Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Water Resources Division
Resource Management Directorate
Nunavut Regional Office
P.O. Box 100
Iqaluit, NU, X0A 0H0

Your file - Votre référence
2AM-LUP2032

November 17, 2020

Our file - Notre référence
CIDM# 1291238

Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0

sent via email: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada Review of the Final Closure and Reclamation Plan from Lupin Mines Incorporated for Type A Water Licence 2AM-LUP2032.

Dear Mr. Dwyer,

Thank you for the October 13, 2020 invitation to review the Final Closure and Reclamation Plan for Water Licence 2AM-LUP2032. The Water Resources Division of Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the application pursuant to CIRNAC's mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*. The result from CIRNAC review and recommendations are provided in the enclosed memorandum for consideration by the Nunavut Water Board.

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

Sincerely,

Godwin Okonkwo
Manager Water Resources

Canada

Technical Review Memorandum

To: Richard Dwyer, Manager of Licensing, Nunavut Water Board

From: Godwin Okonkwo, Manager Water Resources, Crown-Indigenous Relations and Northern Affairs Canada

Date: November 17, 2020

Re: Crown-Indigenous Relations and Northern Affairs Canada Review of the Final Closure and Reclamation Plan for Lupin Mine Site for Type A Water Licence 2AM-LUP2032 by Lupin Mines Incorporated (LMI) in Nunavut.

Region: ☒ Kitikmeot ☐ Kivalliq ☐ Qikiqtani

A. BACKGROUND

The Lupin gold mine is located on the shores of Contwoyto Lake approximately 285 km southeast of Kugluktuk, in the Kitikmeot Region of Nunavut and is owned by Lupin Mines Incorporated (LMI), a subsidiary of Mandalay Resources Corporation. The Lupin gold mine is currently licensed under Nunavut Water Board (NWB) Water Licence No. 2AM-LUP2032, which was approved on 9 April 2020 by the Minister of Northern Affairs. The site had been in care and maintenance since 2005, and is presently undergoing final reclamation under the approved water licence.

Part I condition of the NWB Reasons for Decision document for Type A 2AM-LUP2032 water licence renewal application review requires LMI to submit an updated Final Closure and Reclamation Plan within 90 days following approval of the water licence by the Minister of Northern Affairs, to reflect the relevant comments and recommendations of intervening parties during the review of the water licence application.

On October 13, 2020, the NWB requested that parties review the Final Closure and Reclamation Plan submitted by LMI on September 28, 2020.

B. DOCUMENTS REVIEWED

Documents reviewed by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and Arcadis Canada Inc. (on behalf of CIRNAC) include the following:

- **200928 2AM-LUP2032 Final Closure & Reclamation Plan-IMLE**
  The Main Body of the R1 FCRP dated August 2020, plus Appendices A to G.
  - Appendix A - List of Permits, Licences, and Authorizations Required for Project
  - Appendix B - Type A Water Licence Concordance
  - Appendix C - Glossary of Terms and Definitions
  - Appendix D - Detailed History of Closure Plan Development
  - Appendix E- Consultation Record
  - Appendix F - Environmental Studies/Reclamation Research/Engineering Studies and Design Reports
  - Appendix G - Financial Security

- **Appendix H - Technical Memos in Response to Information Requests, Technical Comments, Commitments from PHC/TM or Exhibits during the Application Review Process (2019)**
  - 200928 2AM-LUP2032 FCRP AppH_01 Decision Matrix Memo_RevC-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_02 Climate Model Rev0 -IMLE
  - 200928 2AM-LUP2032 FCRP AppH_03 TCA Dam Stability Review Rev0 -IMLE
  - 200928 2AM-LUP2032 FCRP AppH_04.1 APEC 2006-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_04.2 Investigation Locations 2006-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_04.3 PCOC Tables 2006-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_04.4 APEC 2017-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_04.5 Current ARD 2017-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_05 Surface_WQ_Model_15Oct2019-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_06 Rev0 Coupled Seepage-Thermal Modelling_15 Oct2019-IMLE
    200928 2AM-LUP2032 FCRP AppH_07 TCA Waste Rock Review_081419_Rev0-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_08 Conceptual Design of Waste Rock Cover Rev0 -IMLE
  - 200928 2AM-LUP2032 FCRP AppH_09 TCACover Rev0-IMLE
  - 200928 2AM-LUP2032 FCRP AppH_10 Decision Matrix Rev0 -IMLE
  - 200928 2AM-LUP2032 FCRP AppH_11 Geophysics Rev0 -IMLE
  - 200928 2AM-LUP2032 FCRP AppH-12 Risk Assessment on 2 TCA Dams Rev0 –IMLE

- In addition to the review of LMI's *Commitment Submissions* noted above, CIRNAC also reviewed the NWB ftp site for LMI and reviewed the files dated 2020 associated the LMI's commitment submissions including the following.

- 200715 2AM-LUP2032- LMI Response Drawings 129500081TCA Closure Drawings_Signed_20200706-IMLE: Re-submission of Tailings Containment Area Closure Drawing package with "*Approved by Alvin Tong, dated 6 July 2020*"
- 200720 2AM-LUP2032 - KIA Reply to LMI Response E25,E26,E27-IMLE
- 200805 2AM-LUP2032 LMI Response to KitIA comments - Final-IMLE
- 200812 2AM-LUP2032 KitIA Response to LMI Comments-IMLE (12 August 2020)
- 200805 2AM-LUP2032 LMI Response Drawing 005 - Outflow_RevB_20200609b_Signed Stamped-IMLE
- Resubmission of Stantec Dwg 005 Outflow RevB with "*Approved by Alvin Tong, dated 4 Aug 2020*".

