Indigenous and Northern Affairs Canada | Affaires autochtones et du Nord Canada

Water Resources
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Your file - Votre référence
2AM-LUP1520

June 30, 2016

Our file - Notre référence
CIDM# 1074936

Karen Kharatyan
A/Manager Licencing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0A 1J0

Re: 2AM-LUP1520 – Lupin Mine Project – Lupin Mines Incorporated (LMI) – Response to LMI Submissions to the NWB in regards to Amendment application to increase Quantum of Security

Dear Mr. Kharatyan:

Thank you for your correspondence dated April 20, 2016 regarding the process steps the Nunavut Water Board (NWB or the Board) has developed in regards to this amendment application for water licence 2AM-LUP1520 for the Lupin Mine Project.

Background

During the renewal and amendment process leading to the issuance of water licence 2AM-LUP1520, the NWB took into consideration Indigenous and Northern Affairs Canada's (INAC) concern on the adequacy of quantum of security for the mine site by submitting a letter to the Minister of Indigenous and Northern Affairs outlining its decision. Contained below are excerpts from the NWB's letter:

"In fixing $25.5 million as the reasonable assessment of the reclamation security that should be posted under the Proposed Licence, the Board, in its original decision did, however, note that additional information may be presented to the Board over the term of the Licence that could require the Board to revisit (as a Board initiated amendment) the security amount fixed under the Licence, noting that:

…as is typical for most Type "A" licences, if information provided to the Board over the term of the Licence indicates that additional security is required to ensure that the financial security fixed under the Water Licence remains sufficient to cover the estimated reclamation liability for the site, consistent with the approach outlined in AANDC's Mine Site Reclamation Policy for Nunavut, 2002 [footnote omitted] the Board may, upon notice, revisit the security amount fixed by the Board in this decision."

Board Decision in Respect of Amendments, Updates and Corrections to the Previously Proposed Licence

"Although during the Board's further consideration of the quantum of security the Board has received no new evidence that would point to the need for an immediate amendment to the security amount currently fixed under Part C, Item 1, the Board does recognize that AANDC's site visit, including geotechnical investigations in August may yield substantive information regarding the current conditions at the site that could challenge the extent to which the $25.5 million security estimate remains adequate and appropriate in the circumstances.

In trying to balance the expectations of all licensees, and the Applicant in respect of this Application specifically, for certainty and finality under a water licence with the on-going public interest in ensuring that the reclamation security in place remains adequate and appropriate throughout the term of a licence, the Board has determined that it is appropriate to replace the current term and condition under Part C, Item 38 of the Proposed Licence with an amended term and condition. While the original term and condition only recognizes the ability of LMI to trigger a change to the amount of security to be held under the Proposed Licence, the Board's suggested substitute clause would expressly allow both the Minister and the Applicant to apply for an amendment to the amount of security required to be held under Part C, Item 1, whenever either party has evidence to support such an amendment. The Board's recommended replacement of Part C, Item 3 would, for example, allow AANDC to apply to update the security amount if the updated reclamation estimate submitted to the Board in November 2015 supports that a reassessment of the adequacy of the security held under the Proposed Licence is warranted."

On this basis, the Board is recommending that Part C, Item 3 of the Proposed Licence be replaced with the following clause:

"The Licensee or the Minister may apply to change the amount of security held under Part C, Item 1 and/or Part C, Item 2 of the Licence. Any request to change the amount of security shall be supplemented by submission(s) that include supporting evidence to justify the request and will be processed by the Board as an amendment to the terms and conditions of the Licence.

Reflecting the reference to this specific type of amendment in the Board's recommended replacement clause in Part C, Item 3, the Board also recommends an associated amendment to Part C, Item 6 of the Proposed Licence to include some additional wording to recognize that if the Minister triggers an amendment to the amount of security that the Licensee may not be obligated to provide an updated security assessment (the additional text proposed to be added is identified as underlined text in the amended clause below):
"The Licensee shall, with the exception of an amendment application submitted by the Minister under Part C, Item 3, submit an updated security assessment as part of any application to renew and/or amend the Licence, or notification to commence active

reclamation of the Project site, if the application is submitted prior to, or subsequent to the assessment required under Part C, Item 5. The updated security assessment shall take into consideration the latest version of RECLAIM and address any changes to the reclamation security previously assigned under Part C, Items 1, 2, 3, 4, and 5 as well as any changes in the Project scope associated with the application."

Subsequently the NWB added a clause to the renewed water licence 2AM-LUP1520 which states "*The Licensee or the Minister may apply to change the amount of security held under Part C, Item 1 and/or Part C, Item 2 of the Licence. Any request to change the amount of security shall be supplemented by submission(s) that include supporting evidence to justify the request and will be processed by the Board as an amendment to the terms and conditions of the Licence".*

January 22, 2016 INAC provided a submission to the NWB requesting that an amendment process be initiated to adjust the quantum of security held under water licence 2AM-LUP1520 based on results and findings of work undertaken by the department. This work included a site visit and inspection in August of 2015 which informed the development of a revised reclamation cost estimate.

This is an excerpt from that letter outlining the submission to the NWB.

"Attached to this letter are two ARCADIS documents:
i) Closure Cost estimate report which supports the department's earlier submissions and state that the revised estimate $45,545,336 million is a more adequate and appropriate amount of security to be held under water licence 2AM-LUP1520, and
ii) Fugitive Tailings assessment report

Also attached is the site inspection conducted by department representatives in August 2015. The report highlights the deficiencies at site and provides supporting evidence that the revised estimate of $45,545,336 million is a more appropriate quantum of security to be held".

The security currently required under the current water licence is $25.5 million and INAC's revised estimate is $45,545,336. The difference in security amounts is approximately $20 million.

LMI's security estimate was originally $24.1 million however they agreed that the $25.5 million security could be carried over from the previous water licence (2AM-LUP0914) to the current water licence (2AM-LUP1520), with the $1.4 million difference remaining as contingency.

On February 9, 2016 LMI sent a letter to the NWB, which when paraphrased stated *"that the amendment request be rejected based on the fact the evidence submitted was not new evidence and that the 25.5 million dollar security carried over from previous licence 2AM-LUP0914 was adequate".*

On February 18, 2016 the NWB accepted INAC's amendment request and sent out correspondence asking that comments be submitted by March 25, 2016 on the amendment request. LMI responded during the comment period, submitting a set of tabulated responses.

On April 20, 2016, the NWB provided a letter detailing the process for this amendment application. The letter states that INAC has 30 days to comment on LMI submissions to the NWB as noted above. As part of trying to resolve the differences in LMI's and INAC's closure cost estimates, INAC asked for a 30 day extension to allow for time to meet with LMI representatives. This 30 day extension was granted and due date for comments was extended to June 20, 2016. In following up and trying to verify certain information, INAC had trouble locating certain documents that LMI had submitted to the Board and subsequently asked the Board for a 10 day extension which was also granted. With the granting of this extension the deadline for submission is now June 30, 2016.

Results of Review

1) LMI Submissions

Indigenous and Northern Affairs Canada (INAC or the Department) along with its consultant (ARCADIS Canada or ARCADIS) have reviewed LMI's submissions to the NWB regarding this amendment process.

Based on a review of all evidence made available either from the licensee, found on the NWB website and INAC's August 2015 site review, the Department remains confident that the reclamation closure cost estimate that is currently covered solely by the $25.5 million in security required under the water licence is inadequate. The revised estimate of $45,545,336 is a more appropriate amount to remediate the site given on-site conditions and INAC's Mine Site Reclamation Policy For Nunavut, 2002.

Table 1 below outlines the four areas of significant difference in the closure cost estimates between LMI and INAC (estimate produced by ARCADIS – INAC's Consultant). ARCADIS has further explained how they have reached their closure costs in the attached memo (Attachment A).

Table 1: Four areas of greatest difference in closure cost estimates between LMI and INAC

Closure Cost Item	LMI Estimate	ARCADIS Estimate	Difference
Tailings Area	$3,395,562	$7,231,080	$3,835,518
Mobilization/Demobilization	$4,917,904	$8,078,895	$3,160,991
Chemicals	$2,498,718	$7,212,041	$4,713,323
Contingency	$1,625,634	$5,150,374	$3,524,740
Total	$12,437,818	$27,672,390	$15,234,572

These four line items account for approximately $15 million of the $20 million difference (or approximately 75% of the difference) between the estimates of LMI and INAC.

1.) Tailings Area – The $3.84 million difference results from a difference in unit rates for earthworks used by LMI and ARCADIS, as well as a 30% increase from 2014 to 2015 in the RECLAIM model used by ARCADIS.
2.) Mobilization/Demobilization – The reason for the $3.16 million difference is the assumption that the on-site fuel will **not** be useable, additional fuel will have to be supplied and additional equipment will be required on site to complete the reclamation work.
3.) Chemicals – The $4.71 million difference attributable to the management of onsite fuel as waste. As stated above, the assumption is that the on-site fuel will be **unusable** therefore the fuel will have to be treated as a waste.
4.) Contingency – ARCADIS has assumed 20% contingency on direct costs as opposed to the 10% used by LMI.

Further details on differences in specific cost areas between LMI and INAC's estimates are provided in Attachment A.

2) Other Documentation

INAC has also reviewed updated documents that were submitted to the NWB in March of 2016.

These documents were:

a) Annual Report and Cover Letter Final
b) Interim Abandonment and Reclamation Plan (IARP) with Appendix A
c) Spill Contingency Plan (SCP) Final
d) Monitoring Schedule Final
e) Dam 6 Wind Tails Memo
f) Commitment List
g) Care and Maintenance Plan Final Appendix 1 and 2

Other documents were also placed on the NWB ftp site under annual report and were not included in this review as they were either not applicable to this discussion or have not been updated for several years (i.e. documents submitted to the NWB in 2005 by Kinross, a past operator of the Lupin mine)

In reviewing the above listed documents, INAC notes that the latest updates on these documents were either made in 2013 or 2016. Updates made to the documents in 2013 have already been reviewed and incorporated in previous submissions as well as the closure cost estimate as part of the recent licence renewal process. A review of the 2016 updates did not yield substantial new information that would alter our revised closure cost estimate. Outlines of activities planned for 2016) cannot be incorporated into the current estimate as the work is yet to be completed.

INAC notes the annual report states that 130,000 lbs of hazardous waste or waste was removed from site in 2015. LMI representatives have stated verbally that approximately 100,000 kg of waste was removed, as is noted in the attached MEMO from ARCADIS.

During a June 6, 2016 call with LMI, Mr. Patrick Downey told INAC personnel that along with the wastes that were removed, the residual fuel inventory on site was reduced to approximately 1.9 M litres and the abandoned piping related to the fuel tank farm was decommissioned with no subsurface impacts identified. At this time these statements cannot be verified and by extension cause no material change in the reclamation closure cost estimate.

INAC acknowledges that the 2016 work plan includes some progressive reclamation and, if completed, would be incorporated into future reclamation closure costs estimates. However, as stated above, these activities cannot be accounted for in the current estimate as they are yet to be undertaken and completed.

3) 2016 INAC Site Inspection

In reviewing all documentation that may impact the closure cost estimate, INAC reviewed the latest inspection report from June 14, 2016. The inspection report notes that LMI should take measures to contain the spill at the Satellite Tank Farm as there appears to be evidence that the spill is spreading and has yet to be remediated.

Other recommendations in the inspection report relate to general site upkeep and maintenance of berms, dams and associated structures to ensure structures do not fail and that the environment is protected.

4) Other

Two teleconferences have occurred between LMI and INAC with regards to closure cost estimates and the site in general; June 6 and June 23, 2016.

The discussion of June 6, 2016 focused primarily on activities completed during the last year, activities planned for the upcoming year and closure cost items where there are substantial differences, items such as the ones outlined in Table 1 above. These discussions although very informative were unproductive, in that, they didn't resolve any of the differences in closure costs.

The discussions of June 23, 2016 once again revolved around the differences in closure costs given that INAC now was in receipt of all applicable documentation, and again although informative, the discussions didn't resolve any of the differences in closure costs.

Conclusion

Based on its work, INAC believes that $45,545,336 is an appropriate reclamation security amount in accordance with INAC's Mine Site Reclamation Policy For Nunavut, 2002. INAC has justified all of its closure costs with explanations and assumptions given the uncertainties at site.

INAC acknowledges LMI's desire to have INAC withdraw its amendment request and to subsequently re-evaluate reclamation security under Part C Item 4 of the approved water licence 2AM-LUP1520 which states *"The Licensee shall, in the year 2017 reassess and update the reclamation security for the project and submit to the board for review a copy of the updated assessment on or before September 30, 2017".*

At this time INAC will not be withdrawing its amendment request to the NWB.

Closing

At this time INAC would like to thank the board for approving the amendment process and also allowing INAC the opportunity to respond to comments on the amendment application. INAC looks forward to the continued participation in the amendment process as outlined by the NWB.

Respectfully submitted,

Karen D. Costello
Director, Resource Management

Enclosures (2):

Attachment A – ARCADIS MEMO dated June 27, 2016
Attachment B – LMI Email dated June 13, 2016

cc. Karén Kharatyan, A/Manager, Licensing, NWB
Scott Burgess, A/Manager, Water Resources, INAC
Ian Parsons, Regional Coordinator, Water Resources, INAC
Erik Allain, Manager, Field Operations, INAC
Eva Paul, Water Resource Officer, Field Operations, INAC

Attachment A: ARCADIS Memorandum dated June 27, 2016

MEMO

ARCADIS Design & Consultancy for natural and built assets

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ENVIRONMENT

To:
Ian Parsons
INAC

Copies:
File

From:
Charles Gravelle

Date:
June 24, 2016

ARCADIS Project No.:
702524-000

Subject:
Lupin Quantum of Security Review
Lupin Mine Water Licence Application
Amendment Process

Pursuant to the Statement of Work (SOW) provided by Ian Parsons of Indigenous and Northern Affairs Canada (INAC), Arcadis was retained to review the latest documents prepared by LMI regarding the evaluation of the Quantum of Security for the Lupin Mine, as part of the Water Licence amendment process. The intent of this review is to confirm if there have been any changes to the site conditions or assumptions made in the preparation of the latest RECLAIM estimate that would change the current 2015 estimate prepared by Arcadis Canada Inc. (Arcadis).

As part of this review three documents were provided by INAC and reviewed by Arcadis namely;

1. LMI Overview Letter dated Feb 2016;
2. Summary Spreadsheet comparing the Arcadis 2014 and 2015 RECLAIM cost estimates; and
3. A set of tabulated responses by LMI to various earlier documents based on previous correspondence.

The results of the current review have determined that there has been no material change to the site conditions that would have significantly altered the current approach taken by Arcadis to develop the RECLAIM cost estimate. The cost differences between the LMI and Arcadis estimates are based primarily in methodology, whereby LMI has prepared an estimate based on progressive reclamation of the property while Arcadis has assumed the site would be inherited by the Crown in its current state as per the directives outlined in the 2002 Mine Site Reclamation Policy for Nunavut. More details on specific elements of the RECLAIM estimate are

provided in the attached response table which builds upon the set of tabulated responses and comments by LMI as noted above.

Further to our review of the three documents above, and at the request of the Nunavut Water Board, an informal teleconference was held between members of LMI's team, INAC and Arcadis. During this meeting, held on 6 June, 2016, there was a general discussion on the following topics:

1. How did Arcadis derive the unit rates used in the RECLAIM estimate;
2. The methodology of approach to preparing the estimate;
3. How did LMI derive its unit rates used in their estimate; and
4. Changes in site conditions that have occurred since the time of August 2015 site investigation.

As part of this discussion, Arcadis explained that unit rates used in the preparation of both their 2014 and 2015 RECLAIM estimates were derived from multiple sources. In cases where Arcadis agreed with the LMI unit rates, those rates were used in the Arcadis quantum of security estimate, however, where Arcadis did not agree with the LMI rates, Arcadis defaulted to the rates provide in the respective versions of the RECLAIM tool. It was noted by Arcadis that the default RECLAIM unit rates used to prepare the respective quantum of security estimates increased between the 2014 and 2015 versions of the RECLAIM tool. Arcadis also stated that it could not replicate the majority of the rates used by LMI in the development of their estimate and as such used those provided in the RECLAIM estimate.

