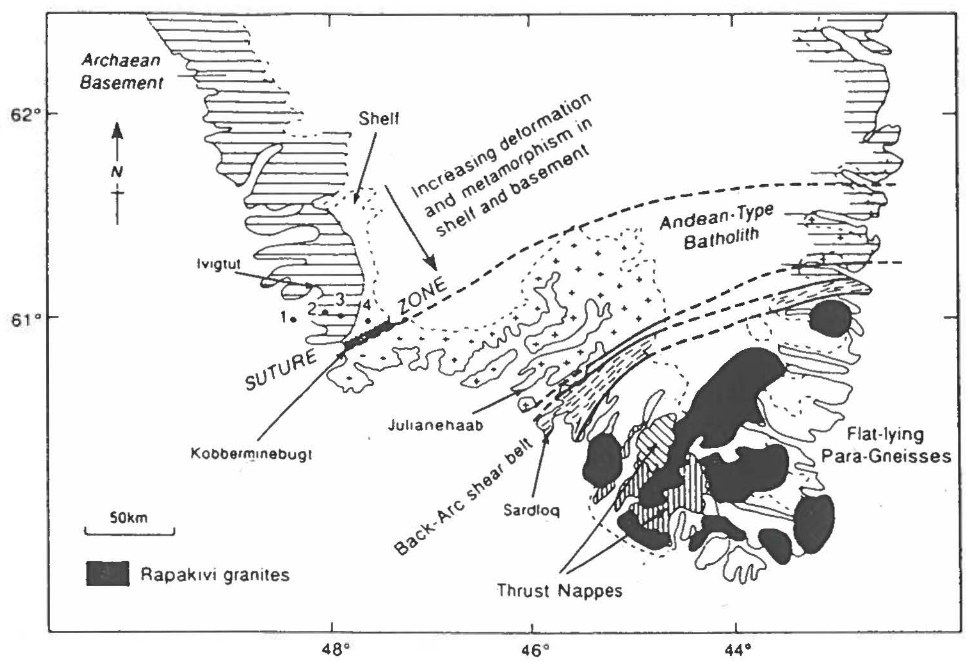
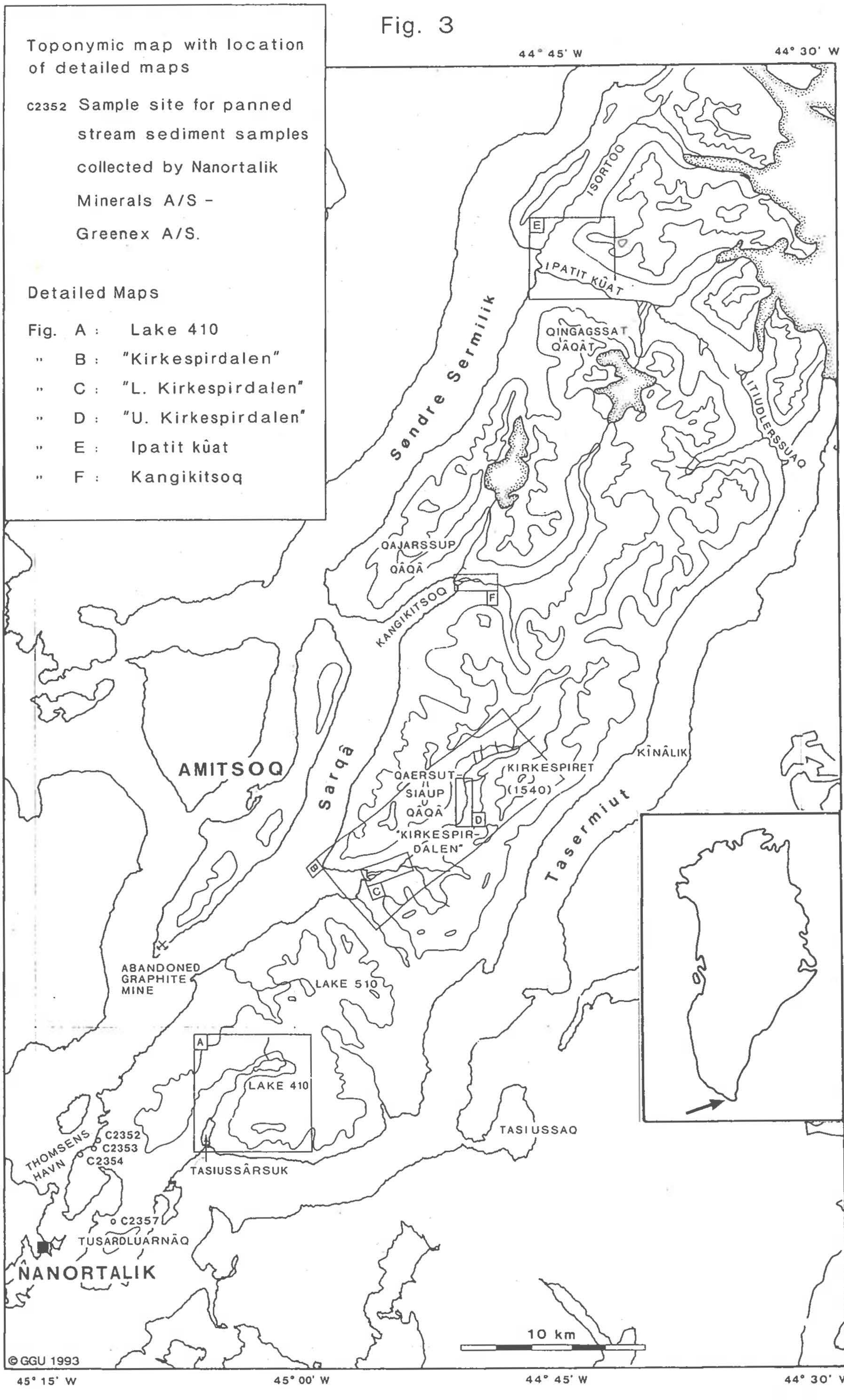


Fig. 2. Geological map of the Ketilidian orogen. Reproduced from Windley (1991).

Fig. 3


Toponymic map with location of detailed maps
C2352 Sample site for panned stream sediment samples collected by Nanortalik Minerals A/S - Greenex A/S.
Detailed Maps
Fig. A : Lake 410
" B : "Kirkespirdalen"
" C : "L. Kirkespirdalen"
" D : "U. Kirkespirdalen"
" E : Ipatit kûat
" F : Kangikitsoq
44° 45' W
44° 30' W
60° 30' N
60° 15' N
45° 15' W
45° 00' W
ISORTOQ
IPATIT KÛAT
Søndre Sermilik
QINGAGSSAT QÂQÂT
ITIUDLERSSUAQ
QAJARSSUP QÂQÂ
KANGIKITSOQ
AMITSOQ
Sarqâ
QAERSUT-SIAUP QÂQÂ
KIRKESPIRET (1540)
"KIRKESPIR-DALEN"
KÎNÂLIK
Tasermiut
ABANDONED GRAPHITE MINE
LAKE 510
LAKE 410
TASIUSSAQ
THOMSENS HAVN
C2352
C2353
C2354
TASIUSSÂRSUK
C2357
TUSARDLUARNÂQ
NANORTALIK
10 km
© GGU 1993

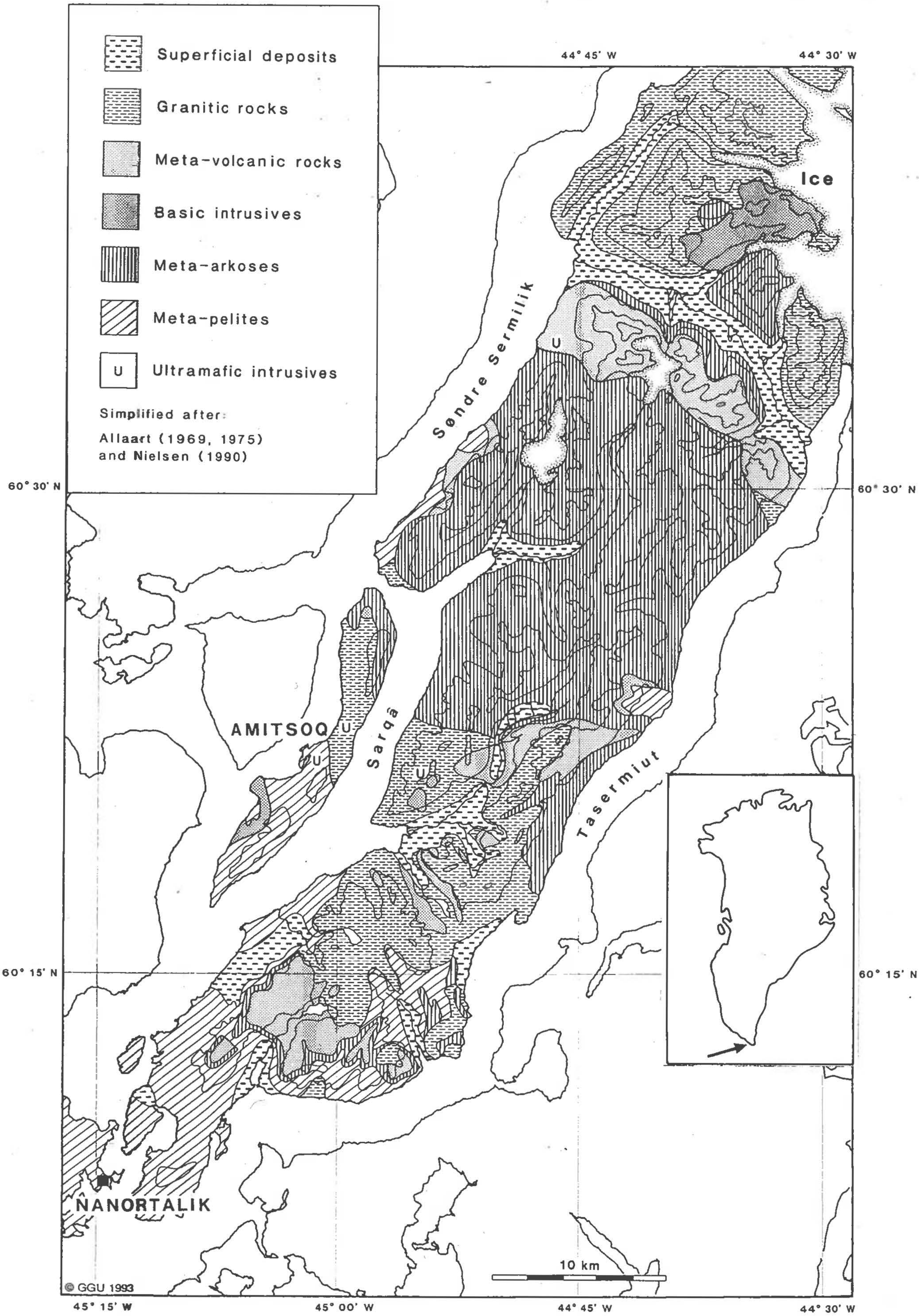
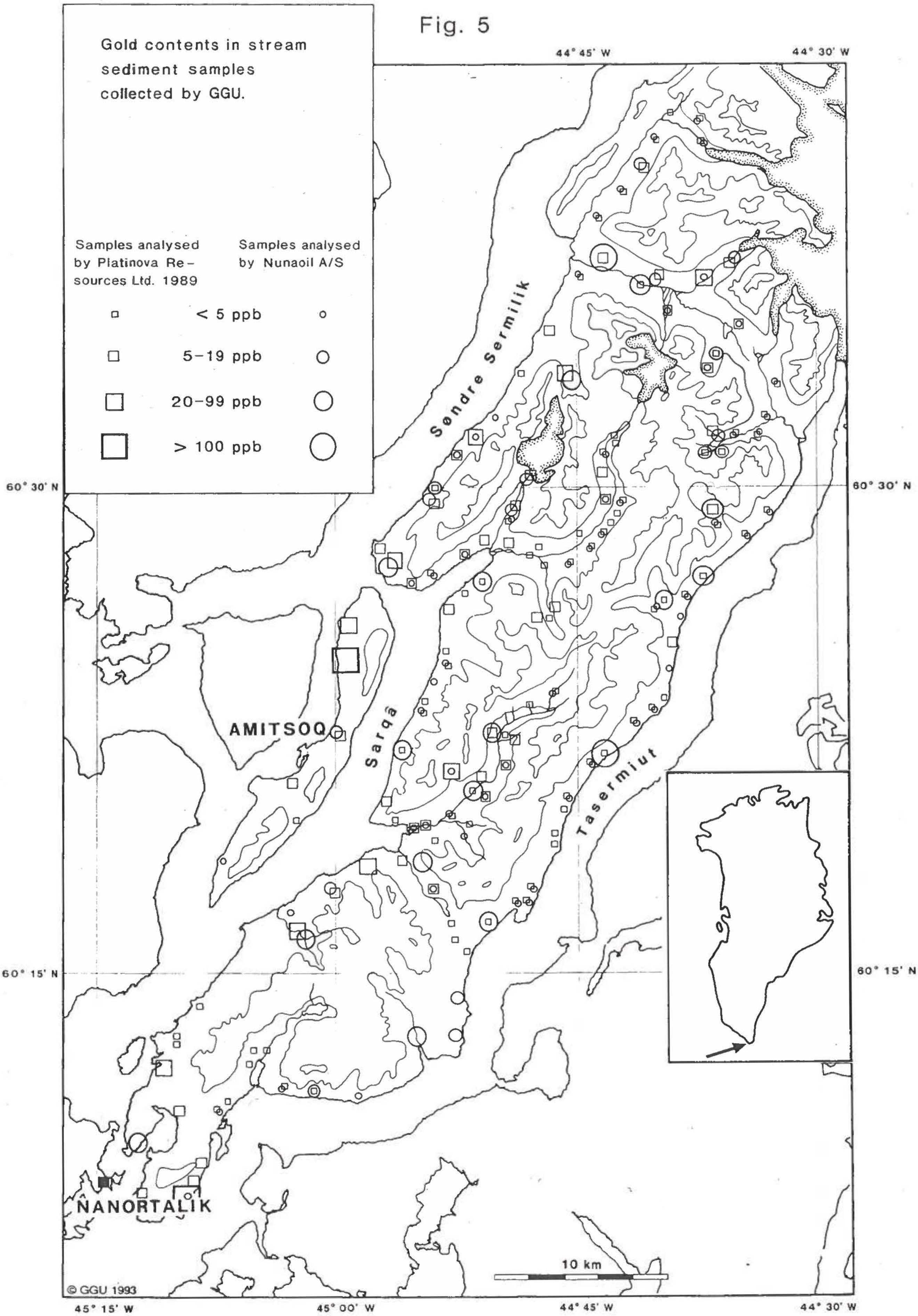


