

## ASX ANNOUNCEMENT

27 November 2019

### Goulamina Metallurgy Testwork Surpasses Expectations

#### **HIGHLIGHTS**

- Achieved target of 6% Li<sub>2</sub>O concentrate grade on a consistent basis
- **World class overall lithium recovery of 87%**
- Low iron content in concentrates of less than 0.7% Fe<sub>2</sub>O<sub>3</sub> from magnetic separation testwork in cooperation with CRIMM in China
- Mica content less than 1%
- Final stage of variability testwork now underway

Mali Lithium (ASX: MLL) is pleased to report that further metallurgical testwork using Goulamina project ore has resulted in a significant improvement in results from those achieved in the project's Pre- Feasibility Study (PFS) in June last year. The Mali Lithium processing team has utilised innovation, experience and lessons learnt from recently commissioned Lithium Concentration plants to improve lithium recovery and product quality by focusing on four main areas:

1. Substituting reflux classification technology for selective mica pre-flotation to remove mica from the final product.
2. Utilising innovative technology from CRIMM allowing the use of "High intensity permanent magnetic separators" to effectively remove Fe<sub>2</sub>O<sub>3</sub> while minimising the corresponding loss of Lithium.
3. Selection of flotation reagents specifically tailored to maximise recovery of Lithium from the Goulamina Ore, based on experience of the metallurgical team and the Nagrom Laboratory.
4. Deletion of Dense Media Separation (DMS), which has thus far formed part of the recovery process, as it will only produce a small volume of coarse product



For this testwork programme a composite sample of drill core from six previously drilled HQ (64mm diameter) diamond drill holes located in the main and west pit was created. The sample had an average grade of 1.74% Li<sub>2</sub>O which is higher than the PFS reserve grade of 1.56% Li<sub>2</sub>O. This is a consequence of selection of drill core to provide a representative sample of ore from the first five years of mining.

While higher feed grades can be associated with more easily achieving the 6% target product grade, the Mali Lithium team is confident that with the flotation testwork conducted and with further upcoming variability testwork, the excellent trends achieved in this round can be successfully replicated across a range of feed grades.

Water was shipped from the Goulamina site for use in the testwork to ensure realistic conditions and credible results.

Two separate batches of testwork were conducted. The first at the Nagrom Laboratory in Western Australia and the second at the Changsha Research Institute of Mining and Metallurgy (CRIMM) Laboratory in China.

### **Nagrom Laboratories**

The testwork at Nagrom consisted of:

1. The composite core material was crushed using High Pressure Grinding Rolls (HPGR) and screened at 3.35mm before being split into numerous sub-samples.
2. Reflux classification testwork for Mica removal was conducted on some samples
3. The remaining samples were used for flotation baseline and optimisation testwork. Preparation of samples was conducted as follows:
  - a. Samples were milled, initially to 80% passing 106micron
  - b. Desliming of milled samples. Initially double stage desliming followed by single stage desliming
  - c. Removal of Iron bearing minerals using electromagnetic separators
  - d. Mica pre-float removal testwork was conducted and optimised
4. Flotation testwork involved the use of several reagents to optimise the flotation regime.
5. Different grind sizes were used to optimise the flotation results. These were 80% passing 106, 150 and 212 microns
6. All baseline and optimisation tests were conducted on small batch samples, and the optimised regime repeated on three larger bulk samples

The significant results that emerged from the Nagrom testwork were:

1. Mica pre-float proved exceptionally successful in removing Mica from the final concentrate **with levels consistently < 1%**.
2. A grind size of 150 microns proved optimal for maximising recovery and achieving a 6% Li<sub>2</sub>O product
3. DMS was removed from the flow sheet to simplify the process and improve overall Lithium recovery
4. A selection of final flotation reagents was made
5. **Overall recovery 87% on a 6% Li<sub>2</sub>O concentrate grade**

A summary of significant results from the Nargrom testwork is shown in table 1 below.