The prime reason for the difference between the LMI and Arcadis quantum of security estimates relates to: a) how existing fuel reserves on site will be managed as part of the reclamation program; and b) the availability of equipment on site. The methodology used in developing the Arcadis quantum of security estimate was discussed during the 6 June teleconference. LMI did not agree that the existing fuel cache should be defined as a waste material while Arcadis and INAC stated that it could not be assumed that the existing fuel would be viable for use at the time of any future remedial or reclamation work. For this reason Arcadis defined the existing fuel inventory as waste requiring off-site disposal. With respect to the availability of equipment, Arcadis stated that the existing fleet on site and the proposed additional equipment to be mobilized to site are insufficient to complete the earthworks and reclamation works outlined in the closure plan, and as such additional equipment would be required to complete the reclamation works in a single season as stated in LMI's closure plan.

In discussing how LMI derived its reclamation works unit rates, it was stated that they would provide the backup on how their rates were derived for any specific topic requested by INAC (a list of specific unit rate items was provided to LMI on 7 June, 2016). Furthermore LMI would provide unit rates for equipment and labour for the years 2014 to 2016 inclusively for review by INAC and Arcadis. Arcadis stated it would be very informative to have this information as it could be used to amend the rates used in the current Arcadis RECLAIM estimate.

Mr. Patrick Downey of LMI stated that by the end of the year 2015, the following work had been completed at the site which would represent a change in condition from the time of the August 2015 inspection:

1. 100,000 kg of hazardous waste was removed from site;
2. Repairs to the Tailing Containment Structure were completed under the supervision of SRK (LMI's consultant);

3. The residual fuel inventory on site reduced to approximately 1.9 M litres; and
4. Abandoned piping related to the fuel tank farm was decommissioned with no subsurface impacts identified.

With respect to these stated changes to site conditions, Arcadis cannot provide any comment as, with the exception of the dam repairs on the Tailing Containment Structure, Arcadis staff were not present to witness, nor have any documents been provided, that would confirm the statements made by Mr. Downey.

At this time, it is Arcadis' opinion that there have been no material changes to the site conditions that have been properly vetted and/or substantiated by third parties that would result in a change to the current quantum of security set forth by Arcadis in their document of October, 2015. A recap of the LMI and Arcadis quantum of security estimates are provided in the attached table.

On 13 June 2016 Arcadis received additional information from LMI, via INAC, on the following topics:

1. Labour and Equipment Rates for the years 2014, 2015 and 2016; and
2. Work breakdowns for the movement of waste rock and cover materials as used in the LMI Quantum of Security Estimate.

The equipment and labour rates were reviewed for information only and are not relevant to the current assignment. In reviewing the work breakdown structures provided by LMI, the plan for the relocation and placement of waste rock and cover material is very aggressive with two shifts working 22 hours a day to complete the work. While the aggregate number of days of work is less than a six month work season no allowance has been given for weather, equipment breakdowns, or the other site works that will require some or all of the excavation or haulage equipment during some period of the reclamation work. It is Arcadis' position that the completion of these tasks, as outlined in the work breakdown structures, is too aggressive and a more conservative approach should have been used in preparing the reclamation estimates for these work items.

Table 1 – Comparison of RECLAIM Estimates

Closure Cost Item	LMI Estimate	2015 Arcadis Estimate	Reason for Difference
Underground Mine	$439,639	$506,380	The difference relates to unit rates used to prepare the concrete cap over the open stope and the completion of a Crown Pillar Study. Arcadis has not been provided with a Crown Pillar study.
Tailings Area	$3,395,562	$7,231,080	The difference relates primarily to the earthworks unit rates used by LMI and Arcadis. The Arcadis rates also increased over 30% between the 2014 and 2015 RECLAIM Models. The quantity of borrow material being recovered for the placement of 1 m in-situ measure of cover material has been assigned a bulk factor to account for both the loss of material into the tailings and the fact that compaction of material will ultimately increase the amount of material required to place a 1 m in-situ layer of material.
Building/Infrastructure Demolition	$6,664,708	$6,577,883	No material difference between costs
Chemicals	$2,498,718	$7,212,041	Multiple aspects of this work element have resulted in the significant cost difference. The amount of monies set aside by LMI for a Phase I/II ESA and Hazmat survey programs are insufficient based on our experience with providing such services on sites such as the Lupin mine site. This difference represents (~$550,000). There is a difference between the volume of PHC-impacted soil to be managed and the unit rates used to cost the treatment of these materials however the net resultant is not material (<$100K). The main difference in cost relates to the management of residual fuels and chemicals which were not accounted for in the LMI estimate. This represents ~$4M in cost. While the management of the residual fuel could be argued (Arcadis still assumes the residual fuel to be a waste) the nearly $1M for the management and disposal costs of the residual chemicals on site still remains a real cost to the reclamation of the site. The cost to manage residual chemicals should have been in LMI's estimate.

Closure Cost Item	LMI Estimate	2015 Arcadis Estimate	Reason for Difference
Waste Rock	$1,887,702	$3,580,000	The difference relates to unit rates used by LMI and Arcadis. The Arcadis rates also increased over 25% between 2014 and 2015 RECLAIM Models.
Interim Care and Maintenance	$0	$644,488	This is a new element in the RECLAIM Model that was not included in the LMI Model as they were using an older version of RECLAIM at the time the model was prepared.
Post Closure Monitoring	$830,013	$2,186,376	The difference in cost relates to the position by Arcadis that monitoring of the site will need to continue for up to 100 years. This position is based on the view that there will always be some level of risk associated with the method of impoundment used for the tailings and the nature of the chemical parameters of concern within the tailings. Care and maintenance is required for maintenance of water retaining tailings dams, spillways and channels and maintenance of the cover (which is subject to wind and water erosion).
Closure Plan, hearing and reports	$0	$257,519	The difference in cost relates to the assumption by LMI that this work element new to the RECLAIM estimate would be covered under other existing work items. This is not clear to Arcadis and as such a low percentage of 1% of direct costs was assigned.
Mobilization/Demobilization	$4,917,904	$8,078,895	The difference between the two costs relates to the assumption that additional fuel will need to be supplied on the basis that the existing fuel inventory is not usable (~$2M in cost) and the need for additional equipment to be mobilized to site to complete the reclamation work outlined in LMI's plan (additional $375K). The balance of cost relates to those associated with mobilization of manpower, supplies and accommodations required to complete the work that were not adequately costed in the LMI estimate.
Project Management	$650,254	$1,287,594	Not clear why LMI is using 4% rather than 5% however this rate difference is not material it is the Direct Cost calculations that control the cost item.

Closure Cost Item	LMI Estimate	2015 Arcadis Estimate	Reason for Difference
Insurance	$0	$257,519	Not clear why LMI did not include for insurance within their estimate.
Engineering	$650,254	$2,575,187	It is LMI's position that the design of the closure plan is a mature design and as such does not require significant amendments going forward. The Arcadis estimate is based on the regulatory requirement (Part I Item 6 of the Water Licence) that all the design plans will need to be reviewed against the existing site conditions at the time of reclamation within the assumption no progressive reclamation work has been completed. The work would then have to be tendered and the reclamation work supervised.
Contingency	$1,625,634	$5,150,374	The amount of contingency used by Arcadis (20% of direct costs) differed from LMI (10% of direct costs) on the basis of the information made available for Arcadis to review when preparing the RECLAIM estimate and our experience with other clean-up programs at mine sites in the Arctic. It is understood that with a quantum of security of $25.5M that LMI has provided a larger than 10% contingency. On the basis of information provided to date Arcadis has not seen approved detailed designs for many of the mine reclamation elements and as such the design of the reclamation program is not as mature as assumed by LMI. We are also anticipating that the results of the Phase II ESA will identify more PHC impacts than currently estimated based on visual inspection of surficial impacted. Furthermore the assumption that all the reclamation work can be completed in one season is also optimistic for the size of the equipment fleet stated in the closure plan by LMI. Part of the contingency amount included in the Arcadis estimate is to cover the likelihood that a second season will be required to complete the reclamation program.
Total Costs	$24,100,389[1]	$45,545,336	

Note 1: a quantum of security equal to $25.5M was agreed to by LMI in their Water Licence Application.

Review of LMI Letter of 9th February, 2016 – 2AM-LUP1520 – Lupin Mine Project – Lupin Mines Incorporated (LMI) – Renewal and Amendment Application – Additional Comments on Issue of Quantum of Security

Letter Introduction

Arcadis is not in a position to comment on the issues related to whether or not the Water Licence process can re-open a quantum of security estimate.

ARCADIS RECLAIM Cost Model dated October 22, 2015

LMI have correctly quoted the Arcadis document, in that the site remains effectively unchanged from the conditions reported in earlier estimates, save for the volume of petroleum hydrocarbon (PHC)-impacted soil, which was based on the results of the August, 2015 site visit.

The issue of whether or not there is sufficient new evidence to re-open the quantum of security discussion is outside our purview, and as such Arcadis cannot comment on the validity of this statement by LMI.

Fugitive Tailing Assessment Report

The October, 2015 quantum of security estimate did not include any monies to mitigate any potential issues related to tailings having migrated outside the limits of the tailings management area (TMA). It was understood that this issue would need to be confirmed, and the contingency for the program would have to be adjusted accordingly once this was known. Given the limited amount of earthworks that may have been required to mitigate this concern, had there been one, the amount of contingency for the overall reclamation program does not effectively change as a result of the Fugitive Tailings Assessment Report.

One point of clarification. The Arcadis report does not state that historical deposit of tailings outside of the TMA did not happen. It simply states that on the basis of the analytical results reported the material encountered outside the TMA is consistent with that found in the borrow area and as such can be inferred to be from the cover material placed within the TMA.

INAC Site Inspection

Arcadis has not commented on the results of an INAC inspection.

Conclusion

It is outside of Arcadis' mandate to comment on the conclusions drawn by LMI on the basis of the information provided to them in the Fall of 2015 and Winter, 2016.

LMI Review of Arcadis December, 2014 and October, 2015 RECLAIM Estimates.

LMI's review of the RECLAIM estimate is not relevant to the current discussion regarding whether or not the quantum of security should remain at $25.5M or increased to over $40M. The difference between the two estimates is effectively due to:

1. Changes in unit rates between the 2014 version and 2015 version of the RECLAIM model. Some of the unit rates changed by over 25% between the two RECLAIM versions which substantially increased the quantum of security costs.
2. Modifications to the work elements included within RECLAIM have resulted in additional work items that were not previously done in the earlier LMI RECLAIM estimate.
3. A modest increase in the volume of PHC-impacted soil estimated for the mine site (40,000 m^3 to 50,000 m^3).

The document provided by LMI tracks where changes were observed, either increases or decreases in the two Arcadis RECLAIM estimates.

LMI Summary Document on LMI Response to NWB Submissions by INAC

Arcadis comments to responses provided by LMI are provided within the attached table.

ARCADIS MEMORANDUM DATED OCTOBER 22, 2015			
	ARCADIS Submission to NWB	**LMI Response to ARCADIS Submission to NWB**	**ARCADIS RESPONSE June 2016**
	The results of the site inspection work completed by ARCADIS Staff during a recent site visit, undertaken 19 to 20 August 2015, have determined that in general the conditions, as outlined in the Lupin Mines Incorporated (LMI) Lupin Mines Closure Estimate Update December 2014, remain unchanged. The assumptions used by LMI in their RECLAIM cost estimate are reflective of the site conditions save for the issues and concerns raised by ARCADIS in their memoranda of 31 December 2014 and 22 January 2015 regarding the LMI December 2014 RECLAIM cost estimate.	We generally agree with ARCARDIS in their determination that in general the conditions, as outlined in the LMI Lupin Mines Closure estimate updated December 2014, remain unchanged. The site conditions at the Lupin site remain in good condition with care and maintenance work being done annually consistent with the evidence as presented at the public hearing. As the NWB is aware, INAC's previous review of LMI's estimate was a desktop review. LMI submits that INAC and ARCADIS' August 2015 inspection of the site did not provide it with any new information such that the quantum of security should be revisited by the NWB six months after the issuance of the licence. As the NWB will note, the Inspection Report includes several inaccuracies which LMI has commented on in separate correspondence to INAC. During 2015, LMI completed maintenance work on the sewage lagoon, tailings pond discharge and backhauls. LMI continues to carry out care and maintenance activities to ensure the site kept in good condition and that the site condition has improved since the LMI Lupin Mines Closure estimate updated December 2014. Site infrastructure is in good condition and with the ongoing care and maintenance being done annually, the security remains sufficient as per the NWB's 2015 decision. LMI has reviewed the January 2016 ARCADIS materials. With respect to the issues and concerns raised in the ARCADIS memorandum dated January 22, 2015 (prepared in advance of the public hearing, but not submitted as part of the public hearing), LMI has, for the great majority of the issues, previously addressed these issues and concerns during the technical review and public hearing for the licence and as such, these issues and concerns have already been thoroughly and fairly considered by the NWB. LMI has provided comments in the table below.	Arcadis has no comment on the LMI response. Arcadis' RECLAIM estimate are based on the documents provided and in the 2015 estimate based on the results of a brief site visit. We can state, on the basis of the site visit in August 2015, that in general the conditions observed by Arcadis staff remain consistent with those outlined by LMI in their documents save for the PHC impacts which Arcadis has stated are greater than those reported by LMI. We cannot comment on whether or not the quantum of security issue can or should be re-opened as this is outside of our mandate.
	On the basis of the information collected during the recent site inspection, and the information included in our earlier reviews of the LMI RECLAIM cost estimate and subsequent correspondence, we have recompiled the RECLAIM estimate for the Lupin mine site and have determined that a quantum of security on the order of $45.5 million would be required to address the site closure	As an overall comment, LMI notes that the majority of changes in the ARCADIS estimate result from a change in rates, rather than as a response to a change in site conditions or ARCADIS' understanding of site conditions as a result of the INAC inspection on August 21-22, 2015. LMI respectfully submits that a change in rates is	No comment regarding whether or not the quantum of security discussion can be re-opened.