Fig. 4. Geological map of the "Nanortalik Peninsula" + island Amitsoq.

Fig. 5


Gold contents in stream sediment samples collected by GGU.
Samples analysed by Platinova Resources Ltd. 1989
Samples analysed by Nunaoil A/S
< 5 ppb
5–19 ppb
20–99 ppb
> 100 ppb
44° 45' W
44° 30' W
45° 15' W
45° 00' W
60° 30' N
60° 15' N
Søndre Sermilik
Sarqâ
Tasermiut
AMITSOQ
NANORTALIK
10 km
© GGU 1993

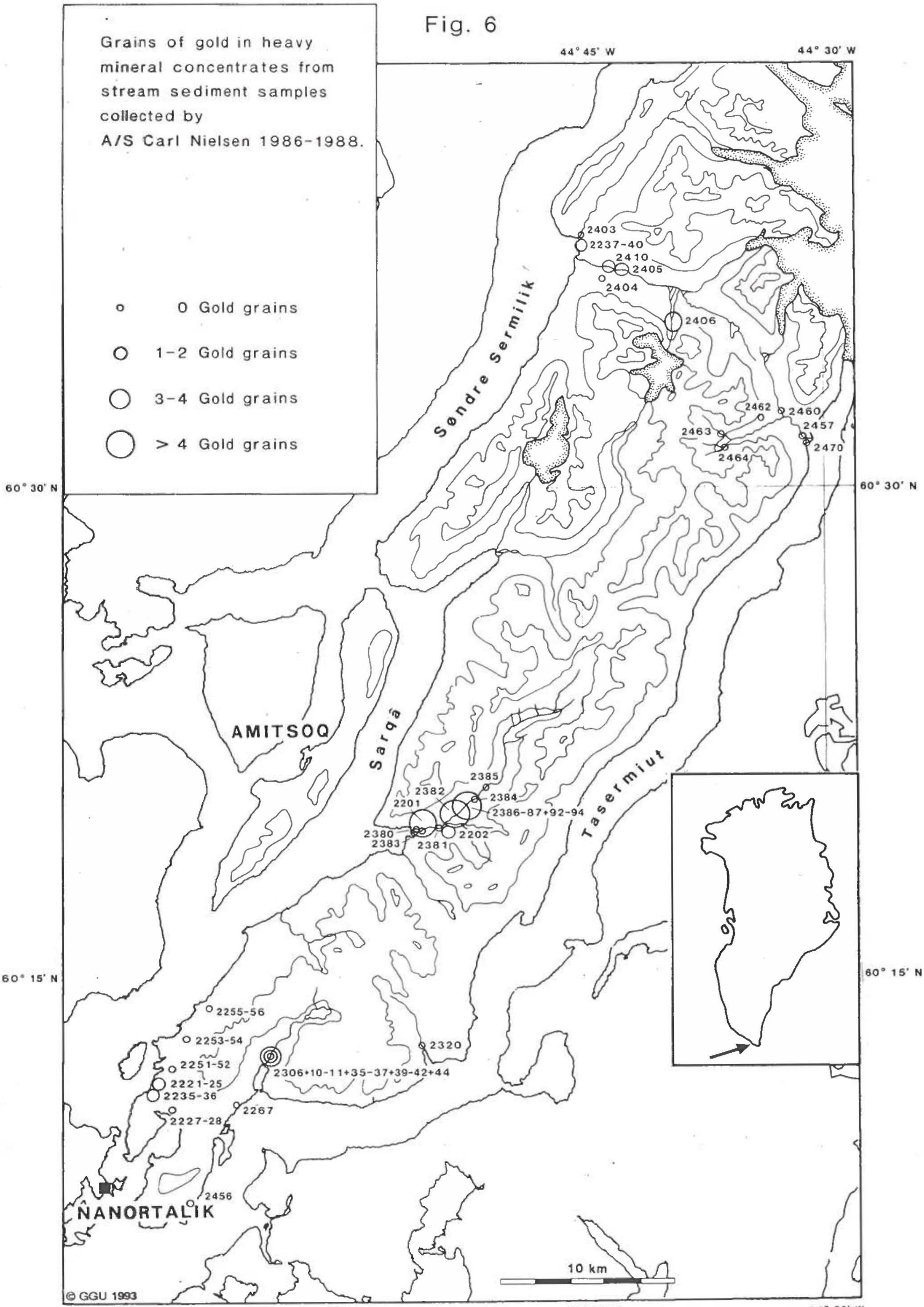


Fig. 6
Grains of gold in heavy mineral concentrates from stream sediment samples collected by A/S Carl Nielsen 1986-1988.
0 Gold grains
1-2 Gold grains
3-4 Gold grains
> 4 Gold grains
44° 45' W
44° 30' W
60° 30' N
60° 15' N
45° 15' W
45° 00' W
Søndre Sermilik
Sarqâ
Tasermiut
AMITSOQ
NANORTALIK
2403
2237-40
2410
2405
2404
2406
2462
2460
2463
2457
2464
2470
2385
2382
2384
2201
2386-87+92-94
2380
2383
2381
2202
2255-56
2253-54
2320
2251-52
2306+10-11+35-37+39-42+44
2221-25
2235-36
2267
2227-28
2456
10 km
© GGU 1993

