

Metallurgical Test Work Indicates Favourable Recoveries and Identifies Areas for Optimization at Marimaca

24.06.2020 | [GlobeNewswire](#)

VANCOUVER, June 24, 2020 - [Marimaca Copper Corp.](#) ("Marimaca Copper" or the "Company") (TSX: MARI) is pleased to provide a summary of the metallurgical test work which has been completed for its flagship Marimaca Copper Project ("Marimaca" or "the Project"), as well as an outline of the current detailed metallurgical work, which is ongoing and is expected to be completed in the current quarter.

Highlights

- The three phases of column and bottle roll test work already completed indicated fast leaching and favourable recoveries, especially in the dominant oxide mineral zones which comprise the majority of the deposit
 - Average 84% recovery of the total copper was obtained in bottle roll testing completed on ore samples taken from mineral zones comprising the expected early years of mine life
 - Average recoveries were 4.8% higher than average acid soluble copper across all samples
 - Indicates leaching recovery, in a heap leach operation, is likely to exceed the acid soluble copper percentage for the mineral sub-zones of Marimaca
- Phase 4 test work is underway and expected to be completed later this month with results to be released during Q3
 - Includes material from La Atomica and Atahualpa which were outside of the original mine plan
 - Tests will include acid leaching with seawater, with and without added chloride ions, conducted in bottle rolls; 30cm mini-columns; 1.5m columns; and in a ROM leach characterisation for low grade material
- Phase 5 test work will commence in Q3 to further refine results from first four phases and address variability across the deposit

Michael Haworth, Executive Chairman of Marimaca Copper commented:

"Metallurgy is one of the key de-risking milestones to address in the development of any mining project. For Marimaca, we have already completed multiple phases of test work to assess the deposit's metallurgical characteristics.

"The results have been very pleasing, especially with respect to the materials which approximately comprise the first five years of the potential mine life, which is the all important payback period. The results show recoveries of over 84% of total copper, on average, in laboratory scale testing. Perhaps most importantly, these results exceeded the expected acid solubility ratio of the ore samples tested. This means that some of the minor copper bearing minerals, which weren't initially identified as acid soluble, are also amenable to acid leaching and gives us great optimism for the potential for higher recoveries in an eventual heap leaching operation.

"It is also clear that, with the amount of technical work and de-risking milestones achieved already, we are well ahead of a typical PEA stage of development. The Phase 4 metallurgical program, which is due to be completed later this month and released during the third quarter, will significantly advance our knowledge and provide additional data across many parts of the deposit. This will provide the Company with a robust geometallurgical model which, in turn, will allow a detailed life of mine analysis of metallurgical recoveries for future studies. Phase 5, which is expected to commence in the 3rd quarter of this year, will allow us to focus on optimizing a very exciting copper project, as we move into the next phases of study."

Marimaca Copper Project Overview

Marimaca Copper released an updated Mineral Resource Estimate (“MRE”) for Marimaca of 70 million tonnes, with an average grade of 0.60% total copper, within the Measured & Indicated Categories (approximately 420Kt of contained copper) and 40 million tonnes, with an average grade of 0.52% total copper, within the Inferred Category (approximately 224kt of contained copper) (refer release on 2 December 2019). This represents an increase of almost 100% from the MRE released in April 2018 and makes the Project one of the most significant copper oxide discoveries in Chile in the last decade.

The Company is currently undertaking a PEA for the Project, which is anticipated to be completed in July 2020. The Project is expected to benefit from low upfront capital development costs and, due to the favourable geometry of the orebody and relatively simple oxide processing through SX-EW, management believes the Project will have very competitive operating costs, delivering compelling economics in the PEA.

Overview of Metallurgical Test Work Programs Completed

The Company has completed three phases of metallurgical test work between April 2017 and March 2018, with a fourth phase currently underway and expected to be completed and released to the market in the coming months. A fifth phase, which extends the previous programs will commence in the 3rd quarter of 2020. The results of Phases 1, 2 and 3 were included in the NI43-101 Definitive Feasibility Study for Marimaca 1-23, released on the 29th of June 2018.