C. RESULTS OF THE REVIEW

1. INTEGRATION OF COMMENTS RESPONSES TO THE FRCP

Comment 1

The R1 version of the FCRP has had editorial updates made throughout the document. In addition, various sections have been updated to provide comments and specific references and responses to questions from CIRNAC and other parties, as per commitments made to the NWB at the technical meeting and/or the public hearing.

The material R1 additions to the FCRP relate to references made to, and the inclusion of the Technical Memoranda provided by LMI in its various responses and commitments. CIRNAC has reviewed these documents previously and provided comments on them. While in some cases, LMI's responses have addressed CIRNAC's concerns, in other cases additional information was (is required) to address issues raised by CIRNAC with respect to these Technical Memoranda. CIRNAC also notes that the R1 FCRP does not include any references to the NWB Conditions 25, 26, 27 that resulted from the Public Hearing of January 2020 Type A 2AM-LUP2032 issued on 28 February 2020 and approved on 9 April 2020.

Recommendation 1

CIRNAC recommends that:

I. LMI create a disposition table listing all issues raised by the Intervenors at the technical and management meetings, along with LMI commitments, responses and technical memos, plus intervenor review comments on LMI's submission and remaining concerns raised by Intervenors with respect to the LMI responses provided to date.

II. LMI update the R1 FCRP to include information related to Conditions 25, 26, and 27 of the approved Water Licence 2AM-LUP2032.

2. SCHEDULE UPDATES

Comment 2

The FCRP Rev 1 (August 2020) includes Table 14 which provides a schedule that was prepared on March 2019. This schedule needs to be updated to remove items that are no longer valid (e.g., includes line items that refer to work to be done under Care and Maintenance) and include all activities agreed to by LMI including such items/activities as follows:

- Construction of water management structures related to "dome";

- Stabilization and erosion protection of tailings dams (M, K, etc.);
- Removal for placement in tailings cells, or cover in place, existing or future exposed tailings (after dewatering); and,
- Construction of water management features (drainage swales and discharge structures) in tailings cells.

In addition to the above, the March 2019 schedule does not reflect the actual works carried out in 2019 or 2020. It would be helpful if LMI can provide a more detailed and updated schedule that includes all actions to be undertaken, links with LMI's RECLAIM estimate and milestones, and illustrates actual verses planned progress as well as any proposed future schedule revisions. This update to the FCRP will provide a better understanding of the state of the closure works and scheduled revisions/adjustments LMI may be proposing going forward.

Recommendation 2

CIRNAC recommends that LMI provide a more detailed and updated schedule for the reclamation works consistent with the work completed as reflected in the Security Reduction requests of 2020. The updated schedule should include the original 2019 proposed project schedule timelines as shown in the R1 FCRP, the actual work carried out to the end of 2020, and any proposed revisions to the schedule going forward. The schedule should be updated to include line items for all activities committed to by LMI.

3. REMOVAL OF CONTAMINATED MATERIALS FROM MILL SITE AREA PRIOR TO CONSOLIDATING WASTE ROCK AND CONSTRUCTION DOME COVER

Comment 3

The R1 FCRP states that approximately 16,000 m^3 heavily arsenic impacted soils and 35,200 m^3 of PHC impacted soils (S4.3.2.3, p 4-6) exist on site that will require active management and disposal.

On page 4-9 in regard to arsenic impacted soils LMI states;

"The heavily arsenic impacted shallow material will be ex-situ remediated using conventional techniques (i.e., excavators, haul trucks, and dozers) and will be excavated and disposed of within the shafts or open crown pillars for isolation."

On the same page in regard to the PHC impacted soils LMI states that;

"35,200 m3 of PHC impacted soil has been identified at 13 historical maintenance, fueling, and fuel storage locations across the Site (Golder 2017a). These locations include: the STF and Powerhouse, the Mill and Office Emergency Tanks, the Main Tank Farm Loaders, the Main Tank Farm Bedding Sand, the Emergency Powerhouse, the South Burn Pit, the Landfill, the RTL Shop, the North Burn Pit, the Incinerator, Cold Storage #1, the Former Airstrip Fuelling Area, and the former Ball Field. This material

will be ex-situ remediated using conventional techniques (i.e., excavators, haul trucks, and dozers) and disposed of in the shafts or open crown pillars."

No drawings were provided in the R1 FCRP document identifying the location and extent of the areas with heavily impacted arsenic or PHCs requiring excavation. In the absence of a drawing providing this information it is difficult to confirm that all of these impacted materials have been removed from these locations before consolidating the waste rock at the mill site.

Recommendation 3

CIRNAC recommends that LMI provide a detailed site plan that identifies the location and estimated extent of heavily impacted arsenic soils, and PHC impacted soils that are expected to be excavated and placed underground. CIRNAC also requests that LMI clarify how it will confirm that these materials have been removed prior to waste rock re-grading and cover placement.