Fig. 7

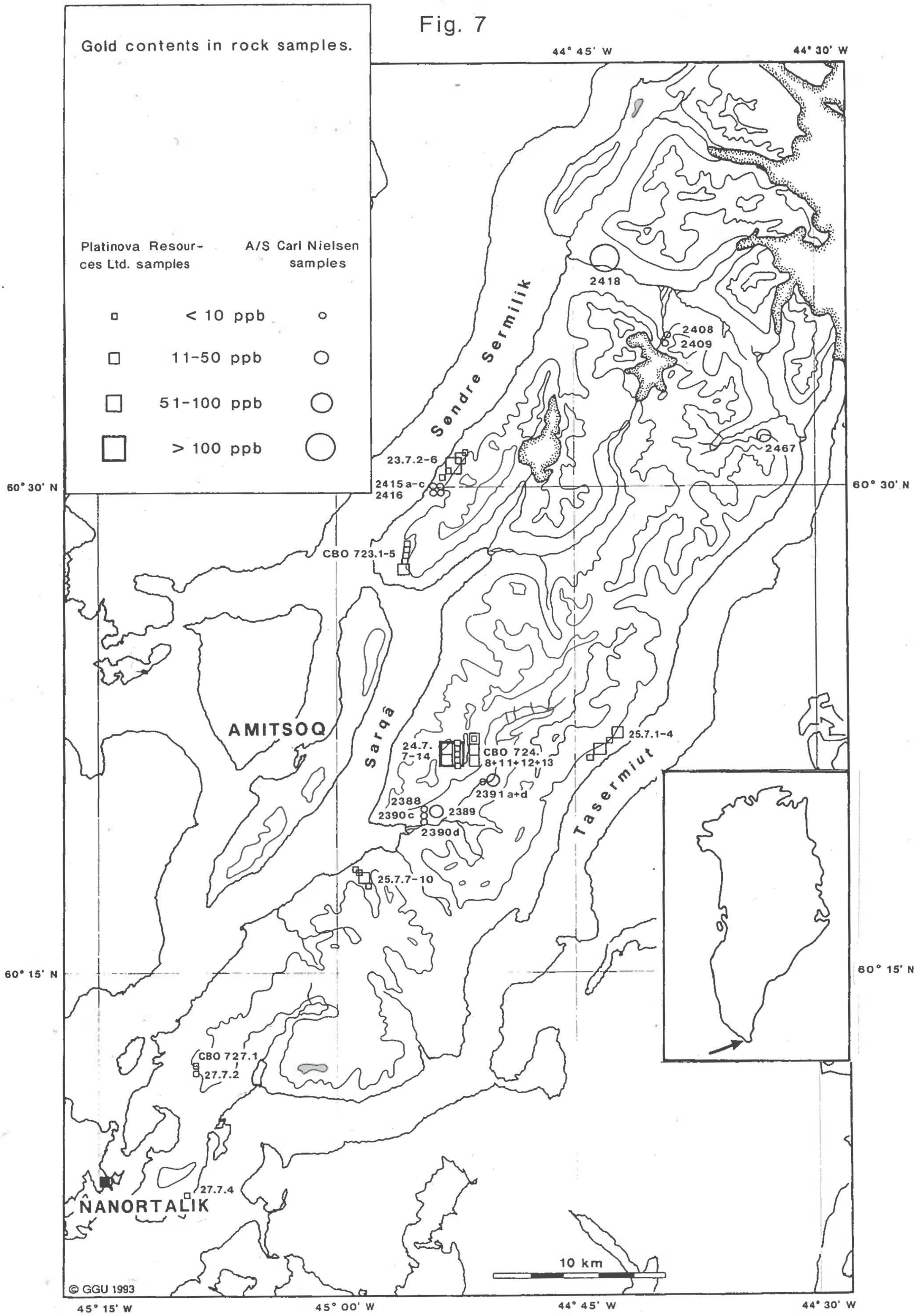

Gold contents in rock samples.
Platinova Resources Ltd. samples
A/S Carl Nielsen samples
< 10 ppb
11-50 ppb
51-100 ppb
> 100 ppb
44° 45' W
44° 30' W
60° 30' N
60° 15' N
45° 15' W
45° 00' W
Søndre Sermilik
Sarqâ
Tasermiut
AMITSOQ
NANORTALIK
2418
2408
2409
2467
23.7.2-6
2415 a-c
2416
CBO 723.1-5
24.7. 7-14
CBO 724. 8+11+12+13
25.7.1-4
2391 a+d
2388
2390c
2389
2390d
25.7.7-10
CBO 727.1
27.7.2
27.7.4
10 km
© GGU 1993

Fig. 8

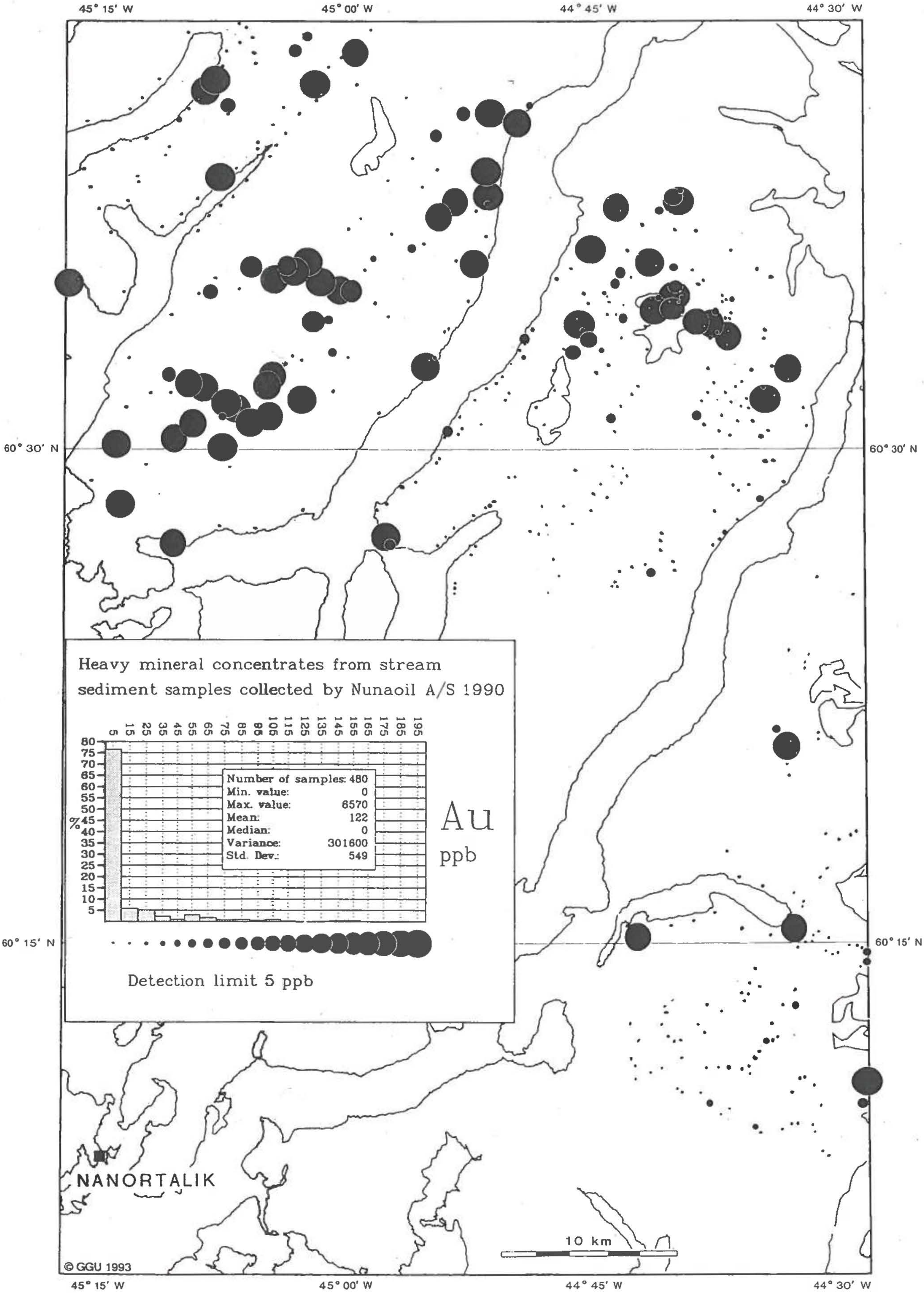

45° 15' W
45° 00' W
44° 45' W
44° 30' W
60° 30' N
60° 15' N
Heavy mineral concentrates from stream sediment samples collected by Nunaoil A/S 1990
Number of samples: 480
Min. value: 0
Max. value: 6570
Mean: 122
Median: 0
Variance: 301600
Std. Dev.: 549
Au
ppb
Detection limit 5 ppb
NANORTALIK
10 km
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Fig. 9

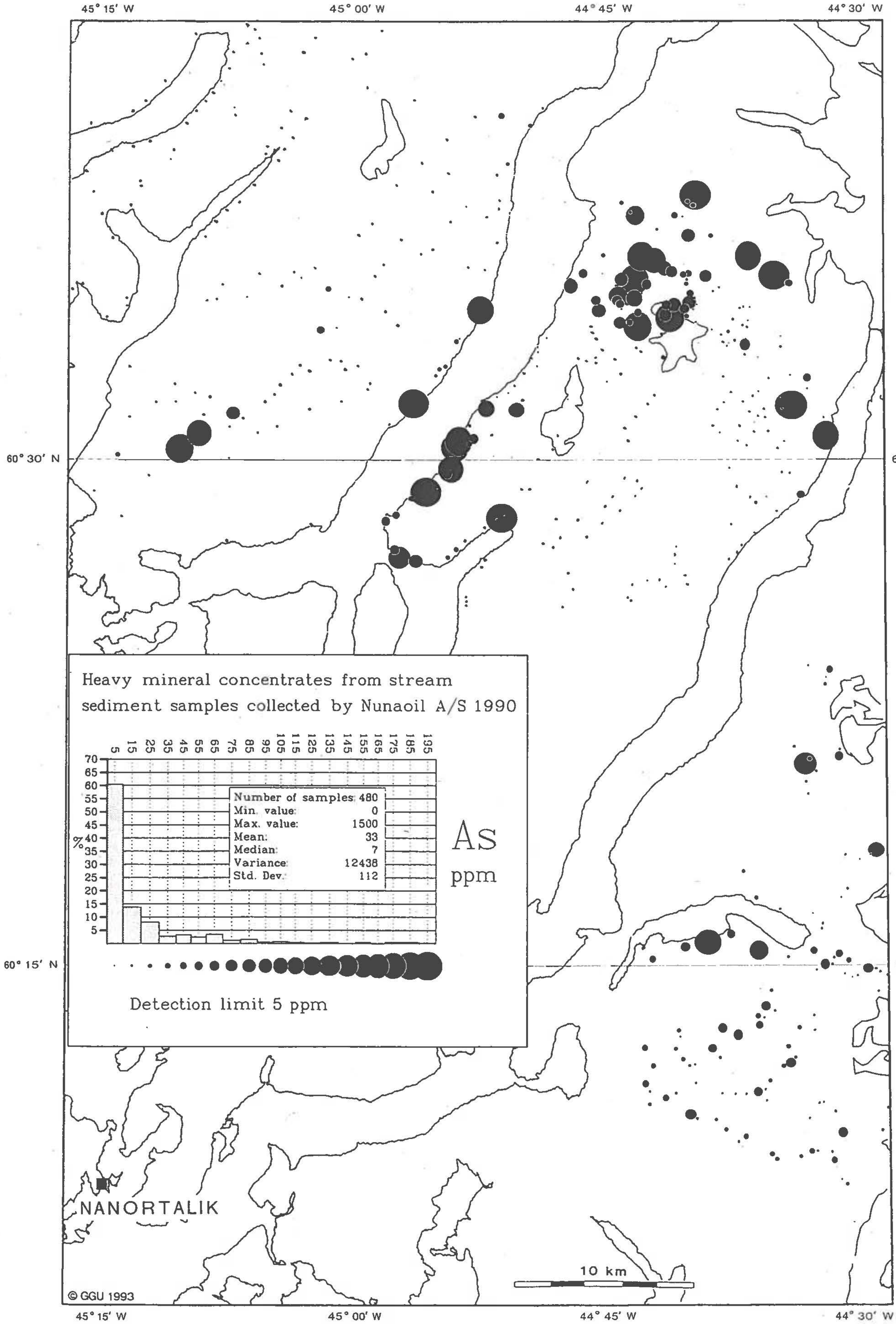
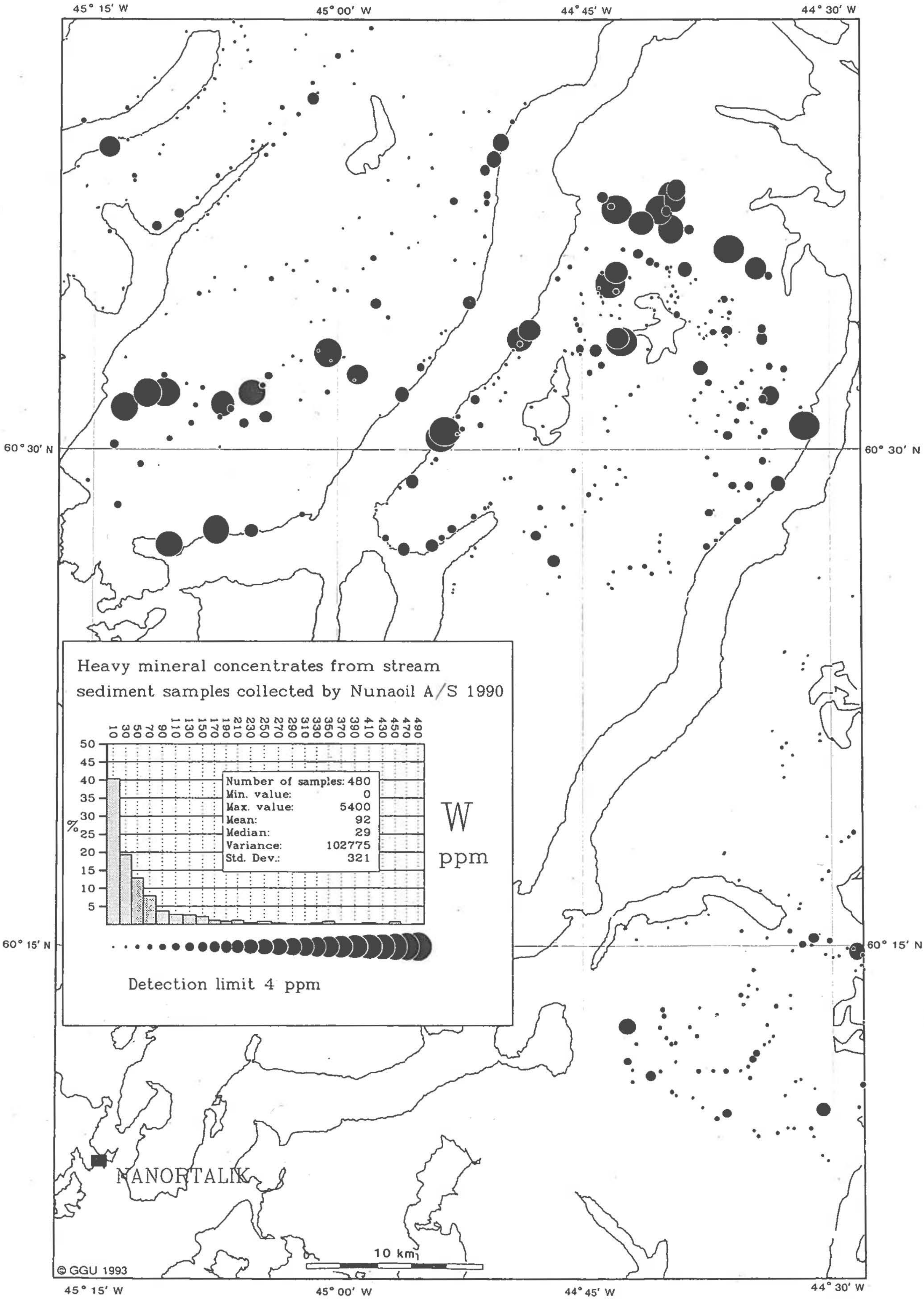

