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CANADIAN ROYALTIES INC.

NUNAVIK NICKEL

Power supply work at the Deception Bay camp and installation of an optical fiber –Nunavik Nickel Mining Project by Canadian Royalties Inc.

Document of answers to questions and comments from Ministère de l'Environnement et de la Lutte contre les changements climatiques

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Signatures

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1 Introduction

This document includes questions and comments addressed to Canadian Royalties Inc. as part of the request to modify the certificate of authorization for power supply work at the Deception Bay camp, including the installation of an optical fiber for the Nunavik Nickel mining project (PNNi).

Questions and comments are issued following the examination of the impacts on the environment and the social environment carried out on the basis of all the information provided by the proponent, as well as their analysis carried out by the Direction of the environmental assessment of mining and northern projects and strategic environmental assessment, in collaboration with the relevant administrative units of the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) and other ministries.

Following the analysis, it appears that several elements are not complete and that clarifications are required before continuing the analysis and conclude on the acceptability of the project. To facilitate understanding, the questions and comments are grouped according to the order of presentation of the request for modification of the certificate of authorization. For the same reason, the proponent is invited to answer them in the same sequence. Sections for which no questions are asked are not shown.

2 Project Description

The Nunavik Nickel project (PNNi), owned by Canadian Royalties Inc. (CRI), obtained a certificate of authorization (CA) relating to the entire PNNi on March 20, 2008 under section 201 of the Environment Quality Act (EQA). Since then, various modifications to the overall CA have been authorized, including the addition of the Allammaq, Puimajuq and Expo Ouest deposits, the increase in the ore processing rate to 4,500 tonnes per day, the widening of roads, the relocation of the collection basin and discharge point of the Méquillon satellite mine, the operation of various quarries and sand pits, the loss of additional fish habitat at the Tr-5 crossing and the minor relocation of the Ivakkak road in the Tr-20 crossing area.

The project covered by this request consists of supplying the Deception Bay camp facilities with 5 KV electrical cable from the generators at the CRI port facilities. In addition, a fiber optic cable will be attached to the electrical cable during the work.

The objective is to improve energy efficiency and reduce the carbon footprint of the Deception Bay camp by reducing fuel consumption through the removal of generators and by optimizing the performance of the generators at the port facilities.

The route of the 5 KV electrical cable including the fiber optic cable between the camp and the Deception Bay port facilities is 4.6 km long with a 0.50 m wide right-of-way.

The power supply work and the installation of an optical fiber are planned over a period of approximately 12 weeks during the winter period in order to minimize the impact on the receiving environment.

After analyzing the additional information that was transmitted, further information and elements are requested from the proponent in order to continue the analysis of the case and render a decision on the authorization of the project.

3 Answers to Questions

3.1 Biophysical Issues

Wetlands and water environments

In section 3.2 of the environmental characterization report presented in Appendix 3, the proponent indicates that environmental monitoring is planned each spring to validate the integrity of the structures and that the inspections will be carried out by helicopter.

QC - 1. *Although this method is favourable for limiting traffic in sensitive areas, the proponent must commit to carry out a land-based inspection to ensure that the structures are stable, free of suspended matter and free of flow obstructions. The proponent must ensure that cables and support structures do not allow debris to accumulate and that the free flow of water is ensured at all times.*

RES - 1: Ground monitoring of each of the structures will be carried out to validate whether debris may accumulate at any point after the spring melt period. Thus, it is confirmed that the CRI team will carry out a ground inspection in order to monitor the stability of the structures and to detect any problems in the environment.

QC - 2. *The proponent must specify the winter protection measures that will be put in place around the pillars in order to avoid the runoff of fine materials into waterways, considering the risk of sedimentation during the thaw period.*

RES -2: No pillars are planned in the installation of the electric cable. The supports for the passage of the cable over the smaller streams are made of wood with a steel gutter to support the cable. For the larger water course, the bridge already in place will be used to support the cable across the river. Consequently, no runoff of fine materials associated with the cable is anticipated, so the risk of additional supply of sediment of anthropogenic origin towards the watercourse during the thaw period is considered nil.

