



## Orion Minerals

ASX/JSE RELEASE: 24 June 2019

### Prieska Bankable Feasibility Study confirms long-life, high-margin South African copper and zinc mine with strong economics

Positive BFS on 2.4Mtpa Project paves way for financing, concentrate off-take and mine construction

#### HIGHLIGHTS

- ▶ Bankable Feasibility Study (BFS) completed on modern 2.4Mtpa underground and open pit mining operation at the Prieska Project in the Northern Cape region of South Africa.
- ▶ The BFS delivers strong project economics with:
  - Undiscounted free cash-flows of AUD1.1 billion pre-tax (AUD819M post-tax).
  - NPV of AUD574M pre-Tax (AUD408M post-tax) at an 8% discount rate.
  - IRR of 38% pre-Tax (33% post-tax).
  - Peak funding requirement of AUD378M.
  - Payback period from first production of 2.9 years.
  - All-in-sustaining margin of 44%.
  - All-in-sustaining unit costs of AUD5,470/t (USD3,773/t) per copper equivalent metal sold.
- ▶ 10-year 'Foundation Phase' delivering payable metal production of 189kt of Copper and 580kt of Zinc in differentiated concentrates.
- ▶ Maiden Ore Reserve of 13.62Mt at 1.1% Cu and 3.2% Zn for 143kt of contained copper and 433kt of contained zinc.
- ▶ Total milled production 20.8Mt at 1.1% Cu and 3.4% Zn (comprising 65% Probable Ore Reserves and 35% Inferred Minerals Resources).
- ▶ Outstanding mine plan optimisation and extensional opportunities including:
  - Over 9Mt @ 1.1% Cu and 3.6% Zn of Mineral Resources not included in the current mine plan.
  - Existing mineralised pillars being assessed for future extraction.
  - Potential additional cashflows from barite and pyrite by-products.
  - High grade drilling intersections on the periphery of the deposit.
  - Significant identified satellite deposit potential within an emerging VMS camp.

#### Next Steps, with the granting of Mining Rights imminent:

- Complete optimisation of the BFS plan.
- Advance project financing discussions.
- Advance project implementation planning.
- Conclude agreements with concentrate off-take partners and key suppliers.

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

"We are delighted with the results of the BFS, which confirm the quality and scale of the Prieska Project and put Orion firmly on-track to become a major new South African base metal producer. The BFS suggests that Prieska will be a high-margin, long life asset, delivering AUD1.1 billion of pre-tax free-cashflow, a pre-tax Net Present Value of AUD574 million at an 8% discount rate and an all-in-sustaining margin of 44% during the 10-year Foundation Phase of the Project.

Importantly, the capital payback period is short - at just under three years from first production, with a low unit operating cost base to take advantage of most metal price environments. There is also ample scope to significantly extend the mine life through further mining studies, drilling and exploration programs to extend the deposit, which remains open at depth and along strike. The huge potential for additional satellite discoveries both within the immediate near-mine environment and within the broader region provides us with a very strong project pipeline which we believe will see us operating in this district for many decades to come.

We have long believed Prieska represents a highly valuable strategic asset with the potential to become a significant source of high-quality copper and zinc concentrates that we believe are highly sought-after in global markets. The favourable results from the BFS strongly support that belief and provide us with the framework to progress this high-quality asset towards financing and production, with an initial focus on harvesting the high-quality resources delineated by our extensive drilling programs undertaken over the past two years.

The Prieska BFS also provides the platform for us to progress the development of what will be a new-generation mining project for South Africa, fully-compliant with the new South African Mining Charter and backed by a strong group of BEE investors and including our host community and employees as shareholders alongside our existing cornerstone shareholders.

With the Prieska BFS now complete and granting of the Mining Right imminent, we intend to fully focus on progressing discussions with project financiers, concentrate off-take partners and key suppliers. We expect to be in a position to make a Final Investment Decision for the Prieska Project development in the second half of this year, putting us on-track to commence construction in late 2019 or early 2020," he said. "I would like to acknowledge the enormous effort of our hard-working team in delivering this outstanding result, which sets Orion up to begin its transformation from explorer to developer."

### Disclosure on Forward Looking Statements

The Bankable Feasibility Study (BFS) reported on herein determines the commercial viability of establishing mining and ore processing operations on the Prieska Copper-Zinc Project (the Project). The BFS has been prepared to an estimation accuracy level of  $\pm 15\%$ . It contains Production Targets and forecast financial information supported by a combination of Probable Ore Reserves and Inferred Mineral Resources, all estimated and disclosed in compliance with ASX Listing Rules and JORC Code (2012) reporting standards. Orion is satisfied that the portions of Inferred Mineral Resources included in the Production Targets (never more than 35% of the mining plan) are not the determining factor in project viability and do not feature as a significant portion early in the mining plan.

Note that there is a low level of geological confidence associated with Inferred Mineral Resources and there is no certainty that further exploration work will result in the determination of Indicated Mineral Resources or that the portion of the production target reliant on Inferred Mineral Resources will be realised.

All material assumptions for the BFS are outlined in this report. These include assumptions about the availability of funding. While Orion considers all of the material assumptions to be based on reasonable grounds, there is no certainty that they will prove to be correct or that the range of outcomes indicated by the BFS will be achieved. Funding in the order of AUD380M (which incorporates a 10% contingency allowance) will be required.

Orion Minerals Ltd (**ASX/JSE: ORN**) (**Orion** or **Company**) is pleased to present the outcomes of a Bankable Feasibility Study for the Foundation Phase of its Prieska Copper-Zinc Project (**Prieska Project** or **Project**), located in the Northern Cape Province of South Africa (**BFS** or **Study**).

The Study confirms the potential of the Prieska Project to underpin a significant near-term, low-cost, copper and zinc development project, with exceptional opportunities for future growth. Based on Study assumptions, the Project will provide excellent financial returns, for a relatively modest capital investment, given the scale of

operations envisaged and the fact that the new production hub is located within a highly-endowed but under-explored volcanic massive sulphide (**VMS**) district, with significant long-term exploration potential.

The BFS investigated the commercial viability of a mining plan for the Foundation Phase aimed at establishing mine infrastructure and operational capacity that is intended to establish the platform for further mining of deposit extensions and the exploration and mine development of neighbouring prospects (**Foundation Phase**).

The Foundation Phase runs for 10 years of run-of-mine production at a design ore processing rate of 2.4Mtpa. This phase targets the exploitation of those portions of the Prieska deposit that were upgraded to Indicated and Inferred Mineral Resources from the first surface-based drilling campaign conducted between 2017 and 2018. The Production Target is composed of 65% Probable Ore Reserves and 35% Inferred Mineral Resources, with Ore Reserves predominating during the early stages of the mining plan.

Both underground and surface mining methods are planned to be used in conjunction with conventional froth-flotation concentration to produce differentiated copper (**Cu**) and zinc (**Zn**) concentrates for export.

Key assumptions and results of the BFS are presented in Table 1 below:

Executive Dashboard					
Production and Financial Summary			Model: OR + IMRE		
Price and FX Assumptions	Unit	Value	Financial Performance	Unit	Value
Metal price – Cu	USD/t	6,834	NPV pre-tax (post-tax) @ 8% discount rate	AUD M	574 (408)
Metal price – Zn	USD/t	2,756	IRR pre-tax (post-tax)	%	38% (33%)
Exchange rate	ZAR:USD	14.5 : 1	Payback from first production	years	2.9
Exchange rate	ZAR:AUD	10 : 1	Undiscounted free cash flow pre-tax (post-tax)	AUD M	1,127 (819)
Exchange rate	AUD:USD	1.45 : 1	Peak funding	AUD M	378
Production Metrics	Unit	Value	Project Cost Metrics	Unit	Value
Life of Mine	Years	9.7	Average cash operating unit cost (C1)	AUD/t	80
Treatment plant capacity	Mtpa	2.4	All-in-sustaining cost per unit ROM t	AUD/t	94
ROM Plant Feed – tonnage	kt	20,827	All-in-sustaining cost per unit Cu_Eq t sold	AUD/t Cu	5,470
ROM Plant Feed – grade - Cu	%	1.10%	All-in-sustaining cost per unit Zn_Eq t sold	AUD/t Zn	1,582
ROM Plant Feed – grade - Zn	%	3.35%	Price received (net of NSR) - Cu	AUD/t Cu	9,785
Overall Plant Recovery - Cu	%	82.7%	Price received (net of NSR) - Zn	AUD/t Zn	2,830
Overall Plant Recovery - Zn	%	83.0%	All-in-sustaining margin	%	44%
Concentrate tonnage - Cu	kt	790	Operating breakeven grade (Cu_Eq)	%	1.2%
Concentrate tonnage - Zn	kt	1,180			
Concentrate grade – Cu U/G (O-Pit)	%	23.8% (25.6%)			
Concentrate grade – Zn U/G (O-Pit)	%	49.9% (35.5%)			
NSR as % of metal price – Cu U/G (O-Pit)	%	98.7% (91.2%)			
NSR as % of metal price – Zn U/G (O-Pit)	%	71.3% (53.7%)			
			Project Cash Flows	Unit	Value
Metal sold (in concentrates) - Cu	tonnes	189,000	LoM net revenue	AUD M	3,284
Metal sold (in concentrates) - Zn	tonnes	580,000	LoM operating costs (+ Royalty and Tax)	AUD M	1,673
Total Sales as Cu equivalent	tonnes	357,000	Project Start-up Capital Expenditure	AUD M	402
Total Sales as Zn equivalent	tonnes	1,233,000	Sustaining Capital Expenditure	AUD M	83