4. CROWN PILLAR STABILIZATION AND DISPOSAL OF MATERIALS UNDERGROUND

Comment 4

Discussion of closure of the underground and placement of material into the underground is found in the Executive Summary 5a) and Section 4.3.2.4 Underground Workings, and in Figures 6, 13, and 14. Review of these sections notes that on page 4-14 LMI states the Preferred Reclamation activities will;

"modify the previous plan for the West Zone disposal as shown on Figure 14. The modified plan would address the void areas and increase the storage capacity. Instead of developing additional drop raises in the remaining crown pillar for disposal, the new plan would be to blast down the remaining crown pillar, creating an open slope trench approximately 260 m in length and approximately 72 m deep".

Consistent with these statements, on page 4-15 Synthesis of Preferred Activities into a Reclamation Plan, LMI states that

"The remaining West Zone crown pillar will be collapsed to provide additional disposal capacity and to prevent future post-closure stability problems. The main haulage shaft, fresh air raise, and the exhaust raise will be completely backfilled to prevent access. Site materials and equipment, waste rock, and hydrocarbon contaminated soils will be disposed of in these areas".

Upon review of the R1 FCRP Figures 6, 13, and 14, CIRNAC identified the following:

- Figure 6 notes that it provides a Site Plan showing the West Zone and provides some notes on open depths and a "ramp" in the areas referred to as WZ Crown Pillar Pit and WZ Underground Disposal Key Cross Section Locations (5).

- Figure 13 shows a section through the West Zone with Kinross's proposed disposal via two large surface openings and three drop raises.
- Figure 14 shows the same cross section as Figure 13 with the crown pillar removed (and shown as Debris at the base of the 87 Level) and capped with 3 m of cover material.

CIRNAC appreciates the intent of these activities, but it is unclear from review of the R1 FCRP how LMI intends to carry out the work. No discussion was provided with respect to how the main haulage shaft, the fresh air raise or exhaust raise will be filled, or how the West Zone (WZ) open stope would be filled and how long term surface subsidence based on fill material consolidation will be avoided. CIRNAC also notes that on page 4-15 LMI states that;

"*Capping material required to cover the West Zone newly opened and backfilled stope will require approximately 3,300 m^3 of waste rock fill to prepare a 1.5 m thick mound over the backfill material in the stope with 3:1 side slopes. The waste rock fill will be covered with an additional 1.0 m of esker.*"

This statement conflicts with the Figure 14 note that states that 3 m of cap material on the over fill materials.

While CIRNAC has seen the approval LMI received from the Mines Inspector it is not clear what was submitted to the Mines Inspector for approval.

Recommendation 4

CIRNAC recommends that LMI provide more detailed discussions and plans related to the following:

- How surface openings and the open stope will be filled.
- How long-term subsidence of fill materials will be avoided.
- The information provided to the Mines Inspector with respect to final closure of surface openings.

5. LONG TERM STABILITY OF DOME COVER AND EROSION STOPES

Comment 5

Since the development of the draft FCRP, CIRNAC has expressed concerns regarding the long-term effectiveness and erosion stability of the proposed dome cover and water management systems. Prior to the Public Hearing of January 2020, LMI replied through a series of discussions and the Technical Memos included in Appendix H-8 (Technical Memorandum in Appendix H-8 regarding Conceptual Design for the Waste Rock "Dome" at Lupin Mine for response to TM/PHC Commitment No.5 (Golder, 2019d).

Pursuant to the Public Hearing, in response to Condition 25 of the Water Licence, Golder provided a Technical Memorandum dated 8 June 2020 that included a brief discussion on the "Dome" Design Objective and two "Not for Construction" drawings; one provided a Plan View drawing of the proposed dome, and the other provided two cross sections through the proposed "dome" along with typical details of the proposed drainage chutes, and the crest perimeter berm.

CIRNAC appreciated LMI's submission of the additional information in the Technical Memorandum and subsequently provided review comments to the NWB for LMI consideration. CIRNAC notes that the 8 June 2020 memo and drawings from LMI were not included in the R1 FCRP document.

Recommendation 5

CIRNAC recommends that the R1 FCRP be updated to include:

- The contents of the 8 June 2020 Golder Technical Memorandum responding to Condition 25 requirements.
- CIRNAC concerns on the "dome" design related to long term erosion, as expressed in CIRNAC comments on the Condition 25 Submissions as dated 25 August 2020.
- Any further design details that LMI may have generated since June 2020 with respect to the "dome" design.

6. TCA – EMBARKEMENT STABILIZATION AND EROSION

Comment 6

Condition 26 is a Licence condition generated with respect to addressing the concerns expressed and the request for additional information by Intervenors to clarify the nature and extent of long term stabilization and closure works at the TCA, and in particular as related to K and M dam repairs and long term stability and erosion control.

By way of a Technical Memorandum from Stantec dated 8 June 2020, LMI provided a substantial information package that included design notes, specifications, and a series of drawings (plans, sections, profiles, and details) related to the proposed closure works for the TCA area. Specifically, the package included 15 drawings: 1 Design Specification drawing, 4 Cell 5 drawings; 4 Cell 3 drawings; 3 M Dam drawings; and 3 K Dam drawings.

CIRNAC notes that the 8 June 2020 memo and drawings were not included in the R1 FCRP document.