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	requirements, as outlined in the LMI Interim Abandonment and Restoration Plan document, on the assumption that no progressive reclamation works were completed on the site. It is understood that the majority of the reclamation cost as derived herein are the result of mobilization of equipment and materials to decommission and remediate the site in its current condition and that any progressive reclamation work completed by LMI would result in a future reduction in the quantum of security presented herein. As noted in the terms and conditions of the existing water licence, the proponent has the opportunity to have the quantum of security adjusted at future dates as they see fit.	insufficient evidence to trigger a review of the security in accordance with Part C, Item 3 of the Licence, especially within six months of the issuance of the licence. As presented during the water licencing process in 2015, LMI's rates were based on actual quotes and this methodology has already been accepted by the NWB. Further details on our rates methodology are re-stated below, for convenient reference by the NWB As stated during the public hearing, LMI plans to re-open the mine when conditions are favourable. Therefore, progressive reclamation is only carried out to the extent possible with re-opening of the mine still under consideration. LMI has hired an engineering firm specifically in regard to the design and construction of the Landfarm as approved in the renewed water licence. The purpose of the Landfarm is, in part, for LMI's ongoing progressive reclamation at site. LMI backhauled approx. 130,000 lbs of waste this past season, completed work at the sewage lagoon, discharged approx. 2,000,000 m3 of treated water from Pond 2 of the Tailings Impoundment Area and completed the windblown study as required by the renewed water licence.	
	The majority of the reclamation cost is associated with mobilization/demobilization and supply of earthmoving and demolition equipment to complete the reclamation works on the assumption that the current mine operator will complete minimal to no reclamation works and the equipment fleet on site is not sufficient to complete the restoration of the site. While it is understood that in the near term some equipment on site could be used during the reclamation works the Crown cannot make this assumption as the condition of this equipment at the time the Crown were to take over responsibility for the site is unknown.	As submitted during the 2015 water licencing process and as previously accepted by the NWB, LMI does not agree that the equipment at site should be deemed unusable for the ARCADIS estimate. In fact, ARCADIS stated in their memoranda that based on visual observations , the equipment on site appears to be in relatively good condition. LMI operated the equipment this past season and if equipment becomes unusable in the future, then costs for replacement equipment will be included in future estimates prepared by LMI. LMI has already included mobilization and demobilization of a fleet of vehicles for closure in their estimate. Further, as required by the NWB, LMI will be submitting an updated RECLAIM estimate to NWB in 2017. LMI is of the view that ARCADIS is not using an appropriate methodology when it included costs that are unlikely to materialize within the term of the licence, or even before the updated estimate process.	Arcadis continues to hold the believe that the equipment fleet suggested by LMI is not capable of completing the reclamation work in one season and as such additional equipment over and above that stated by LMI will be required to complete the reclamation works as outlined in LMI's Closure Plan. The preparation of another RECLAIM estimate in 2017 is not material to the current discussion and as such Arcadis has not comment in this regard. The RECLAIM estimate prepared by Arcadis is predicated on the assumption that the mine operator has abandoned the mine site and the Crown will be responsible for completing the reclamation program. As such the methodology used by Arcadis may not be entirely in line with the approach taken by LMI but is consistent with the mandate provided by INAC in this regard.
	The largest risk to the overall reclamation program would be the assumption the petroleum hydrocarbon (PHC) impacted soils could be treated, used a landfarming technique, in one season. In the event	LMI advised during the water licence renewal process that the landfarm was initially to be used on site for the remediation of a limited quantity of petroleum	The concern we have here is two-fold; 1) has the PHC soil treatment plan been accepted by the NWB and 2) has the NWB accepted the burial of PHC impacted soils within the underground workings? Given the nature of the PHC impacted soils on site it may be challenging to get the soil treatment process completed in one season. On the basis of

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	landfarming of PHC impacted is not completed as part of any progressive reclamation work there is a risk that the amount of impacted soil could not be treated in a single season. This liability will need to be monitored and the quantum of security potentially adjusted upward as the cost to strand the earthmoving equipment required to continue landfarming of PHC impacted soils over an additional one or two seasons has not been accounted for in this estimate.	hydrocarbon contaminated soil during the care and maintenance and operating stages of the mine. INAC had a concern during the water licence process that the *size of the landfarm may be too small for the remediation of contaminated soil at closure. It may address future contamination but it is unlikely that it will address the current inventory of contaminated soil, as stated in their final submission dated January 5, 2015.* LMI responded, in their final submission dated January 21, 2015, that the landfarm was not intended to remediate all potential future volumes of material. It should be noted that the IARP states on page 24 that options for the treatment of fuel laden sand include treatment by volatilization and bioremediation (i.e. landfarming) or burial (i.e. consolidate and cover, underground disposal) upon final closure, therefore there is no real risk that impacted soil could not be treated in a single season. It would appear that the NWB agreed with this reasoning when it set the reclamation amount in May 2015 and again in August 2015.	these concerns Arcadis assigned what may be considered a higher than normal contingency to the RECLAIM estimate. The implications of the PHC soil treatment work not being completed in a single season are significant and as such warrant a greater level of contingency for the overall program.
3. Summary of Site Conditions	The following general observations were made by ARCADIS staff during their recent site inspection work undertaken in August 2015: 1. The site conditions are effectively the same as described by LMI in their evaluation of the site and the contents of the various structures and equipment thereon. 2. There is potential for petroleum hydrocarbon impacts to be present within the overburden that had not been previously identified stemming from historic fuel storage practices as observed on site. For example heavy oil staining was observed within the tank farm areas and in the equipment laydown areas. The underground piping between the tank farm and day tanks are also a potential source of concern in the Camp area. 3. Based on visual observations only, the equipment on site appears to be in relatively good condition. 4. The waste rock pads are in areas that are elevated and dry relative to the surrounding terrain and as such water management from these areas is not anticipated. 5. The quantity of fuel on site was not confirmed during the site inspection. 6. Leaking drums were observed on site in the Mill area. Observations on specific items included in the Interim Abandonment and Restoration Plan are provided below using the same section headers	1. LMI is very pleased to hear that ARCADIS agrees that site conditions are effectively the same as described by LMI. LMI respectfully submits since there has been no change in site conditions, there is no basis to revisit security at this time. 2. The potential for petroleum hydrocarbon impacts was included in LMI's estimate of 40,000m^3. While LMI's estimate is based on detailed surveys, and ARCADIS did not conduct a detailed survey, LMI notes that the difference in cost is very small (less than $10,000). The volumes are not substantially different and an updated environmental site assessment is required by the NWB prior to amending or renewing the current water licence and any changes to hydrocarbon impacts will be reflected in future LMI's estimates (Part I, Item 9). The underground piping between the tank farm and day tanks were removed in 2014. This information was previously provided during the licence renewal process, and taken into account by the NWB in its decision. 3. LMI concurs that the equipment at site is in good condition and as further evidence, LMI continues to use the equipment and can confirm that this is the case. Equipment not in use has been stored appropriately pending a recommencement of	No Comments on this line item. The results of the recent RECLAIM assessment have shown that the major cost difference relate not so much to the physical setting at the site but how certain elements of the work are costed. These are discussed later in this document.

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	included in Section 2 of this document.	mining. 4. LMI agrees the waste rock pads are elevated and dry relative to the surrounding terrain and as such water management from these areas are not anticipated. 5. ARCADIS was advised during their site visit that LMI was using the fuel and that they would not have final fuel quantity until the season was over and the final fuel dips were completed. We advised ARCADIS to use the quantity of fuel that was used during the water licence process even though the number would be slightly higher. The current volume of diesel at site is 1,930,531 litres. 6. LMI policy requires that any leaking drums be transferred into new storage drums and relocated to the Hazardous Waste Storage area for trans-shipment from site. During the inspection, ARCADIS did not identify any leaking drums to LMI and as noted previously. LMI is not aware any leaking drums in the Mill area but will follow up..	
3.1 Buildings and Contents	The majority of the buildings on site are steel framed or modular and can be easily collapsed and transported off-site for disposal. None of the structures appeared to be constructed of materials that would require special material management (i.e. asbestos or lead paint) with the exception of some structures were asbestos containing materials are known to be present. The contents with the buildings will need to be managed appropriately as there are petroleum products and various chemicals in small quantities that will require appropriate management at the time of mine closure. No concerns with the reclamation approach as outlined by LMI in the IARP.	As was previously communicated to the NWB via the 2015 water licencing process and taken into account by the NWB when it set the reclamation security amount, a 2012 investigation by Arctic Response of the buildings identified the small quantities of petroleum products and various chemicals and advised LMI as to the appropriate management of those items. LMI has included the cost of managing these products in their estimate. It appears the ARCADIS estimate continues to fail to take the Arctic Response investigation into account.	On the basis of the site visit in 2015 there was more than a small quantity of petroleum hydrocarbon liquid stored in totes and drums within the various buildings on site to the point that an accurate inventory could not be taken in the short period of time on site. The chemical inventory was not reviewed while on site given the amount of time that would be required to complete this type of assignment. For the purposes of the RECLAIM estimate the quantity reported by LMI was used however this particular issue does contribute to the increased contingency for the overall program given the cost of removing hazardous materials from the site. Arcadis does recognize that LMI is committed to backhauling as much hazardous materials as they can however as of the time of the site inspection a significant quantity of material remained.
3.2 Freshwater Intake System	The freshwater intake system is also relative modular and would be easy to dismantle and ship offsite for disposal. Small tools can be used to decommission the majority of the equipment and hydraulic equipment would be used to remove pumps and other heavier electrical/mechanical components. The decommissioning of the corrugated steel pipe shaft within the intake structure will require some work however this work could be easily done using an excavator. No concerns with the reclamation approach as outlined by LMI in the IARP.	No comments	No comment
3.3 Sewage Disposal Facility	This system is also modular and can easily be decommissioned using small tools with some hydraulic equipment support. No concerns with the reclamation approach as outlined by LMI in the IARP.	No comments	No comment
3.4 Access Roads and Airstrip	The current condition of the site access roads are such that minimal improvements would be required to allow equipment to freely move between the airstrip, the borrow eskers, the tailings containment	LMI agrees that the airstrip may stay in place, although LMI has provided an amount to remove it in their estimate.	No comment

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	structure and the Mill Area. We concur with LMI that twenty-two culverts require removal. While the IARP does state that the Airstrip is to be decommissioned consideration may be given to leaving the airstrip in place however identified as abandoned. For the purposes of this exercise it has been assumed that the reclamation work in this regard will match that outlined in the IARP. The re-grading and scarifying of the access road and removal of culverts can be easily achieved using a dozer with a ripper and either a loader or excavator.		
3.5 Fuel Storage	The existing tank farms can be easily decommissioned whereby the contents of the tanks can be decanted into tanker trucks or totes mobilized to site for the reclamation program. The portion of tanks could be loaded onto flatbed trailers to be transferred off-site for disposal while the larger tanks would need to be dismantled on site and the residual scrap metal shipped off-site along with any residual sludge. The volume of residual fuel on site was not confirmed during the course of the site visit and as such volumes calculated in earlier RECLAIM estimates have been assumed. Inspection of the tank farm containment area and various equipment laydown areas did identify areas of heavy petroleum hydrocarbon staining that will need to be addressed as part of any future reclamation work. On the basis of surface impacts the volume assumed by LMI is consistent with estimates based on observations made by ARCADIS staff during the recent site visit. There is a risk however that given the nature of the liner material used for the secondary containment (a woven geotextile), and some evidence of perforations in the liner, that some leakage into the overburden underlying the tank farms has occurred which would increase the overall volume of impacted soil to be landfarmed. Given the time required to treat petroleum hydrocarbon (PHC) impacted soils in the North this represents a substantial risk to any future reclamation program. The true extent of the PHC concern will not be known until the time of reclamation. It would not be prudent to puncture the existing liner within the tank farm containment areas as part of any future environmental subsurface investigation program unless repairs were to be made to the containment liner. This concern applies to all tank farms on site as well as fuel/oil drum storage areas. The relatively minor staining noted in other parts of the site are not likely to result in a significant increase in the volume of impacted soil and as such are of less risk with respect to this component of the reclamation cost estimate. The volume of impacted soil is primary a function of what the impacts are within and beneath the existing and former tank farm containment structures.	The staining in the Bulk Fuel Storage Area and the Hazmat Storage Area are contained. There is no indication that the liner for these areas is compromised and no evidence of perforations in the liner has been provided by ARCADIS. In LMI's experience, the berms and liner within the tank farms hold water every season which demonstrates that the liner is not perforated and leaking. In addition, as per the recently issued water licence, an updated environment site assessment will be completed prior to renewal or amending of LMI's water licence. Therefore, the NWB has already considered this risk and included an appropriate condition on the licence. At this time, there is only speculation that there may be contamination of overburden underlying the tank farms. In 2014, a geotechnical inspection was carried out by SRK and filed with the NWB. The geotechnical inspection observations were as follows: " **Observations** The tank farm containment systems were observed to be in geotechnically stable condition. Liner exposures and minor damages are noted in both tank farms. The liner exposure is mainly located near the crest of the berm where sand overliner either eroded away or sloughed off. Minor damage typically associated with an exposed liner was found to include punctures of various sizes ranged from less than 2 cm to 30 cm in longest dimensions. It should be noted that site personnel complete repairs to such punctures when identified after inspections. Minor erosion gullies were observed in some areas in the downstream slope of the berms. Active seepage from the tank farms was not observed at the time of visit. Minor water ponding was observed in the main tank farm, assumed to be from runoff ranging from 5 to 15 cm. **Engineering judgment suggests the water ponding in the tank farms indicates that the liner is**	During the course of the August 2015 site inspection there was evidence of damage to the liner underlying the Bulk Fuel Storage Area and Hazmat Storage Area. Arcadis did not provide LMI with any evidence of the damage observed at the time of the inspections. This information can be provided if necessary however it is not material as there is sufficient evident of PHC impacts that the entire tank farm area will require a significant level of effort to mitigate the PHC concerns. No comment on the second paragraph as Arcadis cannot speak for what the NWB inferred or implied with respect to its issuing of a water licence and the need for subsequent testing. It is recommended however that the environmental site assessment work include sampling beneath the liner in areas with observed PHC impacts. The observations provided by SRK relate to the stability of the tanks and not the competence of the liner assembly. The text is not relevant to the discussion of quantum of security.

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		unlikely to be compromised by damages in the bottom of the tank farms."	
3.6 Explosives Magazine	The existing magazines for both the explosives and blasting caps comprise a steel frame structure on a concrete pad that are presently empty. No concerns with the LMI reclamation plan for these units.	No comments	No comment
3.7 Borrow Pits and Quarry	No concerns were identified by the geotechnical inspector during the recent site inspection. No concerns with the LMI reclamation plan for these areas of the site. There will be sufficient plant on site during any reclamation work to address any potential concerns that may arise in the future.	No comments	No comment
3.8 Underground Development	The underground workings were not accessed during the recent site visit. The construction of the mine opening seals, as prescribed by LMI in their IARP, is consistent with industry practice and on the basis of the recent site visit there are no concerns with the proposed plan.	No comments	No comment
3.9 Waste Rock	The stability of the waste rock pad was reviewed as part of the recent geotechnical inspection of the site and no concerns were identified. The primary concern with respect to the waste rock pad, and waste rock in general, relates to the quantity of waste rock on site that may be acid generating. Limited information is available in this regard and as such the assumptions made in this estimate are conservative and consistent with the December 2014 estimate prepared by ARCADIS for this site. Additional testing is required to provide data that would reduce the uncertainty with respect to the volume of PAG rock on site that would require relocation into the underground workings. No testing of the waste rock was undertaken during the recent site visit and as such in the absence of any new information in this regard the quantities of PAG rock have remained the same as previously assumed in earlier RECLAIM estimates.	ARCADIS as stated that no testing of the waste rock was undertaken during the recent site visit and as such in the absence of any new information in this regard the quantities of PAG rock have remained the same as previously provided in LMI's estimate. In the decision by the NWB, it was stated that *"The NWB has reviewed the information provided by both the licensee and interveners in determining that an assessment should be conducted for PAG material associated with the site. Conditions related to the assessment are included Part G in the Licence."* [Note: the condition is Part I, items 9 and 10] LMI's renewed water licence states the following: 9. The Licensee shall submit to the Board for review, as part of any application to amend and/or renew the Licence, or to commence active reclamation of the Project site, an updated or revised version of the Environmental Site Assessment conducted for the Project in 2006. 0. The Licensee shall, as part of the updated Environmental Site Assessment required under Part I, Item 9, conduct a detailed rock characterization study or program to determine the total quantity (inventory) of Potentially Acid Generating (PAG) material associated with the Project site and identify any potential contamination that may be linked to such material. A written report of the results obtained and analyses conducted shall be submitted to the Board for review as part of any application to amend and/or renew the Licence, or notification to commence active reclamation of the Project site.	No comment

