Orion Minerals

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Prieska Zinc-Copper Project Metallurgical Flowsheet Test Work Achieves High Metal Yields and Effective Metal Separation from all Target Zones

- **Flowsheet development phase of metallurgical studies successfully completed.**
- **Zinc and copper successfully separated for all sulphide metallurgical zones.**
- **Metallurgical studies on track with final validation and optimisation work now underway.**

Orion Minerals Ltd (**ASX/JSE: ORN**) (**Orion** or the **Company**) is pleased to announce that the development of a mineral processing flowsheet, for treatment of sulphide zinc-copper mineralisation at the Prieska Zinc-Copper Project (**Prieska Project**) has been successfully completed.

The derived mineral processing flowsheet achieves high zinc and copper recoveries into separated product streams from which the production of high-quality, differentiated zinc and copper concentrates can be yielded.

The processing flowsheet has been tested with notable success on all the mineralised zones of the Prieska deposit that are targeted in the Bankable Feasibility Study (**BFS**) currently underway. The deposit is zoned, for metallurgical testing, by the degree of oxidation, (**shallow supergene and deep hypogene zones)**. The internal variation in zinc and copper grades relative to each other across the deposit was also considered (**zinc-dominant and copper-dominant zones**). Representative core samples for the test work were collected from holes drilled by Orion across these different grade and oxidation zones (refer ASX release 15 November 2017).

Most significantly, effective zinc and copper separation has now been achieved from samples collected within the supergene horizon of the deposit, whilst maintaining acceptable metal yields from both the copper and zinc circuits for differentiated concentrates. This is a notable improvement on the metallurgical performance achieved by historical mining operations and from earlier test work (refer ASX release 15 November 2017).

The derived flowsheet, when applied to samples collected from the supergene horizon, achieved maximum metal recoveries of 88% zinc within the zinc circuit and 74% copper within the copper circuit. Samples collected from the hypogene horizon attained maximum metal recoveries of 85% for zinc within the zinc circuit and 88% for copper within copper circuit.

These metal recoveries, were achieved using only open-circuit testing, (a preliminary step applied to only demonstrate processing flowsheet efficacy) and compare very well to metal recoveries reported to have

been achieved during historical mining operations[1]. Further improvements in metal recovery and the production of optimised, premium quality concentrates can be expected during the follow-up locked-cycle testing that is currently underway.

Locked-cycle testing better simulates the continuous operating conditions of a mineral processing plant and so more accurately defines design metal recoveries and metal concentrate qualities. Locked-cycle test results will form the basis of assumptions to be incorporated into the BFS which is targeted for completion in Q4 2018. A more detailed description of the open-circuit test work methodology used to date is provided in Appendix 1.

Results achieved are summarised in Table 1.

Test Description		Test Head Grade		Cu Circuit Recovery[2]		Zn Circuit Recovery[1]		Combined Tails	
		Cu (%)	Zn (%)	Cu Rec. (%)	Zn Rec. (%)	Zn Rec. (%)	Cu Rec. (%)	Cu Grade (%)	Zn Grade (%)
Cu-rich Deeps	Open Circuit Cleaner	2.3	2.5	87	16	69	3	0.3	0.9
Zn-rich Deeps	Open Circuit Cleaner	1.5	5.7	88	7	85	5	0.1	0.5
Supergene	Open Circuit Cleaner	2.1	3.7	74	7	88	20	0.2	0.2

Table 1: Summary of flowsheet development metallurgical test work results from open circuit tests.

Metallurgical Test Work Approach

Metallurgical studies on the Prieska deposit are being conducted in three defined phases as part of the BFS, these being:

- **Phase 1- flotation amenability scouting:** to determine whether froth flotation (used in historical mining operations) is a mineral processing technique that can continue to be used to recover and concentrate zinc and copper sulphides from the dip and strike extensions of the Prieska deposit that is targeted for future mining;

- **Phase 2 - flowsheet development:** to derive a froth flotation-based processing route, able to produce separated zinc and copper concentrates, within targeted quality ranges and achieve high metal recoveries from all metallurgical zones of the deposit, including open pitable supergene sulphides; and

- **Phase 3 – optimisation and detailed design:** being the final stage of metallurgical design, which aims to optimise, validate and then conclude a detailed design of the ore processing plant, to enable production scheduling and accurate costing.

Results of the successful completion of Phase 1 were reported in November 2017, confirming that the targeted mineralisation at the Prieska deposit was amenable to processing by froth flotation.

The results achieved from Phase 2 test work, reported here, are indicative of how the derived flowsheet performs with respect to recovering and separating targeted metals. Ongoing optimisation aims to improve the resultant concentrate qualities to equal or better the metallurgical performance that was reported to have been achieved during historical mining operations. Over the 20-year mine life, metal

[1] Refer ASX release of 15 November 2017.
[2] Represents the total metal recovered to the high grade cleaner concentrate, high grade cleaner tailings, low grade re-cleaner concentrate, low grade re-cleaner tailings and scavenger rougher concentrate in open circuit testing. Lock-cycle testing aims to recover most of this metal into the final concentrate.

recoveries averaged 85% for both zinc and copper into concentrates that had concentrate grades ranging between 28% to 30% for copper (in the copper concentrates) and 51% to 53% for zinc (in the zinc concentrates)[3].