Test description and Variations	%Li <sub>2</sub> O	%Fe <sub>2</sub> O <sub>3</sub>	Mica	Overall %Recovery*
2.5 L Cell, Grind 212 microns	6.0	0.67	<1%	<b>81.5</b>
2.5 L Cell, 1 Grind 212 Microns	6.1	0.66	<1%	<b>81.1</b>
2.5 L Cell, Grind 212 Microns	6.1	0.64	<1%	<b>85.4</b>
2.5 L Cell, Grind 212 Microns	6.1	0.65	<1%	<b>87.0</b>
2.5 L Cell, Grind 150 microns	6.0	0.62	<1%	<b>87.4</b>
40 L Cell, Grind 150 microns (Bulk test)	<b>6.1</b>	<b>0.78</b>	<1%	<b>87.6</b>

*Table1 – Significant Nagrom testwork results, each using slightly different flow sheet regimes*

### **CRIMM Laboratory**

Testwork at the CRIMM laboratory focused on finding a more efficient and operationally effective method of Fe<sub>2</sub>O<sub>3</sub> removal than electromagnetic Wet High Intensity Magnetic Separation (WHIMS) equipment, traditionally used for Iron removal in Spodumene Concentrators.

As seen from the results above, in the Nagrom laboratory, the WHIMS electromagnets effectively removed Fe<sub>2</sub>O<sub>3</sub> however approximately 5% of Li<sub>2</sub>O was lost (contributing to the 13% loss overall). CRIMM utilises permanent magnets able to increase the amount of Iron removal and reduce Lithium losses. In addition, Permanent magnetic separators eliminate operational issues associated with WHIMS.

The CRIMM testwork consisted of:

1. Crushing 500kg sample to 3.35mm and splitting into sub-samples



2. Conducting magnetic separation testwork at various magnetic field strengths
3. Optimising the magnetic separator circuit to reduce losses of  $\text{Li}_2\text{O}$

The results of the CRIMM testwork can be summarised as:

1. Successful removal of approximately 40% of the total  $\text{Fe}_2\text{O}_3$  from the feed ore. (traditional WHIMS removes approximately 20%)
2. Minimising loss of  $\text{Li}_2\text{O}$  to <1% (as compared to 5% measured with WHIMS)

When these extremely encouraging results are combined with the already high quality concentrate produced at the Nagrom Laboratory, even lower Iron content and higher recoveries could be expected. This will be done in subsequent testwork when the product from CRIMM is returned to Australia to be tested with the established process flow.

Iron Oxide is considered a deleterious element in Lithium Concentrate products due to the negative impact on final product quality of the Lithium Salts (Carbonate and Hydroxide) produced post conversion of the Lithium Concentrate. Levels of Iron Oxide <1% in Lithium Concentrates are considered low and hence indicate a high-quality product. Based on results from the Iron removal testwork, Mali Lithium will be producing an extremely high quality product rivalling concentrates currently being produced.

CRIMM is a subsidiary of major Chinese mining house China Minmetals Corporation and has specialist knowledge and experience in Lithium beneficiation, such as magnetic separation techniques and diverse equipment used in lithium ore beneficiation.

### **Next Steps**

The next step for testing of the Goulamina Ore is variability testwork, which will use the same flotation parameters across a range of feed grades of  $\text{Li}_2\text{O}$  to ensure that the concentration process will deliver similar or improved results, under varying conditions and feed grades, invariably encountered in an operational mine site.

Mali Lithium Managing Director, Chris Evans said *“The flotation, mica removal and magnetic separation testwork recently completed have demonstrated we can exceed our target of producing a high quality, high grade 6%  $\text{Li}_2\text{O}$  concentrate with an overall 87% recovery from our ore at Goulamina,”*



Mr Evans said that recent developments in the Lithium market has shown that only high quality, low cost producers can survive. *“Our testwork has shown us that with our World Class ore body and technical experience we are able to produce concentrate which could be amongst the lowest Iron and Mica content concentrate on the market. and at the same time ensure low operating costs by having high recovery rates. I couldn’t be happier with the results of this recent round of testwork”*

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### **Competent Persons Statement**

Information in this announcement relating to the Goulamina Lithium Project is based on technical data compiled or supervised by Mr Walter Mädél, a full-time employee of Mali Lithium. Mr Mädél is a member of the Australian Institute of Mining and Metallurgy (AUSIMM) and a mineral processing professional with over 27 years of experience in metallurgical process and project development, process design, project implementation and operations. Of his experience, at least 5 years have been specifically focused on hard rock pegmatite Lithium processing development. Mr Mädél consents to the inclusion in the announcement of the matters based on this information in the form and context in which it appears.