Recommendation 6

CIRNAC recommends that the R1 FCRP be updated to include:

- The contents of the 8 June 2020 Stantec Technical Memorandum responding to Condition 26 requirements.
- Any further revisions or details that LMI may have generated since June 2020 with respect to the closure works at the TCA.

7. TCA – N DAM AND POTENTIALLY EXPOSED TAILINGS

Comment 7

Figure 11 of the R1 FCRP shows that a tailings cover is to be placed in the area contained by the N Dam. No other reference is made to work at the N Dam or covering of the N Dam tailings in the R1 FCRP document.

Appendix H-03 TCA Dam Stability Review Rev 0 dated 14 November 2020, includes modeled cross sections of the N Dam (Fig 30, 31, and 32) as part of the geotechnical stability analysis. Given that the downstream embankment of the N Dam was mostly underwater in 2019 it is unclear how the profile was generated.

LMI's provision of additional TCA details in the 8 June 2020 Stantec Technical Memorandum and drawing package addresses the N Dam tailings cover in Drawing 002 Cell 5 Closure, Plan View – in which Note 3 states that topographic and bathymetric surveys were not available due to ponded water, that dewatering is required before cover placement, and that the contractor is to adjust cover placement to ensure a 1 m cover thickness. The drawings do not clearly indicate water flow management in this area, e.g., will there be an outlet from this area, and if so where and how it will be constructed.

Recommendation 7

CIRNAC recommends that LMI provide additional information with respect to the contour information used in the N Dam Safety analysis as well as on the final contour elevations and associated water management for the N Dam containment area.

8. FINANCIAL SECURITY – SECTION 7

Comment 8

In regard to Financial Security, Section 7 has been significantly altered to remove discussion of former liability estimate and other related information. The R1 FCRP makes reference to LMI's January 2020 RECLAIM estimate of $23,463,049; the release framework and milestones; states that $6,549,072 was released to LMI in April 2020, and that the new letter of credit approved 9 June 2020 is in the amount of $19,558,231. CIRNAC appreciates inclusion of this current detail, and observed no discussion on the

difference in security held and LMI's RECLAIM estimate value less the released amount ($2,644,254). This may lead to confusion when parties review the RECLAIM model to evaluate reduction of security and the amount of security still being held.

Recommendation 8

CIRNAC recommends that LMI provide a brief discussion on the difference in security held and LMI's RECLAIM estimate value less the released amount.

D. REFERENCES

Nunavut Waters and Nunavut Surface Rights Tribunal Act (2016)

Department of Crown-Indigenous Relations and Northern Affairs Act (2020)

Nunavut Water Board, February 2020: Amended and Renewed Type "A Water Licence No: 2AM-LUP2032, Reasons for Decision, Including Record of Proceedings. P 62-63

Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Water Resources Division
Resource Management Directorate
Nunavut Regional Office
P.O. Box 100
Iqaluit, NU, X0A 0H0

Your file - Votre référence
2AM-LUP2032
Our file - Notre référence
CIDM#1292732

February 16, 2021

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

Re: Crown-Indigenous Relations and Northern Affairs Canada's reply to Lupin Mines Incorporated's response to our comments on the Final Closure and Reclamation Plan for water licence #2AM-LUP2032 – Lupin Mine Project

Dear Mr. Dwyer,

Thank you for your February 2, 2021 invitation for reply to Lupin Mines Incorporated's (LMI) February 1, 2021 response to Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) November 17, 2020 comments on the Final Closure and Reclamation Plan (FCRP) (version 1, August 2020).

In general, LMI's responses do not address CIRNAC's comments and many defer integrating information until version 2 of the FCRP. Therefore, CIRNAC's general recommendation is for the Nunavut Water Board to defer approval of the plan until interveners have been able to review version 2 of the FCRP. Version 2 of the FCRP is expected to be submitted at the end of March 2021, with the 2020 Annual Report for water licence 2AM-LUP2032.

CIRNAC is concerned with LMI's repeated deferral of our requests for information which would allow for the evaluation of the potential effectiveness of their proposed reclamation strategies. The remainder of this letter is separated into two sections, the first regarding information which CIRNAC has been requesting since the water licence renewal process and the second section contains specific replies to each of LMI's responses. Both sections have been developed with the support of Arcadis Canada Inc.

Missing information on reclamation methodologies

Specifics on reclamation methods and designs are necessary to evaluate if they will be adequate for long term physical and chemical stability of the site. CIRNAC has been

requesting further details since the water licence renewal process initiated in 2019. As LMI did not provide the information during the renewal process, the renewed licence included three conditions to provide some of the missing information within 60 days of licence issuance. These are Part E, Item 25 for design details of the waste rock dome design, Part E, Item 26 for geotechnical details on TCA Dams K & M, and Part E, Item 27 for preliminary design cover for newly exposed tailings.

The Board provided CIRNAC with the opportunity to review three technical memos submitted by LMI covering these three topics. LMI's response to our comments was that the information requested would be integrated into the FCRP revision. The revision number was not specified, which has led to confusion. Our October 30, 2020 reply to the Board's question on whether these responses satisfactory was that we would review the FCRP, as at the time we believed it integrated the missing information. On November 2, 2020, the Board distributed a letter stating it had reviewed the memos and found: "*the information functional and generally satisfying Part E, Items 25, 26, and 27 of Water Licence 2AM-LUP2032.*"

Though the Board is generally satisfied, CIRNAC is seeking details on how the site will be reclaimed. Below is a summary on the information CIRNAC considers to be missing from what was to be provided under Part E Items 25, 26 and 27 of the water licence. The lists for Items 25 and 27 are a re-iteration of comments submitted on August 25, 2020, as well as comments regarding Item 26.

