DCE/GINR – Review of 'Nalunaq Gold Project. Environmental Impact Assessment, March 2023'.

Comments and recommendations

Scientific briefing from DCE – Danish Centre for Environment and Energy and Pinngortitaleriffik, Greenland Institute of Natural Resources.

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Data sheet

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1 Introduction and background

By e-mail of 17. March 2023, the Environmental Agency for Mineral Resource Activities (EAMRA) has requested the Danish Centre for Environment and Energy (DCE) and Greenland Institute of Natural Resources (GINR) to review the summary report "Nalunaq Gold Project. Environmental Impact Assessment 2023" (in the following referred to as the EIA draft [1]), including its supporting documents (Appendix I to XXI to the EIA report).

The EIA draft has been prepared by WSP Golder for Nalunaq A/S (the company) and is the fourth revision of the EIA draft dated 17. March 2023. DCE/GINR's comments and recommendations for the previous version of the EIA draft are listed in [2-5].

The focus of DCE/GINR's review and technical assessment has been to verify that the description of all relevant environmental aspects of the project complies with 1) the conditions specified in the "Nalunaq Gold Project. Scoping and Terms of Reference for the Environmental Impact Assessment for the Nalunaq Project 2020" (WSP Orbicon 2020) and 2) "Guidelines for preparing an Environmental Impact Assessment (EIA) report for mineral exploitation in Greenland, 2015" (referred to as EIA Guidelines hereafter). Fulfilment of the EIA Guidelines entails that all aspects of the project are based on international environmental standards and the principles of Best Available Technology (BAT) and Best Environmental Practice (BEP).

As stated in the EIA Guidelines, the aims of the EIA are:

- "*To estimate and describe the nature and the environment as well as the possible environmental impacts of the proposed project.*
- *To provide a basis for the consideration of the proposed project for Naalakkersuisut (the Government of Greenland).*
- *To provide a basis for public participation in the decision-making process.*
- *To give the authorities all information necessary to determine the conditions of permission and approval of a proposed project*".

In DCE/GINR's review, special attention has been given to verify that the aims of the EIA Guidelines have been adequately addressed and that the presented conclusions of the summary EIA report are supported by clear and unambiguous references to the relevant background documents. The review does not include an evaluation of chapter 3 on 'Administrative and legislative framework' and chapter 4 on 'The EIA process in Greenland'.

In conclusion, DCE/GINR find that the EIA draft is logically structured, including a description of the main issues of the ToR and providing an easy-to-read summary of the main conclusions of the background documents. DCE/GINR assess that the EIA draft complies with the requirements of the EIA Guidelines and provides an adequate and correct basis for public participation in the decision-making process.

However, some parts of the EIA draft's conclusions are based on either theoretical assumptions or desktop and modelling studies. These conclusions are inherently associated with data uncertainty with respect to the quantification of potential environmental impacts, projects risks and mitigation strategies. While the conclusions presented in the EIA draft are assessed to be adequate for the purpose of describing the anticipated environmental impacts of the project, DCE/GINR recommend that special attention and follow-up actions are made to provide sufficient empirical field data to verify some of these assumptions. Chapter 2 lists topics where DCE/GINR recommend additional monitoring and field verification during the construction, operations and closure phase of the project to reduce uncertainty and inform future mitigation.

2 General comments and recommendations

DCE/GINR recommend that special attention and follow-up actions are made to document the following list of topics, if the mining project are to be approved. DCE/GINR recommend that topics 1 and 2 should receive attention before approval of the project (approval of EIA + white paper) but can take place after the EIA has been into the public consultation process. Topics 3 and 4 are actions that are recommended to be included in the monitoring plan for the project.

2.1 Alternative locations for the tailings storage facility (DTSF)

The company's preferred location for the DTSF was identified using a scoring system to evaluate and determine the advantages and disadvantages of each identified alternative. This qualitative risk screening process was based upon the evaluation of a selection of defined essential and non-essential criteria for each site. A total of seven potential alternative locations for the DTSF is described in the EIA draft, with six located in Kirkespir Valley and one located in an adjacent valley to the south of the current harbour.

In response to an early version of the technical background report (Appendix IX to the EIA report), DCE/GINR recommended to also consider an alternative location outside of Kirkespir Valley. The recommended criteria by DCE/GINR for the alternative location of the DTSF can be briefly summarized as:

1. The considered alternative should be placed on consolidated ground/bedrock as opposed to the unconsolidated sediment on top of a local groundwater aquifer of Kirkespir Valley.

2. The considered alternative should have a limited upstream catchment area as opposed to the larger upstream catchment area of Kirkespir Valley with associated flooding risk profile.

3. The considered alternative should be located in an area where DTSF cannot be eroded by nearby rivers as opposed the preferred locations close proximity to Kirkespir River.