These tests have been carried out by Geomet S.A., a well known Chilean laboratory with considerable experience in metallurgical programs for copper deposits in Chile. Phase 4 has been designed and executed under the supervision of Marcelo Jo de Jo & Loyola Process Consultants, who has 35 years’ experience in processing. He is supported by Randolph E. Scheffel, a Consultant Metallurgical Engineer with over 35 years’ experience in copper processing.

These tests were completed on materials obtained from Marimaca to characterise the metallurgical response of the deposit to different operational conditions. The first three phases were performed on a variety of parameters including agglomeration conditions, granulometry, column height, irrigation rates and acid consumption. These tests were followed up with more detailed analysis including bottle roll Iso-pH tests.

The fourth phase program, which is almost complete, comprises broader, more detailed and rigorous programs, which will provide the final technical data and information required for a Preliminary Feasibility Study.

A fifth phase will be undertaken to refine any remaining areas of potential risk or gaps in information and knowledge of the Project. This will likely include optimisation of both acid consumption and recoveries, as well as addressing variability across the deposit, and providing information for the completion of a Definitive Feasibility Study.

Figure 1 below shows the locations of samples used in Geomet Phase 1-2-3-4 testing programs.

Figure 1: Plan Showing Location of Samples from Marimaca Geomet Test Work Programs Phases 1 to 4 is available at <https://www.globenewswire.com/NewsRoom/AttachmentNg/ab516c02-1aed-4d7d-9fcc-3080a0831d59>

METALLURGICAL TESTING PHASES 1 & 2

The first two phases of metallurgical test work, carried out in April and September 2017, were preliminary in nature and designed to characterize the Marimaca Project’s copper oxide metallurgical response. Seven composite samples were prepared for column leaching tests, considering the mineral zones of the deposit which were identified at that time.

The copper oxide species present are brochantite, atacamite, chrysocolla and copper wad. The observed gangue minerals include scarce calcite. Most of the oxides occur as fractures impregnation and filling.

The following table shows the chemical characterization of each sample, the main copper species and composite location.

Sample	CuT %	CuS %	Solubility Rate %	Average Acid Consumption kg/t	Mineralogical Characterization (location)
M1	0.88	0.71	80	49	Chrysocolla (Pit 2)
M2	1.47	1.17	79	32	Brochantite/Atacamite > Supergene sulfide (Pit 2)
M3	0.49	0.32	65	53	Wad dominant (Pit 2)
M4	0.81	0.71	87	39	Chrysocolla (Pit 1)
M5	1.14	0.97	85	39	Brochantite/Atacamite (Pit 1)
M6	0.62	0.47	75	30	Wad dominant > Supergene sulfide (Pit 1)
M7	0.58	0.40	69	23	Mixed Primary Sulfides-Supergene > Oxides (High Pit)

Table 1: Summary of Sample for Met Testing Phases 1 & 2

Description of the Tests

In April 2017, Geomet S.A. laboratory was commissioned to start Phase 1 of the initial metallurgical program which included the mechanical preparation of the ore samples, its characterization, head granulometry analysis, sulphation tests, ISO-pH tests, leaching tests at two granulometries in seven columns of 6" diameter and 1 meter height in duplicate, tailings analysis was considered for each test. A key outcome of the tests was the estimation of potential copper dissolution that may be expected in a leaching operation, which is the ratio of acid soluble copper (CuS %) to total copper in a sample (CuT %) (the acid Solubility Ratio), as shown in the above table. The laboratory procedure to determine CuS is to contact a 1 g of pulverized ore sample with 50ml of sulfuric acid solution at 5% v/w, while agitating for one hour and analyze the copper dissolution.

Based on the previous Phase 1 results, Geomet S.A. was commissioned in September 2017 to execute Phase 2 of the metallurgical program using the same samples, which considered more specific parameters to further optimize the testing results, to inform future process design parameters, including:

- Particle size: - 90% below half inch
- Irrigation Rate – reductions in irrigation rates from phase one to find an optimal rate
- Acid in Agglomeration – sulphation tests to identify acid deficit and triangulate optimal acid application
- Column Leaching – Tests performed at different heights ranging from 1.6m to 3.0m
- Leaching time, application rate and acid consumption

Conclusions

The overall metallurgical response from the first phase showed favourable results supporting good recoveries for the different ore samples tested.