### **About Mali Lithium**

Mali Lithium Limited (ASX:MLL) is developing the world class Goulamina Lithium Project in Mali, West Africa. Goulamina is fully permitted and is the world’s largest uncommitted hard rock Lithium Reserve. The company is currently completing its Definitive Feasibility Study and has released the results of its Pre-Feasibility Study (PFS) on the project to the ASX on 4 July 2018.

The Company also has a diversified commodity portfolio containing prospective gold tenements in southern Mali from which it intends to generate near term value for shareholders.

**APPENDIX**  
**JORC Code, 2012 Edition – Table 1**  
**Section 1 Sampling Techniques and Data**

Criteria	JORC Code explanation	Commentary
Sampling techniques	<ul style="list-style-type: none"> <li>Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.</li> <li>Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.</li> <li>Aspects of the determination of mineralisation that are Material to the Public Report.</li> <li>In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.</li> </ul>	<ul style="list-style-type: none"> <li>Sample used for this testwork: Whole core sample extracted via HQ drilling from two ore bodies on site in Mali – Main and West. No sample from the Sangar ore body was sourced for this testwork.</li> <li>Samples were air-freighted to Perth, Western Australia from Bamako in Mali. Whole HQ core was broken and bagged, each bag containing 1m interval. Intervals were kept separate throughout.</li> <li>Sample consists of total of six HQ drill holes to represent first proposed years of mining and included only fresh ore equivalent (no weathered ore).</li> <li>Three samples from Main: <ul style="list-style-type: none"> <li>GMRC238D (18m-52m)</li> <li>GMRC239D (12m-79m)</li> <li>GMRC240D (44m-78m)</li> </ul> </li> <li>Three samples from West: <ul style="list-style-type: none"> <li>GMRC244D (12m-48m)</li> <li>GMRC246D (8m-43m)</li> <li>GMRC249D (17m-44m)</li> </ul> </li> <li>The samples are sourced from continuous intervals of full HQ core including coarse and fine spodumene containing core corresponding to logging records of twin RC holes.</li> <li>Total mass of bulk sample approximately 1500kg.</li> <li>All whole core was crushed at ALS laboratories to -32mm to comply with the specifications of the HPGR vendor conducting the HPGR testwork at ALS technologies.</li> <li>After completing HPGR crushing at ALS, the bulk sample was shipped to Nagrom laboratories for final HPGR crushing and subsequent metallurgical testwork.</li> </ul>
Drilling techniques	<ul style="list-style-type: none"> <li>Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).</li> </ul>	<ul style="list-style-type: none"> <li>Drill holes were completed by diamond drilling techniques.</li> <li>Diamond drill hole are HQ-sized (64mm diameter core).</li> </ul>
Drill sample recovery	<ul style="list-style-type: none"> <li>Method of recording and assessing core and chip sample recoveries and results assessed.</li> <li>Measures taken to maximise sample recovery and ensure representative nature of the samples.</li> <li>Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.</li> </ul>	<ul style="list-style-type: none"> <li>Recovery of HQ drill core is generally 100% due to the competent nature of the ore.</li> <li>Drill sample quality is considered to be excellent.</li> <li>The core recovered is considered to be representative of the ore body at the drill location and fit for sampling.</li> <li>ML does not consider any bias as there was no loss or gain of fine or coarse material.</li> </ul>