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3.10 Tailings Containmen t Structure	This area was also inspected and found, in general, to be stable by the geotechnical engineer. Issues identified by the geotechnical inspector were known to LMI and being addressed as part of their on-going care and maintenance work. No new concerns with the proposed reclamation plan for this portion of the site subject to the additional testing of the waste rock as prescribed in Section 3.9. The concerns with the long term performance of the TCS, as previously identified in the December 2014 review document prepared by ARCADIS, remain however may be address through progressive reclamation works by LMI. For the purposes of this evaluation the comments and assumptions made by ARCADIS relating to the tailings containment structure will remain unchanged.	ARCADIS confirms that for the purposes of this evaluation the comments and assumptions made by ARCADIS relating to the tailings containment structure will remain unchanged. The NWB has already considered evidence on this point during the water licence renewal process. In regards to the long term performance of the TCS, LMI provided the following evidence at the public hearing: Patrick Downey: 5 Thermistor readings. Again, I don't want to 6 inundate you with a lot of technical data, but 7 essentially what it's showing you here on this one is 8 that just below 2 metres we're below -- we go below 9 freezing. They're constantly monitored, and we -- we 10 continue to see that trend. **So everything is acting as 11 designed.** Same on this one. You can see exactly the 12 same trend. And, again, any questions, I'm happy to 13 answer them. Patrick Downey: 1 MR. DOWNEY: Patrick Downey, LMI. Randy, 2 when you stated that the tailings cover was not 13 functioning as it's designed, we do not agree. I think 14 there were lots of evidence it is functioning as 15 designed. The pH issue raised as a flag that the 16 facility is not functioning is, in our opinion, 17 incorrect. The reason for the pH levels you flagged is 18 that the system is not completely closed. I think 19 we've -- we've argued that one to death over this 20 two -- two, three days, and therefore the low pH in	No comment as nothing new has been presented here.
		21 metals have to be dealt with from those areas. The 22 water currently in the system is treated to adjust the 23 pH prior to discharge. That is part of the management 24 required, and that was part of -- of ongoing management 25 at every part of this tailings cover. There is a very 26 detailed report on the cover design, the -- the Lupin 1 tailings containment closure plan. 2 Specifically with respect to your comment on data, 3 or, actually, you said only a little bit of data 4 gathered, I want to read you a statement from that 5 time. It's from Holubec: (as read) 6 Lupin started to cover exposed tailings in 7 completed cells in 1988 and monitoring the 8 covered tailings to assess the effectiveness 9 of the covers. As a result, Lupin has 10 collected the most extensive and 11 longest-observed performance records of 12 covered	No comment

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		cells in permafrost areas. Data 13 collected includes ground temperatures, water 14 levels within the cover, water quality within 15 the cover, slope of the tailing surface, 16 thickness of tailings deposition, moisture 17 content of the cover, and particle-size 18 analysis of tailings and cover materials. 19 Various studies have determined the 20 durability, physical and chemical, of the 21 cover material; water balance within the 22 cover during drought conditions; and poor	
		23 water expulsion potentials from the compacted 24 tailings during thaw conditions. Test pits 25 excavated through the cover to the tailing 26 surface were examined for evidence [and I 1 hope the translator gets this] cryoturbation, 2 oxidation at the tailings interface, presence 3 of ice lenses, and condition of the tailings 4 cover interface. 5 In 2004, Lupin continued to monitor the 6 various covered cell instrumentation and has 7 collected additional information to validate 8 the effectiveness of the saturated zone 9 cover. 10 We also believe -- and I'm not now quoting -- that our 11 current monitoring continues to validate the above, and 12 the results continue to show the above. 13 The final TCA closure plan which includes detailed 14 reports from Holubec, Ecomatrix, and Golder clearly 15 demonstrate that the system will operate as planned 16 once final closure and cover is complete. This is 17 based on sound scientific and engineering data recorded 18 since 1988 with data analysis to this day.	No comment
3.11 Re-vegetation	On the basis of site observations during the recent site visit it is confirmed that very little vegetation has established itself on the site access roads or other work areas on site since the site has gone into a care and maintenance phase (2005). It is unclear from the IARP what has been proposed by LMI in this regard. There is a program risk to this work element should the regulators want revegetation of the primary work areas.	The NWB has already considered this point during the water licence renewal process. LMI provided the following evidence at the public hearing: Patrick Downey: 14 So re-vegetation. The -- the requirement to 15 re-vegetate, we believe, was entered erroneously in 16 the -- in the last licence. Lupin did try and 17 experiment on -- on re-vegetation just to show that it 18 didn't work. This is 2001. This is 2013. This is 19 2014. I think that was taken probably by the 20 inspector. But you can see that the - - that there's no	No comment

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		21 propagation of vegetation. And, in fact, there are 22 studies showing that at the 1-metre depth of esker that 23 we have, re-vegetation would be virtually impossible.	
3.12 Post Closure Monitoring	The monitoring program for the site will be outlined in the water licence and it is understood that some component or all of the monitoring stations will require some form monitoring into the future. The recent site inspection did not identify any areas of particular concern that should be incorporated into the sampling stations prescribed in the water licence.	LMI agrees that there are no areas of particular concern that should be incorporated into the sampling stations prescribed in the water licence. This conclusion is further evidence of the fact that site conditions remain relatively unchanged and there is no basis for a re-opening of the quantum of security for the site.	No comment
4. Basis of RECLAIM Cost Estimate	This version of the Lupin mine site RECLAIM cost estimate is based on information collected during the recent site inspection works in August 2015 by ARCADIS staff and information included in the documentation provided by AANDC: • LMI Interim Abandonment and Restoration Plan (March 2013); • LMI RECLAIM cost estimate (December 2014) and Addendum documents; • ARCADIS RECLAIM cost estimate (December 2014) and Addendum documents (see Appendix C); • AANDC Letter on the Water Licence Renewal Application by LMI (August 2015); • Water Licence to Lupin Mine Incorporated from Nunavut Water Board (May 2015 – unsigned by Ministry of AANDC); • Mine Site Reclamation Policy for Nunavut (INAC, 2002); and • Mine Site Reclamation Guidelines for the NWT (INAC, 2007). For ease of review we have included the same section headings used in the RECLAIM model. For the purposes of this evaluation the RECLAIM Version 7.0 model was used. As previously stated in our evaluation of the LMI RECLAIM cost estimate, we have used some of their quoted unit rates in lieu of the RECLAIM rates as they are in line with our experience on similar reclamation programs in the North.	No new evidence has been provided with the ARCADIS submission. As both ARCADIS and LMI agree that there have no changes to the site conditions, the ARCADIS estimate is still very much a desktop review of the previous information provided by LMI. Further, there were a number of documents provided by LMI during the water licence process, the NWB public hearing transcripts, as well as the NWB water licence decision report which would have assisted and/or clarified the items of concern as stated in the ARCADIS estimate which ARCADIS appears not to have reviewed.	No comment on this line item. Specific comments are provided as relevant in the subsequent line items.
4.1 Open Pit	This module of the RECLAIM model was not used as it is not applicable for the Lupin site.	No comment	No comment
4.2 Underground Mine	The assumptions made to prepare the RECLAIM estimate for this module include:	[ARCADIS = $463,580 (old $506,380) vs LMI = $439,639] The ARCADIS estimate is not based on any change in site conditions. ARCADIS has relied on the same information in	No material difference in cost here in effect the two estimates are in general agreement with the difference in cost related to a differential in unit rates used between the LMI estimate and the recent version of the RECLAIM cost model.

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	• 1,000 m^3 of waste rock or borrow material would be used to cap the engineered covers used to seal the shaft and vent raises. This quantity of material is based on observation of the work areas (five seals at 200m^3 each) and material take-offs from site maps provided in the IARP. • Five engineered caps would be constructed to seal vertical openings. This quantity is based on the number of openings identified during the site visit. • 2,500 m^3 of waste rock would be used to seal the portal opening. This quantity of material is based on observation of the work areas and material take-offs from site maps provided in the IARP (rounded 3 m x 3 m x 50 m plus 25 m x 40 m x 2 m avg.). • Twenty man days (two workers ten days) would be required to decommissioning and decontaminate any underground equipment that will be left underground. This quantity has been taken to be consistent with the number of working days required to decommission other mine sites of similar site. The rates used for the construction of the engineered caps were derived from recent experience with the closure work at the Outpost Island and Blanchet Island mines as well as the Meliadine Mine. The earthworks unit rates have been updated to the RECLAIM Version 7 estimates based on our review of the site conditions while the rates for the underground hazardous material removal is based on our experience with similar work. The liabilities associated with this module would be assigned 100% to land as the works would have no impact to the local water sources. Details are provided in the worksheet (see Appendix A).	this estimate as in their previous estimate which has already been considered by the NWB. LMI does not agree with the new rates that ARCADIS has used for this estimate as the comparables are not sufficiently similar -- Meliadine is not an operating mine, it has not even been built yet. LMI's estimates are based on third-party contractor and engineering estimates obtained specifically for the Lupin Mine. Moreover, LMI does not agree that an increase in rates is "new evidence" that permits a review of the quantum of security at this time. New rates can and will be addressed in the required 2017 update to the RECLAIM estimate. As stated section 3.8 of the ARCADIS document it states: "The underground workings were not accessed during the recent site visit. The construction of the mine opening seals, as prescribed by LMI in their IARP, is consistent with industry practice and on the basis of the recent site visit there are no concerns with the proposed plan." During the public hearing Patrick Downey stated the following: *In regards to the financial security, we have* *15 submitted a detailed cost estimate. We base this on* *16 third-party contractor quotes and engineering studies* *17 and engineering reviews. The contractor went to site* *18 twice. He went through the data that we provided him* *19 in terms of site reclamation, requirements, tailings* *20 cover, removal of equipment, he went into the mill, was* *21 able to see all of the mill, was able to see what was* *22 already stored in -- in sea cans to be shipped off* *23 site.* *24 All parties contributing to this estimate have* *25 full and free access to the site to verify and develop* *26 26 their unit costs and quantities.* ***This contractor*** ***1 actually went out for quotes to do this work.*** *They* *2 reflect that or he updated the rates or reviewed the* *3 rates that was within an historical estimate. The mob.* *4 and demob. costs are based on actual quotes and* *5 additional input from the contractor and consultants.* *6 Our quantities of (sic) updated to accurately --* *7 accurately reflect the engineering studies.*	

4.3 Tailings Impoundment	The assumptions made to prepare the RECLAIM estimate for this module include: • 100,000 m^3 of waste rock or borrow material would be used to stabilize the tailings containment structures. In the absence of design information for the spillway structure the quantity of rip rap used by LMI has been used for this cost item. • 375,000 m^3 of borrow material would be used to cover the balance of the tailings impoundment area. This quantity is based on an average cover thickness of 1.0 m across an area of 375,000 m^2 and is consistent with the assumptions outlined in the IARP. • Fifty hectares of vegetation improvements would be required. This quantity is based on a nominal percentage (approximately 15%) of the total footprint of the TCA. • 20,000 m^3 of waste rock or borrow material would be used to repair the existing tailings containment structure cover. This quantity is a provisional amount based on the observations made during the recent geotechnical inspections and in review of the assumptions made by LMI in their RECLAIM estimate. • 6,000 m of piping would be decommissioned and dismantled for off-site disposal. This quantity is based on an approximate take off from existing site mapping as provided in the IARP. • 30,600 m^3 of earthworks to construct a spillway. In the absence of design information for the spillway structure the quantity of rip rap used by LMI has been used for this cost item. • 20,000 m^3 of waste rock/rip rap to line the spillway along with 7,000 m^2 of non-woven geotextile. In the absence of design information for the spillway structure the quantity of rip rap used by LMI has been used for this cost item. • An allowance of $60,000 for the supply and installation of instrumentation to monitor the TCS. This allowance is based on experience with the supply and installation of monitoring wells at approximately $2000 per well and thirty wells. • An allowance of $100,000 to manage and treat any water that may require treatment as discussed in the ARCADIS memorandum of 31 December 2014. The quantities are based on the information compiled during the initial RECLAIM review in 2014 and confirmed during the course of the 2015 site visit. The unit rates have been updated from the December 2014 rates to refer those included in the RECLAIM Version 7 unit rate table. The liabilities associated with this module would be a split between Land and Water liabilities as noted. Details are provided in the worksheet (see Appendix A).	[ARCADIS = $5,648,333 (old $7,231,080) vs LMI = $3,939,562] ARCADIS has not relied on any new information or change in site conditions to provide an estimate for reclamation of the tailings impoundment area. Rather, the updated calculation simply reflects a change in rates. LMI submits that a change in rates can be addressed in the required 2017 RECLAIM estimate update, but that a change in rates is not new evidence justifying the re-visiting of the quantum of security six months after a licence is issued. ARCADIS has used the area to be covered at 375,000m^2 and during the water licence process LMI confirmed that 241,000m^2 is the amount of area to be covered. During the water licence public hearing SENES stated the reason they came up with the 375,000m^2 amount as follows: Randy Knapp, SENES 14 When they did their estimate, one of the things 15 they assumed was they would apply a metre of cover. 16 The only difference between what they have done and 17 what we have done is we've used a -- all the unit rate 18 data that we have used in this, for the most part, 19 comes directly from LMI. So we've taken their 20 quantities and their unit rate data and applied them 21 here. But we do them slightly differently. When they 22 looked at a unit rate for cover, they used $7 -- and I 23 think it was -- 28 cents a metre, all found cost. And 24 they must have done that on a square-metre basis 25 because when -- in order to place a metre of material, 26 you can never get a metre of material down because the 1 ground goes like this, and in order to place it 2 accurately, you always end up placing more. 3 So all's we've done differently than they have 4 done is we've assumed a slightly lower unit rate, but 5 we've allowed for one-and-a-quarter metres of cover 6 rather than just a metre. Because, in reality, what's 7 out there today is by -- what's written elsewhere is 8 there's already 1 to 2 metres on average in order to 9 get that actual total metre of cover. So we have a 10 little bit more money to place the sand. 11 We've also allowed for a small amount of money to 12 do a bit of repair. No project ever goes ahead where 13 you do it once and you don't have to come and do a 14 little repair. We've allowed for about 3 percent of 15 additional sand material to be applied to repair what's 16 already there. And I don't think that's at all 17 unreasonable or unexpected for a system. During the water licence hearing LMI explained to SENES how they calculated the cost to cover the 241,000m2 area with an all-in number: MR. DOWNEY: Thank you.	No concerns or comment on re-evaluating the costs in the 2017 RECLAIM estimate. The fundamental issue remains that in order to place an in-situ 1 m thick layer of material more material than would be estimated on a straight quantity take-off would be required. This is why a bulking factor was applied to the quantity of material required to complete the capping work. In the absence of additional information regarding unit rates the latest version RECLAIM rates where used to estimate the cost of this work.

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4.4 Rock Pile	The work under this module will include the following: • Earthworks using 400,000 m^3 of waste rock to complete various reclamation activities within the waste rock that underlies the mill area of the site. This quantity is comprised of two components whereby 100,000 m^3 of the waste rock would be used in the TCA cover and300,000 m^3 of waste rock would be placed underground as per LMI RECLAIM estimate. These quantities have not been amended subject to confirmation with the results of waste rock testing however are conservative as it related to mitigating PAG rock issues. • An allowance of $20,000 has been carried for waste rock testing to confirm quantity of material that would be deemed PAG rock. For the purposes of this estimate the quantities of material remain unchanged from earlier RECLAIM estimates by both LMI and ARCADIS. In the absence of any new data with respect to the potential for PAG rock to be present the assumptions made in the January 2015 estimate prepared by ARCADIS remain unchanged. The unit rates used in the worksheet as presented in Appendix A are a mix of those rates provided in the most recent version of RECLAIM and as allowance for analytical work assuming that staff already on site would undertake the required sample procurement. For the purposes of this evaluation the liability for this module of work would be split between Land and Water as shown in the worksheet.	[ARCADIS = $2,852,000 (old $3,580,000) vs LMI = $1,887,702] ARCADIS has not relied on any new information or change in site conditions to provide an estimate for reclamation of the tailings impoundment area. Rather, the updated calculation simply reflects a change in rates. LMI submits that a change in rates can be addressed in the required 2017 RECLAIM estimate update, but that a change in rates is not new evidence justifying the re-visiting of the quantum of security six months after a licence is issued. As stated by ARCADIS " *For the purposes of this estimate the quantities of material remain unchanged from earlier RECLAIM estimates by both LMI and ARCADIS. In the absence of any new data with respect tothe potential for PAG rock to be present the assumptions made in the January 2015 estimate prepared by ARCADIS remain unchanged.*" In the decision by the NWB, it was stated that *"The NWB has reviewed the information provided by both the licensee and interveners in determining that an assessment should be conducted for PAG material associated with the site. Conditions related to the assessment are included Part G in the Licence."* [Note: the condition is Part I, items 9 and 10] LMI's renewed water licence states the following: 9. The Licensee shall submit to the Board for review, as part of any application to amend and/or renew the Licence, or to commence active reclamation of the Project site, an updated or revised version of the Environmental Site Assessment conducted for the Project in 2006. 10. The Licensee shall, as part of the updated Environmental Site Assessment required under Part I, Item 9, conduct a detailed rock characterization study or program to determine the total quantity (inventory) of Potentially Acid Generating (PAG) material associated with the Project site and identify any potential contamination that may be linked to such material. A written report of the results obtained and analyses conducted shall be submitted to the Board for review as part of any application to amend and/or renew the Licence, or notification to commence active reclamation of the Project site.	
4.5 Building and Equipment	From the observations made by ARCADIS staff during the recent site visit it is confirmed that the magnitude of work for the	[ARCADIS = $6,682,152 (old $6,557,883) vs LMI = $6,664,708] No new evidence provided - as stated by ARCADIS *"For the*	No comment as the costs between the LMI and Arcadis estimates are effectively the same.