Leach kinetics were rapid with 70% to 80% of total copper recovered within the first one third of the leach cycle. Recoveries ranged from 77% +3% for the Chrysocolla to 58% +3% for the mix of primary sulphide and supergene oxides. Average acid consumption across the samples was, on average, slightly over 40kg/t, indicating a mid range acid consumption profile. The table below shows recoveries and acid consumptions:

Sample	CuT %	CuS %	Recovery (%)	Acid Consumption (kg/t)	Mineralogical Characterization (location)
M1	0.88	0.71	77% +3%	42 +- 4	Chrysocolla (Pit 2)
M2	1.47	1.17	67% +- 3%	50 +- 4	Brochantite/Atacamite > Supergene sulfide (Pit 2)
M3	0.49	0.32	62% +- 3%	52 +- 4	Wad dominant (Pit 2)
M4	0.81	0.71	77% +- 3%	42 +- 4	Chrysocolla (Pit 1)
M5	1.14	0.97	76% +- 3%	37 +- 3	Brochantite/Atacamite (Pit 1)
M6	0.62	0.47	70% +- 3%	38 +- 3	Wad dominant > Supergene sulfide (Pit 1)
M7	0.58	0.40	58% +- 3%	40 +- 3	Mixt Primary Sulfides-Supergene > Oxides (High Pit)

Table 2: Phase 1 & 2 Summary of Metallurgical Results per Sample

Given the preliminary nature of this testing, it was expected that significant further optimisation and improvement would be achieved in following test work campaigns with respect to recovery and acid consumption.

METALLURGICAL TESTING PHASE 3

Phase 3 testing, which was completed in March 2018, was primarily focused on defining the metallurgical response on ore samples which would be expected to be representative of the first five years of extraction. For this reason, the samples tested had a higher proportion of brochantite/atacamite and chrysocolla. 37 composites from 13 drill holes were selected, 10 reverse circulation (RC) and 3 diamond drill holes (DDH).

Test Description

This test program included the head chemical characterization of all composites (CuT, CuS, FeT, Al, Mg, CAA, CO₃, AIS, FeTS and MgS) and the completion of 42 iso-pH 1.5 tests, 37 of them at 48hrs and 5 at 72 hrs.

Main Results

The results of the bottle tests are summarized in table 3 below.

Virtually all samples show total copper recoveries which exceeded the acid solubility ratio for the sample. This confirmed the work completed and results received in Phases 1 & 2.

Sample ID	Leach Time (h)	CuT AQ (%)	CuS (%)	Solub. (%)	Ratio	Avg. Copper Recovery (%)	Ratio Leach Rec./CuS	Acid Consumption (kg/t)	Head (kg/t)	CO ₃ (%)	CAA (kg/t)
								Gross (kg/t)	Net (kg/t)		
M-4	48	1.01	0.81	80		84.7	1.06	35.8	22.9	0.15	28.8
M-5	48	0.74	0.48	64.73		74.8	1.16	30.4	22.1	0.15	35.5
M-6	48	0.37	0.26	70.05		82	1.17	44.3	39.8	1.1	48.1
M-7	48	0.87	0.55	63.35		74.9	1.18	33.3	23.3	0.05	37.8
M-8	48	1.66	1.36	81.64		84.6	1.04	40.8	19.4	0.05	40.2
M-9	48	1.13	0.87	77.1		84.7	1.1	40.3	26	0.45	50.3
M-10	48	0.67	0.53	79.54		86.5	1.09	39.9	31.2	0.4	37.5
M-10	72	0.67	0.53	79.54		87.7	1.1	42.3	34	0.4	37.5
M-11	48	0.61	0.47	76.78		83.7	1.09	39.4	31.6	0.6	34.6
M-12	48	1.05	0.96	90.93		93.3	1.03	42.2	27	0.1	48.2
M-13	48	0.65	0.56	86.27		88.7	1.03	33.5	24.8	0.4	52.2
M-13	72	0.65	0.56	86.27		89.9	1.04	40.4	32.4	0.4	52.2
M-1	48	0.5	0.43	85.03		83.7	0.98	45.3	39.6	0.82	36.8
M-2	48	0.46	0.37	81.08		86.9	1.07	44.7	38.8	0.86	37.5
M-3	48	0.62	0.48	77.56		82.9	1.07	47	40.1	1.05	35.3
M-14	48	1.77	1.63	91.9		95.8	1.04	75.9	52.7	1.9	83
M-15	48	1.32	1.09	82.39		91.4	1.11	71.7	54.2	2.48	69.2
M-16	48	0.83	0.63	75.55		76.7	1.02	64.7	56.4	2.62	70.7
M-17	48	0.38	0.28	74.84		80.5	1.08	81.9	77.8	3.86	75
M-17	72	0.38	0.28	74.84		82.9	1.11	85.3	81	3.86	75
M-18	48	0.78	0.68	87.42		88.9	1.02	39.3	29.6	0.32	61.1
M-19	48	0.54	0.45	82.54		81	0.98	57.7	52.2	1.65	58.1