Achieving effective zinc and copper separation into separate concentrate streams for the supergene zone of the deposit is significant in regard to the BFS studies which are considering early mining and cashflow generation from a low capital intensity open pit. The supergene horizon, extending from near-surface to approximately 100 metres below surface, holds an Indicated Mineral Resource of 1.2 million tonnes grading 2.6% zinc and 2.4% copper (refer Table 2).

The deep hypogene sulphide zone, targeted for exploitation by underground mining, is currently estimated as an Inferred Mineral Resource amounting to 22.6 million tonnes grading 3.7% zinc and 1.2% copper, (refer Table 2)[4].

The metallurgical test work results achieved to date confirm that the Prieska deposit is amenable to efficient treatment applying widely-used, well-understood mineral processing techniques and using standard, widely available reagents.

Process Flowsheet

The derived process flowsheet (Figure 1) is an improvement on the historical ore processing route. This process flowsheet will form the basis of process design, equipment selection and equipment sizing, and will be refined and optimised as the results of scheduled metallurgical test work become available.

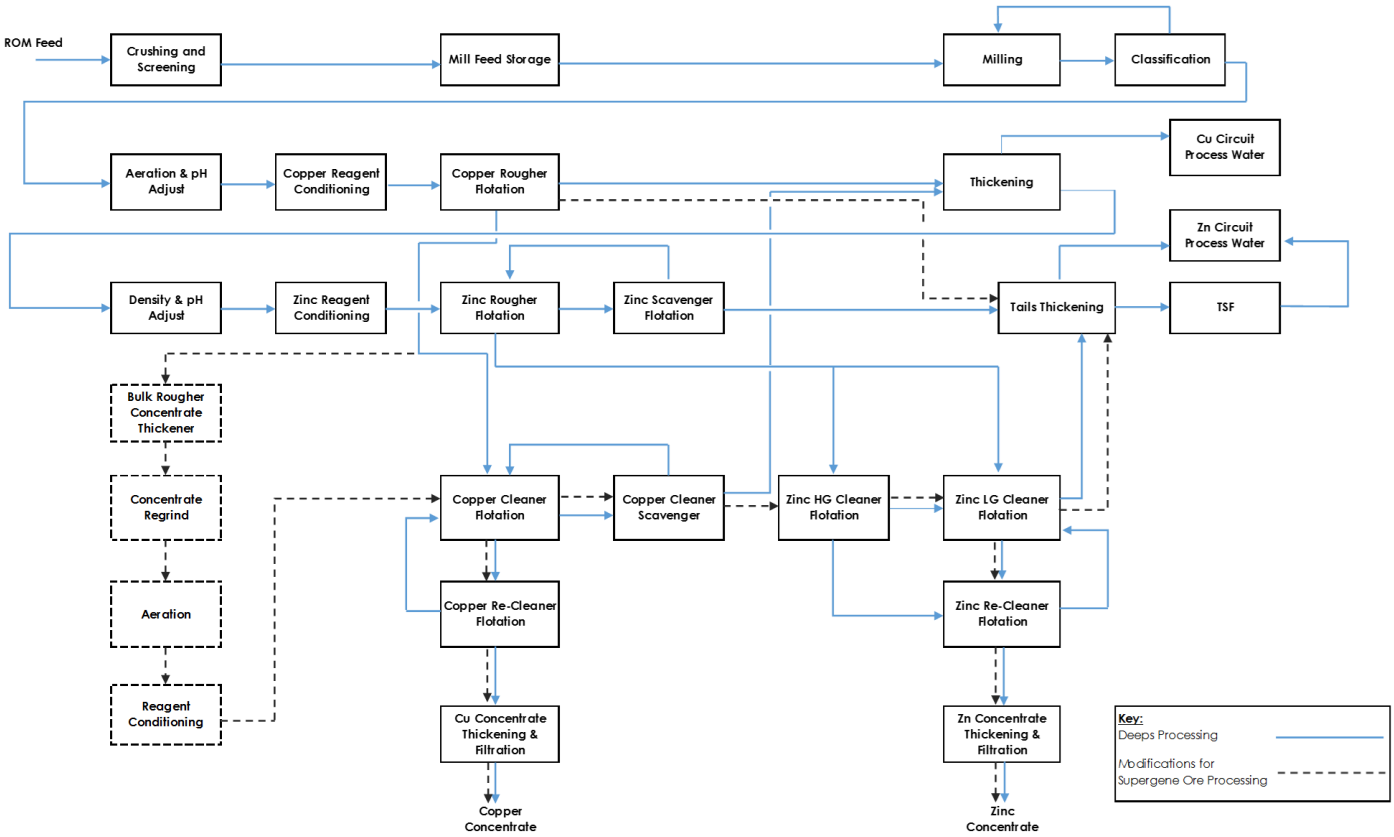


Figure 1: Schematic of the froth flotation flowsheet derived to process the Prieska Zinc-Copper deposit.

[3] Refer ASX release 15 November 2017.
[4] Refer ASX release 8 February 2018.

