

# GREENLAND

## MINEX News

GREENLAND MINERAL EXPLORATION NEWSLETTER

Greenland MINEX News No. 2

January 1993

### Why Greenland ?

*complete geological column*

In Greenland, the largest island in the world, an ice-free area of 385,000 km<sup>2</sup> lies open for mineral exploration. Greenland displays a complete geological column with rocks ranging from the earliest Precambrian to Recent, with Precambrian crystalline rocks making up about 70 % of the exposed surface.

Elsewhere in the world regions with comparable geology have proved fruitful exploration territory for minerals. As mineral exploration in Greenland has been limited, the possibilities for new mineral discoveries are deemed good. In addition geological work benefits from clearly-exposed formations not obscured by vegetation, and the advantages of deep-water fjords and comparatively short transportation routes to markets in North America and Europe.

Two major mineral deposits have been exploited: the Black Angel lead-zinc underground mine and the Ivittuut opencast cryolite mine. Two other deposits have been worked: Blyklippen lead-zinc and Quillisat coal mines. In addition a number of sub-economic deposits have been outlined and a large number of mineral occurrences covering a broad spectrum of metals and industrial minerals are known.

Considerable amounts of geological data are readily available on most regions of Greenland through the work of GGU and other scientific

- Why Greenland ? Page 1
- International promotion

#### **Geological & exploration briefs** Page 3

- Kimberlite search
- Mineral exploration excursion
- Solving the gold riddle
- SUPRASYS 1992
- Satellite imagery project – GIRS
- AEROMAG-92
- Devonian auriferous placers ?
- Latest geological map

#### **Regulatory & licensing information** Page 8

- Exploration licences
- Improved licensing terms

institutions as well as individual persons. The overwhelming part of this material is written in English. GGU's contribution is based on more than 40 years of experience, surveying the framework of Greenland geology through a series of mapping programmes and regional investigations aimed at establishing a solid scientific foundation upon which applied and economic activities can be based.

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## International promotion

*wide range of activities*

MINEX is part of the effort to promote Greenland with respect to exploration and mining. The mining industry's knowledge about Greenland in general and about exploration and mining conditions is often very limited and can be based on myth rather than fact. For this reason MRA and GGU aim to provide in a number of ways a wide range of information about Greenland to industry.

### *Mining magazines*

In 1993 supplements featuring Greenland will be published by mining magazines, viz. Northern Miner Magazine in January and by Mining Journal in February. The supplements are designed as up-dated mini-versions of the handbook on mineral resources in Greenland that was published in 1991 and described in the previous issue of MINEX.

The supplements, that can be requested from MRA, will contain information on Greenland, mineral potential, on-going exploration projects, legislation and licensing terms.

### *International conferences, conventions and trade shows*

In 1993 on-the-spot information on Greenland, its geology, mineral potential, legislation, licensing terms and procedures, will be available at booths at several international geological and exploration meetings. The following events in North America, among others, are on the programme for the first part of the year:

- **January:** Cordilleran Geology and Exploration Roundup, Vancouver.
- **March:** Prospectors and Developers Association annual convention, Toronto.
- **April:** Society of Economic Geologists annual convention, Denver.

### *Promotion tour*

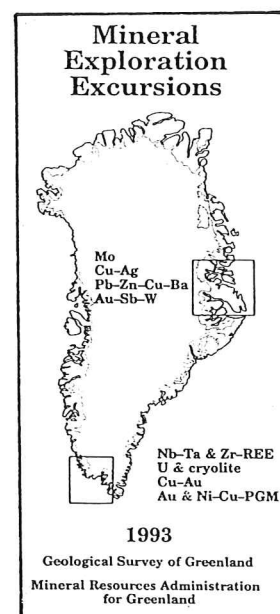
In December 1992 the Premier of Greenland held meetings in London and New York for invited representatives of the mining industry and the financial sector. On the tour were the two exploration companies domiciled in Greenland, Nunaoil A/S and Platinova A/S.

A copy of the Premier's London speech is available from MRA.

### *Mineral exploration excursions*

As in 1992, excursions are offered this summer to central East Greenland and to South-West Greenland for explorationists from the mining industry. The purpose of these field trips is to provide an opportunity to get first hand impressions of the land, its geology, infrastructure, logistics and working conditions as input for evaluations of prospecting and exploration possibilities.