There is a low level of geological confidence associated with Inferred Mineral Resources included in the Production Target and there is no certainty that further exploration work will result in the determination of Indicated Mineral Resources or that the Production Target or financial forecast information will be realised.

**Table 1: Key BFS Results for the Foundation Phase of the Prieska Copper-Zinc Project. Note that the Study estimation accuracy level is ± 15%.**

The Foundation Phase of the Project has undiscounted cashflows of AUD1.1 billion pre-tax (AUD819M post-tax), a Net Present Value (**NPV**) of AUD574M pre-tax and post-royalties (AUD408M post-tax, post royalties), using non-inflation-adjusted estimates and a discount rate of 8%, and achieves an Internal Rate of Return (**IRR**) of 38% pre-

tax (33% post-tax). The NPV is based on long-term forecast metal prices of USD\$6,834/tonne for copper and USD\$2,756/tonne for zinc<sup>1</sup>.

Peak funding requirements amount to AUD378M including a 10% contingency allowance. This would occur in the third year of the capital expenditure (**CAPEX**) program. CAPEX incorporates establishment costs for open pit mining which is planned at the end of the Foundation Phase. Payback is planned to occur 5 years from the start of construction or 2.9 years from the start of production.

Unit all-in-sustaining costs (**AISC**) over the duration of the Foundation Phase would be approximately AUD5,470/t (USD\$3,773/t) copper equivalent metal sold. The realised price (net of smelter charges) would be AUD9,785/t (USD\$(6,748t) copper equivalent metal sold, yielding in the order of a 44% all-in-sustaining margin. The operating break-even grade is estimated at 1.2% copper equivalent, well below the Ore Reserves grade of 2.1% copper equivalent (Cu\_Eq grade (2.1%) = Cu grade (1.1%) + 0.3 x Zn grade (3.4%))<sup>2</sup>, applied in the production schedule.

The NPV estimate is most sensitive to the ZAR-USD exchange rate and least sensitive to capital expenditure. Pre-tax NPV increase from AUD348M to AUD741M as the ZAR-USD exchange rate increases from -15% of the base assumption of 14.5, to +15%. In the case of CAPEX variance, the pre-tax NPV is at a high of AUD622M when the CAPEX is -15% of the base assumption and reduces to a low of AUD526M if CAPEX is increased to +15% of the base assumption.

Beyond the Foundation Phase, it is anticipated that mine-life extension will be underpinned by delineated Mineral Resources not yet incorporated into the mining plan as well as known deposit extensions and existing pillars which are anticipated to require low or no additional capital investment to extend the mine life. Some 9.7Mt of Indicated and Inferred Mineral Resources at grades of 1.1% copper and 3.6% zinc remain outside the immediate mining plan, providing near-term potential to optimise mine plans to incorporate more of these Resources into the Foundation Phase. Significant potential for nearby satellite deposits has also been identified.

## PRIESKA BANKABLE FEASIBILITY STUDY TECHNICAL REPORT EXTRACTS

### Nature of and Contributions to the BFS

The BFS is based on work carried by various consultants and specialists reporting to the Orion Minerals owner's team.

The consultants and specialists are: DRA Projects South Africa (Pty) Ltd; A&B Global Mining; ABS Africa (Pty) Ltd; BPDT & Co.; Bluhm Burton Engineering & Ventilation Consultants; Beulah Africa Pty Ltd; Cart Investments (Pty) Ltd; Earth Science Solutions; Endeavour Financial Limited; Falcon & Hume Attorneys; Fraser McGill Mining & Minerals Advisory; Knight Piésold; METC Engineering Consultants (Pty) Ltd; Mets Consulting South Africa; Patterson & Cooke; PCDS Consultants Pty Ltd; Power Plant Electrical Technologies (Pty) Ltd; Professional Cost Consultants (Pty) Ltd; Questco (Pty) Ltd; Shift Innovations Pty Ltd; Steffen, Robertson & Kirsten South Africa Pty Ltd; The MSA Group (Pty) Ltd; Turnkey Civil (International) Group (Pty) Ltd; VBKom Engineering Consultants; and Z Star Mineral Resource Consultants (Pty) Ltd. Orion's owner's team had overall project management oversight.

References are also made to historical and other more current Project documents.

The report complies with Australian Securities Exchange (**ASX**) listing rules and Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (**JORC (2012)**) reporting standards.

<sup>1</sup> Metal price assumptions based on CIBC Analyst commodity long-term forecast (29 April 2019).

<sup>2</sup> Method used to determine Cu equivalent Zn grades:

$$1\% \text{ Zn} = \frac{(\text{Zn price} \times \text{Zn payability}) \times (\text{Zn plant recovery})}{(\text{Cu price} \times \text{Cu payability}) (\text{Cu plant recovery})} = \frac{(2,756 \times 70.8\%) \times (83.0\%)}{(6,834 \times 98.2\%) (82.7\%)} = 0.3\% \text{ Cu}$$

Cu Equivalent grade = Cu grade + 0.3 x Zn grade.

Recovery assumptions are based on metallurgical test work completed to date at Mintek Laboratories (South Africa) under the supervision of DRA. Refer to Table 1 in the Appendices.

## Project Context and Overview

The Project is located in the Northern Cape Province of South Africa. Figure 1 outlines the location of the Company's exploration activities, with the Prieska Project located at the southern extent, approximately 60km south-west of the town of Prieska.

The BFS evaluates the establishment of new mining operations at the Prieska Copper Mine (**PCM**) which has been closed since 1991. The mine was previously owned and operated by Prieska Copper Mine Limited, a subsidiary of Anglo-Transvaal Consolidated Investment Company Limited (**Anglovaal**).



Figure 1: Location of the Prieska Copper-Zinc Project, Northern Cape Province, South Africa.

The BFS, as summarised herein, was carried out to a cost estimation accuracy level of  $\pm 15\%$  and is supported by a Mineral Resource estimated in accordance with JORC Code guidelines, as announced in January 2019 (refer ASX release 15 January 2019). A detailed underground mine design and schedule, as well as a practical pit design and schedule were completed, containing a combination of Probable Ore Reserves and no more than 21% Inferred Mineral Resources for the first 8 years of production.

The remaining 2 years of the Foundation Phase Production Target is composed of Indicated and Inferred Mineral Resources evaluated by Mine Stope Optimiser (for underground run-of-mine material), and incorporated inside an optimisation economic pit-shell (for open-pit run-of-mine material), using the cost structure and mine modifying factors derived from the first 8 years of the mining plan. In the Study, underground mining is planned to predominate during the first 8 years of production, with open pit mining planned in the latter years.



The Foundation Phase excludes known deposit extensions, remnant pillars and satellite deposits. Some 9.7Mt of delineated Indicated and Inferred Mineral Resources at grades of 1.1% copper and 3.6% zinc have been evaluated to remain outside the immediate mining plan, providing an opportunity to further refine the plan to incorporate some of these excluded Mineral Resources. Project financial evaluations have therefore been limited to considering the Foundation Phase only.

