



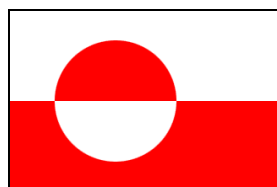
## **NALUNAQ GOLD MINE**

**Nanortalik  
Greenland**



## **ENVIRONMENTAL IMPACT ASSESSMENT**

**July 2009**



**Client: Angus & Ross plc**

Client: Angus & Ross plc

Nalunaq Gold Mine

Environmental Impact Assessment

Prepared

By

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Issued 20<sup>th</sup> July 2009

**Peer Review: T Daffern, Director Mining and Exploration,  
Angus and Ross plc**

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(i) Introduction and Terms of Reference

P I Watkinson was commissioned by Angus & Ross plc in June 2009 to prepare an Environmental and Social Impact Assessment (ESIA) for their Nalunaq (underground) Gold Mine operation located near Nanortalik in Southern Greenland. Angus & Ross plc have recently completed the acquisition of Nalunaq Gold Mine A/S from Crew Gold Corporation on the 2<sup>nd</sup> of July 2009.

Angus & Ross plc is an exploration and mining company with its main properties and interests in Greenland. The company has its Registered Office in Bourne, Lincolnshire, UK. The company is registered in England and its shares are listed on the AIM market of the London Stock Exchange.

P I Watkinson is the trading name of Peter Watkinson whose details are as follows:

**Peter Watkinson, BSc, PgC, MIMMM, FIQ, MMES, AIEMA** has worked in the mining industry for nearly 38 years. He has experience at a high level of responsibility in the technical, operational and managerial aspects of mining, together with experience of operational design planning and assessment, tendering and new project assessment, permitting, planning, environmental and management audit. He also has interests in the alternate energy and energy from waste fields.

Neither Peter Watkinson nor any company associates of P I Watkinson have:

- any rights to subscribe for any Angus & Ross plc securities either now or in the future;
- any vested interest or any rights to subscribe to any interest in any properties or concessions, or in any adjacent properties and concessions held by Angus & Ross plc; nor
- been promised or led to believe that any such rights would be granted to P I Watkinson.

The only commercial interest P I Watkinson has in relation to Angus & Ross plc is the right to charge professional fees to Angus & Ross plc at normal commercial rates, plus normal overhead costs, for work carried out in connection with the investigations reported herein. The payment of these professional fees is not dependent either on project financing or any other considerations.

(ii) Study Strategy

The basic strategy employed for the preparation of this Environmental Impact Assessment study has been to first examine and report on the existing information available on the project including historical activities, baseline conditions, geographical climatic and geological data, mining and operational proposals, environmental data and information, proposals for servicing the mine with materials, personnel, transport, and product removal, and all associated requirements. From this information, together with provided further detailed information and data from the various consultants' reports noted elsewhere, the study identifies the potential environmental aspects and impacts of the Nalunaq Gold Mine proposals. Reference has been made to relevant aspects of Statutory and Code of Practice recommendations enacted and proposed by Local (Greenland Home Rule), National (Danish Government), European (EU), neighbouring States and International bodies together with interested international stakeholders.

(iii) Disclaimer

P I Watkinson has reviewed the environmental data provided by Angus & Ross plc for its assets at Nalunaq Gold Mine, together with other available information and data and has drawn its own conclusions there-from, augmented by the other consultants reports. P I Watkinson has not carried out any independent fieldwork, data capture or other analysis. No visits to the site or Greenland have been made by P I Watkinson.