• *See enclosed folder for 1993 trips*



## Geological & exploration briefs

### Kimberlite search

*company field activity, 1992*

Interest in Greenland's kimberlites and associated rocks noted in the last issue of MINEX, was exemplified by 1992 summer field activity. Thus, encouraged by the kimberlites that pierce the Lower Palaeozoic platform on Somerset Island, Arctic Canada, Platinova A/S established a reconnaissance project in North Greenland. "This area is underlain by thick Archean crust that is considered prospective for diamond bearing kimberlites and the relatively flat, well exposed terrain makes prospecting for small targets relatively easy" reports President Bob Gannicott.

The project is an 'add-on' to the base metal programme north of 81°N, carried out as a

joint venture with Nanisivik Mines Ltd. allowing both projects to realise economic saving in sharing logistic support. Results of both projects are pending.

#### Further reading

Registration of kimberlites and other potentially diamond-bearing rocks in Greenland by L. M. Larsen, 1991. *Rapp. Grønlands geol. Unders.* 152, 61-65.

Occurrences of kimberlite, lamproite and ultramafic lamprophyre in Greenland by L. M. Larsen, 1991. *Open File Ser. Grønlands geol. Unders.* 91/2, 36 pp, with appendix, figs, tables, maps. Available from GGU, price: DKK 65.00.

A review of the 2500 Ma span of alkaline-ultramafic, potassic and carbonatitic magmatism in West Greenland by L. M. Larsen & D. C. Rex, 1992. *Lithos* 28, 367-402.

### Mineral exploration excursion

*7-man group in East Greenland*

The summer excursion to central East Greenland advertised in the first issue of MINEX was carried out as planned.

Participants visiting Greenland for the first time were said to be impressed, not only by the geology and scenery, but by the climate: 24 hours a day sunshine and no wind! Travelling more than 1800 km by helicopter the 7-man group, led by a senior GGU geologist, visited a wide range of mineral occurrences including those previously mined or extensively explored, and targets in the early stage of exploration. On Ymer Ø, at localities of the latter category, the excursion was guided by

Nunaoil A/S through current exploration work for gold, antimony and tungsten.

Other deposits visited were the 150 million tons 0.23 % MoS<sub>2</sub>, Tertiary porphyry molybdenum deposit Malmbjerg, rust zones with gold potential, the Permian 0.5 million tons 9% Pb, 10% Zn Blyklippen deposit, Upper Permian 'zebra-barite' at Bredehorn, Triassic Cu-Ag mineralisation at Devondal, and various localities on Wegener Halvø with syngenetic and epigenetic mineralisations.

For repeat excursion in 1993, see previous page.

## Solving the gold riddle

*notable discovery in South Greenland*

Parts of the Ketilidian mobile belt in south-western Greenland have been known for some years to have anomalous gold concentrations determined by geochemical work on surficial sediments. The search for gold in hard rock has tantalised geologists. Several commercial organisations have been involved in determining the mystery of the source of the anomalies but up to 1992 no source had been pin-pointed. This all changed last summer when Nunaoil A/S located gold-bearing bedrock – a major breakthrough towards solving the gold riddle.

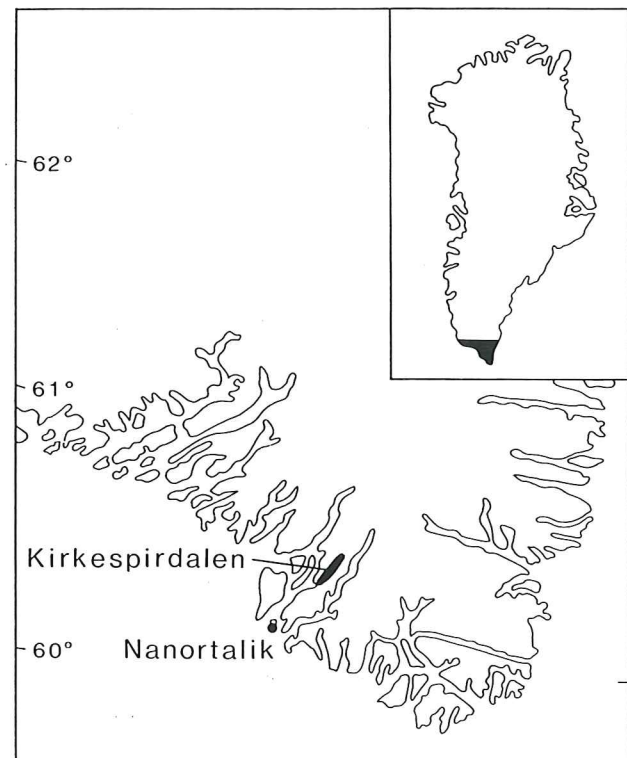
The previous geochemical work stamped the Nanortalik region as a gold target. More specifically, an area 30-40 km north-west of the town, around Kirkespirdalen, showed gold concentrations 5-10 times higher than the immediate surroundings. A 2-week field programme by Nunaoil gave bonus in that macroscopic gold was detected in a suite of quartz veins within a package of mafic supracrustal rocks. This prospect is now known as Nalunaq, an apt Greenlandic name meaning "place that is difficult to find".