I. Information provided for Item 25 "dome design" is insufficient to provide confidence in long term erosion protection and cover stability. Concerns include:
    a. lack of detailed grading information for top of "dome";
    b. lack of design information on storm / freshet flows;
    c. no protection against rill erosion on long 10% slope surfaces;
    d. lack of runoff channels from discharge chutes;
    e. potential for toe erosion from discharge chute runoff flows;
    f. lack of specific notes to address construction constraints that need to be addressed before cover can be placed;
    g. failure to show where materials to be removed prior to cover placement are located; and
    h. failure to show locations of shaft, crown pillar area, that will be buried under the dome.

II. Information provided for Item 26 "additional geotechnical details" includes a series of 15 drawings and our concerns are summarized as:
    a. no detailed information or specifications are provided with respect to the work to be performed on the embankment slopes;
    b. no information is provided with respect to the "compacted fill" to be placed on the dams as shown on dam section drawings;
    c. section drawings show no erosion control measures related for the dam slopes and no armouring or rip rap for any dam work;
    d. it is unclear how the embankment fill will be placed in horizontal layers and adequately compacted to ensure long term stability;

e. there is no information on the closure works on the west end of the M dam as extends beyond the N dam M dam intersection;
f. the is no information on how any potential closure works on the N dam will be carried out if needed or how they will confirm that works are not needed; and
g. there is no discussion of logistics of dewatering Pond 2 and impacts on schedule and work if water level is not lowered before work on the dams is scheduled.

III. Information provided for Item 27 “cover design for potential exposed tailings” is still insufficient to allow for general approval of approach. Based on information provided, LMI should be required to submit details on any new exposed tailings encountered (e.g. potential exposed tailings as may be encountered in Pond 2 between the 480 m contour and the toe of the M&N dams) and provide specific information on proposed approach prior to carrying out any work on the tailings. (Note that there is a potential logistical / timing issue with respect to covering future exposed tails after dewatering if dewatering is the last step of the reclamation of the reclamation.)

Further details on these concerns are presented in Annex A. CIRNAC’s general recommendation is for LMI to provide sufficient information to answer these questions in revision 2 of the FCRP.

Reply to LMI responses to CIRNAC comments on FCRP

Below are further comments on each of the comments CIRNAC initially provided on November 17, 2020, to which LMI responded on February 1, 2021.

1. **Integration of comment responses to the FCRP** – CIRNAC recommended the licensee incorporate to the FCRP I) a disposition table listing issues, commitments, and responses, II) information provided for Part E, Items 25, 26 & 27 of the water licence. LMI commits to the second request for revision 2 of the FCRP. CIRNAC recommends that both a disposition table and information pertaining to licence conditions Part E, Items 25, 26 & 27 be included in revision 2, and that interveners be an opportunity to review revision 2 when it is provided.

2. **Schedule updates** – CIRNAC recommended the FCRP include a detailed and updated work schedule. LMI is committing to provide this information with the Annual Report. This does not address our concern, as the work schedule included in the current version of the FCRP is inaccurate and out of date. CIRNAC recommends version 2 of the FCRP include an updated and accurate work schedule.

3. **Removal of contaminated materials from mill site area prior to consolidating waste rock and construction dome cover** – CIRNAC requested a detailed site plan with location and estimated extent of arsenic and petroleum hydrocarbon (PHC) impacted soils, as well as information on the method for confirming contaminated

materials removal prior to further work. The licensee has provided a figure with test pit locations, indicating which ones have exceedances. This map does not estimate potential extents, does not indicate which exceedances are for arsenic or PHC, and has no indication of potential depth of contamination. Furthermore LMI deferred answering how they will confirm removal of contaminated materials until April 9, 2021, when the Quality Assurance/Quality Control (QA/QC) Plan of the Post Closure Monitoring Plan is to be submitted. To address CIRNAC's concerns, the location and extents of arsenic and PHC impacted soils need to be integrated in the closure plan as they will have to be remediated. We recommend this information be added to version 2 of the FCRP, as well as a method for confirming removal of contaminated materials, since it forms part of the reclamation work and needs to be completed prior to post closure monitoring.

4. **Crown pillar stabilization and disposal of materials underground** – CIRNAC recommended the licensee include a more detailed discussion on how the surface openings and the open stope would be filled, and how long term subsidence of fill material would be avoided. The licensee has responded "*the surface openings and the open stope will be completely filled. Waste materials will be dumped beside the openings and then progressively dozed into the openings.*" As well, they state they expect subsidence to occur during construction, so that it could be accommodated during final grading. This information is not sufficiently detailed to evaluate the likelihood of its effectiveness. For example, does the "progressive dozing into the openings" involve pushing end-dumped material over the opening edge with the bulldozer, or will the fill be placed in lifts, allowing the bulldozer to track over and compact the material? The method used will have an incidence on the likelihood of subsidence. CIRNAC recommends LMI include the information requested in version 2 of the FCRP.