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## **Non Technical Summary**

- a. The Nalunaq Gold Mine in the Kirkespir Valley north of Nanortalik in southern Greenland has been acquired by Angus and Ross plc (A&R) from Crew Gold Corp who operated the mine from 2004 until February 2009. The Greenlandic company Angel Mining (Gold) A/S, which is wholly owned by Angus and Ross, is the operating company for the mine. Angus & Ross has commissioned the preparation of this Environmental and Social Impact Study.
- b. The object of the project is to reopen, develop and operate the Nalunaq Gold Mine. The Mine will utilise underground methods to exploit the resources. Crew has operated the gold mine from mid-2004 until February 2009. A&R intend to restart mine production in the third quarter of 2009 (subject to BMP approval). The target annual production rate will be almost 35,000 ounces of contained gold giving a saleable output of just under 30,000 ounces of Au.
- c. The intentions of the ESIA are:
  - to examine the technical, environmental and economic aspects of the project;
  - to identify important environmental impacts and explain the best way of mitigation; and
  - to show the mine can be developed without unacceptable environmental impacts;
- d. The ESIA considers both, positive (beneficial) and negative (detrimental) effects of projects, as well as the residual effects, after proposed mitigation measures have been taken into account.
- e. The ESIA report has been written in accordance with the regulatory requirements in Greenland.
- f. A number of impacts have been identified and analysed in detail.
- g. Angus & Ross intend to utilise a simple inclined room-and-pillar type mining method with the aid of their own workforce. Ore processing will initially be limited to gravity processing only. A Carbon-in-Pulp (CiP) processing system will be put in place in March 2010 and will be the subject of an amendment to this ESIA which will be submitted in October 2009. Gold doré bullion will be produced at the mine initially from the gravity process and then from the full process route including

- CiP. Metallurgical testing has shown that a considerable amount of gold is of a size less than that which can be recovered by gravity processes alone, so that the later institution of the CiP process will ensure maximum recovery of gold from the ore.
- h. No process tailings or waste rock will be put to external dump but will, instead, all be used as backfill underground. All process plant and activity, including the doré production, will take place within the mine itself in the previously mined out areas. Engineered bulkheads of bespoke design will be installed to maintain the integrity of the impoundment caverns.
  - i. This report attempts to give the historical background to the project including any environmental difficulties encountered and subsequent pollution caused.
  - j. Baseline considerations and ambient values of potential environmental impacts are given and the potential environmental impacts of the component operations of the new proposals are investigated. Mitigation measures to minimise all adverse impacts and monitoring to analyse compliance are proposed. The mitigation measures proposed will result in no significant residual adverse impacts.
  - k. Frameworks for the Environment Management Plan, the Health and Safety Plan and the Environmental Risk Register are proposed.
  - l. The two main potential impacts were found to be:
    - Dust – raised from the site roads and hard standings by wind scour and vehicle movements; and
    - Water discharge from the mine and camp into the Kirkespir River.It is anticipated that the mitigation measures proposed will effectively minimise these impacts and that no residual impacts will accrue.
  - m. Proposals for effective monitoring of all environmental impacts are proposed.
  - n. A Social Impact Assessment (SIA) will be prepared separately after public participation and full consultation with all stakeholders. This SIA will include the preparation of an Impact Benefit Plan (IBP) and Impact Benefit Agreement (IaBA). The SIA will be submitted in October 2009.
  - o. The area disturbed by the development of Angus & Ross plc's Nalunaq Gold Mine is not close to and does not involve any of the following designated areas of special interest:

- Areas or sites of potential great sensitivity or unique geomorphological characteristics
  - Areas of special importance to wildlife
  - Areas with valuable, sensitive or representative biotopes
  - Areas of spiritual, cultural, or other socio-economic value including areas of special importance for traditional resource use.
- p. The environmental effects of the previous mining operation have been seriously noted and marked by Angus & Ross plc. Good environmental practice has been taken into account and built into the operational design of the mine and effective mitigation measures will be enforced to minimise the potential adverse impacts of the development. Full environmental control will be maintained to limit all adverse impacts. The mitigation measures proposed will result in no significant residual adverse impacts.
- q. The comments of the Statutory and Regulating Bodies have been taken into consideration in the formulation of this project.
- r. The development will have significant economic and social benefits for the Nation of Greenland and the local community and Municipality of Nanortalik in particular. Well paid work will be provided together with the knock on indirect and induced economic benefits which will improve the individual, family and community economy and reduce unemployment.
- s. It is believed that the Nalunaq Mine can successfully operate and exploit the gold resource without causing major adverse impact. It is further believed that the benefits of the project to Greenland as a whole and the local community in particular far outweigh any potential disbenefits of the project.**

