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MEMORANDUM – DRAFT for Discussion

TO: Jean Allen, AANDC Nunavut 400094

FROM: Randy Knapp, Oct 19, 2014

CC: Shelagh Montgomery

SUBJ: Lupin Mines Inc. Water Licence Renewal Application – **SENES Comments on October Revised LMI 2014 Reclaim Estimate**

OVERVIEW

We have completed a cursory review of the Revised Reclaim Estimate prepared by LMI and find there are a number of items that are deficient and/or the costs included do not include adequate funds for completion of the work. Given the short period of review, one should treat the list of deficiencies as preliminary, incomplete and subject to change should a more detailed review be completed. In general the Reclaim model was developed to assure all items were accounted for in the estimate and this LMI estimate appears to have left off many of the items included in the Reclaim model.

The LMI estimate with the background write-up is a significant improvement over the 2012 estimate filed in 2013 as it much better explains what has been included in the costs and where the unit rates have come from. Although we may not concur with some of the unit rate data, given they were based upon contractor quotations, we have adopted most of these rates in our review of the estimate.

These items are listed below are the preliminary list of items identified and are summarized in Table 1 at the end of this memo.

ADDITIONAL ITEMS AND PROVISIONS FOR THE RECLAIM COST ESTIMATE

- 1) The Underground Mine
 - No provision for inspection and removal of hazardous materials from the mine. Allow for a crew of 3 men for 4 days (shift boss + 2 labourers) to inspect mine, cleanup shops and remove transformers=12 days at \$2100/d= **\$25,200**

- No provision for the crown pillar stability assessment. Allow \$25,000 for investigation and 25,000 for fencing for a total of **\$50,000**.
- There is no allowance for backfilling the portal. Allow for 1000 m³ fill at \$7.24/m³ = **\$7,240**.

2) Tailings Area

- LMI indicates the current covered areas have 1-2 m of cover. AANDC inspection reports suggest some areas require maintenance and upgrading. LMI indicate 241,328 m² remain to be covered and have allowed for 1 m of cover. In order to get 1 m of cover, you will need to add more cover and we have assumed 1.25 m would be added for a total of 301,660 m³. We have also allowed for 50,000 m³ for cover repair and maintenance. Total cover = 351,660 m³ at \$7.24 = **\$2,546,000**.
- LMI have made no allowance for vegetation yet the water licence requires vegetation. As a minimum, we would suggest selected areas be vegetated. We would allow for 50 ha at \$5200/ha = **\$260,000**.
- LMI have no allowance for dewatering ponds or treating pond water if required. This cost is highly uncertain as no treatment may be necessary but labour will be required to dewater the ponds. For planning we have allowed for **\$50,000** to manage water discharges at closure.
- LMI have no allowance to upgrade existing spillway on Dam 3 (100 m 30H:1V through the dam and 7H:1V along downstream slope with a spillway width of 4 m) Channel is to be lined with geotextile and rip rap over this distance. The quantity of rip rap is 2000 m³. Total cost is 2000 m³ riprap at \$15.20/m³ + 6000 m² geotextile at 3.50/m² = \$51,400.
- Trench required from Cell 4 to Pond 1 to allow water to flow naturally. Drill and blast down 2 m over a distance of 200 m 400 m³ at \$24.72 = **\$ 9,900**.
- LMI have no allowance for new instrumentation in dams or soil cover to monitor the facilities. Many of the existing instruments are not functional. We have allowed for new instrumentation at a cost of **\$60,000**.

3) Buildings and Equipment

- It was assumed that the estimates are complete and include full remediation and removal of the buildings.
- No allowance for remove of culverts from the site. Number unknown- allow **\$50,000**.
- No allowance for covering landfill at closure. Assume 20,000 m² with 1 m cover at 7.24/m³ = **\$144,800**.

4) Chemicals

- No allowance for management of the existing fuel inventory 2.4 million litres. Assume this is flared at a total management cost of \$0.5/L = **\$1,200,000**.
- No allowance for management and disposal of the existing hazardous materials inventory (the actual inventory is unknown). Allow **\$50,000**.