   CIRNAC also recommended the documents provided to the Mines Inspector with respect to final closure of the surface openings be shared, as presently we only have a copy of the authorization letter. Documents referred to in the authorization letter which we would like to see are:
   - 2020-06-25 Drilling and Blasting Plan Approval;
   - West Zone Crown Pillar Blast Locations – Plan view; and
   - M8277 Break-Away Drill and Blast – Lupin Mine Closure – West Zone Pilla…[*sic*].

5. **Long term stability of dome cover and erosion stopes** – CIRNAC recommended information LMI submitted in a technical memo on June 8, 2020 regarding conceptual design for the waste rock "dome" be integrated into the FCRP. Furthermore CIRNAC requested that our concerns raised on August 25, 2020 be addressed and any further details or modifications for these reclamation works developed since June 2020 be provided. LMI has committed to doing so in revision 2 of the FCRP, which CIRNAC will review once received.

6. **Tailings containment area - embankment stabilization and erosion** – CIRNAC recommended the design notes, specifications and drawings for long term stabilization and closure work at the tailings containment area including Dams K & M provided in a June 8, 2020 technical memo for Part E, Item 26 of the licence, be incorporated into the FCRP. Additionally CIRNAC requested any further details or modifications for these reclamation works developed since June 2020. LMI has committed to doing so in revision 2 of the FCRP, which CIRNAC will review once received.

7. **Tailings containment area - N Dam and potentially exposed tailings** – CIRNAC requested the contour information used in the N Dam Safety analysis and the final contour elevations and associated water management for the N Dam containment area be shared. The licensee indicated which contour information they used to generate N Dam profiles, and indicated "*Cell N cover will be shaped to shed water and does not require an outlet*." Plans for the shape of the Cell N cover are not in the FCRP, and CIRNAC recommends they be included for future review.

8. **Financial security** – CIRNAC requested the licensee provide a discussion on the security estimate values. LMI has provided the requested information in their reply and CIRNAC recommends they incorporate these up to date figures in their FCRP.

CIRNAC appreciates the opportunity to participate in this review. If there are any questions, please contact me at (867) 975-3876 or sarah.forte@canada.ca, or Bridget Campbell at (867) 975-4282 or bridget.campbell@canada.ca.

Sincerely,

Sarah Forté

Sarah Forté
Water management specialist

ANNEX A
Unresolved comments regarding technical memos for
Part E, Items 25, 26 & 27 of water licence 2AM-LUP2032

CIRNAC's concerns are raised as questions in the discussions below. The information for Items 25 and 27 is a re-iteration of comments submitted on August 25, 2020. Comments regarding Item 26 have not been shared previously. They have been bolded in the text to emphasize where we still consider information to be lacking. CIRNAC recommends this information be integrated into revision 2 of the Final Closure and Reclamation Plan.

Comments on Item 25 – Waste rock dome design

Our review of the plans and sections observed that the 10% slopes, about 300m of top edge in the north portion of the "dome" is as much as 10m high and this extends out about 100m to the toe. The west and southwest side of the dome has a height of between 5m and 6m and thus extends out some 50+/- meters in these areas. Other than indicating that a berm will be constructed on the top edge of the dome to direct "dome surface" runoff to drainage chutes, no erosion control measures are included for ensure erosion protection and stability of these long 10% esker slopes.
The plans and sections indicate that surface water runoff from the 1.6% surface slope, is expected to be drained off the dome, down the 10% slopes, via 6 runoff "drainage chutes". Surface runoff is to be directed to these "chutes" by a small perimeter berm along the edge of the dome surface (0.5m high, 0.5m crest width, 2:1 slopes) constructed with the same esker material as the 1m dome cover surface. Given the importance of this berm in preventing overland sheet flow to the 10% slopes, we question the long term stability of the berm design as presented.

No information is provided to support the designs of the top perimeter berm, the chutes, or the stilling basins. No drainage elevations are provided with respect to surface grading on the top of the dome edges, and no information is provided with respect to the drainage runoff flows leaving the "stilling basins" at the toe of the dome. No details are provided for the toe of the 10% slopes, nor for runoff from "stilling basins", which in some locations could undercut the toe of the cover (see north central discharge). In the absence of this information we do not have confidence that the design as shown will be stable in the long term. The proposed designs as shown reinforce our concerns that the 10% slopes will at a minimum be subject to long term rill erosion even if the upper berm controls runoff to the discharge chutes. We are concerned about the long term performance integrity of the up diversion berm if constructed as shown with esker material. We note that any failure along of the top berm would result in additional erosive forces on the 10% slopes. We are concerned that no toe stabilization / armouring measures are included to protect the toe of the 10% slope. **Provide information listed in this paragraph to demonstrate how the long-term erosion stability of the designs is being ensured.**

In reviewing the typical drainage chute details, it appears to us that they are inconsistent as the 0.5 m depth of the drainage chute as shown in cross section is shown as 0.5 m berm on the top of the chute drainage profile detail and the perimeter berm is not shown on this detail. **A plan view detail of the top and bottom of the drainage chutes should be provided.**

The notes on the site plan included:

- Note 1 which states that *"subgrade under the dome area is to be prepared in accordance with the Water Licence and FCRP before waste rock or cover materials are placed".*

The intent of this statement is correct, but it is not clear to us how LMI will ensure compliance with this note is achieved if it these requirements are not specifically stated on the drawings. **Ensure all relevant requirements are specifically referenced.**

- Drawing Note 2 provides a list of materials that are to be removed before waste rock is placed, but the drawing does not identify the locations of these materials.