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	decommissioning, decontamination and dismantling of the various buildings and pieces of equipment on site, as presented by LMI in their RECLAIM cost estimate is reasonable and consistent with our observations. The work under this task will include the following (given the level of detail provided in this module the reader is directed to the worksheet in Appendix A to review material quantities): 1. Decommissioning, dismantling, containerization and transfer off-site of building and equipment components for disposal. 2. Transfer and disposal of mine/earthmoving equipment off-site for disposal 3. Deconstruction of tank farms (including the secondary containment structures) 4. Consolidation and management of barrels and totes on site. 5. Consolidation and disposal of boneyard debris 6. Grading and contouring of areas impacted by mine activities 7. Removal and disposal of existing culverts (22 in total) 8. Scarifying of 16 km of road and the 2 km airstrip (based on a 3 m wide roadway and 42.5 m wide airstrip) 9. The building footprint areas as provided in the RECLAIM estimate are based on site observations and review of the quantities reported by LMI 10. The allowance used to mitigate concerns with the boneyard are based on 35 working days to complete stabilization work at a rate of $10,000 per day for all labour, equipment and supplies 11. The allowance used for the construction of the landfill are based on 45 working days to complete the construction of the landfill at a rate of $10,000 per day for all labour, equipment and supplies Note that it was the IARP that stated the airstrip was to be scarified. ARCADIS is not opposed to leaving the airstrip as it currently exists. For the purposes of this estimate the material quantities remain unchanged between the LMI and ARCADIS RECLAIM estimates. The unit rates used in the worksheet as presented in Appendix A are mix of those provide by LMI (were consistent with industry rates for the work) and the latest rates as provided in Version 7.0 of the RECLAIM model. The majority of the work under this module will be done to address concerns related to Land liabilities however a portion of the work will ensure Water liabilities are address. Details of the land and water liabilities are provided on the work sheet in Appendix A.	*purposes of this estimate the material quantities remain unchanged between the LMI and ARCADIS RECLAIM estimates."* ARCADIS has added 22 culverts to be removed and disposed of in their estimate, noting that LMI included 22 culverts to be removed and disposed in their estimate. It should be noted that LMI already has a historical landfill which was mistakenly left out of the last licence but has been re-added in the current recent water licence. Boneyard clean-up is included in LMI's estimate. As stated in LMI's final submission, dated January 25, 2015, work has been completed on removal of waste, removal of buried pipelines and the placement of material within the crown pillar openings that would reduce work to be completed for final closure.	

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4.6 Chemicals, Hazardous Materials and Contaminated Soils	A detailed inventory of the chemicals and other hazardous materials on site was not completed by ARCADIS during the recent site visit given the timeframe of the site visit. The cataloguing of all chemicals and hazardous materials was deemed to be outside the scope of work however an evaluation of the material quantities was undertaken so as to assess the quantum of material that would require management. In general the quantities provided by LMI in their RECLAIM estimate have been used herein unless otherwise noted. The work involved under this module includes: 1. Completion of a Phase I/II ESA to characterize the environmental liabilities on site (the rate for this work was increased to reflect levels of effort recently quoted by ARCADIS for the assessment of environmental liabilities at other mine sites). 2. An allowance was added for asbestos abatement work (the abatement budget could be amended once the asbestos assessment report was reviewed by ARCADIS). 3. Containerization and disposal of 100,000 litres of waste oil is new to the estimate and is based on observations made during the August 2015 site visit. The quantity of waste oil is based on the 55 totes (~1000 L each) located in the hazardous materials laydown area and on the order of 40 to 50 totes observed in the accessible areas of the warehouse on site. 4. Containerization and disposal of 2,344,460 litres of fuel (2,177,211 of diesel and 167,249 of Jet A as measured by Delta Carter on 23 August 2014. 5. Consolidation and disposal of 1000 kg of hazardous material (reagent and other chemicals) 6. Consolidation and disposal of 100 kg of batteries 7. Consolidation and disposal of 5000 kg of miscellaneous chemicals and solvents as observed in various buildings around the site during the August 2015 site visit 8. Consolidation and disposal of 100 drums of hazardous material 9. Management (consolidation, treatment and grading) of 50,000 m^3 of petroleum hydrocarbon impacted soil (increased from 40,000 m^3 estimated in the LMI RECLAIM estimate whereby the condition of the liners within the tank farms suggest that there will be additional PHC impacted soils beneath the tank farms). The increased volume is based on an area of 200 m by 50 m by an average depth of 1 m beneath the main tank farm. The original PHC impacted soil volume of 40,000 m^3 was also	[ARCADIS = $7,222,882 (old $7,212,041) vs LMI = $2,498,718] LMI does not see any new evidence provided by INAC, as ARCADIS stated a detailed inventory was not completed during the recent site visit and deemed to be outside the scope of work. As stated in the Inspectors report dated October 30, 2015, whom also accompanied ARCADIS during their site visit, during the period of Inspection there were approximately 40 metal waste oil cubes, 200 45 gallon barrels of assorted waste oil and other lubricants plus approximately 50 5 gallon pails of drill oil which does not seem to be the same number the ARCADIS has provided in their estimate. 1. No new evidence - Completion of the Phase I/II environment site assessment was completed in 2006 and remains valid given the limited mining activity since that time. As per the recently issued water licence, an updated environment site assessment needs to be completed prior to renewal or amending of LMI's water licence and therefore the $600,000 they have allocated to a Phase I/II site assessments is not required. 2. No new evidence – LMI provided an allowance for asbestos in their estimate and further clarified in its submission dated January 21, 2015 during the water licence process that it was based on a study completed in 2012 by Arctic Response. 3. No new evidence - Containerization and disposal of waste oil is not new information as LMI provided this information during the water licence process, including photographic evidence. LMI backhauled approx. 90,000 lbs of waste oil this past season, along with approximately 40,000 lbs of additional waste. ARCADIS has not based this number on a detailed inventory as completed by LMI this season, which will be submitted with their annual report this year as required 4. No new evidence – ARCADIS did not test the fuel at the Lupin site. It was confirmed to ARCADIS during their site visit that the fuel was being used while they were at site. LMI has reviewed the *Mine Site Reclamation Policy for Nunavut* (2002) and it does not include any statement that a provision to mobilize fuel is required and that	The fundamental issue here is whether or not the residual fuel on site is a waste or an asset that can be used during the course of the reclamation work. For the Arcadis RECLAIM estimate a conservative assumption that the fuel remaining on site could not be used during the course of reclamation was used. This differs from the LMI assumption that all residual fuel will be used during the course of the reclamation work. The approach taken by Arcadis in this regard is consistent with the INAC approach to the management of residual fuels. If at a later date it is determined that the fuel is useful then LMI has the ability to reduce their quantum of security to manage this issue. The reality of the situation is that under any scenario where by other complete the reclamation work the residual fuel would be considered a waste. The elimination of a Phase I/II ESA from the estimate is not consistent with the requirements of INAC for a full evaluation of the environmental liabilities on a site once the site has been reverted to the Crown. The site conditions will have changed since 2006 and as such the statement by LMI that the site conditions have remained unchanged has not be substantiated. It is understood that an ESA will be required in advance of the 2017 quantum of security estimate and this assessment would form the new benchmark for the existing site issues. The issue of asbestos in buildings needs to be reviewed as there are concerns that the Arctic Response report of 2012 did not adequately assess the entire inventory of structures on site or some of the building elements not often associated with having asbestos such as drywall compound. The age of the structures on site suggests that there may be some of these building materials within the building on site. LMI is correct that a detailed inventory of all petroleum materials was not completed given the limited time on site. The inventory of material on site as prepared by LMI was also not provided to Arcadis at the time of the RECLAIM estimate. Arcadis staff did however record and inventory of what materials were present within the Hazardous Waste Storage Area and as such this formed the basis of the quantity estimates used in the 2015 RECLAIM estimate. It is understood from discussions with LMI that they have since removed a quantity of material from site and as such the quantities of material used in the security estimates will have changed but not before the timeline for the recent 2015 RECLAIM estimate. The change in PHC impacted soil is based on visual inspection of the site during the August 2015 site visit and a more conservative assumption on depth of impact based on the site conditions observed. At the time the 2015 RECLAIM estimate was prepared the Landfarm Management Plan has not been submitted and as such has not been reviewed by Arcadis nor has it been considered for the purposes of costing engineering services. This topic is not relevant to the discussion of chemical and chemical management on site. The amount of material removed from site at the end of the 2015 season is not material to the 2015 RECLAIM estimate prepared by Arcadis as no evidence has been provided to Arcadis that would confirm the disposal of these materials. Any amendments can be

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	included in the estimate and is based on the areas of the site observed to be impacted with PHC staining and/or olfactory impacts. The estimated area of impact centered primarily on the tank farms, powerhouse, satellite tank farm and drum cache areas is estimated to be on the order of 30,000 to 40,000 m^2 with an inferred depth of impact between 1 to 1.5 m. 10. An allowance for the transfer of 500 m^3 of impacted soil off site that cannot be treated on site and is based on 1% of the total PHC volume estimate. The unit rates for the above referenced work come from a mix of rates provided in earlier estimates and updated RECLAIM rates as provided in Version 7 of the model. In general the work under this module relates to land based liabilities however a portion of the liability has been assign to water. Details of the cost breakdown are provided in the module worksheet (see Appendix A).	estimates cannot take into account fuel present on site. LMI have consulted engineers familiar with RECLAIM and they have confirmed that RECLAIM does not require that the estimate must assume no fuel is present at site, and that all fuel on site must be destroyed. SRK (who developed the first iteration of RECLAIM) has confirmed that it is permissible under RECLAIM to assume use of fuel already on site for reclamation purposes. With respect to INAC estimates relating to fuel, there is no reason to consider the fuel on site as unusable. LMI and INAC contractors both used it during 2014 and the fuel is of standard and useable quality. The volumes stored on site are well known and reported to the NWB. As such, it is not necessary to include mobilization of fuel to site and disposal of on- site inventories within the estimate. As stated in the NWB decision on this issue "Consequently, although the Board recognizes that, without the benefit of verification of current site conditions, the AANDC estimate was based on a worst case assumption of large volumes of unusable fuel being left on-site, the NWB prefers the assumptions provided by LMI's 2014 update in this regard, as it was based on current knowledge of the status of the site and the usability of fuel volumes present on-site." There is no information provided by INAC which would justify the NWB re-visiting this conclusion. 5. No new evidence - Consolidation and disposal of hazardous materials has been included in the LMI's estimate. This season approx. 118,000 lbs of hazardous materials were backhauled to Yellowknife along with approx. 12,000 lbs of additional waste. 6. There are approx. two pallets of batteries on site. 7. Consolidation and disposal of misc chemicals and solvents has been included in the LMI estimate, of which approx. 28,000 lbs were backhauled from site this past season. 8. During the 2015 season approx. 118,000 lbs of hazardous material	made in the next update to the quantum of security estimate as part of the provisions for progressive reclamation.
		were backhauled to Yellowknife along with approx. 12,000 lbs of additional waste.	

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		9. LMI disagrees with the increase in the amount of hydrocarbon soil from 40,000m^3 (in LMI and ARCADIS December 2014 version) to 50,000m^3 as ARCADIS did not complete any studies to support their assessment. The areas of impacted soil noted by ARCADIS are accounted for by LMI and LMI has hired engineers and specialists to determine the extent and will be proceeding with a landfarm to treat the soil as approved by the NWB in the renewed water licence. There were discussions and submissions during the water licence process in regards to hydrocarbon impacted soil and this item will be included in the updated environment site assessment as required in the renewed water licence. The Licensee shall submit to the Board for review, as part of any application to amend and/or renew the Licence, or to commence active reclamation of the Project site, an updated or revised version of the Environmental Site Assessment conducted for the Project in 2006. As approved by the NWB, the Landfarm Management plan will allow for soil treatment and LMI has hired an engineering firm specifically in regards to the design and construction of the Landfarm. 10. LMI has stated during the water licence process that they will be treating hydrocarbon impacted soil with the approved landfarm during care and maintenance, will continue to backhaul soils when required and during closure they also provided the option to place material underground.	
4.7 Water Management and Short Term Water Treatment	This module of the RECLAIM model was not used for this evaluation. Allowances for water management have been included in other modules of this estimate.	No comments	No comment
4.8 Post-Closure Water Treatment	This module of the RECLAIM model was not used as it is not applicable for the Lupin site. Allowances have been included in the Post Closure costing module.	In the previous estimate submitted during the water licence process ARCADIS did use this module as well as the Post Closure costing module.	No comment
4.9 Interim Care and Maintenance	This module was not part of the RECLAIM version 6.1 Model and as such the evaluation of the Interim Care and Maintenance costs is new for this site. For the purposes the following assumptions have been made: • A five year period has been assumed.	[ARCADIS = $644,488 (old $0) vs LMI = $0] No new evidence – The RECLAIM estimate submitted by ARCADIS during the water licence process used RECLAIM 7 so we are not sure why they are stating that this module was not a part of the RECLAIM version 6.1 model. If this is indeed	No comment. This is a new item under the latest version of the RECLAIM model and as such has not been considered by LMI in their estimate of 2014.

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	• Crew would consist of a supervisor and three skilled workers for two man months a year supplemented by an electrician and mechanic on the basis of one man month per year respectively. • Fuel consumption per annum would be 20,000 L. • Accommodations would not be required however consumables would need to be transferred in as required (an allowance equal to the accommodation rate in the Version 7 rate table has been assumed). The unit rates for the above referenced work have been taken from RECLAIM model rates as provided in Version 7. In general all the work within this module relates to liabilities associated with water as outlined in the work sheet provided in Appendix A.	a new module which was not included in the previous version submitted during the water licence renewal process then LMI believes this should not be included at this time. It appears that this number may have been used in the previous estimate under Post Closure costing module/Indirect Costs.	
4.10 Post-Closure Monitoring and Maintenance	The post-closure monitoring and maintenance for this site will need to be involved that the twelve site visits over twenty-five years as assumed by LMI. The potential for an adverse impact on the local environment as a result of a failure within the tailings containment structure is too great and as such a more involved post-closure monitoring program has been assumed herein consistent with the program previously in earlier versions of the ARCADIS RECLAIM estimate (see Appendix C). The recommended scope of work to be undertaken under this module would include: • Preparation of final Closure and Permit Plans as well as a final site Audit • Annual site inspection monitoring, not including geotechnical/environmental, would be done annually for up to 100 years post closure. Although the tailings remain a potential hazard and may require monitoring, care and maintenance beyond 100 years, the net present value of these costs is not material. Furthermore, technological developments would be expected over the next 100 years which are likely to mitigate long terms concerns and perhaps allow a permanent walk-a-way solution. For example, tailings could be re-mined in future for metal recovery. • Geotechnical inspections of the site would continue annually for the first ten years and then every five years between Years 11 and 100 post closure. These costs have been discounted at 3%/annum and are required as noted above. • Environmental Monitoring would be completed every year for the initial post-closure phase (Phase 1 – years 1 to 10 post closure) and then once every ten years starting 15 years post closure during Phase 2 (years 11 to 100).	[ARCADIS = $2,186,376 (old $2,205,670) vs LMI = $830,013] ARCADIS stated the costs included for this work are consistent with those previously included in the ARCADIS December 2015 RECLAIM estimate, therefore there is no new evidence to consider with respect to post-closure monitoring and maintenance. INAC bases its suggestion that post closure monitoring, inspection, care and maintenance should be required for 100 years on the basis that tailings are “retained behind man-made dams and impound water with hydraulic structures”. INAC’s recommendation is based on a fundamental misunderstanding about the system that will be left in place at final closure. The detailed report completed by Holubec Consulting as part of the final TCA plan clearly states that there will be no dams or structures holding back water at final closure. Therefore, an allowance for 100 years of monitoring and maintenance of “*water retaining structures*” is not required. This was addressed at the public hearing and previous submissions by LMI whereby the closure design from a chemical and physical stability perspective is functioning as intended based on several years of monitoring. It is noted in the approved TCA closure plan that a period of 7 years post closure monitoring is anticipated. LMI costing is based on a 25 year post closure monitoring timeframe and is therefore precautionary and conservative.	No comment. Nothing material new has transpired since the hearing discussions between our Mr. Randy Knapp and Mr. Downey of LMI. There is a fundamental difference in philosophy regarding the future risks associated with the tailings contained within the TMAs and any seepage from this structure.