The largest vein in the discovered suite outcrops over a strike length of 800 m, has a 30-40° dip, a thickness between 5 cm and 1.66 m, and is locally boudinaged. Gold values range from 235.3 g/t over 1 m down to 2.0 g/t over 0.4 m. Average grade is 50 g/t; average width 0.45 m. The gold occurs both in horizons parallel to the vein and as disseminated grains. Visible gold is said to be common and high-grade sections with abundant macroscopic gold occur in several places, including both ends of the vein which is open along strike.

The veins are dominated by quartz and show as well as visible gold, traces of chalcopyrite, pyrite, arsenopyrite and scheelite. The largest gold grain noted is 2 × 1 × 1 mm. In both the hanging and footwall to the main vein, a number of subsidiary gold-bearing

quartz veins occur, between 10-15 cm wide and with up to 200 m strike length.

Gold has been also occasionally seen in the adjacent country rocks which forms a several hundred metre thick sequence of fine- to medium-grained amphibolites. The mineralisation is located on a steep mountain side, some 7 km from a deep water fjord.



### Further reading

Discovery of the Nalunaq gold deposit Kirkespirdalen, South-West Greenland by J. Gowen, O. Christiansen, L. Grahl-Madsen, T. Robyn & J. Pedersen, in press. Abstract, *Symposium proceedings, S.E.G. 1993*, Integrated methods in exploration and discovery, Denver, U.S.A., April 17-20, 1993.

Geochemical mapping: distribution of gold arsenic, antimony and tantalum in South Greenland by A. Steenfelt & T. Tukiainen, 1991. *Rapp. Grønlands geol. Unders.* 152, 55-61.

## SUPRASYSYD 1992

### *preliminary field results*

GGU's SUPRASYSYD 1992 programme was carried out as planned in July and August. Described in the previous issue of MINEX as a first-year geological reconnaissance of the relatively unknown eastern part of the Ketilidian mobile belt, previous work had suggested a potential for massive sulphides in felsic to intermediate volcanics and volcanogenic sediments. The summer programme embraced five main emphases of investigation:

- regional reconnaissance mapping
- hard-rock exploration sampling
- stream-sediment sampling
- gravity survey
- assessment of remote sensing images

The two main results of the regional reconnaissance are:

- As portrayed on the 1:500 000 geological map sheet, Sydgrønland (compiled some 20 years ago), the geology of the eastern coastal region is in need of major revision.
- Supracrustal rocks in various stages of gneissification make up a substantial part of the region, derived from detrital clastics of psammitic and semi-pelitic composition, not from acid volcanics and volcanogenic sediments as previously deemed. Only minor mafic volcanics were encountered; intermediate volcanics are rare, felsic volcanics extremely so.

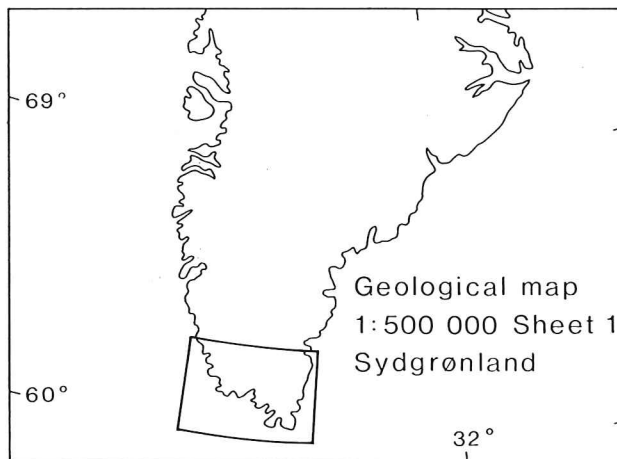
The hard-rock sampling programme concentrated on the supracrustal rocks. In addition to routine grab sampling and chip sampling in mineralised areas, three programmes were emphasised.