### Ownership and Mineral Tenements

Orion completed the acquisition of Agama Exploration and Mining (Pty) Ltd (**Agama**) in March 2017. Through Agama's subsidiary companies, Repli Trading No 27 (Pty) Ltd (**Repli**) and Vardocube (Pty) Ltd (**Vardocube**), Orion will hold a 70% interest in both the Repli Prospecting Right and the Vardocube Prospecting Right, after reducing its shareholdings in line with South African regulations and policy relating to Black Economic Empowerment (**BEE**). Together these tenements cover the Project site.

The remaining ownership of the Project is to be held by BEE companies (20%), a community fund (5%) and an employee share scheme (5%), as guided by legislative and Mining Charter III prescriptions for promoting transformation. Orion and the BEE partners will proportionately contribute to all project development funding needs. The community fund and employee share scheme are not required to directly contribute to funding project development upfront. However, Orion and the BEE companies are entitled to recover all funding contributions they each make on behalf of the community fund and employee share scheme from project cashflows.

Applications for the Mining Right (**MRA**), Integrated Waste and Water Management Plan licence (**IWWMP**), Integrated Water Use Licence (**IWUL**) and Environmental Authorisation (EA) for the Repli project area were submitted to the relevant authorities in April 2018. Applications for the Vardocube project area were submitted in September 2018. The first of this suite of permits is expected to be granted during Q3 2019, allowing mine construction to be able to commence in the calendar year 2019. Key land access agreements are already in place.

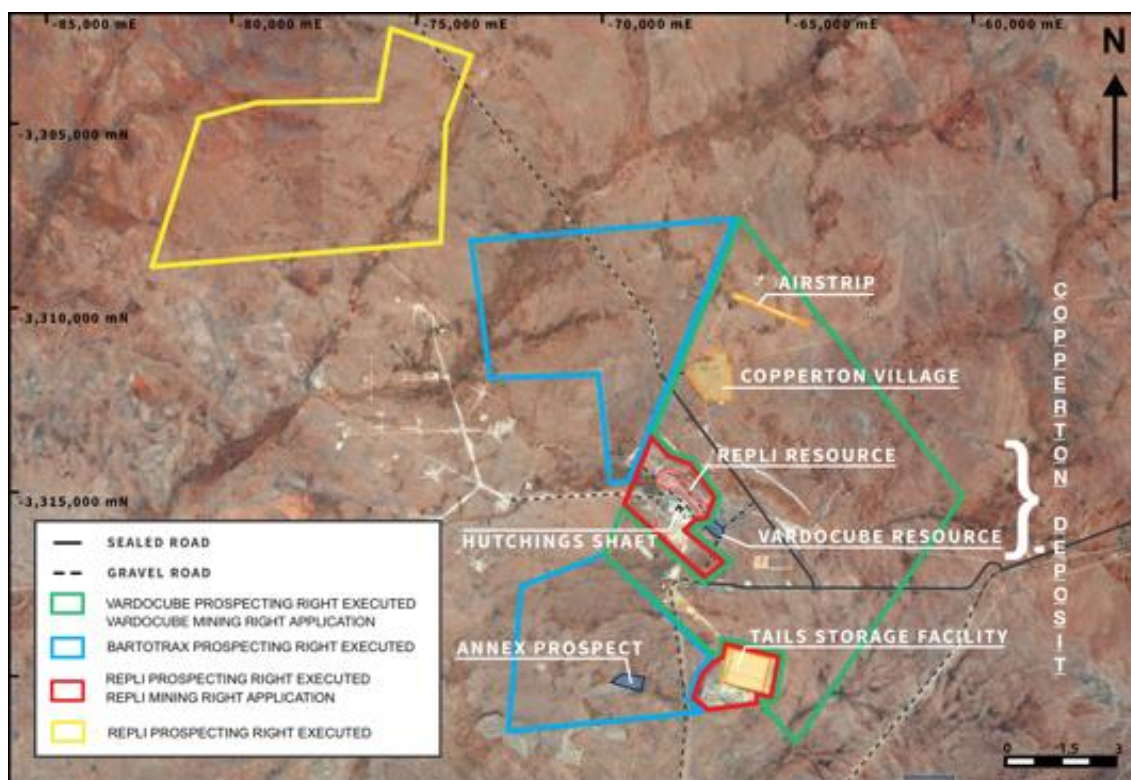


Figure 2: Mineral Tenement Map for the Project Area.

## History

PCM operated the mine from 1971 until 1991. During this time, the mine processed 46Mt of run-of-mine (**ROM**) material and produced 1.01Mt of zinc and 0.43Mt of copper as high-grade concentrates, whilst achieving average processing plant recoveries of 84.3% for zinc and 84.9% for copper, (refer ASX release 15 November 2017). Reported 'mineral reserve' grades at the time the original mine was commissioned were 3.8% zinc and 1.7% copper<sup>3</sup>. Pyrite was also intermittently produced as a by-product. The concentrates were sent to either O'kiep or Zincor for smelting or Saldanha Bay for export.

## Existing infrastructure

Despite the Project site being located in a remote part of South Africa, with no nearby large human settlements, it is well-serviced by infrastructure that was established for the previous mining operation. Existing infrastructure includes a water pipeline from the Orange River, tarred roads, national grid power supply and a 1.7km-long air strip. The village of Copperton, which is located 4km by road from the main rock hoisting shaft, used to be the principal residence for the PCM community. The town is still in use, though only 40 of the original 300 houses remain. The farming service town of Prieska, with a population of 16,000, lies 60km north-east of the Project site. The operating rail siding of Groveput, located 50km from the Project site, on-route to the town of Prieska, provides rail access to the main Kimberley – De Aar railway line.

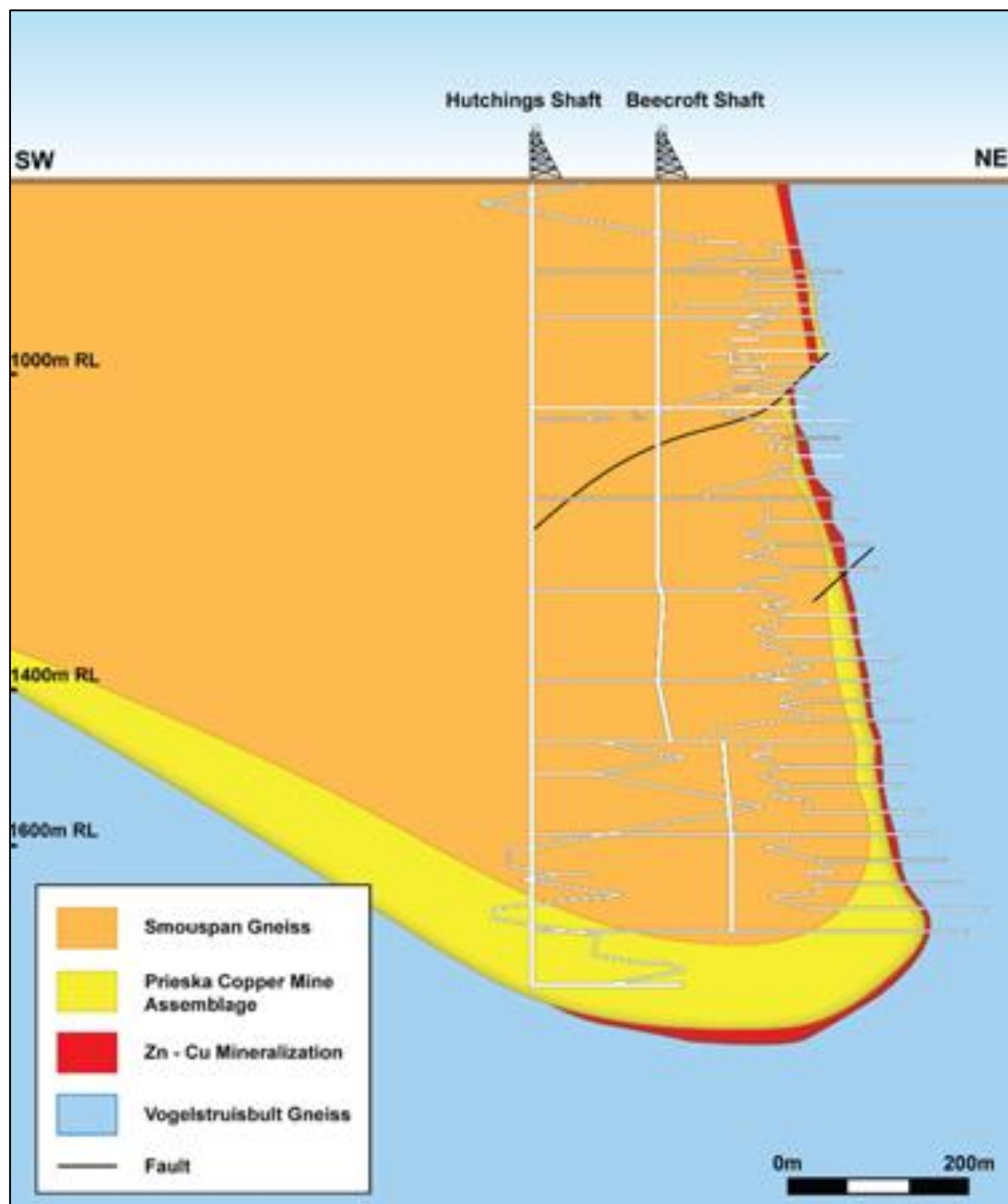
The main hoisting shaft, which is 1,024m deep, 8.8m in diameter and concrete-lined, along with associated concrete headgear, remain intact. New infrastructure, such as rock-and-materials winders, underground rock handling facilities, an ore processing plant and related surface infrastructure, is designed to be purpose-built for the new mine. The mine is currently flooded to a depth of 330m below surface and 14-months of pumping is planned to de-water the mine.