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	• A nominal allowance has also been included to cover erosion repair work and potential water treatment concerns during the post-closure period. The costs included for this work are consistent with those previously included in the ARCADIS December 2015 RECLAIM estimate.		
4.11 Mobilization and Demobilization	The LMI RECLAIM estimate assumed that the reclamation of the entire Lupin site could be accomplished in one season. On the basis of the recent site visit we concur that subject to the results of additional subsurface investigation work related to PAG rock and potential petroleum hydrocarbon contamination not already accounted for in this estimate the reclamation work could be done in a single season provided sufficient resources were assigned to the work. The current condition of the equipment on site suggests that the existing fleet could be used to do a large portion of the work however for the purposes of this estimate we have to assume the equipment is not available and equipment will need to be mobilized to site over an ice road in and an ice road out the following winter road season. As previously noted in earlier RECLAIM estimates the NWB want the winter road construction to be independent of any potential combined operations with the other mine sites along the existing winter road alignment and as such we have assumed a winter road between Yellowknife and the Lupin mine (568 km one way). The following work would be undertaken within this module: 1. Mobilization of an equipment fleet (excavators 2, dump truck 4, dozer 2, front end loader 2, crane 1, demolition shears 1 and light duty truck 3) 2. Mobilization of workers, fuel, supplies, tools and consumables as well as a temporary camp during the reclamation work 3. Construction of two 568 km long winter roads (includes for winter road tariffs) The material quantities used to derive this module cost are provided in the work sheet located in Appendix A. For the purposes of this estimate the unit rates are based on a mix of rates provided by LMI and updated RECLAIM Version 7 rates. The liability costs have been split as a function of the direct cost ratio between land and water liabilities as compared to the overall direct costs.	[ARCADIS = $8,078,895 (old $8,227,267) vs LMI = $4,91,904] 1. No new evidence - There is no reason why for the purposes of this estimate that ARCADIS has to assume that the equipment will not be available and that the amount of equipment they included will need to be mobilized to site. LMI has included a fleet of equipment to be mobilized and demobilized in their estimate. During the water licence process INAC recommended that LMI identify infrastructure and equipment on site that is no longer useable in annual reports and that the reclamation cost estimate is updated accordingly. LMI agreed that this would be reflected in any updated reclaim estimates. However, at this time the equipment on site is maintained and fully functional. Any equipment that is not in use during care and maintenance has been stored according to proper mechanical procedures (batteries removed etc.) and can be brought back on line with little effort. 2. No new evidence – these items, with the exception of fuel, are included in LMI's estimate based actual costs over the past seasons to mobilize workers to site with supplies, tools, consumables etc. 3. No new evidence – LMI's estimate includes a winter road with tariffs. In the ARCADIS estimate they have used a unit of 1,172 km but as stated (and LMI agrees) each way is 568 km which would add up to 1,136 km not 1, 172km.	The fundamental difference between the two estimates relates to the need to purchase and transport fuel to the site and the size of the equipment fleet required to complete the reclamation work in one season as stated by LMI. The purchase of fuel is an extension of the issue of whether or not fuel on site is considered a resource or a waste. LMI classifies the residual fuel as a resource and Arcadis classifies the fuel as a waste. The equipment fleet stated by LMI is not large enough to complete the earthworks, PHC soil treatment and demolition works on site concurrently as would be required to complete the work in a single season. We concur there is no new evidence with respect to the estimate however the concerns raised by Arcadis remain valid and also form part of the reason why the project contingency has been set at a higher percentage.
4.12 Other Considerations	The following assumptions have been made with respect to Indirect Costs: 1. Project Management costs would be 5% of Direct Costs as is consistent with industry standards for this type of work. 2. Engineering Costs would be 10% of Direct Costs based on	As stated in the NWB decision "With respect to the difference in contingency for uncertainty built into AANDC's estimate (25%) and LMI's contingency (10%), the Board finds that considerable uncertainty may arise in terms of what updates to the existing abandonment and reclamation plans would be necessary and what reclamation security may then	No comment on the first item as Arcadis cannot speak on behalf of the NWB and whether or not they did or did not accept the lower contingency amount. The statement that the environmental liabilities pertaining to the site are well know is not entirely true. There is an understanding of what the main issues are on site however the lack of recent data on the waste rock and PHC impacted soil suggests there is the potential for more liabilities than are currently assigned to the property.

ARCADIS MEMORANDUM DATED OCTOBER 22, 2015			
	ARCADIS Submission to NWB	**LMI Response to ARCADIS Submission to NWB**	**ARCADIS RESPONSE June 2016**
	recent experience with mine reclamation programs in the north where the Crown has had to assume responsibility for the mine clean-up program. 3. Health and Safety would be 1% of Direct Costs based on the level of effort observed by 4. ARCADIS on recent mine reclamation works. 5. Bonding and Insurance would be 1% of Direct Costs as is consistent with industry standards for this type of work. 6. Contingency Factor has been lowered to 20% to account for additional work items added to the ARCADIS RECLAIM estimate as compared to the latest LMI RECLAIM Versions 6.1 estimate. The contingency factor remains high given the uncertainty with respect to the total volume of PAG rock and possible petroleum hydrocarbon impacts as may exist beneath the tank farm liners which may result in an additional season of on-site soil treatment. 7. Market Price Factor Adjustment has been set to 0%. The percentage split of Indirect Costs associated with Land vs Water liabilities has been set by the ratio of Direct Costs for these liabilities at a ratio of 42% to 58%.	be required in the event that the mine site were to return to active operations. However, with respect to the mine site's current state of Care and Maintenance the site has been in this state from 2005 to present. As a result, in the Board's view there is much less uncertainty regarding the abandonment and reclamation requirements and liability associated with the site while maintained in the current care and maintenance phase. Given that the Renewed and Amended Licence limits LMI to activities associated with care and maintenance and the transition to active operations, the Board does not see the need for the significant boost to the contingency built into the estimate." LMI maintains that the LMI evidence before the Board shows that environmental risks relating to the Mine site are well known and accounted for within the closure plan and security posted, which include a 19% contingency. This approach is well supported by LMI's approach to reclamation cost estimates. Quantities and material cost estimates that form the basis of this estimate are based on proper engineered data and supported by contractor unit rates based on site visits by an experienced Northern Contractor. It should be noted that the material amounts are generally very similar to those previously approved by the NWB, as nothing on site has substantially changed since the bond was set by the Board. The Lupin Mine licence is unlike many others in that it is a mature site with known quantities and significant studies completed and a final closure plan for the TCA, all of which are filed with the NWB. LMI's 10% contingency is based on detailed analysis and is consistent with other projects at this life stage. There have been several technical papers published by authors with significant experience in mine site reclamation costs and estimates and the contingency amounts stated in these papers are consistent with that calculated by LMI. Furthermore, there is an additional $1.4M in the security currently held by AANDC when compared to LMI's cost estimate, which effectively brings the contingency to 19%, which is very precautionary and conservative given the high level of knowledge about the Mine site.	The details of the engineering estimate completed by LMI were not provided for review by Arcadis and as such Arcadis has reservations with the unit rate used to prepare the LMI estimate. Arcadis disagrees that the Lupin site is a mature site the reality is that the site conditions have not undergone an ESA process in over ten years and as such the impacts from the mine on the surrounding area and media (soil, surface water, groundwater) are not well known. There are sufficient data gaps that with respect to the aforementioned media as well as the potential for PAG rock that the results of the ESA work next year will have to be heavily scrutinized to ensure all the existing environmental liabilities have been properly addressed. It is recognized that the sum of $25.5M in security has been posted by LMI as the quantum of security and as such represents a higher contingency than stated within their 2014 RECLAIM estimate.

ARCADIS MEMORANDA DATED DECEMBER 31, 2014			
	ARCADIS MEMORANDUM DATED DECEMBER 31, 2014	**LMI RESPONSE TO ARCADIS MEMORANDUM DECEMBER 31, 2014**	
	The ARCADIS memoranda dated December 31, 2014 was provided to the NWB and LMI with INAC's final submission dated January 5, 2015.	LMI responded to the ARCADIS memoranda dated December 31, 2014 (submitted by INAC to the NWB on January 5, 2015) on	

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
1.0 Review of New Information Submitted in December 2014	Review of new information submitted in December 2014	LMI would like to state that this is the first time LMI have had an opportunity to review this document (we note the document was prepared prior to the close of the public hearing, but not provided to the NWB or the parties in that public hearing). The comments ARCADIS provided to INAC for consideration in this memo are from statements made in LMI's final submission to NWB dated January 21, 2015 in reply to INAC's submission dated January 5, 2015 and are therefore not new information submitted in December 2014 as stated in the title of the ARCADIS document	No Comment
1.1 Fuel Inventory	*Recommendation* *AANDC recommends that the quantity of all fuel on site, including fuel stored in other vessels, is provided prior to the Public Hearing (i.e. number of vessels including drums). If the total amount of fuel remains unknown following the Public Hearing, the precautionary approach should be used to assume the highest reclamation liability on site when setting the financial security (i.e. assume all vessels are full).* LML Response to 1.1 LML has responded that they have met their commitments and never agreed to measure fuel in other vessels. They have agreed to complete this is 2015 as it could not reasonably completed before the hearing. **This is a rational compromise**. It should be noted AANDC did not allow for additional costs for the reclamation estimate for management of fuel and assumed this would be covered in the contingency.	No further comments. ARCADIS as stated *"This is a rationale compromise".*	No Comment. Not entirely clear how this is relevant to the current discussion. The fundamental issue remains as to whether or not residual fuel is a waste or a resource.

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
1.2 Landfarm Management Plan	*Recommendation* *AANDC recommends that a) landfarm construction is only considered during mine operations and not during care and maintenance; b) the licence require a final Landfarm Management Plana minimum of 60 days prior to construction of a landfarm;* *c) that interested parties are provided an opportunity to comment on the final Landfarm Management Plan; and d) construction of a landfarm not occur until the plan is approved, in writing, by the Board.* LML Response to 1.2 LML has confirmed that the landfarm is proposed for the care and maintenance period. A final decision for treating soils at closure has not been made (LML assume landfarming for the liability estimate). LMI has not agreed to update the plan to address comments from third parties within 90 days and request the plan be approved as is. LMI note that a Construction Summary Report is likely to be required. This report will be prepared by a qualified engineer and should be a preliminary plan should be adequate to confirm the landfarm is in accordance with the conceptual plan. LMI further state the proposed landfarm should be available during the care and maintenance period for progressive reclamation of petroleum hydrocarbon contaminated soil that is currently present outside of the fuel containment facility. **SENES would support this position**. **LMI has adequately addressed the comments and questions raised by AANDC on the Landfarm Management Plan.**	No further comments. ARCADIS stated *"SENES would support this position. LMI has adequately addressed the comments and questions raised by AANDC on the Landfarm Management Plan."*	No Comment as Arcadis has not seen the Landfarm document and as such we cannot amend our concerns regarding the treatment of PHC impacted soils in a single season.

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
1.3 Errarta for Interim Abandonment and Restoration Plan	*Recommendation* *AANDC recommends that a) the licence require an updated IARP within 90 days of licence issuance; b) the updated plan is prepared in accordance with the Mine Site Reclamation Guidelines for the Northwest Territories, (INAC, 2007) and consistent with the Mine Site Reclamation Policy (INAC, 2002) as required in Schedule I, Item 1 of the existing licence; c) the plan is circulated for comments by interested parties prior to approval; d) a change in status (i.e. mining operations) not commence until the plan is approved, in writing, by the Board; and e) the precautionary approach is used where sufficient information is not provided in the IARP and the reclamation estimate when setting financial security.* LMI Response to 1.3 LMI has agreed with the 90-day submission timeframe reflected at (a) as well as (b) and (c). LML does not agree that final approval be provided before mining operations commence. **SENES would support this position given that the IARP is a fluid document which will change as progressive reclamation is completed and new information becomes available.** LMI objects to the wording of item e). We assume they object to the term of using precautionary approach "sufficient information" is not available. LMI believe sufficient information is available and we do not concur. There is uncertainty about the performance of the cover, the quantity of contaminated soils, the quantity of acidic rock etc. The quantities used in the RECLAIM estimate were typically the same as used by LMI. The difference is addressed in the contingency applied. LMI uses a low value of 10% while SENES used 25% contingency (a precautionary approach).	In regards to the contingency amount, in the NWB's decision it was stated "With respect to the difference in contingency for uncertainty built into AANDC's estimate (25%) and LMI's contingency (10%), the Board finds that considerable uncertainty may arise in terms of what updates to the existing abandonment and reclamation plans would be necessary and what reclamation security may then be required in the event that the mine site were to return to active operations. However, with respect to the mine site's current state of Care and Maintenance the site has been in this state from 2005 to present. As a result, in the Board's view there is much less uncertainty regarding the abandonment and reclamation requirements and liability associated with the site while maintained in the current care and maintenance phase. Given that the Renewed and Amended Licence limits LMI to activities associated with care and maintenance and the transition to active operations, the Board does not see the need for the significant boost to the contingency built into the estimate."	No comment as this item was addressed earlier in this review. See above.
2.0 Outstanding Issues			
2.1 Windblown Tailings	*Recommendation* *AANDC recommends that a) a study framework for the windblown material be submitted for review and approval prior to issuance of a licence; b) a precautionary approach be used when setting the financial security and that it is based on the assumption that this material is tailings, until proven otherwise; and c) the* *investigation and report on windblown tailings be a condition of the licence which is to* *be submitted by December 31, 2015.* LMI has committed to sampling the localized area proximal to DAM 6 in 2015. LMI has not agreed to conduct a wider area sampling program.	As a part of the renewed water licence recently approved, Part E, Item 26 states: The Licensee shall, during 2015, conduct a detailed sampling program within the vicinity of the Tailings Containment Area and other areas identified or suspected of being impacted by windblown Tailings associated with the Project. A written report detailing the sampling results along with relevant analyses shall be submitted to the Board for review by December 31, 2015. LMI hired SRK Engineering to complete the detailed	No Comment. The results of the 2015 evaluation were discussed earlier in this review document and are not repeated here.