5) Waste Rock

In the original documentation, waste rock was generally believed to be non-acid generating. During development studies, waste rock was alkaline and had near neutral net neutralization potential. Morrow (2006) collected a large number of samples and reported that about 44% of this waste rock samples had already become acidic and some leached elevated levels of metals (see Figure 1 in Morrow 2006). Morrow found acidic ground waters in drainage from waste rock and also measured the median concentration of arsenic in the waste at 1140 mg As/kg. Morrow recommended that additional ground water quality monitoring would need to be conducted to assess the long term impact of seepage from the waste.

In the revised A&R plan developed by Kinross in 2005, the potential for ARD was identified this was addressed by removing waste rock to the underground mine where it would be frozen or capped and no longer a long term residual liability. Morrow also suggested that cover in place may also be a suitable option.

The actual quantity of waste rock that may require management is not known and additional study will be required. If it is assumed that 40 % of the rock requires management (Note that 44% of samples of development rock were already acidic in 2005), then transport of the rock to the mine would cost approximately 400,000 m³ at \$7.24/m³ = **\$2,896,000**.

6) Mobilization

The mobilization assumes all work can be completed in 1 calendar year. This is possible but if the work extended beyond 1 year, there would be additional costs. There is also an increased requirement for fuel to operate equipment (more cover, move waste rock etc.). We have not allowed for extension of the project beyond 1 year. The actual costs have not been estimated but we believe could include:

- Mobilization of additional fuel- allow 2,000,000 L at \$1.3/L=\$2,600,000
- Mobilization of 3 additional trucks, 1 loader and 2 excavators- \$900,000
- Additional labour, accommodation and transport-allow \$400,000

Total increased costs for mobilization **\$3,900,000**.

7) Long Term Care and Maintenance

LMI has assumed that the site will be monitored for 10 years and provide costs to conduct this monitoring. After 10 years they assume the site will be abandoned. They include no costs for maintenance of the closure works during this period, no costs for longer term inspections, no costs for long term maintenance of spillways, dams, ditches etc. The site contains arsenic bearing acidic tailings in an engineered storage basin that cannot be abandoned and must be maintained. Based upon the annual geotechnical inspections, maintenance has been required virtually every year. In the longer term, monitoring, care and maintenance requirements will reduce, however they must be completed and the owner should be liable for these costs.

Although the actual costs are not known and allowances are debateable, it is certain these costs will be incurred. Based upon our previous review of these costs, we have estimated these costs for 100 years would be on the order of **\$7,640,000**. These costs would reduce if discounting of future costs was included.

8) Other Factors

LMI has not provided costs for:

- Preparation and environmental review and permitting of the final closure plan. We have allowed **\$900,000** to complete this work.
- No allowance for insurance. We have allowed **1%** of the estimated direct cost.
- Contingency. LMI has allowed for 10%. Given there has been no engineering and this is a highly conceptual plan, we would not use less than **25%**.
- LMI has allowed for 4% for the engineering work. This includes design and field supervision of the works. We would recommend engineering costs of at least **10%** for this project.
- Project management costs were set at 4%. This is likely on the low side and suggest **5%** be used.
- Future site characterization could find much larger inventories of contaminated soils especially below the tank farm areas. We have not made provisions for additional contaminated material but have assumed there is adequate contingency to address these costs.

SUMMARY

It is our opinion that closure costs as developed by LMI are low at \$24 million. Based upon this preliminary review we would increase the costs as shown in Table 1 to about \$47.5 million. These costs could increase if additional contaminated soils were found on site or could decrease if less waste rock was proven to be acidic or if the net present value of future costs was used.

Table 1- Comparison of Costs

Closure Cost	LMI Estimate	SENES
Underground Mine	\$428,282	\$510,722
Tailings Areas	\$3,875,562	\$5,078,724
Building /infrastructure Demotion	\$6,664,708	\$6,859,508
Chemicals	\$2,498,718	\$3,748,798
Waste Rock	\$0	\$2,896,000
Post Closure Monitoring	<u>\$1,573,162</u>	<u>\$7,640,000</u>
Subtotal	\$15,040,432	\$26,733,752
Mobilization/Demobilization	\$6,300,394	\$9,850,394
Project Management (4%, 5%)	\$601,617	\$1,336,688
Insurance (0%, 1%)	\$0	\$267,338
Engineering (4%, 10%)	\$601,617	\$2,673,375
Contingency (10%, 25%)	\$1,504,043	\$6,683,438
Total Costs	\$24,048,104	\$47,544,984