Climatic changes

In section 5 of the request for modification of the CA, it is specified that the impact of the installation of the electrical cable will be permanent since it will be used for the long term.

QC - 3. *The proponent must specify the anticipated life span of the electrical cable and based on this, indicate how the potential effects of climate change have been considered in the design of the project*.

RES – 3: The expected life span of the power cables is estimated to be the duration of the exploitation of the deposits within the framework of the Nunavik Nickel project (PNNi) and until the end of the restoration of the various sites. The anticipated life of these cables is greater than the potential life of the mine. The specifications sheet of the cables used is provided in the attachment. The cables are suitable for extreme conditions, from -40°C to +90°C. The cable supports are installed on the surface of the ground and are therefore already exposed to thawing permafrost. The CRI environmental team will monitor the installations to follow the degradation of the wooden parts during the walking visits and replace them if necessary. By considering all of these decision-making elements during the planning and design of the project, the potential effects of climate change were taken into account, right up to the planned installation of the cables, which is considered adequate in terms of climate change.

In section 4 of the CA amendment request, it is indicated that the cable will be laid directly on the ground, with the exception of watercourses, where it will be raised. Thus, the integrity of the cable and the structures (pillars) could be affected by various events, in particular by a change in the hydrological regime which could modify the frequency and intensity of floods and the formation of flow jams. Consequently:

QC - 4. *The proponent must conduct an analysis of the projected climate hazards and demonstrate how the infrastructure will adapt to them. The proposed adaptation measures may be in the design, location, or management of the infrastructure*[1].

RES – 4: Analysis of projected climatic hazards and demonstration of adapted infrastructures

The projections of climatic hazards, presented in the Portrait bioclimatique future du Nunavik (Mailhot et Chaumont, 2017), which have been identified as subject to a potential impact on the cable installation infrastructures are:

1. The generalized increase in precipitation by 2050 and the associated increase in the average flood amplitude.
2. Widespread increase in air temperatures and associated permafrost degradation.

Impacts and mitigation of the envisaged increase in flood flows

The influence of the increase in precipitation alone on the cable installations is considered to be negligible, given the importance of the increase and the frequency of the precipitation events envisaged. The potential impacts are more related to the increase in surface runoff and the flow of watercourses that will have to be crossed by the cable.

The Nunavik Nickel project (PNNi) is located near hydrometric stations on the False (2,175 km²), Hamelin (4,156 km²), and Arnaud (26,647 km²) rivers for which future hydrological projections are available in the Portrait bioclimatique future du Nunavik (Mailhot et Chaumont, 2017). These watercourses draining different areas are also representative of the different types of watercourses that will potentially be crossed by the facilities. No precise projection is available for small ephemeral streams. However, since the anticipated increase in spring flood or snowmelt flows occur when the surface layer of the soil remains frozen, an increase in surface runoff and the flow of small watercourses is also to be expected.

By 2050, the increases envisaged in the average amplitude of spring floods are 9 to 12%, 6 to 10% and 10 to 13% for the False, Hamelin and Arnaud rivers respectively. Data is not available for local hydrological analysis of extreme flows. In addition, a simulation of the amplitude of extreme floods in the area greatly exceeds the design criteria for such a facility. It can therefore be considered conservative to expect an increase of 10 to 15% in the amplitude of the flows or flood levels reached in the area during the design..

The risks to be considered in relation with the increase in runoff and the amplitude of flood flows are : the resistance of the installations, submersion and the accumulation of debris at the installations. Since the current cable route will only cross one major river and the crossing will be at the level of an existing bridge, the resistance of the crossing to increased flows has already been taken into account during the design of the structure and its condition will be regularly checked to ensure the safety of users. This bridge is the only possible access to the Glencore and CRI port facilities. There is no doubt that maintaining its integrity is and will be a priority for the operations of both mines.

The risks associated with debris accumulation due to increased surface runoff have already been addressed in the Responses (RES) to QC1 and QC2.