- Channel and chip sampling of graphitic and sulphidic chert and amphibolite horizons in semi-pelitic supracrustals.
- Channel, chip and grab sampling of late carbonate vein systems, including one area of well-preserved amphibolite facies basic to

felsic volcanics.

- Sampling of a regional mica-rich lamprophyre suite (c. 1240 Ma), preliminary analyses of which suggest K-rich ultramafic rocks.

Economic assessment will be based on the analytical results, now pending. It is noteworthy that project SUPRASYSYD, designed as a multi-season effort, and aimed at a reappraisal of the Ketilidian mobile belt, was stimulated, among other things, by a number of geochemical anomalies, particularly with respect to gold. One recent gold discovery is reported on elsewhere in this issue of MINEX. This find accentuates the need for continued efforts towards a comprehensive understanding of the various terranes making up the mobile belt. The 1992 field season was a start in this direction.



#### Further reading

Geological Map of Greenland 1:500 000, sheet 1, Sydgrønland, compiled by J. H. Allaart, 1975. Copenhagen: Grønlands geol. Unders. Available from GGU, price DKK 100.00; with map description from 1990, DKK 170.00.

Reconnaissance geochemical mapping of eastern South Greenland (60°30' to 62°30') by A. Steenfelt, E. Dam & P. Erfurt, 1992. *Open File Ser. Grønlands geol. Unders.* 92/10, 15 pp., 49 figs. Available from GGU, price: DKK 68.00.

## Satellite imagery project – GIRS

*South Greenland*

Project GIRS (Geological Information from Remote Sensing) was initiated in 1992. This project explores the possible use of earth observation satellite imagery as a tool for geological investigations in Greenland.

In cooperation with SSC Satellitbild i Kiruna AB (Swedish Space Corporation), seven 1:100 000 scale image map sheets covering selected parts of South Greenland have been prepared. The imagery is based on SPOT multispectral (XS) data with 20 × 20 m

resolution (pixel size), each map sheet covering about 50 × 55 km. At a later date Landsat Thematic Mapper data may be incorporated into the project.

During the 1992 field season, the SPOT imagery, existing both as analog maps and as digital data, was subjected to various checks and experiments using logistics provided by SUPRASYS (see above) Results will be published early in 1993 in the GGU Open File Series.

## AEROMAG-92

*high resolution aeromagnetic data, Lersletten*

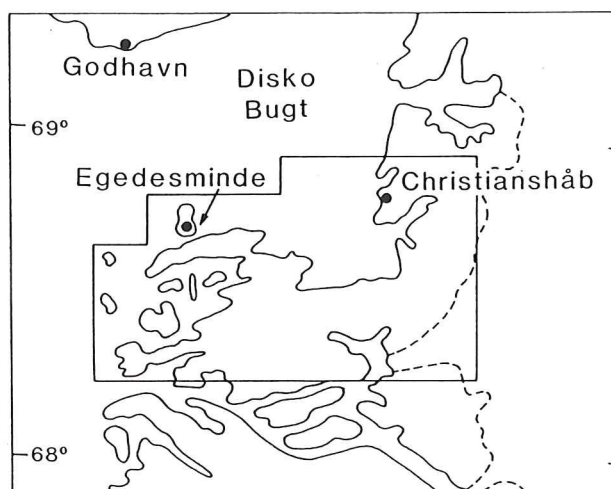
In the summer of 1992 an aeromagnetic survey over Lersletten south of Disko Bugt, central West Greenland, was flown. The Precambrian shield underlying the area is by Greenland standards relatively poorly exposed and it has not been mapped in detail. From a mineral exploration viewpoint the area is known particularly for its copper, zinc and iron mineralisation. The object of the survey was to outline lithological units and structures to provide the regional framework for further geological appraisals of the area.

The survey was flown by Geoterrex Ltd of Ottawa under contract to GGU with additional finance from MRA and Nunaoil A/S.