4. The considered alternative should have no drainage or outlet to sensitive recipients (as Kirkespir River) as opposed to the preferred options direct discharge into Kirkespir River.

Based on the analysis of alternatives presented in Appendix IX to the EIA, DCE/GINR observe that only one of seven alternatives are located outside of Kirkespir Valley. A site investigation has not been carried out at that site (location 6) and the site, as an alternative location, is dismissed solely on the basis of subjective ranking methodology.

According to the EIA, mitigation of risk arising from the location of the preferred DTSF location will be handled via engineering solutions rather than risk elimination. While the EIA report may provide an accurate description of total risks of the preferred option, DCE/GINR assess that the potential for

identifying a feasible alternative location with an overall lower environmental risk profile has not been completely exhausted.

Generally, DCE/GINR recommend that potential risks identified by the above-mentioned criteria are resolved via risk mitigation than through engineering. Consequently, DCE/GINR recommend that an alternative location for the DTSF is investigated and described to a sufficient level of detail, prior to a potential approval of the project. DCE/GINR assess that will ensure that a potential approval of the DTSF location is made on a sufficiently developed knowledge base of all feasible alternatives.

2.2 Water treatment techniques

Active treatment of contact water from the DTSF before discharge to the environment is not part of the project plan. Instead, the EIA describes that any contaminants can be controlled through sedimentation prior to discharge to the environment and discharge will be monitored.

DCE/GINR recommend that additional documentation is provided prior to a potential approval of the project, showing that active water treatment techniques exist and can be implemented for all relevant contaminants if monitoring results of wastewater to the environment show that it is needed.

2.3 Environmental impacts from dust emissions

Quantification of dust emissions per identified source is not included in the EIA assessment. Instead, a qualitative analysis of potential dust emissions is based on a guidance document by the Institute of Air Quality Management (UK-based association of air quality specialist; non-governmental). The EIA report concludes that dust emissions will be low with greatest impacts within 100-400 meters from identified sources.

DCE/GINR recommend that these assumptions are verified by field measurements and monitoring at representative locations over time during operation to document that both concentrations and deposition levels of dust comply with the Environmental Air Quality Criteria for mining activities in Greenland (see EIA Guidelines, Appendix 3).

2.4 Annual precipitation range

Site specific measurements of the combined annual precipitation does not exist at the Nalunaq project area. Instead, climate data from the Narsarsuaq Station was used in lieu of site-specific precipitation data, resulting in an annual average of 602 mm/year. The accuracy of the annual precipitation range is important for assessment of the flooding risk, short- and long-term stability of the tailings storage facility (DTSF), surface water management, seepage rates through DTSF, surface erosion of tailings, discharge rates via sedimentation pond etc.

As stated in the EIA (chapter 6.3), onsite monitoring is ongoing at Nalunaq to collect reliable verification of the precipitation values to be used for the design of the project. DCE/GINR recommend that precipitation monitoring is continued throughout the life of the mine, including special attention to document also winter precipitation (snow and sleet). DCE/GINR recommend that the accuracy of the flooding risk assessment and other precipitation affected

risk factors are re-evaluated after continuous precipitation monitoring for some years to assess whether updates to the project design is needed as a result of the measured annual mean versus the assumed annual mean.

3 List of references and previous notes on Nalunaq EIA versions

[1] WSP Golder. Nalunaq Gold Project, Environmental Impact Assessment 2023. 17 March 2023.

[2] Bach, L, Juncher Jørgensen, C, Jia, Y, Bomholt Dyrholm Jacobsen, I. 2023. DCE/GINR – Review of 'Nalunaq Gold Project. Environmental Impact Assessment, January 2023'. Aarhus University, DCE - Danish Centre for Environment and Energy. – Scientific note. 28 February 2023

[3] Bach, L, Juncher Jørgensen, C, Jia, Y, Bomholt Dyrholm Jacobsen, I, and Nymand, J. 2022. DCE/GINR – Review of 'Nalunaq Gold Project. Environmental Impact Assessment, July 2022'. Aarhus University, DCE - Danish Centre for Environment and Energy. – Scientific note. 21 October 2022

[4] Bach, L, Juncher Jørgensen, C, Bomholt Dyrholm Jacobsen, I, Jia, Y and Nymand, J. 2021. DCE/GINR – Review of "Nalunaq Gold Project. Environmental Impact Assessment 2021. Version 01-10-2021" – draft 2. Aarhus University, DCE - Danish Centre for Environment and Energy. – Scientific note. 26 November 2021

[5] Bach, L, Juncher Jørgensen, C, Jia, Y and Nymand, J. 2021. DCE/GINR – Review of the Nalunaq Gold Project, Environmental Impact Assessment 2021, for the EIA Process, Nalunaq Project, License 2003/05. Aarhus University, DCE - Danish Centre for Environment and Energy. – Scientific note. 2021