Water Resources Division
Resource Management Directorate
Nunavut Regional Office
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Your file - Votre référence
2AM-BRP1831
Our file - Notre référence
108214066

December 16, 2022

Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0
E-mail: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada's follow up of Sabina's supplementary information provided December 5, 2022 on the Primary Pond – Goose Site Engineering Design Report and Drawings, in support of Type A Water License 2AM-BRP1831

Dear Richard,

Thank you for the December 6, 2022 invitation to review and provide comment on Sabina's supplementary information provided in support of the Design report and Drawings, for Type A Water Licence No. 2AM-BRP1831.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the package pursuant to its mandated responsibilities and submits the following comments and recommendations in the attached Technical Memorandum.

If there are any questions or concerns, please contact me at (867) 975-4550 or Andrew.Keim@canada.ca.

Sincerely,

Andrew Keim,
Regional Manager -Waters
Resource Management Directorate

Technical Review Memorandum

Date: December 16, 2022

To: Richard Dwyer, Nunavut Water Board

From: Andrew Keim, CIRNAC

Subject: **Crown-Indigenous Relations and Northern Affairs Canada's follow up of Sabina's supplementary information provided December 5, 2022 on the Primary Pond – Goose Site Engineering Design Report and Drawings, in support of Type A Water License 2AM-BRP1831**

Region: ☒ Kitikmeot ☐ Kivalliq ☐ Qikiqtani

A. BACKGROUND

On September 23, 2022 Sabina provided to the Nunavut Water Board (NWB) a package referred to as the Primary Pond Engineering Design Report and Drawings. This submission represented Sabina's required 60 days notice, to provide final Design and Construction Drawings with a detailed report subject to Part D item 2(d) of the License (2AM-BRP1831). This includes all other infrastructure that requires Engineers approval.

On September 25, 2022 the NWB distributed the package to interested parties and requested comment be returned to the NWB by October 24, 2022. Due to a number of issues CIRNAC required an extension until October 31, 2022.

CIRNAC, upon receipt of the package from the NWB engaged with Tetra Tech Canada Inc to review the Design Report against the Project's current Nunavut Water Board Water Licence (2AM-*BRP1831*) and, where applicable, relevant guidance from the Canadian Dam Association (CDA).

On October 31, 2022 CIRNAC provided the Nunavut Water Board a series of comments and recommendations for consideration and review by the Board and the proponent.

On December 5, 2022 the proponent submitted for review a supplementary information package that was provided to CIRNAC on December 6, 2022 by the Nunavut Water Board. CIRNAC provides the following submission in support of our review of that supplementary package.

B. RESULTS OF REVIEW

1. Design Report Composition and Delivery

Recommendation:
(R-01) CIRNAC recommends that Sabina provide a copy of the Drawings and Specifications prepared by SRK including all details on the design parameters, all analysis, methods, and assumptions for the Primary Pond.

Sabina's Response (Page 21)

In additional to the drawings and technical specifications provided in the original package Sabina has included the following set of technical attachments, to provide additional details on design parameters and analysis completed, for the Primary Pond design.

1. Attachment 1 – Subsurface Model – SRK Memo
2. Attachment 2 – Hydrology Update – SRK Memo
3. Attachment 3 – Thermal Analysis – SRK Memo
4. Attachment 4 - Stability Analysis – SRK Memo
5. Attachment 5 – Seepage Analysis – SRK Memo
6. Attachment 6 – Additional Monitoring Details - Drawings, and Instrumentation Specification Sheets

These have been separated out in sections for clarity and to help to more readily respond to the IRs received from both the KIA, and CIRNAC.

(R-01) CIRNAC thanks Sabina and accepts the additional submissions and finds that the information provided meets the requirements of the recommendation.