A total of 10,062 km of high resolution data were acquired with line spacing 1 km and tie-line spacing 5 km. The processed data reveal many conspicuous structures both at surface and at depth, including possible large sub-surface intrusions and what appear to be major crustal, possibly lithospheric, features. Early in 1993 the results will be presented in the GGU Open File Series. At the same time

the maps produced by Geoterrex and the digital data will be released to the public at modest prices to cover the cost of reproduction of maps and magnetic tapes.

As mentioned later under 'regulatory & licensing information' an exploration licence over part of Lersletten is being granted to Nunaoil A/S, January 1993.



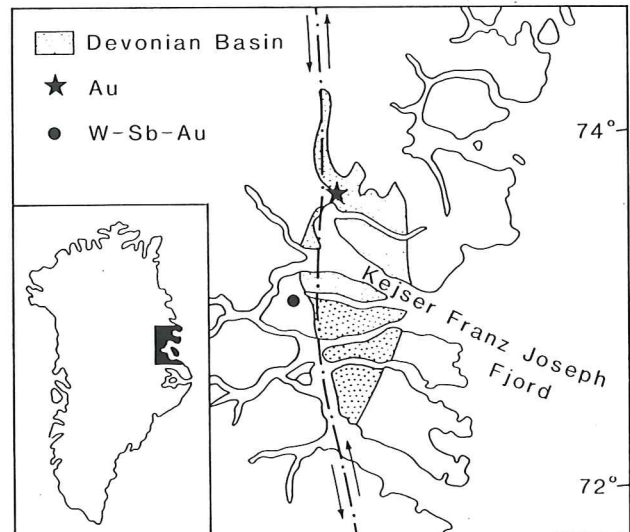
## Devonian auriferous placers ?

*new gold anomalies, East Greenland*

The East Greenland Caledonides, a major orogenic zone 1100 km long and about 200 km wide, continue to be a potential gold target. Work by Nordisk Mineselskab A/S over 30 years (1952-1984) demonstrated gold anomalies in several settings from Precambrian to Palaeozoic. Exploration work on gold prospects by commercial ventures is currently in progress.

The recent analyses of about 1400 stream-sediment samples from the Kejsler Franz Joseph Fjord area, collected by GGU in previous years, have yielded interesting results with implications for gold potential. The three highest gold values, 100-340 ppb in the 0.15 mm fraction, cluster within the Devonian Basin in Hudson Land, not far from the basin's faulted western margin. The Devonian strata in the immediate area are predominantly fluvial sediments with westerly provenance in Proterozoic shallow-water sediments, that 50 km farther south on Ymer Ø are known to host fault-controlled W-Sb-Au mineralisation. The newly discovered anomalies are associated with high values of elements characteristic of heavy minerals, e.g. Hf, Th and REE. Thus there may be a potential for auriferous placer-type deposits in the Devonian fluvial system.

The new results will be available soon in the GGU Open File Series – see reference opposite. See also 'Latest geological map'.



### Further reading

The mineral occurrences of central East Greenland by O. Harpøth, J. L. Pedersen, H. K. Schönwandt & B. Thomassen, 1986. *Meddelelser om Grønland, Geoscience 17*, 139 pp.

The Devonian basin project, North-East Greenland – a summary by P.-H. Larsen & H. Olsen, 1991. *Rapp. Grønlands geol. Unders. 152*, 17-20.

Stream sediment geochemical evidence for gold mineralisation in Hudson Land (73°10' to 74°25'N, 21°30' to 24°45'W), northern East Greenland by A. Steinfelt, 1993. *Open File Ser. Grønlands geol. Unders. 93/1* (in press).

## Latest geological map

*December 1992*

The map entitled 'Upper Proterozoic (Eleonore Bay Supergroup) to Devonian, central fjord zone, East Greenland' covering the Devonian basin between 72° and 74°30'N

is the latest map released by GGU (December 1992). At 1:250 000 scale the map is designed to accompany a paper but is available now in loose sale, price DKK 130.00.