It is unclear how this will be achieved in the absence of specific references to the dome plan. **Include location of materials to be removed before waste rock placement.**

- Drawing Note 4 states that crown pillar and openings and mine shafts are to be filled before waste rock is placed on top.

Provide plans shared with Inspector of Mines to obtain approvals.

Moreover, in addition to our specific concerns with the "dome" design concepts, we are also generally concerned that the remedial requirements that need to be undertaken are not specifically identified or referenced on the plan provided. We are concerned for example that in the absence of specific information on where contaminated soils to be removed are located, that confirmation that these soils have been remove may be not be considered prior to reworking of the waste rock and placement of the esker cover. **Provide specific cross reference to these works to ensure that they are identified in the FCRP and noted as appropriate.**

Comments on Item 26 – Geotechnical details on TCA Dams M & K

CIRNAC's comments are arranged by drawing.

Specifications

Drawing 001 – Information is missing with respect to embankment stabilization as follows:

- *Table 1* is labelled "Foundation Preparation Specification"; *Table 2* is labelled "Fill Placement Specifications" - **Provide a table with specifications for "Tailings Dam Embankment Repair/Stabilization"**
- *Table 1* has specifications under the headings of "General, Cover Foundation Preparation, and Dam Outfall Channel Area Foundation" - **Include a section dealing with embankment placement and stabilization**.

- *Table 2* has “fill specifications” for “cover” - **Include specification for embankment placement and stabilization**
- *Table 2* lists “fill types” as “cover fill, riprap, and geotextile filter fabric” - **Include reference to “compacted fill” type material as shown in sections for M and K dams (drawings 11,12,14, and 15)**

Cell 5

Dwg 002 –Plan View

Plan does not indicate any flows from area between N & M dams. It is also unclear how surface water in the area between N &M dams will flow into the drainage channel. **How will flows from area between N & M dams be treated, how will they flow into the drainage channel?** In addition, the current design of the downstream side of the N Dam does not appear consistent with industry practice for long-term structures, **how will long-term stability of this structure be ensured?**

Dwg 003 –Profile

Stations 510 to 880 shows 30m base width drainage channel flowing to east at 0% slope. Stations 120 to 400 are also shown as sloping at 0% to the outlet at J dam. **How will flows be ensured at these locations?**

What is the material above the Tailings Upper Limit comprised? If it is tailings it will need to be regraded such that the 1m profile is maintained above tailings or the cover needs to be raised and drainage paths modified accordingly.

Given the length of the profile it may be appropriate to have a series of check dams along the profile to slow water down during significant rain fall events. **What is being done to ensure integrity during higher flow periods?**

Dwg 004 - Cell 5 Cross Section

We have difficulty in understanding these sections (i.e. the difference between the assumed tailings upper limit and the bottom of the esker fill cover.) **Provide a discussion on how the slopes on the tailings cover will be adjusted once the elevation of the tailings is confirmed.**

Also from the results of recent investigation work by LMI’s consultant they have confirmed that the 1 m minimum cover has not been maintained in numerous locations across both Cell 5 and 3. **How will the stability of the cover be maintained if wind erosion is the primary cause of the material losses assuming the original placement was at least 1m thick?** Even with the relatively flat side slopes the nature of the esker material on side will likely experience erosion which would subsequently impact the performance of the channel. Vegetation would normally be used to stabilize the side slope but as we know this approach will not work at Lupin given the lack of vegetation observed to date on the TCA sections capped decades ago.

Dwg 005 - Outflow Channel
The detail should show where the spillway ends in relation to final post water elevation. The spillway should be terminated before the elevation of the final post water elevation and it should be confirmed that there are no obstructions at the end of the spillway as a result of the ground elevations at that location (ie the ponding of water at the outflow of the channel should be avoided). **Include information on final post water elevation.**

How was the Freshet runoff dealt with in the calculation of the 100 year storm event? If the two happen concurrently, there is the potential the existing design will not accommodate the increased flow.

Cell 3
Dwg 006 –Plan View
Detail the entire drainage channel (existing and new) to illustrate the watershed that could be reporting to the drainage channel. **Provide design information as to how the size of the channel was derived, to help determine if the channel is appropriately sized**.

How was the Freshet runoff dealt with in the calculation of the 100 year storm event? If the two happen concurrently, there is the potential the existing design will not accommodate the increased flow.