## **1 Introduction**

The Environmental and Social Impact Assessment (ESIA) is a process used to evaluate the potential impacts on the environment and the community, of proposed developments. Its overall aim as part of a feasibility study is to minimise negative impacts. The EIA is also a tool to assist the financial institutions, state authorities and the wider international community, in the evaluation of environmentally related factors.

EIA also provides an important tool to aid a feasibility study, by highlighting possible environmental problems or risks, which can then be 'designed out' of the project at much lower cost than remediation works, after an environmental impact or incident has occurred. The EIA provides an opportunity to demonstrate that the mine has been designed in a sustainable manner, with control and mitigation measures incorporated from the outset. As such, conducting an EIA as part of the Feasibility Study for the project enables findings from both activities to be incorporated throughout the process allowing iterative changes to be made in the design or the impact mitigation measures.

A critical component of the full EIA is consultation with the local community; this is essential to ensure that the impact assessment takes account of issues regarded as priorities by those people living around and affected by the development. The applicant will also consult with relevant statutory authorities.

EIA considers both, positive (beneficial) and negative (detrimental) effects of projects, as well as the residual effects, after proposed mitigation measures have been taken into account.

A separate Social Impact Assessment (SIA) including an Impact Benefit Plan and Impact Benefit Agreement, as now required by Greenland Home Rule Government requirements, will be produced to assess the impact of the proposals on the local communities and its general socio-economic impacts.

## **Summary of the Project**

Angus & Ross plc (A&R) have acquired the assets of Nalunaq Gold Mine A/S (NGM) from Crew Gold Corporation (Crew) of Weybridge, Surrey, UK. The object of the project is to reopen, develop and operate the Nalunaq Mine situated near Nanortalik in Southern Greenland. The Mine will utilise underground methods to exploit the resources. Crew has operated the gold mine from mid-2004 until February 2009. During this period, it has produced approximately 308,000 ounces of gold. A&R intend to submit revised mining and environmental plans to the Bureau of Mines and Petroleum of the Greenland Home Rule Government during July 2009 and to restart mine production in the third quarter of 2009. The target annual production rate will be almost 35,000 ounces of contained gold giving a saleable output of just under 30,000 ounces of Au.

Angus & Ross intend to utilise a simple inclined room-and-pillar type mining method with the aid of their own workforce. Ore processing will initially be limited to gravity processing only. A Carbon-in-Pulp (CiP) processing system will be put in place in due course and will be the subject of an amendment to this EIA. Initially, doré will be produced at the mine using concentrated ore from the gravity process. Metallurgical testing has shown that a considerable amount of gold is of a size less than that which can be recovered by gravity processes alone, so that the later institution of the CiP process will ensure maximum recovery of gold from the ore. No tailings or waste rock will be put to external tip but will, instead, all be used as backfill underground. All process plant and activity, including the doré production, will take place within the mine itself in the previously mined out areas. Engineered bulkheads of bespoke design will be installed to maintain the integrity of the impoundment caverns. Full environmental control will be maintained to limit all adverse impacts. This report attempts to give the historical background to the project including any environmental difficulties encountered and subsequent pollution caused. Baseline considerations and ambient values of potential environmental impacts are given and the potential environmental impacts of the component operations of the new proposals are investigated. Mitigation measures to minimise all adverse impacts and monitoring to analyse compliance are proposed. The mitigation measures proposed will result in no significant residual adverse impacts. Frameworks for the Environment

Management Plan, the Health and Safety Plan and the Environmental Risk Register are proposed. It is believed that the Nalunaq Mine can successfully operate and exploit the gold bearing deposit without causing major adverse impact. It is further believed that the benefits of the project to Greenland as a whole and the local communities in particular far outweigh any potential disbenefits.