*Regulatory & licensing information*

**Exploration licences**

*status January 1993*

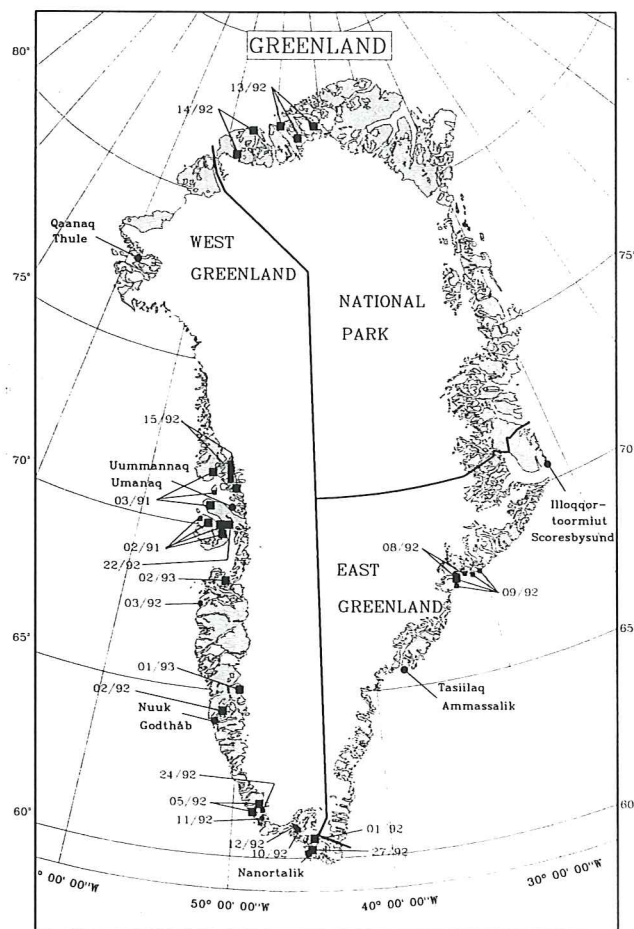
Few exploration licences were surrendered in 1992. These are 05/91 (Pasminco), 04/92 (Nunaoil), 06/92 (Nunaoil) and 07/92 (Coffs Harbour). Parts of 02/91 (Falconbridge), 03/91 (Falconbridge) and 03/92 (Nunaoil) were also relinquished.

The modified licence terms introduced this year (see below) imply that year 2 of the licence period is a kind of 'free' year provided that the licence is surrendered during that year. For this reason several licensees have postponed decisions as regards surrender of the licence or relinquishment of the licence area to sometime in 1993.

The four exploration licences 02/91, 03/91, 04/91 and 25/92 (Falconbridge) are being consolidated into 2 licences: 02/91 and 03/91.

New licences are 27/92 at Nanortalik (Nunaoil), 01/93 at Isukasia near Nuuk (Nunaoil) and 02/93 at Lersletten south of Disko Bugt (Nunaoil).

*Valid exploration licences, January 1993*



**Improved licensing terms**

*in effect from 1993*

The Mineral Resources Act provides basically for three different types of licences: (non-exclusive) prospecting, (exclusive)

exploration and (exclusive) exploitation licences. Standard Terms apply to all licences. The Standard Terms for prospecting and



exploration licences were modified late 1992 with effect from 1993. The amendments are in all cases improvements for the licensees and may be summarized as follows:

1. Exploration licence commitments – calculated as an amount per licence and an amount per km<sup>2</sup> – are now calculated on the basis of the size of the licence as follows:
  - For year 1 (of the licence period) the exploration commitment is calculated based on the size of the licence area at the granting of the licence.
  - For years 2-10 the exploration commitments are calculated based on the licence area on December 31 of the year in question. If the licensee during the year relinquishes part of the licence area the exploration commitments for that year will be reduced correspondingly. If the licensee surrenders the licence during the year the total exploration commitment for that year will be annulled.
2. The expenses approved by MRA under exploration licences are increased by adding

a general allowance of 50% to cover other project expenses which are not comprised by the licence terms.

3. An exploration licence area may upon application be enlarged.
4. In North and East Greenland special exclusive exploration licences for large areas (not less than 1,000 km<sup>2</sup>) may be granted for 3 years with exploration commitments of 500 DKK per km<sup>2</sup> per year.
5. Expenses spent under a prospecting licence may within 3 years from the calendar year in which the expenses have been spent qualify as fulfilment of the exploration obligations for one or more exploration licences.

As regards existing licences a licensee may choose that the modified terms shall apply also for the licence in question with effect as of 1993.

The modified Standard Terms are available from MRA in English and Danish; a summary leaflet is also available.