45° 15' W
45° 00' W
44° 45' W
44° 30' W
60° 30' N
60° 15' N
Heavy mineral concentrates from stream sediment samples collected by Nunaoil A/S 1990
Number of samples: 480
Min. value: 0
Max. value: 1500
Mean: 33
Median: 7
Variance: 12438
Std. Dev.: 112
As
ppm
%
Detection limit 5 ppm
NANORTALIK
10 km
© GGU 1993

Fig. 10


45° 15' W
45° 00' W
44° 45' W
44° 30' W
60° 30' N
60° 15' N
Heavy mineral concentrates from stream
sediment samples collected by Nunaoil A/S 1990
Number of samples: 480
Min. value: 0
Max. value: 5400
Mean: 92
Median: 29
Variance: 102775
Std. Dev.: 321
W
ppm
%
Detection limit 4 ppm
NANORTALIK
10 km
© GGU 1993

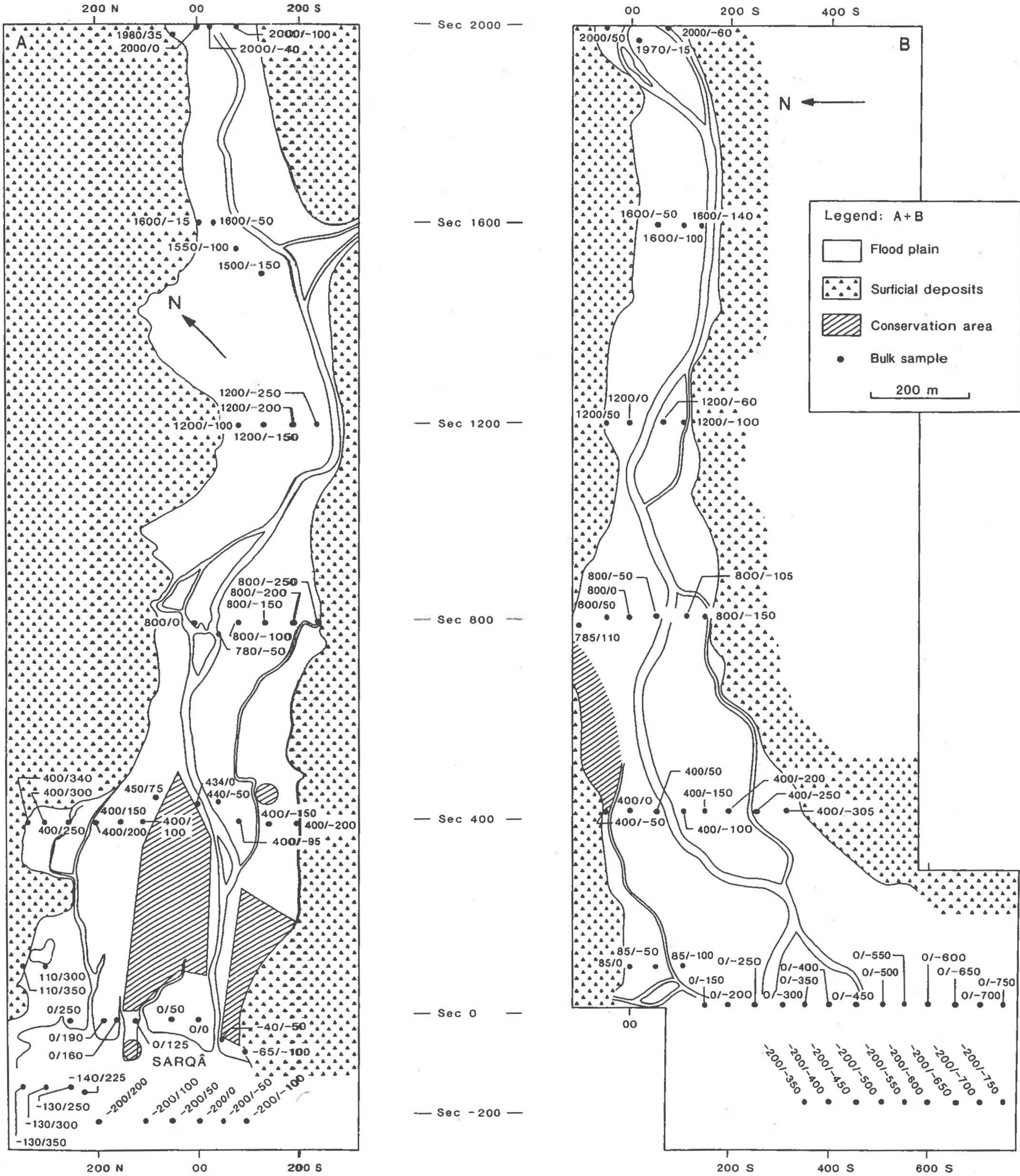


Fig. 11. Bulk sample sites Lower "Kirkespirdalen" (A) and Kangikitsoq (B). Modified from Christensen (1989).

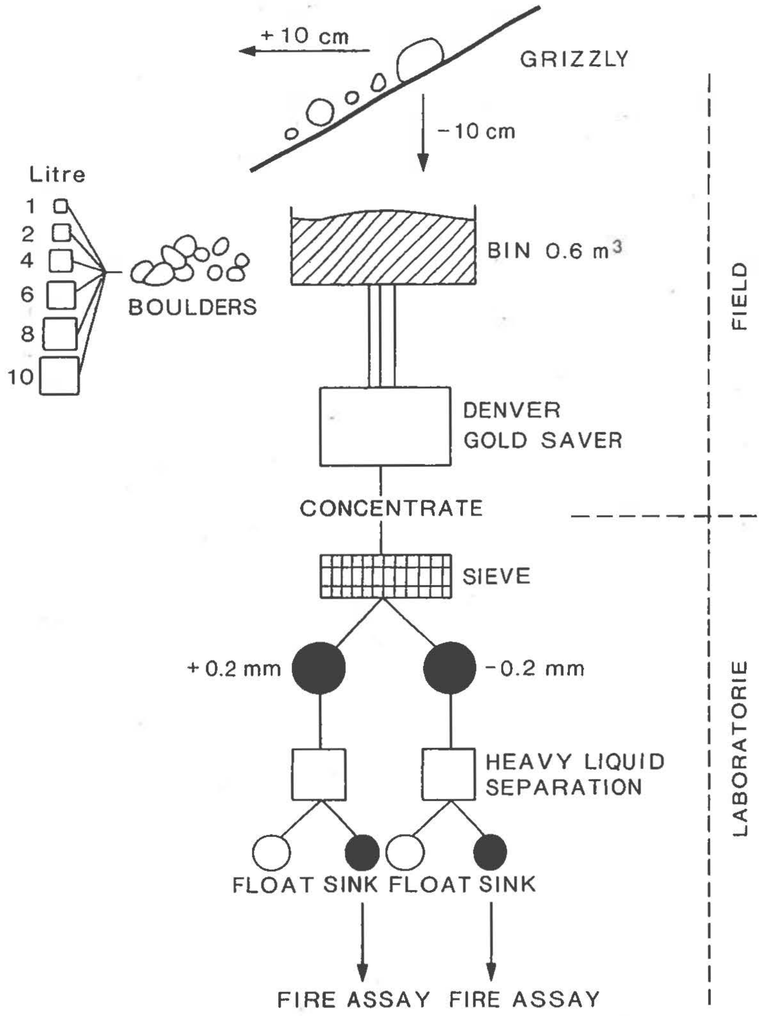


Fig. 12. Flow sheet of reduction methods used by Greenex A/S - Nanortalik Minerals A/S.