Prieska Project Background

The Prieska Project is in the Northern Cape province of South Africa approximately 290km south-west of the city of Kimberley, (Figure 2). Prieska Copper Mine operated as an underground zinc and copper mine, exploiting the Copperton deposit, between 1971 and 1991 to produce 1.01 million tonnes of zinc and 430,000 tonnes of copper in concentrates[5].

Orion is investigating establishing new mining operations to continue the extraction of the remaining zinc-copper mineralisation at Prieska, a volcanogenic massive sulphide – style (**VMS**) deposit, with significant remaining potential. Orion has now delineated, as part of an on-going mine development program a JORC-compliant, global Mineral Resource amounting to 24 million tonnes grading 1.2% copper and 3.5% zinc, comprising, amongst others, a hypogene Inferred Mineral Resources of 22.6 million tonnes grading 3.7% zinc and 1.2% copper (**Deep Sulphide zone**) and a supergene Indicated Mineral Resources amounting to 1.2 million tonnes grading 2.6% zinc and 2.4% copper (**+105 Supergene zone**)[6]. Mineral Resources definition work is ongoing, with objective of upgrading Mineral Resource confidence and to further expand the global Mineral Resource.

Mine development studies are in progress and are scheduled to deliver a BFS in Q4 2018. DRA Projects South Africa Pty Ltd are the lead consultant appointed to compile the BFS, part of which includes design of the ore processing plant. Metallurgical test work is being conducted at the Mintek laboratories in Johannesburg, South Africa.

Figure 2: Location of Prieska Zinc-Copper Project.

[5] Obtained from mine production records.
[6] Refer ASX release 8 February 2018.

Global Mineral Resource For Prieska Project – Repli Trading No 27 (PTY) Ltd

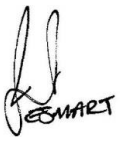
Classification			Zn		Cu		Au		Ag	
		Tonnes	Metal Tonnes	Grade (%)	Metal Tonnes	Grade (%)	Metal Ounces	Grade (g/t)	Metal Ounces	Grade (g/t)
Deep Sulphide	Inferred	22,649,000	839,000	3.71	266,000	1.17	153,000	0.21	6,904,000	9.48
+105 Supergene	Indicated	1,241,000	32,000	2.57	30,000	2.37	9,000	0.23	348,000	8.73
+105 Oxide	Inferred	272,000	2,000	0.86	2,000	0.63	1,000	0.12	17,000	1.82
Total Global		24,162,000	874,000	3.47	297,000	1.23	163,000	0.21	7,269,000	9.36

Note All Resources Stated at Zero Cut-off. All masses rounded to thousands which may result in rounding errors in totals

Table 2: Global Indicated and Inferred Mineral Resource estimate for the Prieska Project (refer ASX release 8 February 2018 for further details).

Orion's Managing Director and CEO, Errol Smart, commented:

" The Phase 2 metallurgical test work results have yet again met all our expectations and are an important advance within the BFS studies underway. The importance of achieving effective metal separation as a precursor to locked cycle test work to optimise concentrate qualities is significant. The suitability of the open pit supergene target to the same process routes and concentrate sales strategies is particularly important.



Errol Smart
Managing Director and CEO

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Competent Persons Statement

The information as presented in this report that relates to the results of metallurgical test work at the Prieska Project is not in contravention of the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (**JORC Code**) and has been compiled and assessed under the supervision of Mr Errol Smart, Orion's Managing Director. Mr Smart (PrSciNat) is registered with the South African Council for Natural Scientific Professionals, a Recognised Overseas Professional Organisation (ROPO) for JORC purposes and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the JORC Code. Mr Smart consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears.

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Appendix 1: Test Work Methodology

Open circuit bench scale flotation tests were conducted in 1kg batches. Each sample was milled using a laboratory rod mill at 50% solids by mass to achieve a target grind of 80% passing 75 microns for the zinc-rich hypogene sample and 70% passing 75 microns for the supergene and copper-rich hypogene samples.

The milled slurry was then transferred into a 2.5 litre flotation cell, which was agitated using a Denver D12 flotation machine at an impellor speed of 1200 rpm. Depending on the feed mass, cleaner flotation testing was conducted in either a 1 litre or 2 litre flotation cell which was agitated using a Denver D12 flotation machine at an impellor speed of 1000 -1200 rpm. The supergene test procedure included a rougher concentrate regrind step which was conducted in a stirred mill using ceramic media to achieve a target grind of 80% passing 25 microns. Concentrates were collected by scraping off the froth at 15 second intervals. All test products were pulverised and assayed for copper, lead, zinc, iron and sulphur using the ICP analysis method.

The total copper circuit recoveries as presented in Table 1, reflect the total recovery to the copper re-cleaner concentrate, re-cleaner concentrate tailings and scavenger cleaner concentrate streams in open circuit testing. The total zinc circuit recoveries as presented in Table 1, reflect the total recovery to the high grade cleaner concentrate, high grade cleaner tailings, low grade re-cleaner concentrate, low grade re-cleaner tailings and scavenger rougher concentrate in open circuit testing.