M-20	48	1.14	0.9	78.78	80	1.01	78.1	65.7	2.57	68.4
M-21	48	0.82	0.72	88.46	87.5	0.99	18.5	8.8	4.34	30.5
M-22	48	1.18	1.09	92.83	90.5	0.97	66.7	52.4	2.13	44.5
M-23	48	1.65	1.58	95.62	93.9	0.98	97.7	76.9	3.96	86.5
M-23	72	1.65	1.58	95.62	93.9	0.98	104.6	83.9	3.96	86.5
M-24	48	1.62	1.41	86.82	89.8	1.03	51.9	32	0.31	37.3
M-25	48	0.4	0.31	77.7	82.8	1.07	33	28.1	0.59	18.1
M-26	48	1.05	0.87	82.83	82.7	1	41.8	29.1	0.36	49.4
M-27	48	0.54	0.43	80.36	82.1	1.02	35.4	29.2	0.63	33.2
M-28	48	0.43	0.33	78.32	79.7	1.02	43.1	38.2	1.37	38.9
M-29	48	0.57	0.5	88.88	88.7	1	60.2	52.9	1.97	46.8
M-30	48	0.85	0.62	73.9	84.2	1.14	48.5	39.2	0.2	38.6
M-31	48	0.59	0.36	62.26	78.3	1.26	32.5	26.4	0.58	38.9
M-32	48	0.72	0.52	72.55	82.8	1.14	40	31.6	0.74	27
M-33	48	0.47	0.34	71.52	77.6	1.09	48.1	43	1.71	71
M-34	48	0.76	0.57	74.71	80.4	1.08	51.6	42.7	1.66	41.8
M-35	48	1.04	0.61	58.81	72.5	1.23	46.2	35.5	0.74	12.3
M-35	72	1.04	0.61	58.81	71	1.21	52.3	42.1	0.74	12.3
M-36	48	0.42	0.34	80.79	82.4	1.02	59.1	54.1	2.16	46.1
M-37	48	1.84	1.56	84.63	87.2	1.03	79.8	56.8	2.39	71.2

Table 3: Iso-pH tests, CuT recovery and acid consumption

Conclusions

For the 42 samples, average recoveries exceeded the acid solubility ratio of the samples by nearly 5%.

The average total copper extraction was 84.15%, and the average of the acid solubility ratio was 79.4% across the samples.

This confirmed the conclusion from previous test work, that a portion of the acid insoluble copper, in some cases a very meaningful portion, was dissolved. This also agrees with the assessment of the likelihood of leaching potential of the materials tested to exceed the acid solubility ratio. This is thought to be a result of the increased exposure time to acid – in the case of the bottle rolls, exposure time of 5hrs and 72hrs, when compared to 1hr in the initial acid solubility test.

The average net acid consumption across the samples was 39.3 kg/t continuing to indicate a mid range acid consumer. It should be noted that acid consumption may be further optimised by adjusting concentrations, but this work will be completed in later phases of testing.