Criteria	JORC Code explanation	Commentary
Logging	<ul style="list-style-type: none"> <li>Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.</li> <li>Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.</li> <li>The total length and percentage of the relevant intersections logged.</li> </ul>	<ul style="list-style-type: none"> <li>All cored material has been geologically logged by Company geologists.</li> <li>Where appropriate, geological logging recorded the abundance of specific minerals, rock types and weathering using a standardised logging system.</li> <li>Diamond drilled holes for metallurgical testing were drilled as twins to previously drilled RC holes to ensure the mineralised intervals are representative.</li> <li>All core was photographed in trays in wet and dry state, and photographs stored in the ML database.</li> </ul>
Sub-sampling techniques and sample preparation	<ul style="list-style-type: none"> <li>If core, whether cut or sawn and whether quarter, half or all core taken.</li> <li>If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.</li> <li>For all sample types, the nature, quality and appropriateness of the sample preparation technique.</li> <li>Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.</li> <li>Measures taken to ensure that the sampling is representative of the in-situ material collected, including for instance results for field duplicate/second-half sampling.</li> <li>Whether sample sizes are appropriate to the grain size of the material being sampled.</li> </ul>	<ul style="list-style-type: none"> <li>Full HQ core was utilised to make up the bulk sample for metallurgical testing.</li> <li>For metallurgical testwork, all samples were crushed by HPGR and screened to -3.35mm after completion of HPGR testwork.</li> <li>At Nagrom laboratories, all metallurgical samples were weighed, dried and crushed to -2mm in a jaw crusher. A 1.0kg split of the crushed sample was subsequently pulverised in a ring mill (with tungsten-carbide bowl and rings) to achieve a nominal particle size of 85% passing 75µm.</li> <li>Sample sizes and laboratory preparation techniques are considered to be appropriate.</li> </ul>
Quality of assay data and laboratory tests	<ul style="list-style-type: none"> <li>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.</li> <li>For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.</li> <li>Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.</li> </ul>	<ul style="list-style-type: none"> <li>Analysis for lithium and a suite of other elements is undertaken at ALS and Nagrom Perth by ICP-AES after Sodium Peroxide Fusion. Detection limits for lithium are 0.01-10%.</li> <li>For remaining elements reported (excluding Li<sub>2</sub>O), standard XRF methodology was utilised</li> <li>Sodium Peroxide fusion is considered a "total" assay technique for lithium</li> <li>No geophysical tools or other non-assay instrument types were used in the analyses reported.</li> <li>Review of routine standard reference material and sample blanks suggest there is a small positive analytical bias for assays &lt;0.3% Li<sub>2</sub>O in the reported analyses.</li> </ul>
Verification of sampling and assaying	<ul style="list-style-type: none"> <li>The verification of significant intersections by either independent or alternative company personnel.</li> <li>The use of twinned holes.</li> <li>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.</li> <li>Discuss any adjustment to assay data.</li> </ul>	<ul style="list-style-type: none"> <li>Twin RC holes exist for every HQ hole but were not utilized to verify data of HQ holes.</li> <li>Existing assays from twin RC holes were only used to estimate an indicative final grade and consistency of bulk sample.</li> <li>There were no adjustments to assay data.</li> </ul>

Criteria	JORC Code explanation	Commentary
<i>Location of data points</i>	<ul style="list-style-type: none"> <li>• Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.</li> <li>• Specification of the grid system used.</li> <li>• Quality and adequacy of topographic control.</li> </ul>	<ul style="list-style-type: none"> <li>• Drill hole collars were set out in UTM grid Zone 29N and WGS84 datum.</li> <li>• Drill hole collars were initially set out using hand held GPS.</li> <li>• All drill holes are routinely surveyed for down hole deviation at approximately 50m spaced intervals down the hole.</li> <li>• Worldview 2 elevation data was used to establish topographic control where appropriate.</li> <li>• Locational accuracy at collar and down the drill hole is considered appropriate for core drilling.</li> </ul>
<i>Data spacing and distribution</i>	<ul style="list-style-type: none"> <li>• Data spacing for reporting of Exploration Results.</li> <li>• Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.</li> <li>• Whether sample compositing has been applied.</li> </ul>	<ul style="list-style-type: none"> <li>• Holes drilled for metallurgical testing were distributed within the zones of indicated mineralisation in the Main and West zones and were focussed on the material likely to be produced in the first year's production.</li> </ul>
<i>Orientation of data in relation to geological structure</i>	<ul style="list-style-type: none"> <li>• Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.</li> <li>• If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.</li> </ul>	<ul style="list-style-type: none"> <li>• The drill hole orientation was designed to intersect the mineralised pegmatites as close to perpendicular as possible for the drilling method.</li> <li>• Drilling orientation has generally not biased the sampling.</li> <li>• The Competent Person considers that the drilling directions utilised were appropriate for proper intersection of the pegmatite ore bodies to yield core suitable for the nature of metallurgical testwork.</li> </ul>
<i>Sample security</i>	<ul style="list-style-type: none"> <li>• The measures taken to ensure sample security.</li> </ul>	<ul style="list-style-type: none"> <li>• Samples are stored on site prior to shipping to Australia where they are stored in drums at the analytical laboratories.</li> </ul>
<i>Audits or reviews</i>	<ul style="list-style-type: none"> <li>• The results of any audits or reviews of sampling techniques and data.</li> </ul>	<ul style="list-style-type: none"> <li>• A review of the sampling techniques for metallurgical testing has not been undertaken by a third party.</li> </ul>