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
	LMI has indicated it cannot proceed with the study plan framework before the licence is issued until it better understands what AANDC requires. LMI did commit to ongoing clarification of the area to ensure sampling targets the correct area. It is LMIs position that tailings dust, even if present in the tundra area, is not amenable to removal without extensive damage to the environment. **SENES would concur and would strongly suggest that the investigation program include visual inspections of the complete tailings perimeter to identify if there are any areas with material levels of windblown deposition**. Should these be identified and sampled. If material areas with windblown dust are identified then a risk assessment based plan should developed to address remedial measures if necessary. It should be noted no allowances were included in the SENES liability estimate for cleanup of windblown tailings. It was assumed this could be addressed with the contingency.	sampling program as required and submitted the results to the NWB on December 31, 2015 (see attached). SRK's conclusion is as follows: The results do not show that windblown tails are currently being deposited outside of the facility as a result of the exposed saturated tails in Cell 3. The size analysis shows that the material analyzed is coarse to fine grain sands. The grain size material is not indicative of windblown materials. The results indicate that the potential for windblown deposition of tailings outside of the TCA has been controlled by the placement of the esker sand cover. The absence of surficial material on elevated areas of the downstream toe of Dam 6 further supports this conclusion. The arsenic concentrations and the grain size of the subsoil samples suggest the historical deposition of tailings occurred in the vicinity of Dam 6. A sand cover is in place over the tails downgradient of the toe of Dam 6. A review of Lupin Mine spill reports and available operating records did not reveal a spill or overtopping of tails at Dam 6. Nor was documentation found that discussed capping tails on the downstream toe of Dam 6. It is possible the deposition of tails in ths area predates the construction of Dam 6. The Ecological Risk Assessment for the Lupin Mine Tailings Containment Area (Golder 2004) showed that the risks from sand-covered tailings are acceptable, both for humans and wildlife. The study did not assess areas outside the TCA.	
2.2 Porewater Quality Monitoring	*Recommendation* *AANDC recommends that the licence require a) porewater quality monitoring in the sand cover; and b) annual sampling of the piezometers.* LMI Response to 2.2 LMI has indicates that water levels monitoring will demonstrate the cover is functioning as designed and furthermore Pond monitoring will confirm that water quality meets requirements. As such they see little benefit is conduction porewater monitoring. Porewater monitoring is simply another confirmatory measurement however **SENES concurs with LMI that it is not essential.**	No further comments. ARCADIS stated *"SENES concurs with LMI that it is not essential."*	No Comment
2.3 Hazardous Waste	*Recommendation* *AANDC recommends a) that a current inventory of hazardous waste as committed by LMI is submitted for review prior to the Public Hearing; b) that annual removal of hazardous waste be required to prevent the over-accumulation of hazardous waste on site; c) that LMI confirm that removal*	ARCADIS stated "Given LMIs commitment to remove hazardous waste at every opportunity, **this restriction is onerous**." LMI has backhauled approx. 130,000 lbs of waste this past season, details of which will be provided as required in the	No new comments. This item was discussed earlier in this review document.

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
	of hazardous waste is included in the reclamation estimate (and indicate where in the estimate it is accounted for); d) the storage of hazardous waste on site is limited to the maximum amount of stored hazardous waste used to calculate the reclamation cost estimate (i.e. 2 truckloads) and if LMI cannot commit to limiting storage to 2 truckloads of hazardous waste, then adjustments to the reclamation estimate are recommended to ensure that the total estimated costs for the removal of hazardous waste covers the maximum quantity of hazardous waste proposed for storage on site. LMI Responses to 2.3 a) LMI responded that they attempted to complete the inventory before the hearing but were delayed by weather as such it would not be possible to submit before the hearing. LMI states it committed to completing this task during the 2015 season it should not be viewed as something LMI did not address. b) LMI states that it removes hazardous waste at every opportunity but does not agree with annual removal during the care and maintenance period. c) LMI has stated the removal/disposal cost is in their RECLAIM estimate but did not address where this can be found in the estimate. d) LMI does not accept that 2 truckloads of waste accumulation is reasonable. The storage facility is lined and it is LMIs position that storage area is capable of storing additional material if needed and does not pose a risk to the environment. Given LMIs commitment to remove hazardous waste at every opportunity, **this restriction is onerous**.	2015 annual report	
2.4 Management Plans	*Recommendation* *AANDC recommends that a) the licence require LMI to submit updated plans within 60 days of licence issuance; b) that commitments made by LMI are reflected in the water licence; and c) monitoring of internal pond water quality be included as a condition of the licence.* LMI Response to 2.4 LMI has agreed to all conditions but has requested 90 days rather than 60 days to allow for a suitable time to address all Management Plans.	No further comments.	No Comment
2.5 Care and Maintenance	*Recommendation* *AANDC recommends that a) Part E, Item 6f of the existing licence remain as a condition during mining operations; and b) the licence include a condition that LMI investigate the feasibility of remote surveillance for remote monitoring during care and maintenance.* LMI Response to 2.5 LMI provided a long response. We glean from this response that LMI accept the conditions for monitoring for operations but request reduced frequencies as they proposed for Care and maintenance and the ramp up period. **Given that ramp up does not include mining and milling, we**	No further comments.	No Comment

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
	concur this is not unreasonable. LMI also agreed to continue to investigate the potential for remote monitoring during the care and maintenance period.		
2.6 Progressive Reclamation	*Recommendation* *Due to the potential risk that the mine does not resume operations during the life of the proposed licence, AANDC recommends that the licence require a) progressive covering of the exposed tailings during C&M and b) LMI to submit an updated progressive reclamation plan as part the update to the IARP. This plan should provide a schedule for the progressive decommissioning and reclamation of these areas.* LMI Response: LMI does not propose or see any benefit of reclaiming the currently uncovered tailings. AANC has requested a schedule for progressive reclamation and we assume this will be provided in the updated IARP. LMI indicate the Landfarm Management plan will allow for progressive historic spill at the satellite tank farm. They further note that ongoing removal of waste from the site will continue but a fixed schedule cannot be provided as this material is removed on an opportunistic basis.	As stated in LMI's annual reporting each year from 2011-2014 (2015 will be submitted on March 31, 2016), LMI has not completed progressive covering of the exposed tailings during care and maintenance as they plan to restart operations. During the public hearing Patrick Downey provided a response in regards to the progressive covering of the exposed tailings as follows: 9 MR. DOWNEY: Thank you. Patrick Downey, 10LMI. I believe Slide 52, please. I'd like to read you 11 Part I, Item 9 of the last water licence -- sorry, 11 the -- sorry, Patrick Downey, LMI. It states that: 12 (as read) 13 Progressive reclamation, including 12 progressive covering of the tailings and 16 re-vegetation as soon as realistically 17 possible. 18 And on Schedule B, the general conditions of annual 19 reporting in the same document, it states: (as read) 20 For care and maintenance, provide an updated 21 status of any progressive reclamation as it 22 relates to tailings cover remediation and 23 justification for not proceeding to full 24 reclamation under Part I, Item 5. 5 So, Eva, I think -- or, sorry, I think you stated that 26 you were not aware that Lupin Mines was planning to go 1 back into production until, more or less, this session, 2 I believe is what you stated; is that correct? 3 MS. PAUL: Thank you, Mr. Chair. I 4 stated something to that effect -- Eva Paul. I stated 5 something to that effect, yes. 6 MR. DOWNEY: I'd like to read you the 7 sections from our annual reports in regards to the 8 reclamation. 9 THE CHAIR: Can I have a name? 10 MR. DOWNEY: Patrick Downey, LMI. (as 11 read) 12 No reclamation activities as it relates to 13 tailings cover occurred in 2011. LMI is	No Comment

		14 currently investigating options to restart 14 mine operations. Until such time as this 15 work is advanced, the property will remain 17 under care and maintenance. Formal 18 reclamation works will not be initiated. 19 2012, I can read the same, but more or less exactly the 20 same. 2013: (as read) 21 LMI continues to monitor the global economic 15 climate and evaluate the feasibility of 22 operating the Lupin mine, along with the 24 potential for identifying additional 25 resources through its exploration activities. 26 In the interim, the site remains in care and 1 maintenance, and a decision with respect to 2 Part I, Item 5 was not contemplated in 2013. 3 I was wondering how would it not be known that we were 4 planning to go back into operations when we were 5 reporting it every year in our annual report? 16 THE CHAIR: AANDC? 17 MS. PAUL: Eva Paul. Thank you, 6 Mr. Chair. Can you rephrase the question, Patrick? 9 I'm not -- I have read the annual reports and I 10 understood the material in them, but the company was 11 still in care and maintenance. 12 MR. DOWNEY: My statement -- Patrick 18 Downey, LMI. My statement was in regards to the fact 14 that I believe we always stated we were going back into 15 production. We -- we reported it in our annual 16 reports, and we gave a good and valid reason why we 19 were not covering the tailings in -- in -- in 20 progressive reclamation. We were doing other 17 progressive reclamation work, but not specifically on 20 the tailings, and we noted that in each report. I have 21 no further points in that regard. As approved by the NWB, the Landfarm Management plan will allow for soil treatment and LMI has hired an engineering firm specifically in regards to the design and construction of the Landfarm. In regards to removal of waste, LMI still concurs that waste backhaul from the site will continue but a fixed schedule cannot be provided as this material is removed on an opportunistic basis, noting that LMI backhauled approx. 130,000 lbs of waste this past season.	

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
3.0 Other Issues			
3.1 Acid Generating Waste Rock	AANDC Comment- *In the original closure plan documentation, waste rock was generally believed to be non-acid generating.* LML Response LMI indicate it is not clear on where the above statement comes from and requests that AANDC provide the source. LMI is correct. The basis was assumed from the original licensing when no special provisions were included to identify and manage acid rock. The material issue is that there is on-site today potentially large quantities of acid generating waste. *Recommendation* *AANDC requests that a detailed waste rock characterization study is required by the licence to address the acid rock issue and its potential effect on the environment. The study should identify the totally quantity of potentially contaminated waste rock and the proposed a management plan for this material. This investigation is required to provide an improved estimate of the quantity of waste rock that may require relocation and management for the reclamation liability estimate.* LMI Response to 3.1 LMI agrees that additional studies will be required to assess the various remedial options available for dealing with potentially acid generating waste rock in order to develop a final reclamation and closure plan. If the preferred option requires segregation of the PAG rock, it is acknowledged that further work will be required to assess methods for identifying this material during excavation. However, segregation may not be the most cost effective approach for some of the options under consideration, such as consolidating and covering the waste. Therefore, LMI proposes to complete a more detailed options evaluation prior to closure, and then tailor any further investigations required to support further advancement of the preferred option. **SENES supports this position**.	ARCADIS stated *"Therefore, LMI proposes to complete a more detailed options evaluation prior to closure, and then tailor any further investigations required to support further advancement of the preferred option.* ***SENES supports this position.****"* In the decision by the NWB, it was stated that *"The NWB has reviewed the information provided by both the licensee and interveners in determining that an assessment should be conducted for PAG material associated with the site. Conditions related to the assessment are included Part G in the Licence."* [Note: the condition is Part I, items 9 and 10] LMI's renewed water licence states the following: 9. The Licensee shall submit to the Board for review, as part of any application to amend and/or renew the Licence, or to commence active reclamation of the Project site, an updated or revised version of the Environmental Site Assessment conducted for the Project in 2006. 10. The Licensee shall, as part of the updated Environmental Site Assessment required under Part I, Item 9, conduct a detailed rock characterization study or program to determine the total quantity (inventory) of Potentially Acid Generating (PAG) material associated with the Project site and identify any potential contamination that may be linked to such material. A written report of the results obtained and analyses conducted shall be submitted to the Board for review as part of any application to amend and/or renew the Licence, or notification to commence active reclamation of the Project site.	No Comment as this issue has been addressed earlier in the review document.
3.2 Asbestos	*Recommendation* *AANDC recommends that the licence require LMI to conduct an investigation to confirm that asbestos is not present on site.* LMI Response LMI has responded that they have conducted investigations that confirm asbestos is present on site and the need for special handling of certain materials has been taken into consideration in the demolition plans.	No further comments	No further comment
Major Conclusions and Findings	*Here are my thoughts.* • *LMI have committed to updating plans including the IARP.*	As a part of the renewed water licence recently approved, Part E, Item 26 states:	No further comment

ARCADIS MEMORANDA DATED JANUARY 22, 2015			
	ARCADIS MEMORANDUM DATED JANUARY 22, 2015	**LMI RESPONSE TO ARCADIS MEMORANDUM DATED JANUARY 22, 2015**	
	• *LMI has also agreed to a windblown tailings assessment. As long LMI agree to:* *i) Complete the investigation program;* *ii) Include visual inspections of the complete tailings perimeter to identify if there are any areas with material levels of windblown deposition (include Dam 6 area;)* *iii) If areas are identified, they should be sampled and characterized*	The Licensee shall, during 2015, conduct a detailed sampling program within the vicinity of the Tailings Containment Area and other areas identified or suspected of being impacted by windblown Tailings associated with the Project. A written report detailing the sampling results along with relevant analyses shall be submitted to the Board for review by December 31, 2015. LMI hired SRK Engineering to complete the detailed sampling program as required and submitted the results to the NWB on December 31, 2015 (see	
	(quality, areal extent and depth) and; *iv) If material areas with windblown dust are identified then a risk assessment based plan should developed to address remedial measures if necessary;* *then, I believe this addresses AANDC issues.* • *The most significant issue is the Reclamation Liability. To me this dwarfs all other concerns. The objective has to be get the liability provision increased. Perhaps this could go to arbitration.*	attached). The updated IARP has been submitted to the NWB.	

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<tr><th colspan="4">ARCADIS ASSESSMENT OF POTENTIAL FUGITIVE TAILINGS DATED OCTOBER 30, 2015</th></tr>
<tr><th></th><th>ARCADIS MEMORANDUM DATED OCTOBER 30, 2015</th><th>LMI RESPONSE to ARCADIS MEMORANDUM DATED OCTOBER 30, 2015</th><th></th></tr>
<tr>
<td>Assessment of Potential Fugitive Tailings</td>
<td>
While conducting inspections of the internal and perimeter dams at the TCA on August 21 and 22, 2015, our Mr. Barry Cooke, P.Eng., collected surface and near surface samples of the tailings from Cell 3 north of Perimeter Dam 6, the potential fugitive material south of Perimeter Dam 6, plus a sample from an esker located a few kilometers south of the TCA, at the locations shown on Figure 1. Photographs of the sampling locations are provided in Appendix A.

The tailings in Cell 3 near Perimeter Dam 6 had been covered using material sourced from the esker, and based on visual observations by Mr. Cooke, the possible fugitive material south of Perimeter Dam 6 resembled the esker cover material over the tailings in Cell 3. Table 1 summarizes the results of the sampling, and includes the analytical schedule for the samples. Six samples were collected from three locations south of Perimeter Dam 6, a surface sample and a second sample from what was inferred to be the original tundra, at a depth of 0.075 to 0.125 m. All samples were analysed for metals and pH, and samples of the tailings (Sa 1 and Dup 1) and the esker (Sa 8) were submitted for gradation analyses.

The laboratory certificates for the analyses are attached to this letter in Appendix B. As can be seen, the tailings samples (Sa 1 and Dup 1) comprised 7.6% gravel, 11.0% sand, 77.4% silt and 4.0% clay sizes. The esker sample comprised 15.6% gravel, 72.7 % sand and 11.7% silt sizes.
Review of the results of the pH analyses indicates that all samples had a low, or acidic, pH. Values ranged from 2.85 to 4.38.

The results returned for metals analysis indicated that the two samples of tailings (Sa 1 and Dup 1) contained an average concentration of arsenic of 3850 mglkg, an order of magnitude higher than that measured in the samples collected from the area south of Perimeter Dam 6 (Sa 2 to Sa 7), with arsenic levels ranging from 51 to 590 mg/kg, averaging 204 mg/kg. The esker sample (Sa 8) was found to contain an arsenic level of 4 mglkg. Similar trends in concentrations were noted for barium, chromium, lead and zinc in the samples collected from south of Perimeter Dam 6, in that contaminant levels were significantly lower than those measured in the tailings samples.