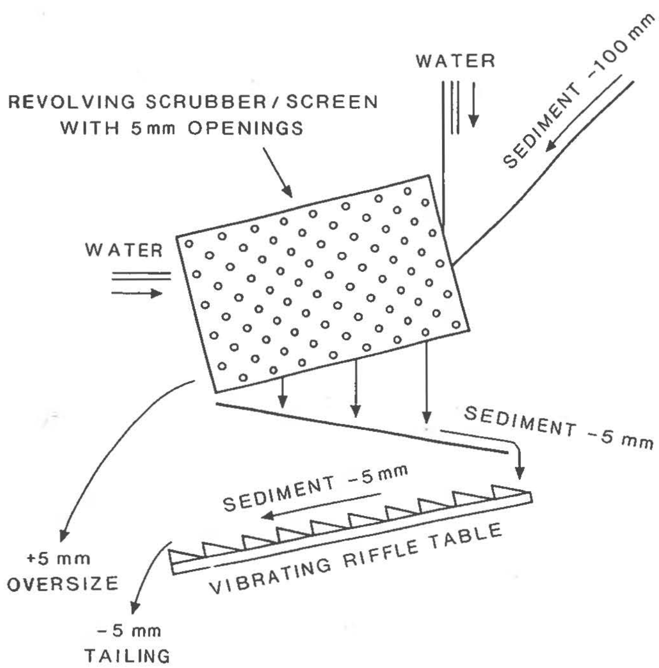


Fig. 13. Denver gold saver flow sheet.

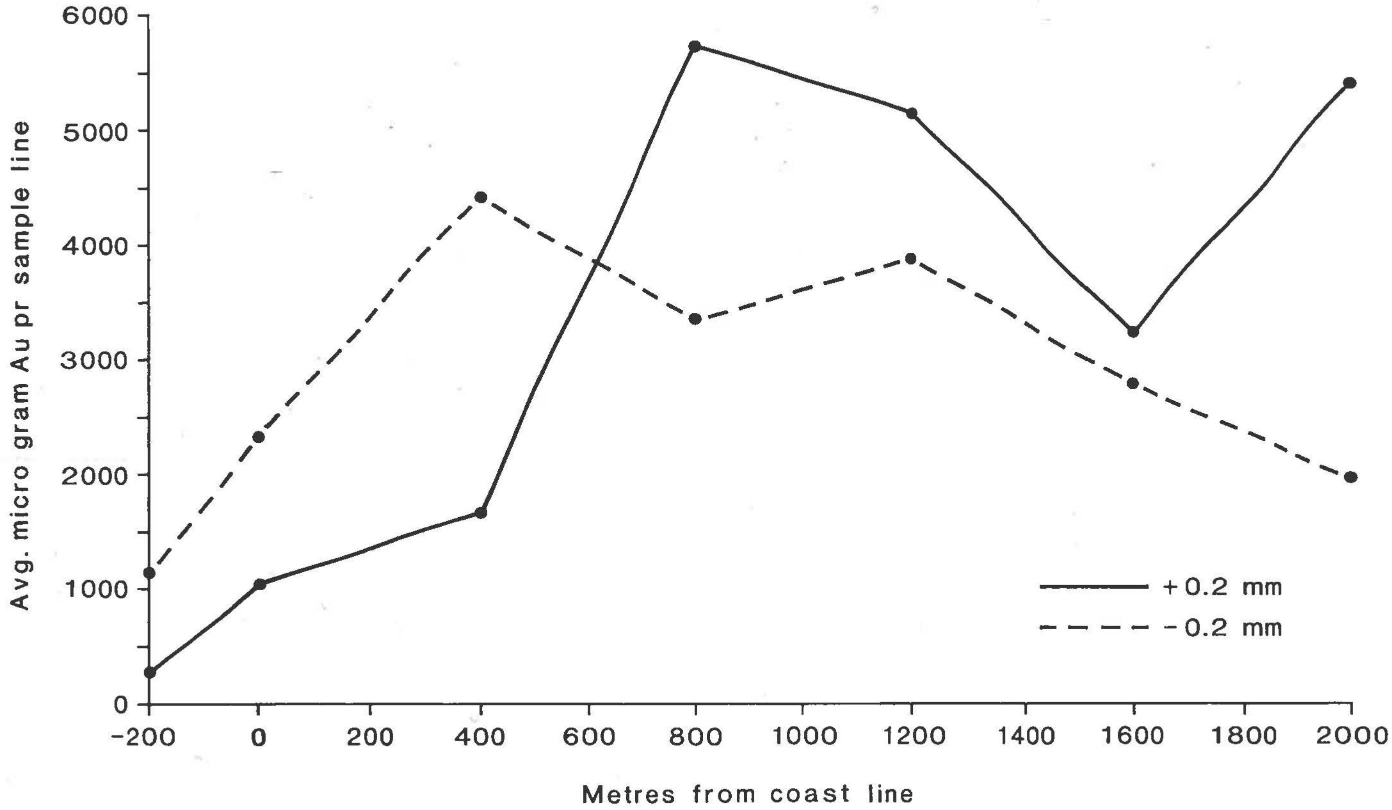


Fig. 14. Lower "Kirkespirdalen". Distribution of gold in the 0.2-5 mm and the minus 0.2 mm fractions. Average amount of gold calculated for each sample line.

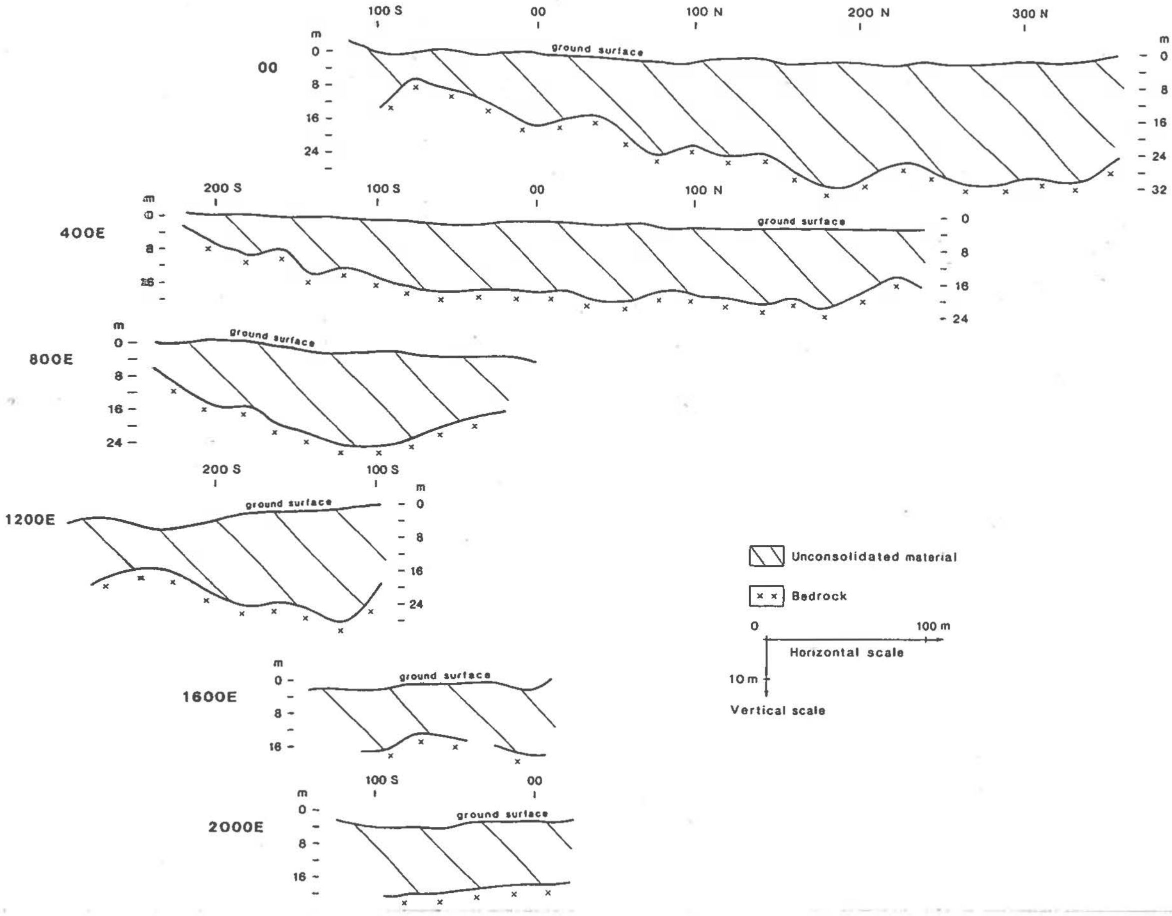


Fig. 15. Depth to bedrock, Lower "Kirkespirdalen". The sections are based on a seismic survey along bulk sample lines (cf. Fig. 11). Modified from Williams (1988).