## Mineral Resources and Exploration

The Prieska Deposit is a VMS-style deposit, with mineralisation defined along 2.4km of a northwest-southeast trending strike extent and down to a depth of 1.25km. Mineralisation of Cu, Zn, silver (**Ag**) and gold (**Au**) is in massive sulphides distributed as a persistent lens within gneiss rock assemblages.

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<sup>3</sup> Note that these were historical estimates not compiled in accordance with JORC Code guidelines.



**Figure 3: Geological cross-section through the Prieska Deposit. (modified after Theart et al, 1989 and Wagner and Van Schalkwyk, 1986).**

By the time the mine closed, the deposit had been exploited to a depth of 900m below surface. In addition, strike and dip extensions had been identified, mineral resource estimates prepared and access development partially established into some of the deposit extensions.

Orion used the extensive catalogue of historical data to guide its verification and infill drilling campaigns on both the near-surface +105 Level supergene deposit (+105 Level Deposit) and the Deep Sulphide hypogene deposit (Deep Sulphide Deposit). These programs culminated in the declaration of Mineral Resources estimated in accordance with JORC Code guidelines for both the Deep Sulphide Mineral Resource and the +105 Level Mineral Resource as tabled individually below (refer ASX 18 December 2018 and ASX 15 January 2019).



Deep Sulphide Mineral Resource for Repli + Vardocube Tenements (Effective Date: 15 December 2018) <sup>4</sup>						
Tenement	Classification	Tonnes	Cu (metal tonnes)	Cu (%)	Zn (metal tonnes)	Zn (%)
Repli	Indicated	15,052,000	170,000	1.15	510,000	3.38
	Inferred	6,998,000	80,000	1.04	270,000	3.86
	<b>Total</b>	<b>22,050,000</b>	<b>249,000</b>	<b>1.13</b>	<b>779,000</b>	<b>3.53</b>
Vardocube	Indicated	3,455,000	44,000	1.27	158,000	4.57
	Inferred	3,221,000	41,000	1.27	147,000	4.56
	<b>Total</b>	<b>6,676,000</b>	<b>85,000</b>	<b>1.27</b>	<b>305,000</b>	<b>4.57</b>
<b>Deep Sulphide Total</b>	Indicated	18,507,000	217,000	1.17	667,000	3.60
	Inferred	10,219,000	117,000	1.14	417,000	4.08
	<b>Total</b>	<b>28,726,000</b>	<b>334,000</b>	<b>1.16</b>	<b>1,084,000</b>	<b>3.77</b>
Deep Sulphide Resource bottom cut-off = 4% Equivalent Zn. Mineral Resources stated at zero % cut-off. Tonnes are rounded to thousands, which may result in rounding errors.						

**Table 2: Mineral Resource Estimate – Deep Sulphide Resource.**

+105 Updated Mineral Resource for the Repli Tenement (Effective Date: 11 January 2019) <sup>5</sup>						
Classification	Mineralised Zone	Tonnes	Cu (metal tonnes)	Cu (%)	Zn (metal tonnes)	Zn (%)
Indicated	Supergene	624,000	10,000	1.54	19,000	3.05
	<b>Total</b>	<b>624,000</b>	<b>10,000</b>	<b>1.54</b>	<b>19,000</b>	<b>3.05</b>
Inferred	Oxide	511,000	3,000	0.6	4,000	0.9
	Supergene	627,000	14,000	2.2	11,000	1.8
	<b>Total</b>	<b>1,138,000</b>	<b>17,000</b>	<b>1.5</b>	<b>16,000</b>	<b>1.4</b>
<b>Total</b>	<b>+105 Mineral Resource</b>	<b>1,762,000</b>	<b>27,000</b>	<b>1.5</b>	<b>35,000</b>	<b>2.0</b>
+105m Level Mineral Resource bottom cut-off = 0.3% Cu. Mineral Resources stated at zero % cut-off. Tonnes are rounded to thousands, which may result in rounding errors.						

**Table 3: Mineral Resource Estimate – +105 Level Mineral Resource.**

<sup>4</sup> Mineral Resource reported in ASX release of 18 December 2018: "Landmark Resource Upgrade Sets Strong Foundation" available to the public on [www.orionminerals.com.au/investors/market-news](http://www.orionminerals.com.au/investors/market-news). Competent Person Orion's exploration: Mr. Errol Smart. Competent Person: Orion's Mineral Resource: Mr. Sean Duggan. Orion confirms it is not aware of any new information or data that materially affects the information included above. For the Mineral Resources, the company confirms that all material assumptions and technical parameters underpinning the estimates in the ASX release of 18 December 2018 continue to apply and have not materially changed. Orion confirms that the form and context in which the Competent Person's findings are presented here have not materially changed.

<sup>5</sup> Mineral Resource reported in ASX release of 15 January 2019: "Prieska Total Resource Exceeds 30Mt @ 3.7% Zn and 1.2% Cu Following Updated Open Pit Resource" available to the public on [www.orionminerals.com.au/investors/market-news](http://www.orionminerals.com.au/investors/market-news). Competent Person Orion's exploration: Mr. Errol Smart. Competent Person: Orion's Mineral Resource: Mr. Sean Duggan. Orion confirms it is not aware of any new information or data that materially affects the information included above. For the Mineral Resources, the company confirms that all material assumptions and technical parameters underpinning the estimates in the ASX release of 15 January 2019 continue to apply and have not materially changed. Orion confirms that the form and context in which the Competent Person's findings are presented here have not materially changed.

Combined Prieska Project Mineral Resource for Repli + Vardocube Tenements (Effective Date: 11 January 2019) <sup>5</sup>						
Mineral Resource	Classification	Tonnes	Cu (metal tonnes)	Cu (%)	Zn (metal tonnes)	Zn (%)
Deep Sulphide Resource	Indicated	18,507,000	217,000	1.17	667,000	3.60
	Inferred	10,219,000	117,000	1.1	417,000	4.1
+ 105m Level Resource	Indicated	624,000	10,000	1.54	19,000	3.05
	Inferred	1,138,000	17,000	1.4	16,000	1.4
<b>Total</b>	Indicated	19,131,000	227,000	1.18	686,000	3.59
	Inferred	11,357,000	134,000	1.2	433,000	3.8
<b>Grand Total</b>		<b>30,488,000</b>	<b>361,000</b>	<b>1.2</b>	<b>1,119,000</b>	<b>3.7</b>

Deep Sulphide Resource bottom cut-off = 4% Equivalent Zn; +105m Level Mineral Resource bottom cut-off = 0.3% Cu. Mineral Resources stated at zero % cut-off. Tonnes are rounded to thousands, which may result in rounding errors.

The Mineral Resources are inclusive of Ore Reserves.