[1] The document Portrait bioclimatique future du Nunavik produced by Ouranos on the projections of climatic hazards in Nunavik can be consulted for this purpose. This document is available online at the following address : https://mffp.gouv.qc.ca/nos-publications/elaboration-portrait-bioclimatique-futur-nunavik-tome-1/

Impacts and mitigation of permafrost degradation

The Portrait bioclimatique futur du Nunavik (Mailhot et Chaumont, 2017) highlights a generalized and significant increase in air temperatures. However, the direct influence of this increase on the infrastructure targeted by this project is considered negligible. Nevertheless, the increase in air temperatures will lead to permafrost degradation and as cable installation sections will be made directly on the ground, permafrost degradation could locally damage infrastructures indirectly.

As observed in already vulnerable areas, permafrost thaw can cause significant impacts on the ground surface (e.g., landslides, localized ground subsidence, flooding). These changes in soil stability linked to permafrost degradation regularly lead to significant impacts on infrastructures.

Linear infrastructure (e.g., roads, cables) built directly on the ground surface, even with a limited right-of-way (e.g., 0.5 m), can also lead to a localized acceleration of permafrost degradation. This process is associated with thermal insulation of infrastructures, either (1) due to a change in surface which limits heat exchange between the air and the ground, thus limiting the penetration of cold into the ground during winter, (2) an obstruction by the infrastructures of the free circulation of air on the surface of the ground, favoring warmer temperatures in both summer and winter, and finally (3) by favoring a localized accumulation of snow (e.g. elevated linear ground infrastructure acting as a snow barrier); excessive snow accumulation can act as a thermal insulator that promotes local permafrost degradation.

Special arrangements will be favored during the installation of the cable in order to limit localized damage to infrastructures that could be associated with permafrost degradation resulting from warming air temperatures or exacerbated by changes to natural surfaces. It is important to note that these particular installation methods are deemed unnecessary for sections of the cable route overlying bedrock outcrops or very shallow soils. Finally, the annual walking inspections of the infrastructure carried out to identify occasional accumulations of debris will also make it possible to verify the condition of the infrastructure and to carry out the repairs required in the event of damage linked to the localized degradation of the permafrost.

Greenhouse gas emissions

QC - 5. *The proponent must detail its quantification and reasoning concerning the anticipated reduction in greenhouse gas emissions (1350 t CO2 equivalent) related to the removal of the camp's generators, in particular by specifying how the connection of the camp to the electrical network supplied by the generators of the port facilities allows this reduction.*

RES – 5: It is important to note that the anticipated reduction is an estimate that is only used to assess the magnitude of the emission avoidance. Indeed, it is estimated from measured data that varies year after year depending on the quality of the diesel (out of CRI's control), and its consumption (i.e., the needs at the camp).

The quantification is carried out according to the QC.16 Electricity production protocol of the Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere. It is used in the annual mandatory declarations of CRI. The consumption of the camp generators was between 320,000 and 567,000 L from 2015 to 2020. It was estimated that this transfer represented a saving of 500,000 L of diesel. The conversion factor used is that of 2020 and its value is 2.7 t CO2 eq/kl. This factor is calculated using the average carbon content and the higher calorific value of the diesel, which are analyzed in an accredited laboratory at each diesel delivery. Thereby:

- 320 kl * 2,7 t CO2 eq/kl = 864 t CO2 eq.
- 500 kl * 2,7 t CO2 eq/kl = 1350 t CO2 eq.
- 567 kl * 2,7 t CO2 eq/kl = 1531 t CO2 eq.

The transfer of the power required for the electricity supply of the camp to the generators of the port facilities will not lead to an increase in the diesel consumption of the latter. In fact, the energy needs of port facilities only use 30% of the potential power of generators; supplying the camp with power from the generators will allow the use of 80% of their power. According to the manufacturer's technical specifications, supported by the observation of real consumption data, these generators do not consume more when the demand increases from 30 to 80% of their load.

It can thus be concluded that the project will make it possible to avoid approximately between 864 tonnes of CO2 equivalent and 1531 tonnes of CO2 equivalent in atmospheric emissions.