Dwg 007 –Profile
Slope identifiers are missing from the profiles. **Provide information to allow us to identify whether or not dead zones would exist along the profile.**

Given the length of the profile it may be appropriate to have a series of check dams along the profile to slow water down during significant rain fall events. **What is being done to ensure integrity during higher flow periods?**

Dwg 008 - Cell 3 Cross Section
Esker material on the side slopes of the drainage ditch will experience erosion if placed at a 40% slope which would subsequently impact the performance of the drainage channel. Vegetation would normally be used to stabilize the side slope but as we know this approach will not work at Lupin given the lack of vegetation observed to date on the TCA sections capped decades ago. **How will erosion of the esker material be prevented?**

The drawing notes specify that 1m minimum cover will maintained over the tailings, but it is not clearly shown that the 1m cover will be maintained over the invert of the drainage ditch. **What is the depth of cover over the invert of the drainage ditch?**

Dwg 009 - Outflow Channel
We have no concerns with design provided the design event used to complete the design is reasonable and accounts for the Freshet. **Has the 100 year event been added to the typical freshet run off?**

M Dam

Dwg 010 –Plan View

We have several concerns related to this drawing:

1) Given the sequencing of the reclamation works as currently understood, it is unclear if the water level in Pond 2 will be lowered to below the toe of the M Dam prior to the initiation of the M Dam rehabilitation works. **Clarify when Pond 2 water level will be lowered in relation to M Dam rehabilitation.**
2) No specific notes have been added to the drawing explicitly instructing the contractor to remove unstable soil from within the rehabilitation work area after the water level has been lowered. **To avoid confusion or misinterpretation of the engineer's design intent, add explicit notes on this drawing confirming how the dam rehabilitation work is to proceed to ensure soft and/or saturated soils/tailings are removed from the work area.**

If the rehabilitation work is to be completed prior to the breach of the outfall dam to Pond 2, then there is the potential for water levels to be as high as they were observed in 2019 or at a level coincident with the elevation of the dam toe. As such there is the potential for wave action to undermine the toe of the M Dam, similar to what was observed at the K Dam. In order to mitigate this potential issue, consideration should be given to the placement of riprap armouring along the toe of the dam within the wave action zone thereby ensuring the long-term stability of the dam toe. **How will the toe of M Dam be protected from potential wave action?**

Furthermore, if esker material is to be used to rehabilitate the dam slopes instead of the rip rap as originally stated in the ICRP and as per the Kinross documents supporting the 2005 approval of TCA closure, then the final long-term slope for the downstream side of the M Dam should be designed in a manner consistent with industry practice for earth structures. Any surface water flow down the face of the slope would be retarded by the installation of a transect drainage swale or channel so as to minimize the potential for surface erosion. Again, in the absence of potential vegetation cover, other erosion control measures are required to ensure the long term stability of the dam structure particularly with the steepness of the downstream slope proposed in the current design. **How will dam slopes be protected from erosion given that industry practise is not being followed?**

Dwg 011 – Sections 1

Same comment as for Dwg 010 regarding protection of downstream slope from erosion.

Dwg 012 – Sections 2

Same comment as for Dwg 010 regarding protection of downstream slope from erosion.

K Dam
Dwg 013 –Plan View
Same comment as discussed for the M Dam apply to the rehabilitation of the K Dam where there is current evidence of material erosion along the dam.

Dwg 014 – Sections 1
Same comment as for M Dam Dwg 010 regarding protection of downstream slope from erosion.

Furthermore, consideration should be given to stepping out or buttressing the downstream slope when the height of the rehabilitation work exceeds 5 m in the vertical dimension. This additional structure should be contoured so as to provide transect drainage across the face of the rehabilitated area thereby minimizing the potential for esker material erosion. In the absence of any potential to vegetate the downstream slope other erosion control measures are necessary to ensure the long-term stability of the slope.

Dwg 015 – Sections 2
Same comment as for M Dam Dwg 010 regarding protection of downstream slope from erosion.

Comments on Item 27 - Preliminary cover design for newly exposed tailings
In general, we have no issues with the rational and design approach for the Cell 4 exposed tailings or the plans sections and details provided. However, it is noted that Cell 4 exposed tailings are known exposed tailings. The Nunavut Water Board request was to provide details on how LMI would handle tailings that could potentially become exposed when drawing down the water levels in the ponds.

While it can be inferred that the approach to covering any newly exposed tailings that might result from drawing down Ponds 1 and 2 would be the same as that used for covering the Cell 4 tailings, no details or discussions have been presented on how such tailings covers would be placed and secured. For example,

- **Would esker materials be placed directly over the tailings or would a geotextile filter clothe be placed prior to placing esker materials over the tailings?**
- **Would the perimeters of the cover material be stabilized with geotextile fabric and boulder materials?**

At this point in time, the Stantec's comment on how any potentially exposed tailings materials would be handled is that "*If other exposed tailings are found, outside of the identified Cell 4 area, specific design will be done according to specific site conditions. The general criteria above will apply, along with specific design feature(s) as needed once site condition and specifics are identified."* **How will necessary site specific design(s) for any such tailings area cover(s) be provided for review before any exposed tailings are covered?**

In Stantec's Closure section, they state that "*… cover on any potentially exposed tailings within the dewatered former pond areas will be the most prudent measure to mitigate ARD risks"*. CIRNAC, as stated in the past, disagrees with the above statement. We note that the FCRP stated that any exposed tailings would either be covered in place or removed to the containment cells and covered. In our opinion, relocation and consolidation of any exposed tailings outside of the existing tailings cells into the existing cells is the most appropriate action which would also provide the most robust long term stability of the site and tailings areas. Our comment in this regard is also applicable to the existing Cell 4 exposed tailings, which we would have preferred that LMI relocate to Cell 5. **How does LMI reconcile the FCRP and the closure section of the submitted document?**