**Table 4: Mineral Resource Estimate – Combined.**

Of the 30M tonnes of Mineral Resources delineated, 9.7M tonnes remain outside the current mining plan, pending further mine optimisation studies. There is significant potential for deposit extensions, with 'out of resource' mineralisation confirmed by diamond drill hole core samples. Remnant pillars are also planned for further investigation.

Satellite deposit potential has been demonstrated with recent intersections of sulphide mineralisation at Ayoba, 5km from the proposed Prieska ore processing plant. Further afield, available historical data and recent exploration work by Orion has confirmed the existence of numerous follow-up massive sulphide Cu-Zn-rich targets within the nearby mineral tenements also held by Orion<sup>6</sup>.

### Ore Reserves and Mining Plan

Both open pit and underground mining are planned for the duration of the Foundation Phase, Figure 4. Underground mining is planned to commence on completion of mine dewatering, shaft refurbishment and underground infrastructure establishment, some 24 months from site mobilisation. Underground mining is then scheduled to build up over 14 months to a steady-state run-of-mine production rate of 200ktpm (kilo tonnes per month) or 2.4Mtpa (million tonnes per annum).

<sup>6</sup> Refer to ASX releases 16 January 2019 for Ayoba satellite exploration target and 25 February 2019 for Prieska deposit extensional potential.

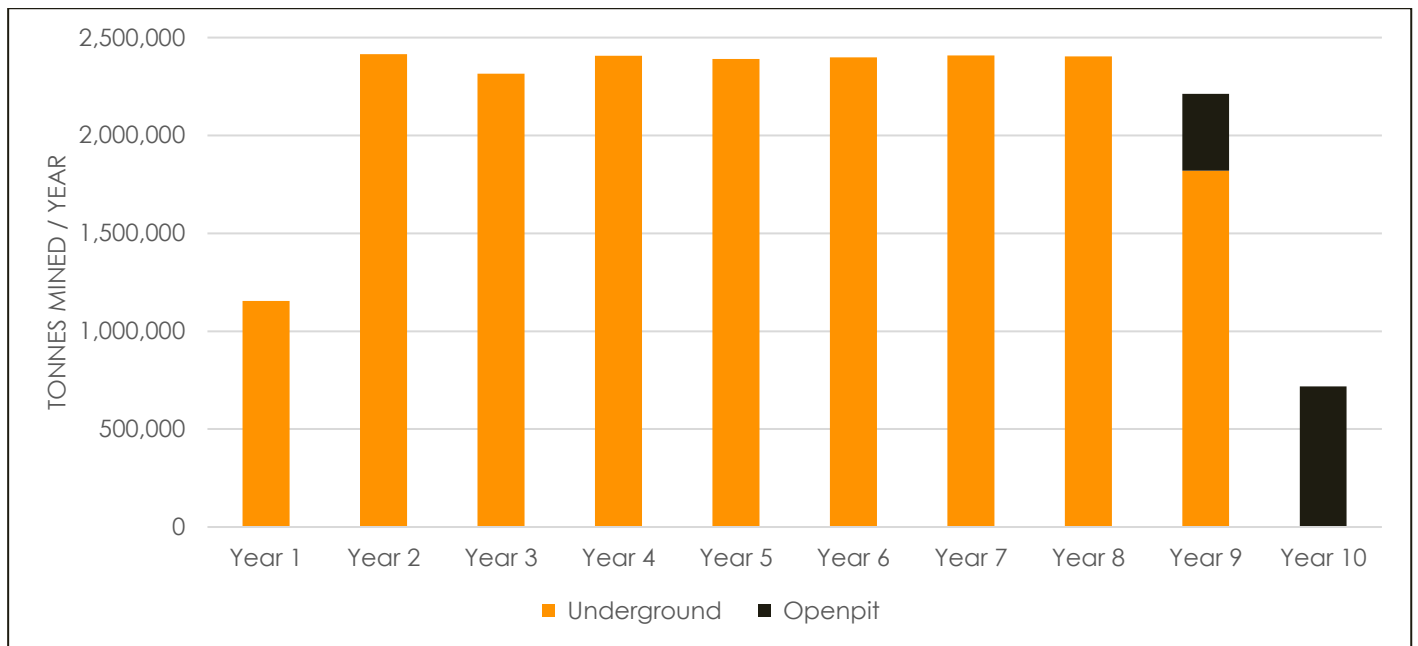


Figure 4: Project mine production profile.

Mining of Ore Reserves has been prioritised in the production schedule, with Inferred Mineral Resources contributing no more than 21% in the first 8 years of production. Thereafter, the remainder of the Inferred and Indicated Mineral Resources evaluated in Mine Stope Optimiser and Whittle Pit Optimisation is incorporated into the plan, Figure 5.

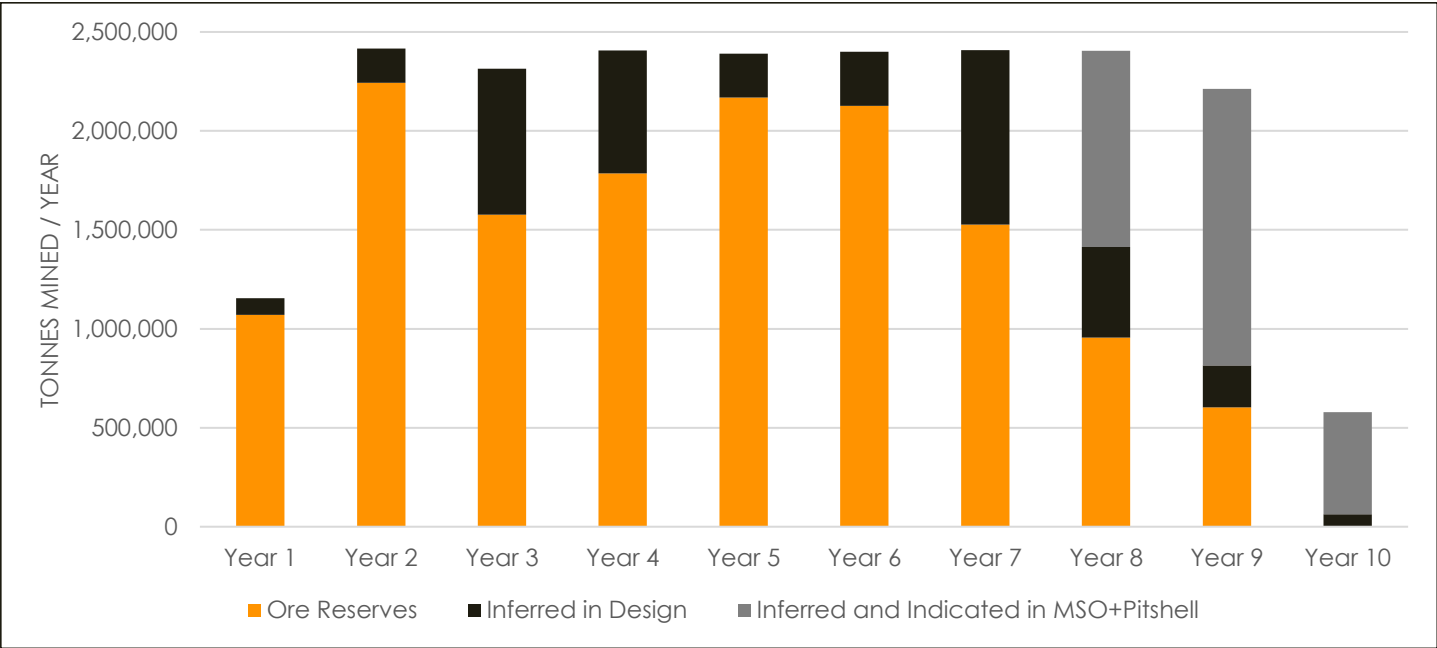


Figure 5: Production profile illustrating the comparative contributions from Ore Reserves, Indicated Mineral Resources and Inferred Mineral Resources.

Tunnel development remaining from the previous mining operations allows for early access to underground production mining areas. A combination of Longhole Open Stopping with Fill (**LHOSF**) and Drift-and-Fill (**D&F**) mining methods will be used, supported with paste back-filling. Some low-profile, D&F mining is planned in the latter years, along with open-pit mining of the near-surface +105 Level Supergene Deposit in the back two years of the mining plan.