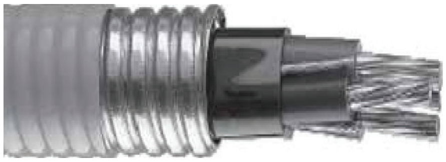
References

Mailhot A. et Chaumont D. 2017. *Élaboration du portrait bioclimatique futur du Nunavik – Tome I*. Rapport présenté au Ministère des Forêts, de la Faune et des Parcs. Ouranos. 216 pages.

Appendix A
Armoured Power and Control Cable

Teck 90 5 kV (Nonshielded) Three Conductor

Three Conductors, XLPE or TRXLPE Insulation, Inner/Outer PVC Jacket, Aluminum Interlocking Armour, 90°C, 5 kV, CSA



SPECIFICATIONS

1. CONDUCTOR: Class B stranded bare copper
2. CONDUCTOR SHIELD: Semiconducting shield over the conductor
3. INSULATION: Cross-Linked Polyethylene (XLPE) or Tree-Retardant XLPE (TRXLPE)
4. GROUNDING CONDUCTOR: An uninsulated Class B stranded grounding conductor is included in the cable assembly
5. INNER JACKET: Polyvinyl Chloride (PVC)
6. ARMOUR: Aluminum interlocking armour
7. OVERALL JACKET: Orange Polyvinyl Chloride (PVC); FT4; -40°C
   Black PVC jacket also available, please contact your local Anixter sales office
8. TEMPERATURE: 90°C
9. VOLTAGE: 5,000 V
10. STANDARDS: In accordance with CSA C22.2 No.131 and CSA C22.2 No.174 for use in Class 1, Division 1 Hazardous Locations
11. NOTE: Insulation level percentage is not applicable to nonshielded power cables as per CSA C22.2 No.131

APPLICATIONS

Suitable for direct earth burial and for exposed or concealed wiring in wet or dry locations.
Also for use in ventilated, nonventilated and ladder-type cable tray in wet or dry locations in accordance with the Canadian Electrical Code.

Anixter No.	Conductor Size	Ground Conductor Size	Nominal Diameters						Approx. Weight	
			Inner Jacket		Armour		Outer Jacket			
	AWG/kcmil	AWG	in.	mm	in.	mm	in.	mm	lb. /1,000 ft.	kg/km
7TN-0603AJ-08	6	8	1.02	25.91	1.27	32.26	1.37	34.80	927	1,379
7TN-0403AJ-08	4	8	1.12	28.45	1.37	34.80	1.47	37.34	1,138	1,693
7TN-0303AJ-08	3	6	1.17	29.72	1.42	36.07	1.52	38.61	1,310	1,949
7TN-0203AJ-08	2	6	1.24	31.50	1.49	37.85	1.59	40.39	1,476	2,196
7TN-0103AJ-08	1	6	1.31	33.27	1.59	40.39	1.69	42.93	1,752	2,607
7TN-1013AJ-08	1/0	6	1.39	35.31	1.67	42.42	1.77	44.96	2,012	2,994
7TN-2023AJ-08	2/0	6	1.48	37.59	1.76	44.70	1.86	47.24	2,334	3,473
7TN-3033AJ-08	3/0	4	1.58	40.13	1.87	47.50	1.97	50.04	2,835	4,218
7TN-4043AJ-08	4/0	4	1.69	42.93	1.98	50.29	2.08	52.83	3,328	4,952
7TN-2503AJ-08	250	4	1.86	47.24	2.15	54.61	2.25	57.15	3,910	5,818
7TN-3503AJ-08	350	3	2.07	52.58	2.36	59.94	2.49	63.25	5,102	7,592
7TN-5003AJ-08	500	3	2.33	59.18	2.62	66.55	2.75	69.85	6,721	10,001
7TN-7503AJ-08	750	2	2.72	69.09	3.01	76.45	3.14	79.76	9,469	14,090
7TN-10003AJ-08	1000	1	3.10	78.74	3.39	86.11	3.54	89.92	13,790	20,520

Note: For black PVC jacket, replace Anixter part number suffix **-08** with **-02**.
For Steel Interlock Armour (SIA), replace Anixter part number suffix **AJ** with **SJ**.