METALLURGICAL TESTING PHASE 4

The Phase 4 metallurgical test work program commenced in January 2020 and is expected to be completed by the end of June 2020 and released during the 3rd quarter. Following on from the results received in Phases 1, 2 and 3, this phase was designed to be broader in its coverage of the metallurgical response of Marimaca, providing significantly more detail with respect to certain mineralisation sub zones and addressing some aspects of variability across the deposit.

Composite samples were taken considering the updated mineral subzones, which are now defined as follows:

- Bronchantite / Atacamite;
- Chrysocolla;
- Wad;

- Mixed; and
- Enriched.

Each zone has different copper mineral species and, it was noted, in the tests conducted in the Phase 3 program, the overall leaching recovery exceeded the acid solubility ratio across the samples. Assessing the leaching characteristics of each subzone, and their true leaching potential, will be an important step in developing a robust geometallurgical model, which can consider variability across the deposit and provide data to optimize future design.

The solubility ratio for copper oxides such as atacamite, brochantite and chrysocolla, which dissolve quickly when exposed to acid, is a good predictor of leachability. However, where the mineralization has several copper bearing minerals with different dissolution characteristics under these leaching conditions, the copper acid solubility ratio may underestimate the acid leaching potential for heap leach operations, especially where some copper sulphides such as chalcocite, covellite and bornite are present, as these sulphides could be partially dissolved under oxidation conditions.

For this reason, it is also common to assay for cyanide soluble copper when assaying copper oxide samples. This gives an indication of the total leaching potential because cyanide dissolves some of the copper sulphides that may be present in the sample and assumes that, during the leaching operation, some oxidation reactions, such as, ferric leaching and/or cupric chloride leaching occur. Due to these reactions during sulphide leaching it can be inferred that copper dissolution in a leaching operation may materially exceed the copper acid solubility ratio identified. Phase 4 metallurgical testing is addressing this point through both mini column and 1.5 m column testing under different leaching conditions.

Tests being undertaken in Phase 4 include:

- Head Chemical Characterization with sequential copper analysis
- Particle size characterization
- 1.5 iso-pH test with and without seawater
- Acid and chloride leaching tests in 30 cm mini-columns
- 1.5 m columns tests; and
- ROM leaching in 1m3 iso containers of a low grade wad sample with minor presence of chrysocolla, atacamite and secondary sulphides.

METALLURGICAL TESTING PHASE 5

Phase 5 metallurgical testing will be informed by the results and synthesis of information obtained in all the previous metallurgical testing programs. Scoping is currently underway for this work and the Company expects that this will provide sufficient information required for a bankable feasibility study and to move into detailed design and engineering.

The test work program will consider parameters including, but not limited to, agglomeration conditions, column height, granulometry, irrigation rate, acid concentration and leaching cycle time.

A core objective of the Phase 5 test plan is to complete the full evaluation of metallurgical variability of the resource, extending on the variability work which is being completed as part of the Phase 4 program. The sample base used in this program will be much larger and will provide data on multiple permutations of mineral sub-zone which may be expected during operations.

Qualified Person

The technical information in this news release, including the information that relates to geology, drilling and mineralization was prepared under the supervision of, or has been reviewed by Sergio Rivera, Vice President of Exploration, [Marimaca Copper Corp.](#), a geologist with more than 36 years of experience and a member of the Colegio de Geólogos de Chile and of the Institute of Mining Engineers of Chile, and who is the Qualified Person for the purposes of NI 43-101 responsible for the design and execution of the drilling program.

The Qualified Person for other content than geological information of this news release is Luis Tondo, Chief Executive Officer and Director of Marimaca Copper, a mining engineer with more than 30 years of experience and a Fellow of The Australasian Institute of Mining and Metallurgy, who is the Qualified Person for the purposes of NI 43-101.

All QPs confirm they have visited the project area, reviewed relevant project information, allowing the correct technical judgement in their respective areas of expertise, in turn used in the writing and reviewing the contents of this news release.