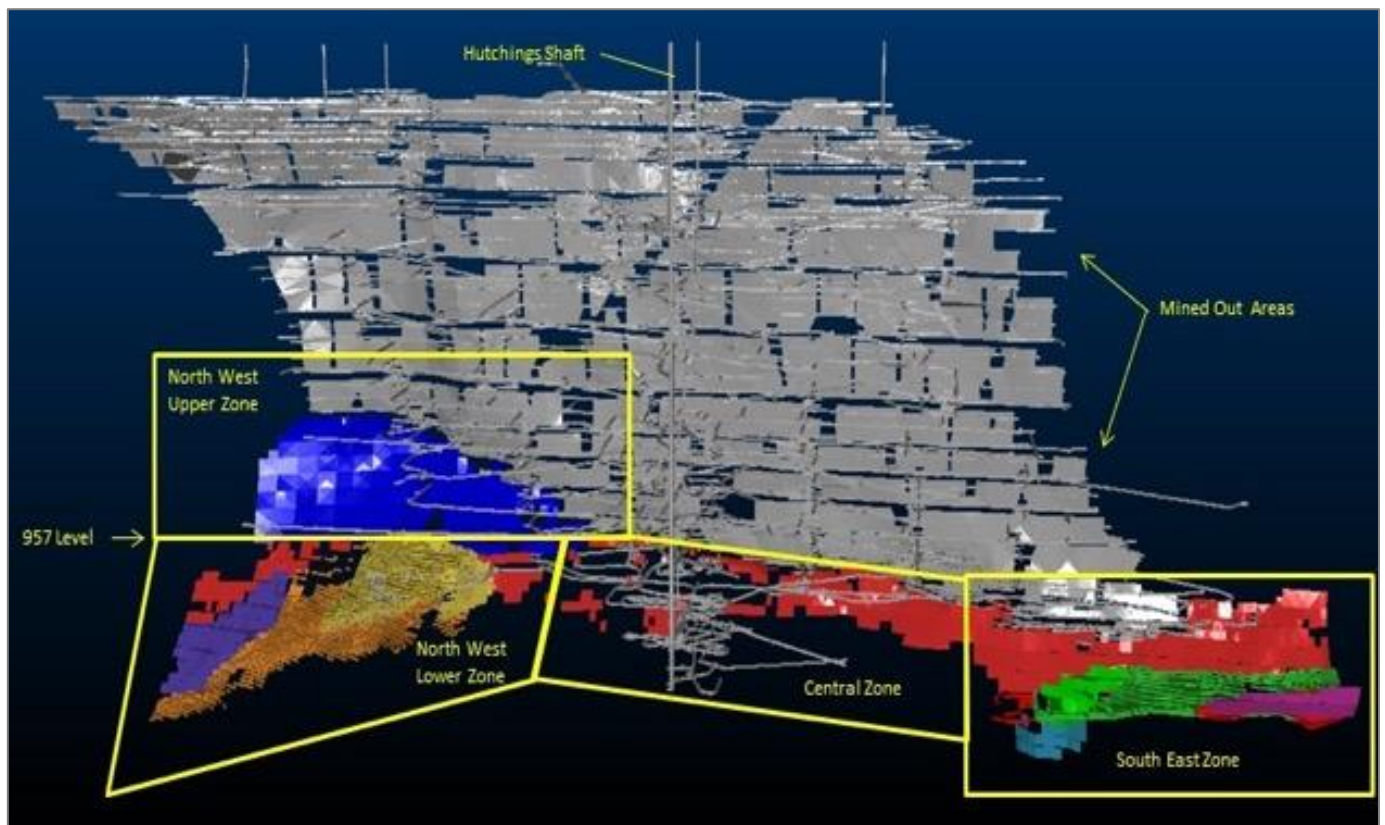


Figure 6: Planned underground mining zones.

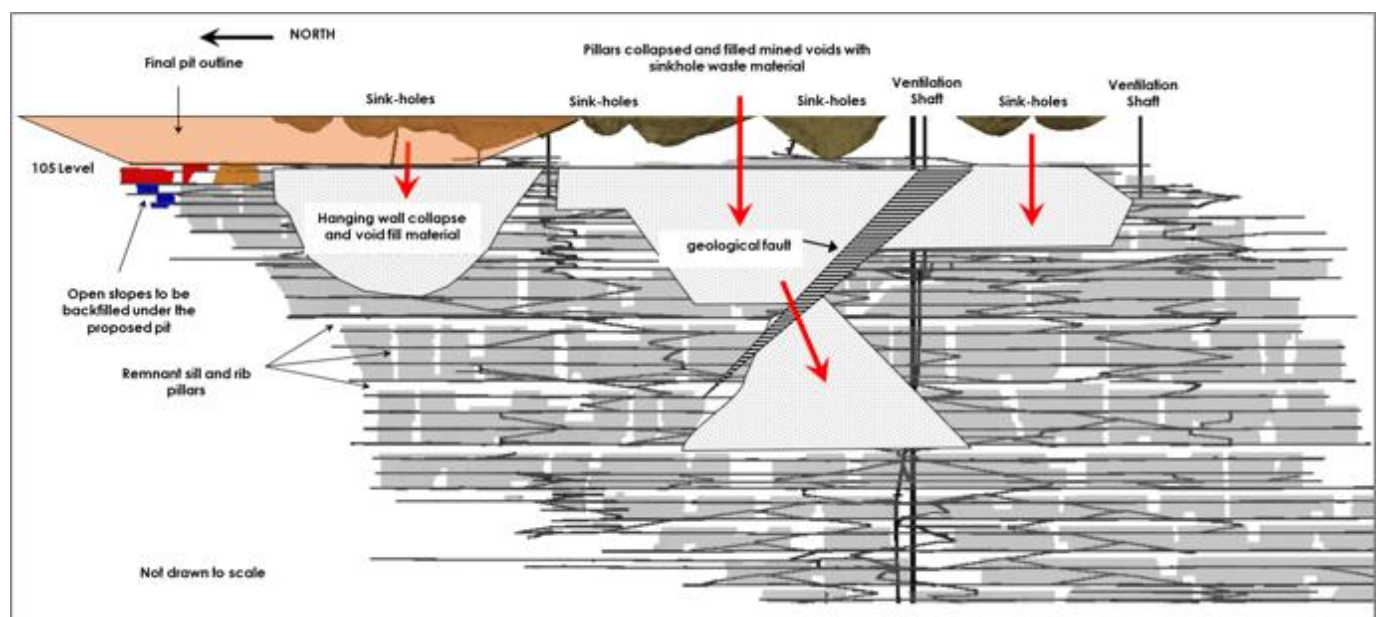


Figure 7: Longitudinal section showing location of proposed open pit and voids.

Some 20.8Mt of material at an average grade of 1.1% Cu and 3.4% Zn is planned to be mined and processed to produce 189kt of Cu and 580kt of Zn contained in differentiated concentrates during the Foundation Phase.

Probable Ore Reserves, estimated in accordance with JORC Code guidelines, make up 65% of the Production Target. Inferred and Indicated Mineral Resources incorporated in the detailed mine plans make up 21% of the Production Target. Inferred and Indicated Mineral Resources incorporated in Mine Stope Optimiser shapes and the Whittle pit optimisation pitshell make up the remaining 14%. The Probable Ore Reserves are tabulated below.

The calculated Deep Sulphide Probable Ore Reserve amounts to 13.14Mt grading 1.0% Cu and 3.2% Zn, including 136kt copper metal tonnes and 417kt zinc metal tonnes (Cu-Eq of 257kt metal tonnes at 2.0%). The Ore Reserves are quoted in accordance with the guidelines of the 2012 Edition of the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code).

Prieska Project Deep Sulphide Ore Reserves (Effective Date: 16 June 2019)								
Deposit	Ore Reserve Classification	Tonnage (Mt)	Cu		Zn		Cu equivalent <sup>7</sup>	
			Metal Tonnes (kt)	Grade (%)	Metal Tonnes (kt)	Grade (%)	Metal Tonnes (kt)	Grade (%)
Deep Sulphide	Probable	13.14	136	1.0	417	3.2	257	2.0
<b>Total</b>	<b>Probable</b>	<b>13.14</b>	<b>136</b>	<b>1.0</b>	<b>417</b>	<b>3.2</b>	<b>257</b>	<b>2.0</b>

Deep Sulphide Ore Reserves calculated using financial assumptions and modifying factors stated in the Study. Tonnes are rounded to thousands, which may result in rounding errors.