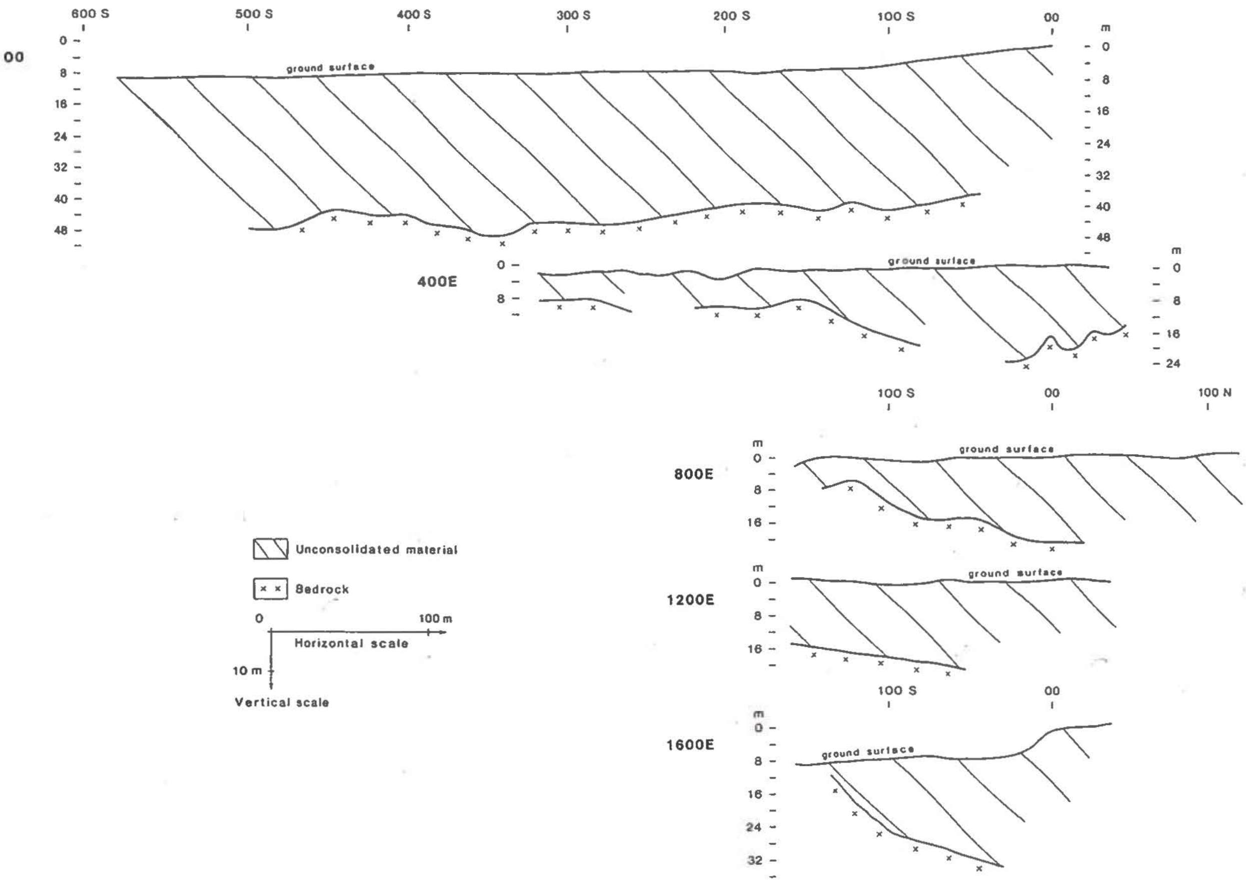
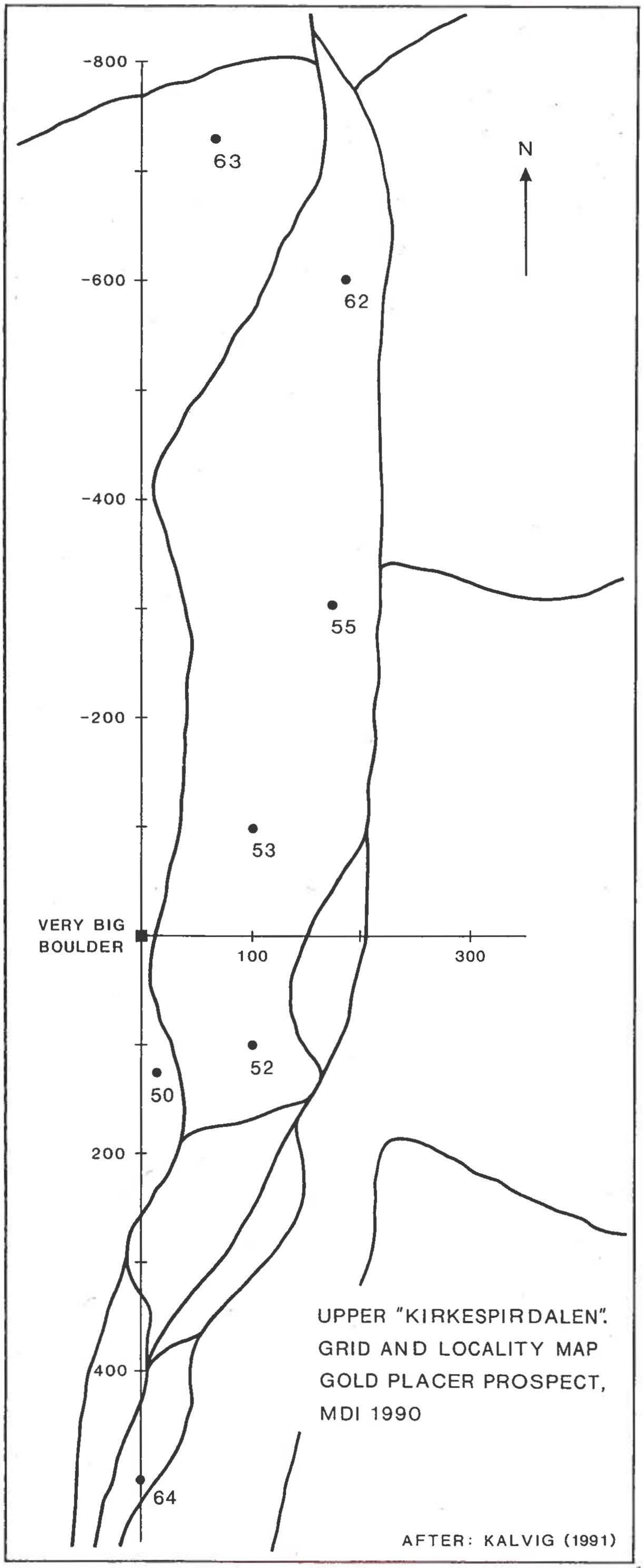


Fig. 16. Depth to bedrock, Kangikitsoq. The sections are based on a seismic surveys along bulk sample lines (cf. Fig. 11). Modified from Williams (1988).

Fig. 17


-800
-600
-400
-200
200
400
N
63
62
55
53
52
50
64
VERY BIG
BOULDER
100
300
UPPER "KIRKESPIRDALEN".
GRID AND LOCALITY MAP
GOLD PLACER PROSPECT,
MDI 1990
AFTER: KALVIG (1991)

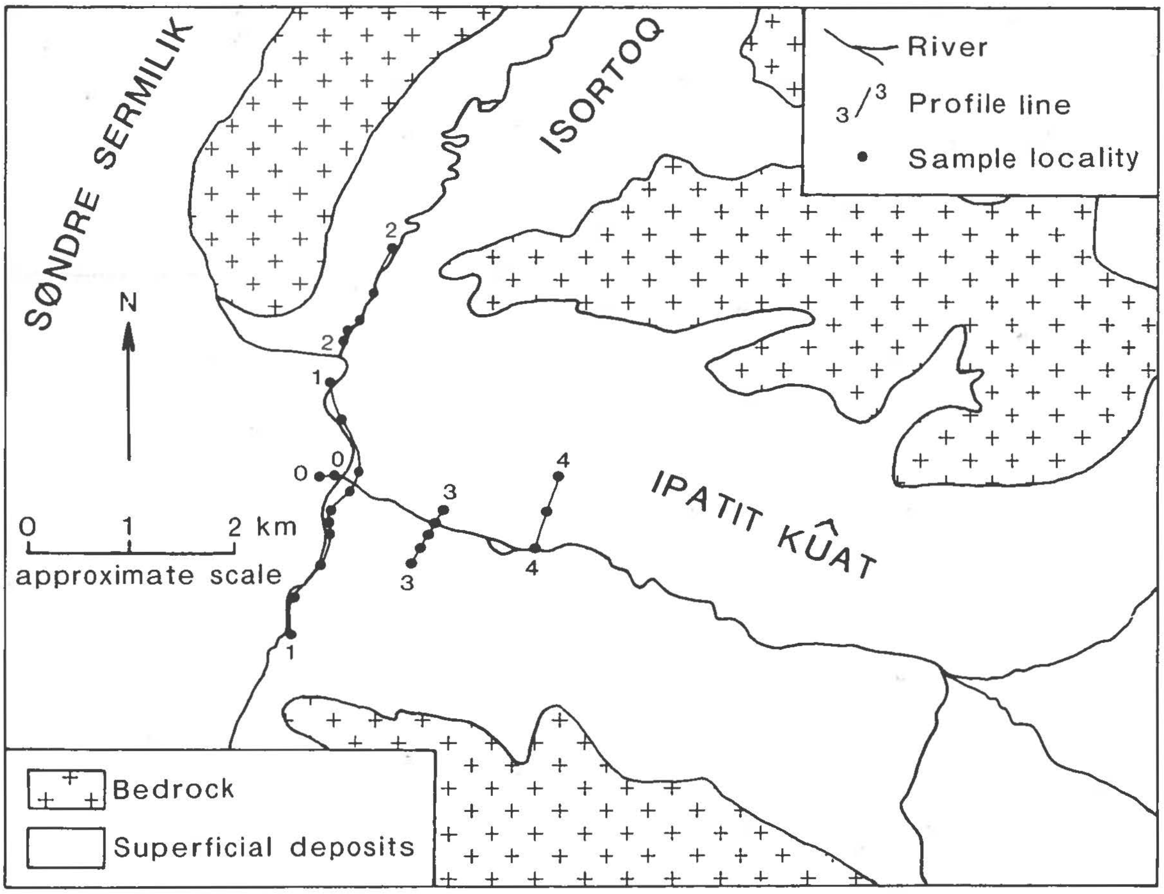


Fig. 18. Sample sites, Ipatit Kuat. Sketch map drawn from aeriel photograph. Modified from Kalvig & Nielsen (1990).

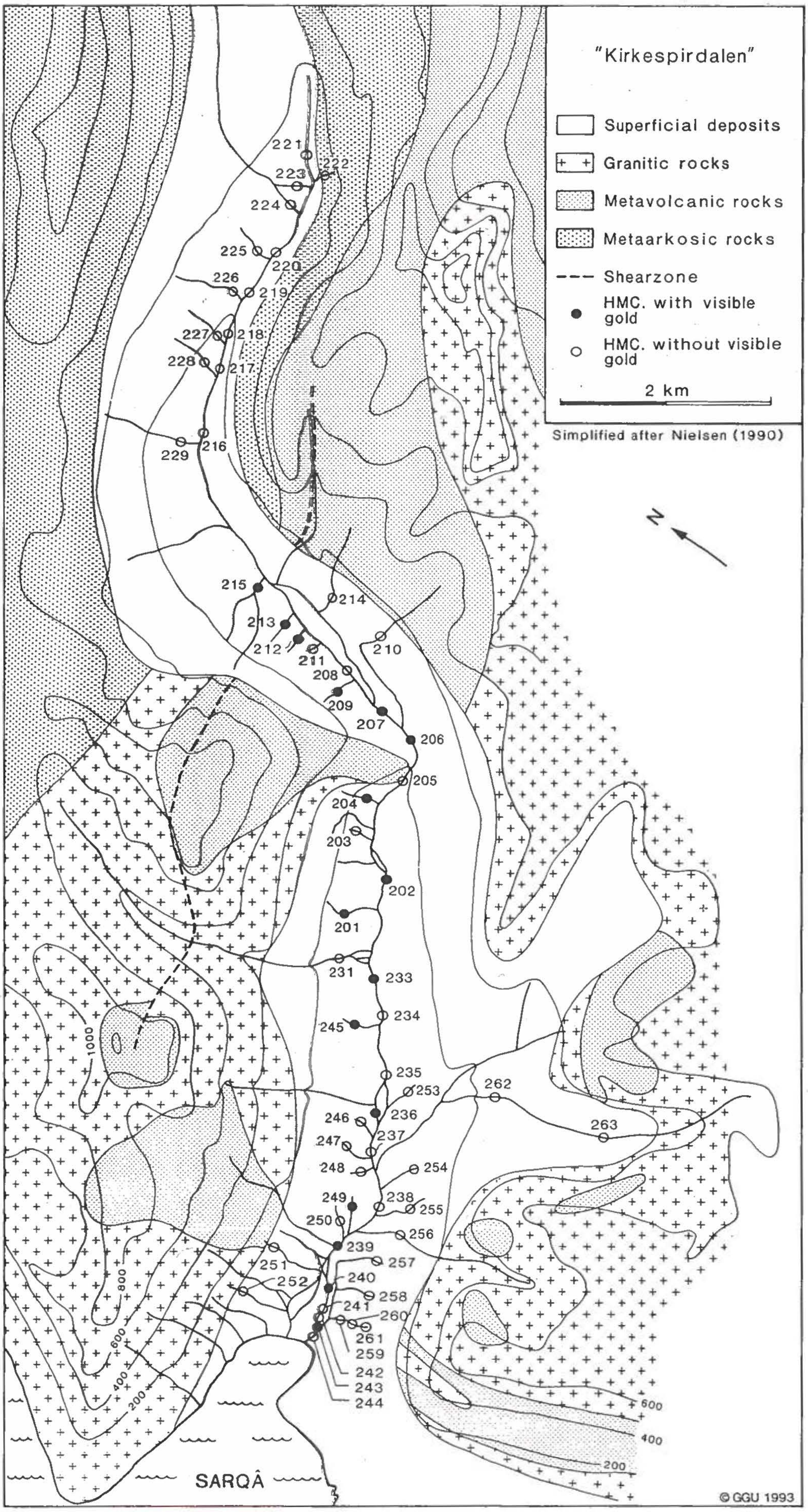


Fig. 19. Heavy mineral sample sites.