Based on the analytical results, it appears that the material south of Perimeter Dam 6 is not pure tailings, nor is it pure esker material. Rather, the material south of Perimeter Dam 6 could be a mixture of tailings and esker cover material.
</td>
<td>
As a part of the renewed water licence recently approved by the NWB, Part E, Item 26 states:

The Licensee shall, during 2015, conduct a detailed sampling program within the vicinity of the Tailings Containment Area and other areas identified or suspected of being impacted by windblown Tailings associated with the Project. A written report detailing the sampling results along with relevant analyses shall be submitted to the Board for review by December 31, 2015.

LMI hired SRK Engineering to complete the detailed sampling program as required and submitted the results to the NWB on December 31, 2015 (see attached).

SRK reviewed the memo provided by ARCADIS and advised LMI of the following:

The samples reported in the December 31, 2015 SRK Windblown Tails memo include the duplicate samples collected by SRK at the time of the inspection with Mr. Cook. The table below lists how the samples can be compared by location.
<table>
<tr><th>ARCADIS Sample Number</th><th></th><th>SRK Sample Number</th></tr>
<tr><td>SA2</td><td></td><td>LUP15059-DAM6 SURFMAT</td></tr>
<tr><td>SA3</td><td></td><td>LUP15060-DAM6 DEEPMAT</td></tr>
<tr><td>SA4</td><td></td><td>LUP15061-DAM6 SURFMAT</td></tr>
<tr><td>SA5</td><td></td><td>LUP15062-DAM6 DEEPMAT</td></tr>
<tr><td>SA6</td><td></td><td>LUP15063-DAM6 SURFMAT</td></tr>
<tr><td>SA7</td><td></td><td>LUP15064-DAM6 DEEPMAT</td></tr>
</table>
Direct comparison of the results must be cautioned because:
1) The samples were not exact field duplicates; SRK collected soil samples from the same horizons sampled by ARCADIS in test pits dug immediately adjacent to those sampled by ARCADIS.
2) ARCADIS had the analytical laboratory analyze metals by the modified ICPMS method EPA 6020A required by the Ontario Ministry of Environment. The samples tested for SRK were analyzed by a modified ICPMS method EPA 6010A suitable for comparison to the federal CCME guidelines. Even though both laboratories used ICPMS to test for metals, modifications to the EPA method allow for different acids to be used to digest the soil, different concentrations of the acid and or different periods of time allowed for digestion.

In general the metal concentrations detected by SRK were slightly higher than those reported by ARCADIS. Arsenic concentrations
</td>
<td>No further comment</td>
</tr>
</table>

ARCADIS ASSESSMENT OF POTENTIAL FUGITIVE TAILINGS DATED OCTOBER 30, 2015			
	ARCADIS MEMORANDUM DATED OCTOBER 30, 2015	**LMI RESPONSE to ARCADIS MEMORANDUM DATED OCTOBER 30, 2015**	
		were a notable exception. Arsenic concentrations in the ARCADIS samples ranged from 51 to 590 mg/kg. Arsenic concentrations in the comparable samples collected by SRK ranged from 47.3 to 2410 mg/kg. The results obtained by ARCADIS do not change the conclusions provided in SRK's memorandum dated December 31, 2015 that there is no evidence of windblown tailings currently being deposited outside of the exposed saturated tails in Cell 3. SRK's recommendations remain valid. Based on the results obtained by ARCADIS, SRK also recommends that future soil samples tested be analyzed using the same methodology applied by SRK in 2015. SRK's conclusion is as follows: *The results do not show that windblown tails are currently being deposited outside of the facility as a result of the exposed saturated tails in Cell 3. The size analysis shows that the material analyzed is coarse to fine grain sands. The grain size material is not indicative of windblown materials. The results indicate that the potential for windblown deposition of tailings outside of the TCA has been controlled by the placement of the esker sand cover. The absence of surficial material on elevated areas of the downstream toe of Dam 6 further supports this conclusion.* *The arsenic concentrations and the grain size of the subsoil samples suggest the historical deposition of tailings occurred in the vicinity of Dam 6. A sand cover is in place over the tails downgradient of the toe of Dam 6. A review of Lupin Mine spill reports and available operating records did not reveal a spill or overtopping of tails at Dam 6. Nor was documentation found that discussed capping tails on the downstream toe of Dam 6. It is possible the deposition of tails in this area predates the construction of Dam 6. The Ecological Risk Assessment for the Lupin Mine Tailings Containment Area (Golder 2004) showed that the risks from sand-covered tailings are acceptable, both for humans and wildlife. The study did not assess areas outside the TCA.*	

Attachment B: LMI Email dated June 13, 2016

LMI Labor Summary (based on 2014 take-off quantities)
LMI Rate Structure

Designation	2014 Rate	2015 Rate	2016 Rate
Electrician-F/M	$54.43	$54.43	$51.71
Electrician-J/M	$49.17	$49.17	$46.71
Ironworker-F/M	$53.43	$53.43	$50.76
Ironworker-J/M	$47.95	$47.95	$45.55
Labourer-F/M	$43.38	$43.38	$41.21
Labourer-J/M	$39.77	$39.77	$37.78
Mechanic (ME2)	$40.41	$40.41	$38.39
Mechanic (ME2)	$40.41	$40.41	$38.39
Serviceman	$33.92	$33.92	$32.22
Millwright-F/M	$56.55	$56.55	$53.72
Millwright-J/M	$51.06	$51.06	$48.51
Operator-F/M	$51.79	$51.79	$49.20
Operator-R/T	$47.36	$47.36	$44.99
Operator-Truck	$44.01	$44.01	$41.81
Operator-Equip	$46.29	$46.29	$43.98
Operator-J/M	$50.64	$50.64	$48.11
Pipefitter-F/M	$56.37	$56.37	$53.55
Pipefitter-J/M	$50.86	$50.86	$48.32

Equipment Charge-out Rates

Cat 777	$187.00
Bkho 375L	$179.20
7500 ftlb	$44.05
Cat 992D	$245.00
Cat D10N	$185.26
110 Ton	$185.10
40t Toro	$22.48
LT 9000	$28.67
Volvo 5350B	$77.23
D85E	$34.65
D8K	$34.65
966E FEL	$16.57
RT522	$111.86

PAG Rock

Total	0	100,000

Productivity calculations:

Capacity Cat 992D Loader	10.0	m^3 per bucket (crushed rock)		
Fill factor	90%			
Load factor	85%			
Calculated Loac	7.7	m^3 per bucket (crushed rock)		
Cycle time	1.20	minutes/cycle =	50	loads per hour max
		@ 50 min/hr =	41.7	loads per hour assumed
Calculated productivity:	319	m^3 per hour		
Rock required to move:	100,000	m^3		
Total time required to load material:	314	hours		
		Hours per shift	11	
		Shifts per day	2	
		Total days =	14	
		@ 4.3 weeks/mth =	0.5	months
		@ 3 mths/season =	0.2	seasons

Capacity Volvo Truck	35	m^3 (crushed rock)		
Fill factor	85%			
Load factor	85%			
Calculated Loac	25.3	m^3 (crushed rock)		
Cycle time	18	minutes/cycle =	3.33	loads per hour max
		@ 50 min/hr =	2.78	loads per hour assumed
Calculated productivity:	70	m^3 per hour, per truck		
Number trucks required:	1.00	trucks, rounded up =	1	trucks
Total trucking time required:	1,424	hours		
		Hours per shift	11	
		Shifts per day	2	
		Total days =	65	
		@ 4.3 weeks/mth =	2.1	
		@ 3 mths/season =	0.7	

Therefore One season will Complete the movement required.

SHAFT DUMP AREAS					Labor		Equipment		Total
Desc	Quan.	Item	Hours	Hrs Ttl	$/hr	Cost	$/hr	Cost	Cost
Rock Placement		100,000	m^3ROM mat'l to move from mill area to shaft area.						
Rip/ Stockpile	1	D10N Dozer	100	100	$43.98	$4,398	$185.26	$18,526	$22,924
	1	D8K Dozer	100	100	$43.98	$4,398	$34.65	$3,465	$7,863
Load	1	992D Loader	314	314	$43.98	$13,796	$245.00	$76,863	$90,659
Haul and Dump	1	volvo	1424	1424	$41.81	$59,521	$77.23	$109,947	$169,468
spotter	2		633	1266	$32.22	$40,796			$40,796
safety	2		634	1268	$51.71	$65,566			$65,566
Sub-total						$188,474		$208,801	$397,275
PAG- Shaft Area				4471.4		$188,474		$208,801	$397,275

PAG Rock

Total	0	200,000

Dump to open stopes to average of 500m UG- Maximum haul distance 4.2km.

Productivity calculations:

Capacity Cat 992D Loader	10.0	m^3 per bucket (crushed rock)		
Fill factor	90%			
Load factor	85%			
Calculated Load	7.7	m^3 per bucket (crushed rock)		
Cycle time	1.20	minutes/cycle =	50	loads per hour max
		@ 50 min/hr =	41.7	loads per hour assumed
Calculated productivity:	319	m^3 per hour		
Rock required to move:	200,000	m^3		
Total time required to load material:	627	hours		
		Hours per shift	11	
		Shifts per day	2	
		Total days =	29	
		@ 4.3 weeks/mth =	0.9	months
		@ 3 mths/season =	0.3	seasons

Capacity 40t UG Truck	40	m^3 (crushed rock)		
Fill factor	95%			
Load factor	95%			
Calculated Load	36.1	m^3 (crushed rock)		
Cycle time	32	minutes/cycle =	1.88	loads per hour max
		@ 50 min/hr =	1.56	loads per hour assumed
Calculated productivity:	56	m^3 per hour, per truck		
Number trucks required:	2.00	trucks, rounded up =	2	trucks
Total trucking time required:	1,773	hours		
		Hours per shift	11	
		Shifts per day	2	
		Total days =	81	
		@ 4.3 weeks/mth =	2.7	
		@ 3 mths/season =	0.9	

Therefore One season will Complete the movement required.

PAG TO UG					Labor		Equipment		Total
Desc	Quan.	Item	Hours	Hrs Ttl	$/hr	Cost	$/hr	Cost	Cost
Rock Placement		200,000	m^3ROM mat'l to move from mill area to tails area.						
Rip/ Stockpile	1	D10N Dozer	100	100	$43.98	$4,398	$185.26	$18,526	$22,924
	1	D8K Dozer	100	100	$43.98	$4,398	$34.65	$3,465	$7,863
Load	1	992D Loader	627	627	$43.98	$27,592	$245.00	$153,725	$181,318
Haul and Dump	2	40t Toro	1773	3546	$41.81	$148,244	$22.48	$79,707	$227,952
UG spotters	8		800	6400	$43.98	$281,443			$281,443
safety	2		800	1600	$51.71	$82,734			$82,734
Sub-total						$548,809		$255,424	$804,233
PAG UG1				12373		$548,809		$255,424	$804,233

PAG Rock

Total	0	100,000

Productivity calculations:

Capacity Cat 992D Loader	10.0	m^3 per bucket (crushed rock)		
Fill factor	90%			
Load factor	85%			
Calculated Load	7.7	m^3 per bucket (crushed rock)		
Cycle time	1.20	minutes/cycle =	50	loads per hour max
		@ 50 min/hr =	41.7	loads per hour assumed
Calculated productivity:	319	m^3 per hour		
Rock required to move:	100,000	m^3		
Total time required to load material:	314	hours		
		Hours per shift	11	
		Shifts per day	2	
		Total days =	14	
		@ 4.3 weeks/mth =	0.5	months
		@ 3 mths/season =	0.2	seasons

Capacity Cat 777 Truck	51.5	m^3 crushed rock)		
Fill factor	85%			
Load factor	75%			
Calculated Load	32.8	m^3 (crushed rock)		
Cycle time	27	minutes/cycle =	2.22	loads per hour max
		@ 50 min/hr =	1.85	loads per hour assumed
Calculated productivity:	61	m^3 per hour, per truck		
Number trucks required:	1.00	trucks, rounded up =	1	trucks
Total trucking time required:	1,645	hours		
		Hours per shift	11	
		Shifts per day	2	
		Total days =	75	
		@ 4.3 weeks/mth =	2.5	
		@ 3 mths/season =	0.8	

Therefore One season will Complete the movement required.

PAG to Tails					Labor		Equipment		Total
Desc	Quan.	Item	Hours	Hrs Ttl	$/hr	Cost	$/hr	Cost	Cost
Rock Placement		100,000	m^3ROM mat'l to move from mill area to tails area.						
Rip/ Stockpile	1	D10N Dozer	200	200	$43.98	$8,795	$185.26	$37,052	$45,847
	1	D8K Dozer	200	200	$43.98	$8,795	$34.65	$6,930	$15,725
Load	1	992D Loader	314	314	$43.98	$13,796	$245.00	$76,863	$90,659
Haul	1	Cat 777 Trucks	1645	1645	$41.81	$68,767	$187.00	$307,573	$376,340
Place	1	Cat D85E Dozer	314	314	$43.98	$13,796	$34.65	$10,871	$24,667
Spotters	2		1645	3290	$32.22	$106,017			$106,017
safety	2		1646	3292	$51.71	$170,224			$170,224
Sub-total						$219,967		$439,288	$659,255
PAG-Tailings Containment Area				9254.2		$219,967		$439,288	$659,255

Tailing Containment Area

Cell	Depth m	Area m^2	Volume m^3
5	1.20	129,000	154,800
3	1.20	71,100	85,320
Total		200,100	240,120

Using PCL productivity calculations:

Capacity Cat 992D Loader	10.0	m^3 per bucket (heaped esker sand)			
Fill factor	90%				
Load factor	90%				
Calculated Load	8.1	m^3 per bucket (heaped esker sand)			
Cycle time	0.75	minutes/cycle =	80	loads per hour max	
		@ 50 min/hr =	66.7	loads per hour assumed	
Calculated productivity:	540	m^3 per hour			
Esker material required to move:	240,120	m^3			
Total time required to load material:	445	hours			
		Hours per shift	11		
		Shifts per day	2		
		Total days =	20		
		@ 4.3 weeks/mth =	0.7	months	
		@ 3 mths/season =	0.2	seasons	

Capacity Cat 777 Truck	51.5	m^3 (heaped esker sand)			
Fill factor	90%				
Load factor	85%				
Calculated Load	39.4	m^3 (heaped esker sand)			
Cycle time	28.6	minutes/cycle =	2.10	loads per hour max	
		@ 50 min/hr =	1.75	loads per hour assumed	
Calculated productivity:	69	m^3 per hour, per truck			
Number trucks required:	2.00	trucks, rounded up =	2	trucks	
Total trucking time required:	1,743	hours			
		Hours per shift	11		
		Shifts per day	2		
		Total days =	79		
		@ 4.3 weeks/mth =	2.6		
		@ 3 mths/season =	0.9		

Therefore One season will Complete the Cover required.

TAILINGS CONTAINMENT AREA					Labor		Equipment		Total
Desc	Quan.	Item	Hours	Hrs Ttl	$/hr	Cost	$/hr	Cost	Cost
Granular Cover		240,120	m^3 esker mat'l to move from Fingers Lake to tails area.						
Stockpiling									
Strip / Stockpile	1	D10N Dozer	200	200	$43.98	$8,795	$185.26	$37,052	$45,847
	1	D8K Dozer	200	200	$43.98	$8,795	$34.65	$6,930	$15,725
Load	1	992D Loader	445	445	$43.98	$19,554	$245.00	$108,943	$128,498
Haul	2	Cat 777 Trucks	1743	3486	$41.81	$145,757	$187.00	$651,925	$797,682
Place	1	Cat D85E Dozer	445	445	$43.98	$19,554	$34.65	$15,408	$34,962
spotters	2		1743	3486	$32.22	$112,340		$0	$112,340
Sub-total						$314,797		$820,258	$1,135,054
Fingers Lake Esker		Reclaim - contour and grade quarry							
Sub-total	1	D10N Dozer	2400	2400	$43.98	$105,541	$185.26	$444,624	$550,165
Tailings Containment Area				10662		$420,338		$1,264,882	$1,685,219