**Table 5: Ore Reserves Estimate – Deep Sulphide Mineral Resource.**

The calculated +105 Level Probable Ore Reserves amount to 484kt grading 1.5% Cu and 3.3% Zn, including 7kt copper metal tonnes and 16kt zinc metal, (Cu-Eq of 11kt metal at 2.2%). The Ore Reserves are quoted in accordance with the JORC Code.

Prieska Project +105 Level Ore Reserves (Effective Date: 15 June 2019)								
Deposit	Ore Reserve Classification	Tonnage (kt)	Cu		Zn		Cu Equivalent <sup>8</sup>	
			Metal Tonnes (kt)	Grade (%)	Metal Tonnes (kt)	Grade (%)	Metal Tonnes (kt)	Grade (%)
+ 105 Supergene	Probable	484	7	1.5	16	3.3	11	2.2
<b>Total</b>	<b>Probable</b>	<b>484</b>	<b>7</b>	<b>1.5</b>	<b>16</b>	<b>3.3</b>	<b>11</b>	<b>2.2</b>

+105m Level Ore Reserves calculated using financial assumptions and modifying factors stated in the Study. Tonnes are rounded to thousands, which may result in rounding errors.

**Table 6: Ore Reserves Estimate – +105 Level Mineral Resource.**

The combined Project Probable Ore Reserves amount to **13.62** grading **1.1% Cu** and **3.2% Zn**, including **143kt copper metal** and **433kt zinc metal**, (Cu-Eq of 268kt metal tonnes at 2.0%).

<sup>7</sup> Method used to determine Cu equivalent Zn grades:

1% Zn =  $\frac{(\text{Zn price} \times \text{Zn payability}) \times (\text{Zn plant recovery})}{(\text{Cu price} \times \text{Cu payability}) \times (\text{Cu plant recovery})} = \frac{(2,756 \times 71.3\%) \times (84.4\%)}{(6,834 \times 98.7\%) \times (83.9\%)} = 0.29\% \text{ Cu grade}$

Cu Equivalent Grade = Cu Grade + 0.29 x Zn Grade

Plant recovery assumptions are based on metallurgical test work completed to date at Mintek Laboratories (South Africa) under the supervision of DRA. Refer to Table 1 in the Appendices.

<sup>8</sup> 1% Zn =  $\frac{(\text{Zn price} \times \text{Zn payability}) \times (\text{Zn plant recovery})}{(\text{Cu price} \times \text{Cu payability}) \times (\text{Cu plant recovery})} = \frac{(2,756 \times 53.7\%) \times (59.4\%)}{(6,834 \times 91.2\%) \times (66.7\%)} = 0.2\% \text{ Cu}$

Cu-Equivalent grade = Cu grade + 0.2 x Zn grade

Plant recovery assumptions are based on metallurgical test work completed to date at Mintek Laboratories (South Africa) under the supervision of DRA. Refer to Table 1 in the Appendices.



Prieska Project Ore Reserves Estimate (Effective Date: 16 June 2019)								
Deposit	Ore Reserve Classification	Tonnage (Mt)	Cu		Zn		Cu Equivalent	
			Metal Tonnes (kt)	Grade (%)	Metal Tonnes (kt)	Grade (%)	Metal Tonnes (kt)	Grade (%)
+ 105 Supergene	Probable	0.48	7	1.5	16	3.3	11	2.2
Deep Sulphide	Probable	13.14	136	1.0	417	3.2	257	2.0
<b>Total</b>	<b>Probable</b>	<b>13.62</b>	<b>143</b>	<b>1.1</b>	<b>433</b>	<b>3.2</b>	<b>268</b>	<b>2.0</b>

Project Ore Reserves calculated using financial assumptions and modifying factors stated in the Study. Tonnes are rounded to thousands, which may result in rounding errors.

Table 7: Ore Reserves Estimate – Combined Mineral Resource.

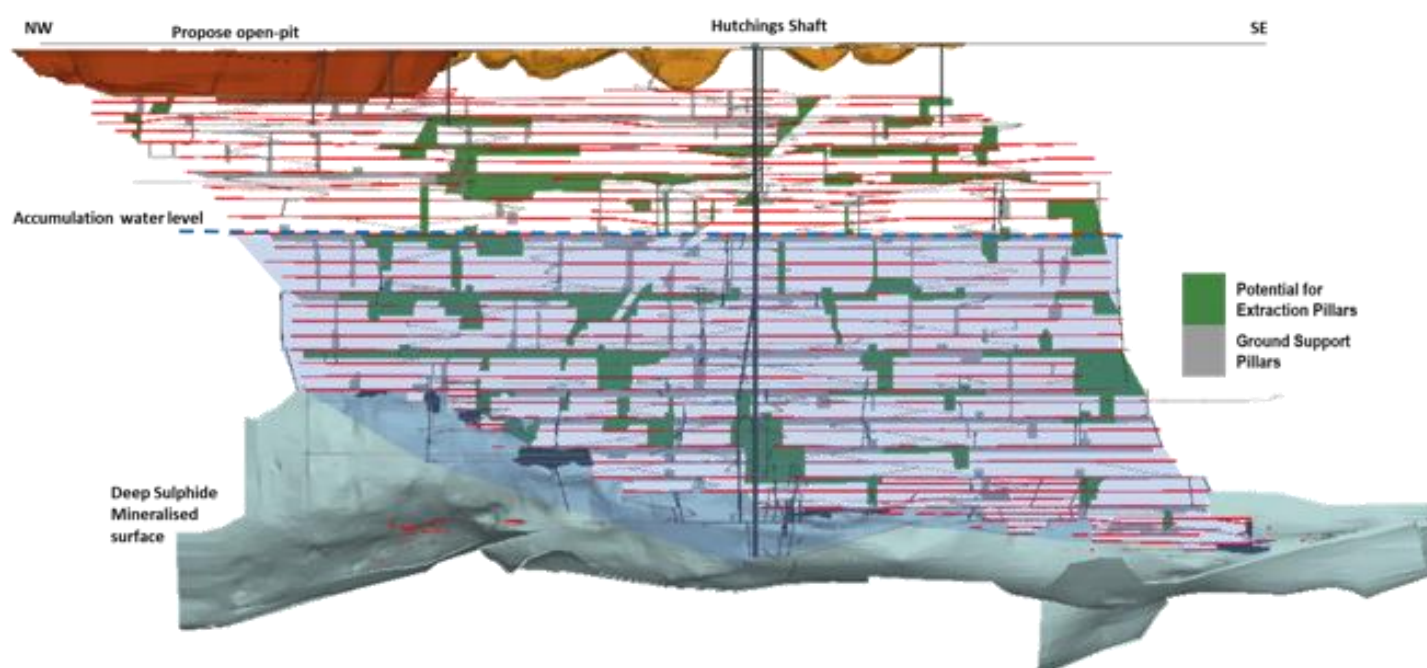


Figure 8: Views showing the remnant pillars and the accumulated water level.

### Shaft Refurbishment and Dewatering

The Hutchings Shaft and underground workings are currently flooded to a depth of 330m below surface and contain a volume of 8.7 million m<sup>3</sup> of accumulated water. Dewatering of the workings via a pumping system to be installed in the Hutchings Shaft is planned. Water will be pumped into a 1 million m<sup>3</sup> volume dewatering dam on surface, from where mechanical evaporators will be used to accelerate evaporation.

Examinations and testing of the shaft steelwork from surface down to 30m below the water level, along with the use of video camera inspection down to 200m below the water surface, as well as shaft probing and water quality testing to within 100m of the shaft bottom helped determine that the majority of the shaft is in good order. Sections of the shaft will be refurbished. A pre-owned Koepe rock winder and a double-drum men-and material winder with new ropes and equipment have been identified for purchase and installation. The steelwork refurbishment will be carried out concurrently with the underground dewatering campaign to reduce the project construction time and make optimal use of the available construction crews.

## Ore Processing and Product Sales

Ore processing is planned to involve conventional differential froth flotation to produce separate copper and zinc concentrates at average grades of 24% Cu and 50% Zn from underground mined material. Minor modifications to the processing plant will allow the open-pit material to be treated at the end of the mine life, on a campaign basis, to produce separate copper and zinc concentrates at average grades of 26% copper and 36% zinc.