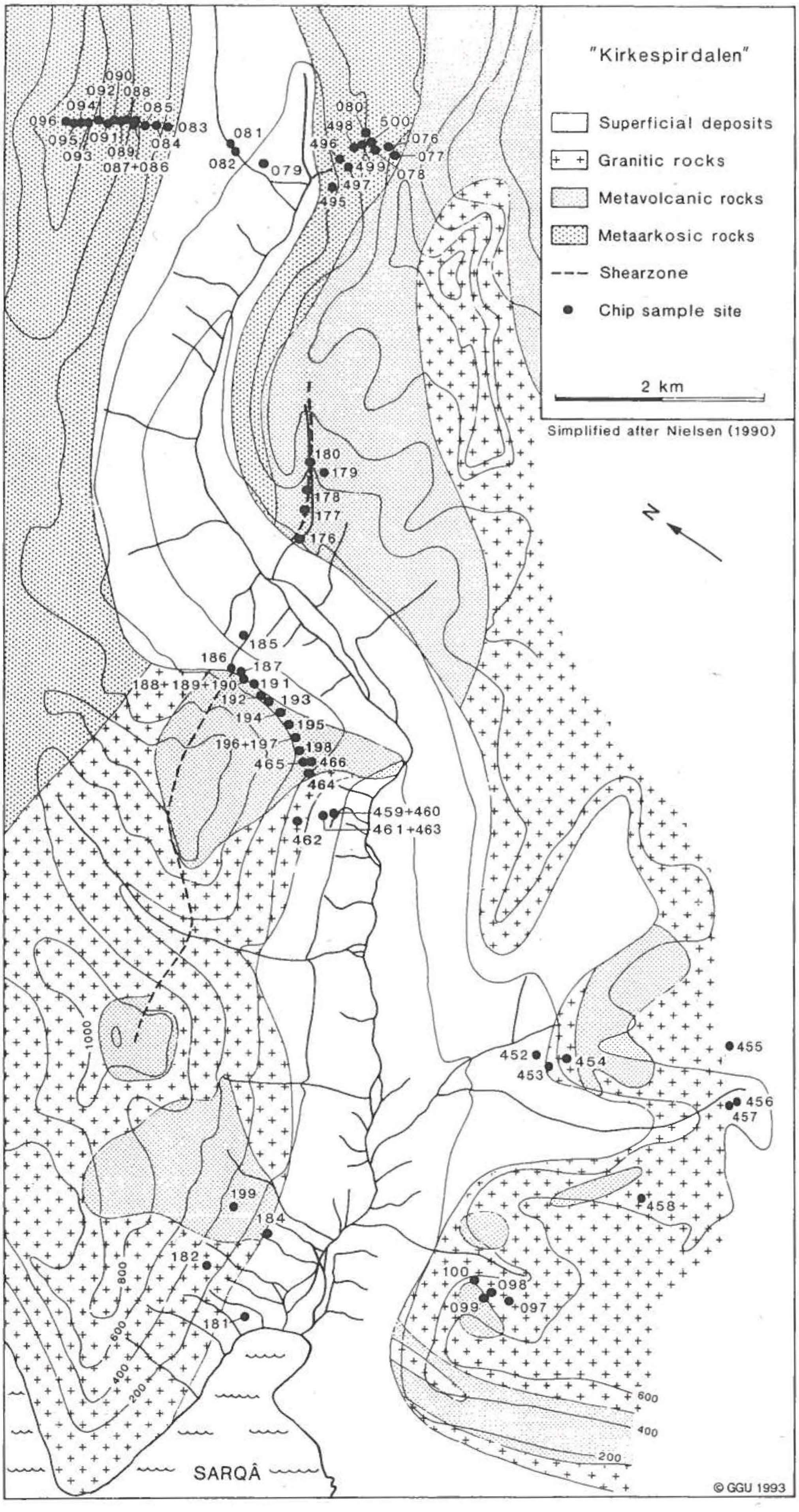


Fig. 20. Chip sample sites.

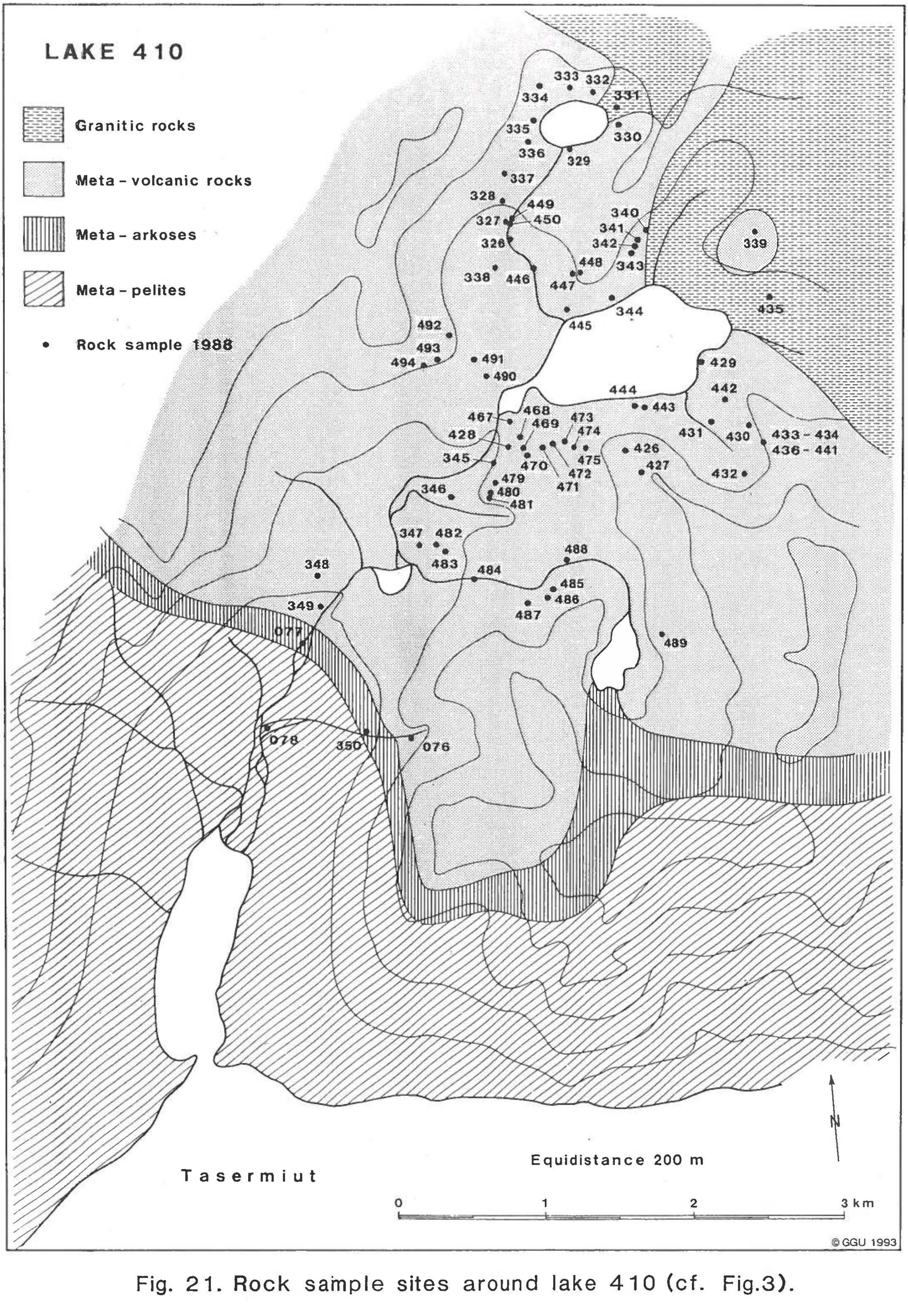


Fig. 21. Rock sample sites around lake 410 (cf. Fig.3).

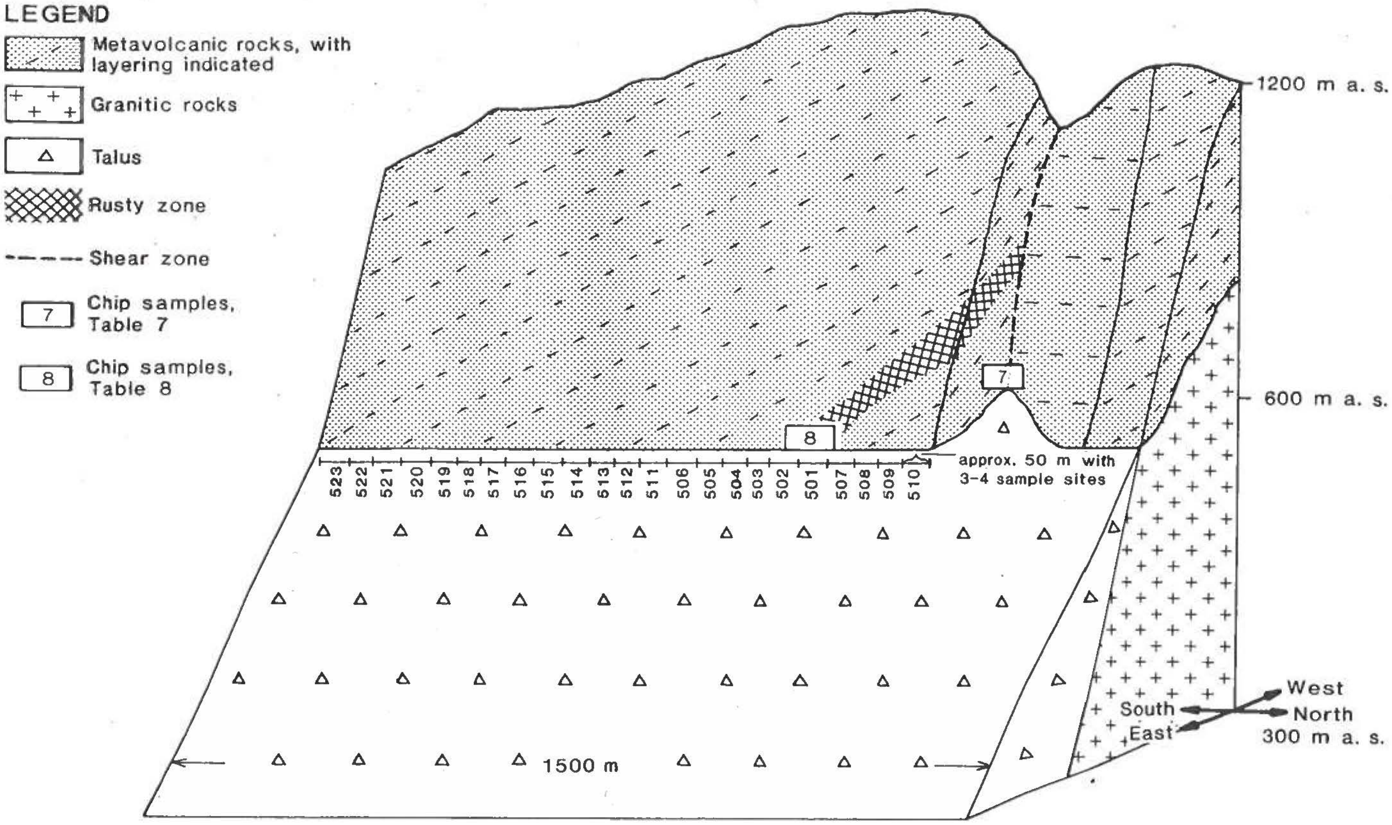


Fig. 22. Top talus sampling programme, Qaersutsiaup Qâqâ.