2. Design Criteria

Recommendation:
(R-02) CIRNAC recommends;

A. If inundation mapping has been completed it should be included in the Design Report to support the dam class selected for Population at Risk and Loss of Life;
B. Sabina clarify and provide justification for the dam class selected for Population at Risk and Loss of Life;

C. Sabina provide justification as to how it selected the Environmental and Cultural Values dam class; and
D. Sabina provide justification as to how it selected the Infrastructure and Economics dam class.

Sabina's Response Page 24:

Sabina's response including additional maps and clarification provided on the process used in classification of the Dam met the requirements contained in the recommendations.

(R-02) CIRNAC accepts the additional information. CIRNAC is satisfied with the response.

3. Design Parameters

Recommendation:
(R-03) CIRNAC recommends that Sabina provide a Design Report that includes the design inputs, parameters, and values used to perform any seepage, stability, and thermal analyses in support of design of the Primary Pond to satisfy the Design Parameters requirement of Part D, Item 3a of the Water Licence.

Sabina's Response Page 27:

In additional to the drawings and technical specifications provided in the original package Sabina has included the following set of technical attachments, to provide additional details on design parameters and analysis completed, for the Primary Pond design.

1. Attachment 1 – Subsurface Model – SRK Memo
2. Attachment 2 – Hydrology Update – SRK Memo
3. Attachment 3 – Thermal Analysis – SRK Memo
4. Attachment 4 - Stability Analysis – SRK Memo
5. Attachment 5 – Seepage Analysis – SRK Memo
6. Attachment 6 – Additional Monitoring Details - Drawings, and Instrumentation Specification Sheets

An overview of the seepage analysis is provided in Attachment 5, an overview of the stability analysis provided in attachment 4, and an overview of the thermal analysis is provided in Attachment 3.

(R-04) CIRNAC accepts the additional submission, the information provided meets the requirements of the recommendation.

4. Design Analysis and Methods

Recommendation:

(R-04) CIRNAC recommends that the Design Report include a description of the design analyses, methodologies, and results undertaken in support of the design of the Primary Pond to satisfy the Design Analysis and Methods requirement of Part D, Item 3a of the Water Licence. Specifically;

- **A.** Seepage parameters, methods, analysis, and results be provided in the Design Report;
- **B.** Stability parameters, methods, analysis, and results be provided in the Design Report; and
- **C.** Thermal parameters, methods, analysis, and results be provided in the Design Report.

Sabina's Response Page 27:

See the response in response in CIRNAC-NWB;

- **A**. Seepage analysis is provided in Attachment 5;
- **B.** Stability analysis provided in Attachment 4; and,
- **C.** Thermal analysis is provided in Attachment 3

(R-04) CIRNAC accepts the additional submissions, the information provided meets the requirements of the recommendation.

5. Design Assumptions and Limitations

Recommendation:

(R-05) CIRNAC recommends that Sabina identify in the Design Report these items to satisfy the Design assumptions and Limitations requirement of Part D, Item 3a of the Water Licence

Sabina's Response Page 28:

Additional details on the design assumptions and limitation are detailed (by technical subject) in the attached technical memorandums (see CIRNAC-NWB-1 for a list of all attachments).

To help confirm the foundation assumptions percolation testing will be completed prior to the start of construction. Currently the percolation testing on site is planned to be completed in late 2022 – late Nov to Dec) to gain additional foundation characterization information that may be used to help update and refine the key trench designs prior to construction. Additional discussions around the preconstruction percolation testing are provided in responses to KIA-NWB-2 and KIA-NWB-7.

A detailed monitoring program (see the last few design drawings and details in Attachment 6) will be installed and set-up as part of the Primary Pond construction. This monitoring will allow for ongoing performance monitoring and for calibration and checks against any design assumptions and performance criteria. A review of the instrumentation monitoring for the Primary Pond will be included as part of the required annual geotechnical inspection reporting.

(R-05) CIRNAC accepts the additional submission, the information provided meets the requirements of the recommendation.

6. Site specific data and analysis in support of design and management decisions

Recommendation:

(R-06) CIRNAC recommends that Sabina provide site-specific geotechnical and permafrost characterization data, including borehole logs, laboratory test results, and instrumentation measurements, used in support of the Primary Pond's design to satisfy Part D, Item 3b of the Water Licence.