### **Authors**

The following have directly contributed to this EIA:

GBM	Minerals Processing
Golder Pastec	Ventilation, Geotechnical Design, Water, Backfill
P I Watkinson	Technical Author and Co-ordinator of the ESIA

## **2 Angus & Ross plc**

### **The Company**

Angus & Ross plc is an exploration and mining company registered in England & Wales under the Companies Act. It was registered under its present name in 1997 (Registration Number 3319691, VAT number GB-860 170643) and its shares are listed on the AIM market of the London Stock Exchange (Symbol: AGU.L). Its main properties and assets are in Greenland. The company has its headquarters in Bourne, Lincolnshire, UK. It has a core of strong and informed institutional shareholders augmented by an unusually large retail component resulting in good market liquidity. By far the majority of the value in Angus & Ross plc is found within the Nalunaq Gold Mine [Angel Mining (Gold) A/S] and the Black Angel Lead/Zinc Mine in West Greenland. The Greenlandic company Black Angel Mining A/S is the operating company for the Black Angel Mine and is wholly owned by Angus & Ross plc.

### **History of Proposals**

Angus & Ross plc (A&R) completed the acquisition of the assets of Nalunaq Gold Mine A/S (NGM) from Crew Gold Corporation (Crew) of Weybridge, Surrey, UK on 2<sup>nd</sup> July 2009. Crew operated the gold mine from mid-2004 until February 2009. During this period, it produced approximately 308,000 ounces of gold. Crew had also previously completed more than 19,000 metres of tunnelling and over 30,000 metres of diamond drilling.

The mine started operation on 1<sup>st</sup> July 2004 but was placed on care and maintenance by Crew in February 2009. The stated reason for idling the mine was the high cost of production, with Crew unwilling to make further investment. All the mining equipment remains intact at the camp. The high production costs were reported by Crew to be due to:

- High cost of actual mining due to ramp development in waste and a relatively complicated mining method with little evidence of trying to do it differently;

- High costs due to a poorly negotiated and implemented mining contract with a third party mining contractor, which was based on hours worked rather production performance;
- High shipping costs of ore; and
- High toll processing charges by a remote third party (no ore processing apart from pre-concentration screening was carried out on site).

A&R commenced the process to acquire NGM in March 2009 and agreed non-legally binding heads of terms on 7<sup>th</sup> of April 2009. Since then, full financing has been arranged and the acquisition has been finalised and confirmed. The assets acquired include mining and exploration licences (which must however be transferred to A&R by the Greenland Authorities after the due process), mining equipment, a fully operational mine camp and ship loading harbour facilities located close to the town of Nanortalik at the southern tip of Greenland. NGM had a fully paid environmental bond of 16million Danish Kroner (DKK), which remains in place, but again must be formally transferred to A&R. A quantity of run-of-mine gold ore in stock at the harbour will be transported back to the mine and will be the initial ore to be treated in the gravity plant by A&R.

A&R is submitting revised mining and environmental plans to the Bureau of Mines and Petroleum Bureau of Minerals and Petroleum (BMP) of the Greenland Home Rule Government and this EIA forms part of those submissions. Mine operations and doré production is planned to start in the third quarter of 2009. The target annual production rate will be approximately 35,000 ounces of contained gold per annum.

A&R believes that it can operate the mine profitably by adopting a mining method that will enable it to employ predominately local labour and by producing doré on site which will eliminate the costs of concentrate shipping and external processing.

Preliminary life of mine plans completed by A&R indicate that a further 350,000 ounces of gold can be recovered from the Nalunaq gold mine during a projected 10 year operational life. Exploration of the deposit during the operation may amend this expectancy. The Nalunaq gold mine will remain on



a care and maintenance basis until A&R start the refurbishment of the mine and recommence operations.