Marimaca Copper and the Marimaca Project

Marimaca is fast becoming recognised as one of the most significant copper discoveries in Chile in recent years as it represents a new type of deposit which challenges accepted exploration wisdom and promises to open up new frontiers for discoveries elsewhere in the country. Marimaca is hosted by intrusive rocks while the numerous manto deposits in the same region are hosted by volcanics. With a lack of new copper exploration discoveries in Chile, the growing Marimaca resource is a high-profile development project as it is situated in the coastal belt at low elevation close to Antofagasta and Mejillones. This prime location could enable its future development at a reduce capital cost relative to many other copper developments. Marimaca will benefit from nearby existing infrastructure including roads, powerlines, ports, a sulphuric acid plant, a skilled workforce and seawater and a relatively low environmental impact.

Contact Information

For further information please visit www.marimaca.com or contact:

Tavistock
+44 (0) 207 920 3150
Jos Simson/Emily Moss
marimaca@tavistock.co.uk

Forward Looking Statements

This news release includes certain “forward-looking statements” under applicable Canadian securities legislation. These statements relate to future events or the Company’s future performance, business prospects or opportunities. Forward-looking statements include, but are not limited to, the impact of a rebranding of the Company, the future development and exploration potential of the Marimaca Project. Actual future results may differ materially. There can be no assurance that such statements will prove to be accurate, and actual results and future events could differ materially from those anticipated in such statements. Forward-looking statements reflect the beliefs, opinions and projections on the date the statements are made and are based upon a number of assumptions and estimates that, while considered reasonable by Marimaca Copper, are inherently subject to significant business, economic, competitive, political and social uncertainties and contingencies. Many factors, both known and unknown, could cause actual results, performance or achievements to be materially different from the results, performance or achievements that are or may be expressed or implied by such forward-looking statements and the parties have made assumptions and estimates based on or related to many of these factors. Such factors include, without limitation: risks related to share price and market conditions, the inherent risks involved in the mining, exploration and development of mineral properties, the uncertainties involved in interpreting drilling results and other geological data, fluctuating metal prices, the possibility of project delays or cost overruns or unanticipated excessive operating costs and expenses, uncertainties related to the necessity of financing, the availability of and costs of financing needed in the future as well as those factors disclosed in the Company’s documents filed from time to time with the securities regulators in the Provinces of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland and Labrador. Accordingly, readers should not place undue reliance on forward-looking statements. Marimaca Copper undertakes no obligation to update publicly or otherwise revise any forward-looking statements contained herein whether as a result of new information or future events or otherwise, except as may be required by law.

Dieser Artikel stammt von [Minenportal.de](https://www.minenportal.de)

Die URL für diesen Artikel lautet:

<https://www.minenportal.de/artikel/310935--Metallurgical-Test-Work-Indicates-FavourableRecoveries-and-Identifies-Areas-for-Optimization-at-Marimaca.html>

Für den Inhalt des Beitrages ist allein der Autor verantwortlich bzw. die aufgeführte Quelle. Bild- oder Filmrechte liegen beim Autor/Quelle bzw. bei der vom ihm benannten Quelle. Bei Übersetzungen können Fehler nicht ausgeschlossen werden. Der vertretene Standpunkt eines Autors spiegelt generell nicht die Meinung des Webseiten-Betreibers wieder. Mittels der Veröffentlichung will dieser lediglich ein pluralistisches Meinungsbild darstellen. Direkte oder indirekte Aussagen in einem Beitrag stellen keinerlei Aufforderung zum Kauf-/Verkauf von Wertpapieren dar. Wir wehren uns gegen jede Form von Hass, Diskriminierung und Verletzung der Menschenwürde. Beachten Sie bitte auch unsere [AGB/Disclaimer!](#)

Die Reproduktion, Modifikation oder Verwendung der Inhalte ganz oder teilweise ohne schriftliche Genehmigung ist untersagt!
Alle Angaben ohne Gewähr! Copyright © by [Minenportal.de](https://www.minenportal.de) 2007-2025. Es gelten unsere [AGB](#) und [Datenschutzrichtlinien](#).