Sabina's Response Page 29:

An overview and investigation of the subsurface conditions (foundation conditions) below the Primary Pond footprint is provided in Attachment 1. This includes an overview summary of past drilling information and logs.

Before construction a detailed percolation testing (drilling, sampling, field falling head testing and corresponding laboratory testing - soil index testing, and laboratory testing) is planned to be completed to help further investigate the foundation conditions and allow an opportunity for the key trench and embankment design to be optimized. The percolation testing on site is planned to be completed in late 2022 - late Nov to Dec), immediately in advance of construction, to gain additional foundation characterization information. This

information will be used to further updated and refine the subsurface foundation excavations.

In addition, and as part of the Primary Pond design (as shown in the design drawings, and additional details provided in Attachment 6), a detailed monitoring systems is planned to be installed (installation of a system of ground temperature cables, deformation and settlement monitoring). This monitoring would allow for the Primary Pond embankment to be carefully monitored throughout operation, and help to provide advance warning of potential deformation of thermal trends so mitigation measures can be implement if / as required to maintain the embankment functionality and performance.

(R-06) CIRNAC is satisfied with the clarification and the response provided.

7. Source Locations of Construction Materials

Recommendation:

(R-07) CIRNAC recommends that the Design Report identify the rock source(s) to be utilized for the Primary Pond's construction materials and provide the specific geochemical data or analysis demonstrating the source's ARD/ML characteristics to satisfy Part D, Item 3c of the Water Licence.

Sabina's Response Page 30:

All construction rock will be sources from:

A. Approved and permitted quarry locations (which have been confirmed through geochemical sampling and testing to be geochemically suitable for construction)
B. A sand esker that has been located and used in past years for construction (material collected in the winter, immediately north of the Goose airstrip and on the north side of Goose Lake)
C. Echo Pit pre-development work (i.e. pit stripping above or outside of the contact with the ore body in that area – ongoing geochemical sampling being completed on this rock to confirm the geochemical suitability for construction).

To meet the material specifications for this project (as outlined in the provided technical specifications) materials from the sources above may also be run through the site screens and crusher.

The geochemical testing characteristics of quarry, construction materials and waste materials are documented as part of the annual reporting submissions (submitted around the end of March each year).

(R-07) CIRNAC reviewed the clarification and looks forward to the next annual report where this information is to be provided.

8. Signature and Seal of Engineer on Drawings

Recommendation:
(R-08) CIRNAC recommends that Sabina provide any separate detailed design reporting for the Primary Pond that have been signed and stamped by a Professional Engineer registered with NAPEG to satisfy Part D, Item 3g of the Water Licence.

Sabina's Response Page 31:

Attachment 7 provided signed and stamped version of the Issued for Permit drawings for the Primary Pond. Technical design appendices, reviewed and prepared under the supervision of a NAPEG Professional Engineer have also been included in these Information Request response to provide additional details on the technical analyses completed to inform the current Primary Pond design.

(R-08) CIRNAC reviewed the additional information and is satisfied with the response.

9. Primary Pond Dam Key Trench Liner Plan and Sections

Recommendation:
(R-09) CIRNAC recommends that it would be advisable to identify placement of this layer on the Cross Section drawings and add it for future reviews so that all information is available when completing the review.

Sabina's Response Page 31:

Comments are noted and acknowledged. Additional details and clarifications on the use of "Bentonite / Fly Ash Sand Fill" will be included / added as part of the next revision of the construction drawings.

Note that the next revision of the construction drawings is planned to be issued immediately prior to construction and following the additional foundation percolation testing planned to be completed around the end of November to early December 2022.

Additional comments and clarifications on the purpose and use of the Bentonite / Fly Ash Sand Fill material is provided in the information request response KIA-NWB-16.

(R-09) CIRNAC reviewed the additional information and is satisfied with the response.