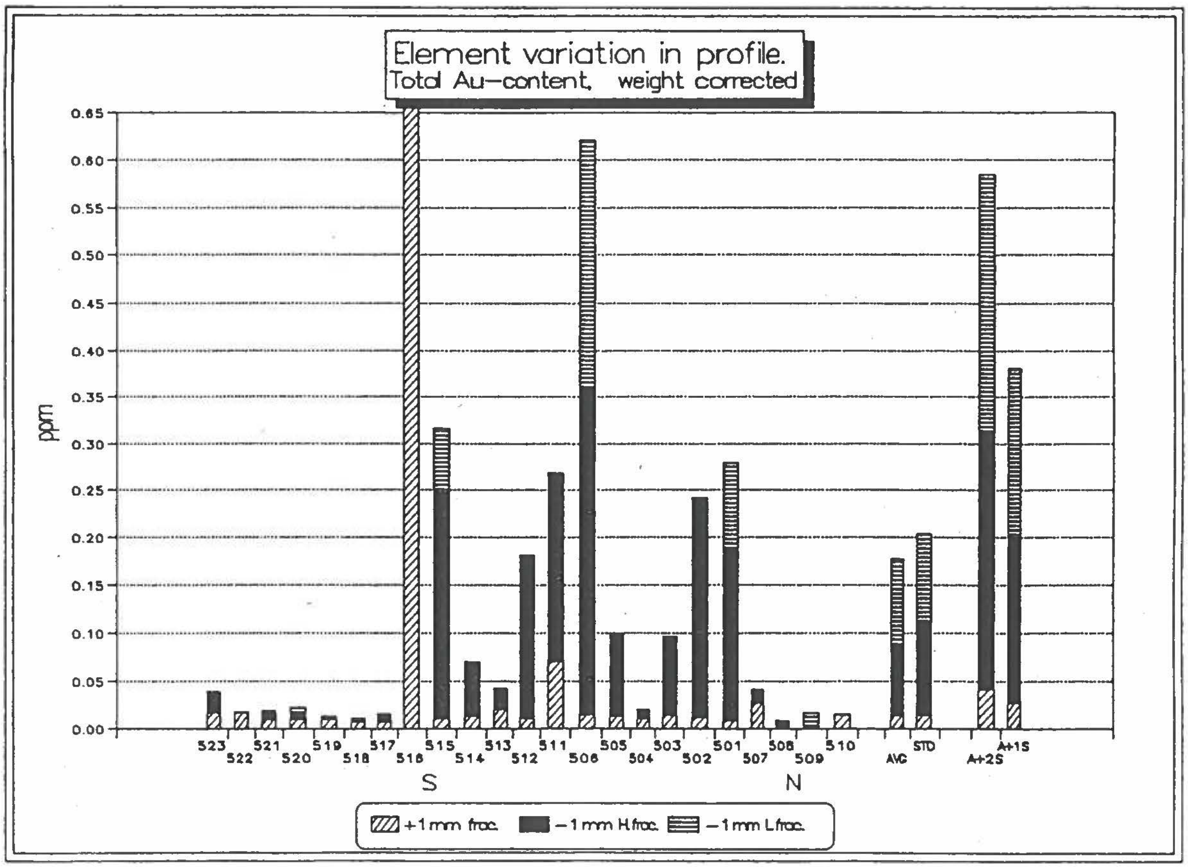


Fig. 23. Gold distribution in top talus samples.

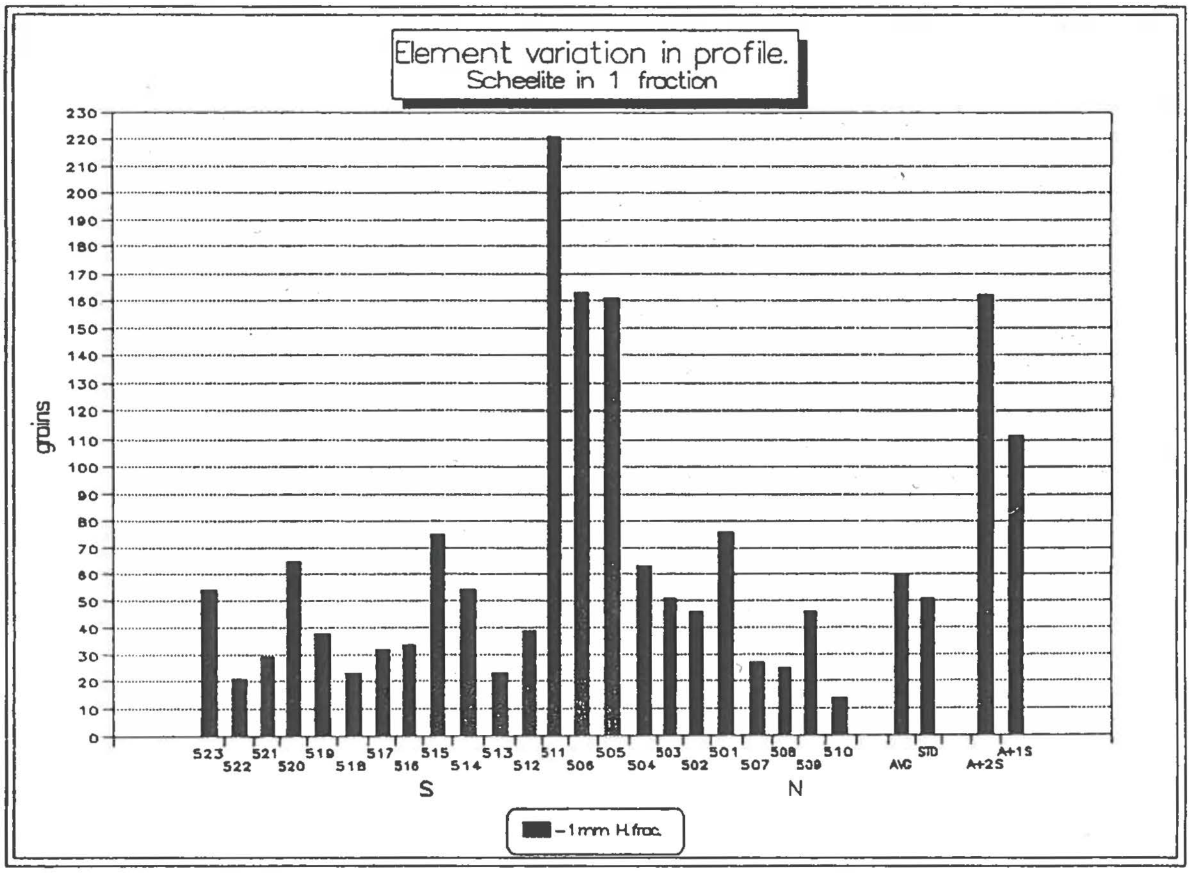


Fig. 24. Sheelite distribution in top talus samples

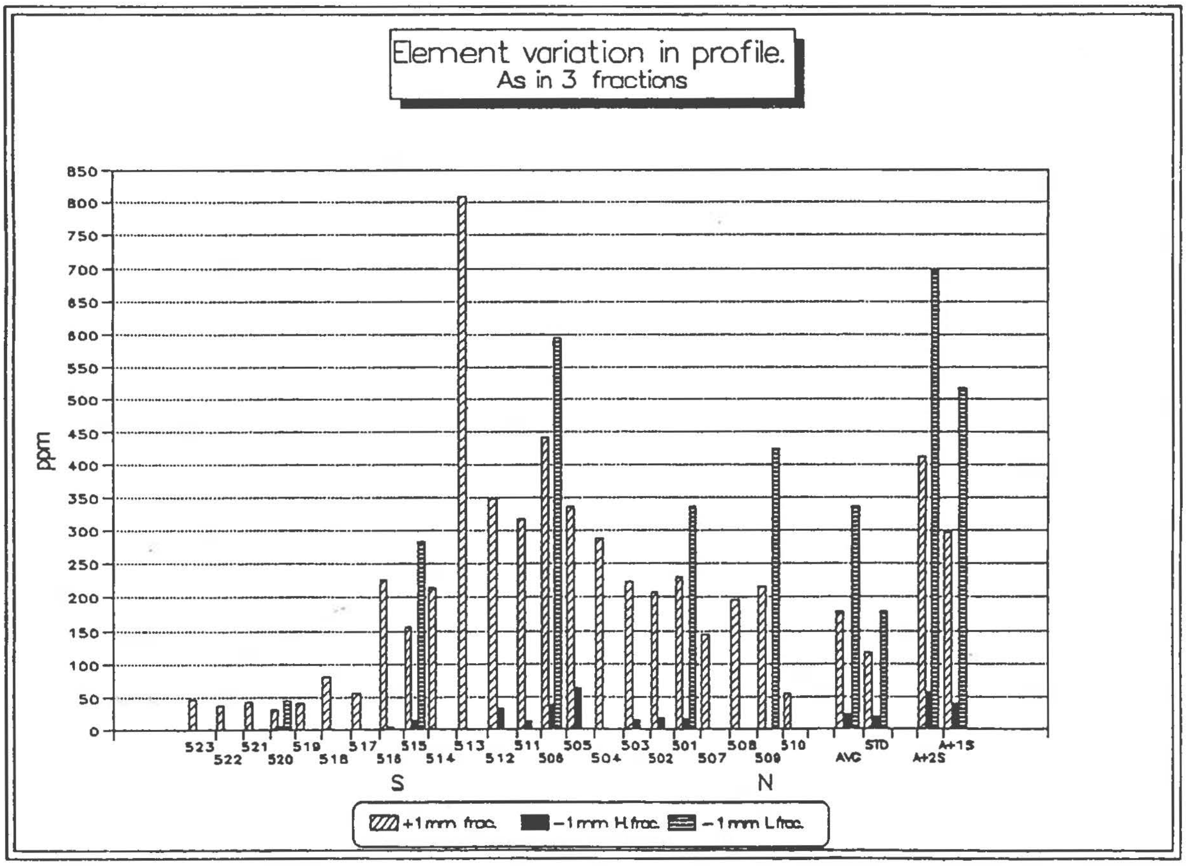


Fig. 25. Arsenic distribution in top talus samples.

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