### **3. Framework of the Proposal**

#### **Legislative Framework**

Section 10 of the Mineral Resources Act, which forms the main relevant piece of Legislation, requires that "*Prior to the commencement of exploitation and development activities a plan for the activities.....shall have been approved by the Greenland Home Rule Government..*" Further the BMP Guidelines for preparing an EIA for Mineral Exploitation in Greenland state that "*An EIA must be prepared when a company prepares to exploit a mineral deposit.*" The recommended procedures for the preparation of the EIA are set out in the BMP Guidelines. There is an existing ESIA in place which relates to the previous operations run by Crew. BMP have ruled that A&R must prepare a new EIA to cover their proposals before operations can commence.

#### **Environmental framework**

The Environmental Impact Study has been prepared to comply with the requirements set out above, as agreed by discussion with BMP. The main objectives of the EIA are to provide the following:

- A general description of the location and situation of the project;
- A description of the mining and environmental history of the site;
- A description of the possible impacts arising as a consequence of the proposed development;
- A description of mitigation measures intended to avoid, reduce or remedy those impacts;
- Details of an ongoing monitoring environmental programme through the life of the project; and
- Proposals for reducing the carbon footprint of the proposed operation.

#### **Background to the application**

The Nalunaq Mine was previously operated by Nalunaq Gold Mine A/S between 2004 and its idling in February 2009. The operation caused some

environmental damage some of which has not been remediated. This proposal utilises modern working methods which take into account good environmental practice and are designed to minimise environmental impacts. Full environmental control will be maintained to limit all adverse impacts. Consultation by Angus & Ross plc has taken place with the Authorities throughout the acquisition and redesign process. Meetings with BMP during this time have agreed a number of requirements for the EIA and this report takes these requirements into consideration.

### **Scope of the application**

This report covers the re-development of the Nalunaq Mine including the initial mineral process route which utilises gravity separation techniques only together with doré production. A carbon-in-pulp processing plant is being designed and will be put in place following start up. The impacts of this additional process route are not discussed in this EIA but will be dealt with in an Addendum to this report which is anticipated to be available in October 2009. No mineral process plant waste tailings or waste rock will be placed outside the mine so that no references are required for external above ground waste rock dumps or tailings management facilities (TMF/tailings dams). Full environmental control will be proposed and maintained to limit all adverse impacts.

## **4 Consultation**

### **Consulted Bodies**

As part of the acquisition and development of Nalunaq, Angus & Ross plc have undertaken consultation with the stakeholders and in particular with the Greenland Authorities, the Local Community representatives, local people and the environmental body involved with the monitoring of the ecological effects of mining operations in Greenland. All the bodies consulted have given positive assistance to Angus & Ross plc in this consultation and full and free exchange of views, ideas suggestions and requirements has taken place.

The main bodies consulted have included:

- Greenland Home Rule Government
- Bureau of Minerals and Petroleum at Nuuk
- Department of Arctic Environment (DMU) - National Environmental Research Institute (NERI) at Roskilde, Denmark
- Municipality of Nanortalik

It is intended that discussion with the Geological Survey of Denmark and Greenland in Copenhagen (GEUS) and the Greenland Museum at Nuuk will also be undertaken in the near future.

Public Consultation is a key part of the EIA and SIA process. Further consultation with the Statutory Bodies is ongoing and will also refer to the findings of this EIA. As part of the separate SIA process and the SIA report due to be submitted in October, detailed consultation will take place with the Community Representatives and the local people themselves. The SIA will be submitted with details of the consultations and the results of the discussions to include both the positive and negative comments, the hopes and aspirations and the doubts and fears which the community have expressed about the project, together with the answering comments and any provisions or statements made by the Company.

## **Key Issues Raised by Consultees**

The two key issues raised by the consultees are:

- Control of dust from the operation; and
- Control and safe use of the cyanide and other chemicals required for gold extraction, particularly with regard to safeguarding the surface water and groundwater regimes.