The flowsheet for processing underground material is similar to the flowsheet used during previous mining operations. Life-of-mine metal recoveries into concentrates are anticipated to be 84.4% for Cu and 83.9% for Zn from treating underground mined material and 66.7% and 59.4% for Cu and Zn respectively for open-pit mined material.

The concentrates will be trucked to Grovetown, 50km from site, and then railed to the Port of Ngqura (at Coega) for export to smelters in Asia and Europe. Net smelter returns for the Cu and Zn concentrates (accounting for metal payabilities, treatment and refining charges, and penalty provisions) are expected to be 98.7% and 71.3% of market metal prices for Cu and Zn respectively for underground sourced metal; and 91.2% and 53.7% for Cu and Zn respectively for open-pit sourced material.

Recent changes in benchmark treatment costs for zinc concentrate and treatment and refining costs for copper concentrates have been applied, with the discounts on benchmark charges being offered by potential off-takers for the clean Project products. A 3-D view of the plant area is shown below and a processing flow-sheet is displayed in Appendix 1.

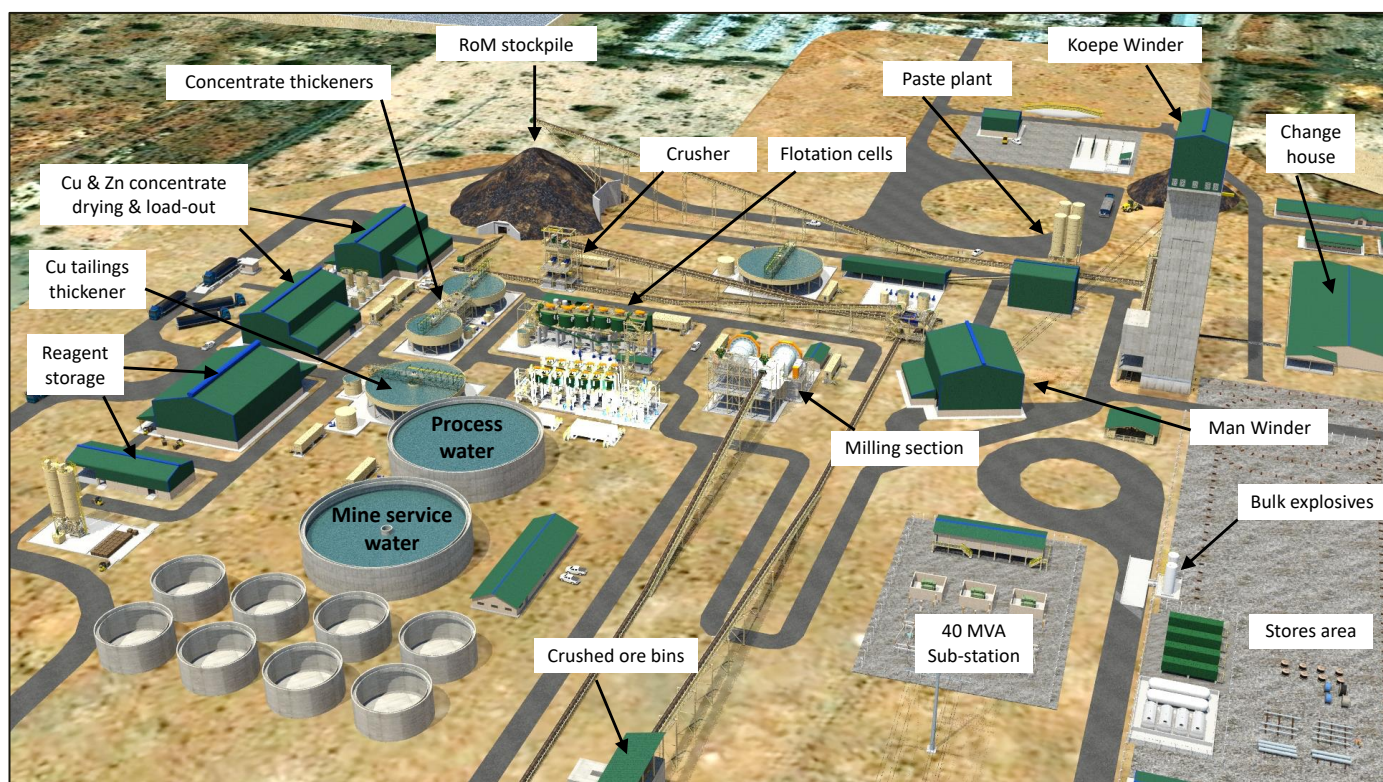


Figure 9: Project site general layout.

## Mine Infrastructure and Staffing

Water for the mining operations is planned to be supplied from the Orange River, at a rate of 4.1ML per day, via the existing water pipeline. Power requirements of 38MW, is expected to be sourced from the national power utility company, Eskom, via the onsite Cuprum substation. Plans are at an advanced stage to commission the establishment of a renewable energy alternative source to national grid power supply, capable of potentially providing 52% of the mine's energy needs in the near term.

A tailings storage facility that will initially serve as a dewatering reservoir will be constructed to service the Foundation Phase. Accommodation for some of the 893-strong workforce, (including allowance for training and personnel on leave), will initially be at Copperton, with plans to establish the permanent mine village in Prieska once planning approvals allow for such migration to occur. No new roads will be required to access the site, though some internal roads are planned in order to access site infrastructure.

### Environment, Health, Safety and Community

All environmental studies and applications for authorisations have been completed for the Project. Environmental management is planned in compliance with NEMA as well as the Equator Principles and IFC standards. Community engagement has commenced with the establishment of an active Stakeholder Engagement Forum to guide the mine development process.

### Operating Costs

The estimated operating costs for the underground phase were built up from first principles. Open pit mining operating costs were a combination of contractor quotations and first principles. The average unit operating costs over the Foundation Phase are shown below:

Operating cost element	AUD/t ROM
Mining	48.10
Processing	16.10
Surface and In-directs	6.70
Concentrate Transport	9.40
Corporate Costs	1.40
Off-mine Costs	2.30
Royalty (Government)	5.70
Sustaining CAPEX	4.00
<b>Total</b>	<b>93.70</b>

**Table 8: All-in-sustaining unit costs.**

The all-in sustaining cost (AISC) per pound of copper equivalent metal sold is estimated at AUD 5,470/t (USD3,773/t) or AUD 1,582/t (USD1,091/t) in terms of equivalent zinc metal sold.

## Capital Expenditure and Construction Program

While the total capital cost to construct the mine is estimated to be AUD402M which includes a 10% contingency, peak funding required is marginally less at AUD398M. Capital costs were derived from vendor quotations, detailed bills of quantities and labour rates from construction contractors.

Capex Area	AUD (Million)
Power supply	45.0
Water supply	2.4
Tailing Storage Facility	31.4
Shaft refurbishment	45.7
Mine dewatering + construction power	37.1
Surface infrastructure	36.7
Underground infrastructure	34.0
Open Pit establishment and equipping	2.5
Processing plant	89.6
Project management (EPCM + Owner)	41.0
<b>Subtotal</b>	<b>365.3</b>
Contingency 10%	36.5
<b>Total Capex</b>	<b>401.8</b>

Table 9: Capital Expenditure.

Parameter	Unit	Total	Year 1	Year 2	Year 3	Year 4	Year 10
Project Capital	AUD million	<b>401.8</b>	25.3	150.4	220.5	3.5	2.1

Table 10: Capital Expenditure Spend Schedule.

As shown in the execution schedule below, the construction period to first concentrate production is estimated to be 27 months.



Prieska Cu & Zn Project Schedule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<b>Evaporation Dam &amp; TSF</b>																														
Construct evaporation dam 1																														
Install evaporators dam 1																														
Construct evaporation dam 2																														
Install evaporators dam 2																														
Construct TSF																														
<b>Shaft de-watering and construction</b>																														
Shaft Sinkers mobilisation																														
Shaft preparation work																														
Shaft de-watering																														
UG Construction																														
<b>Mining</b>																														
Mobilise Mining Contractor																														
Mining ug																														
Shaft hoisting																														
<b>Processing &amp; paste plant</b>																														
Process plant construction																														
Process plant comissioning																														
Paste plant																														
<b>Surface infrastructure</b>																														
Bulk Water Supply Works																														
Eskom temporary power																														
Cuprum feeder bay																														
40 MVA mine sub-station																														
Surface ventilation fans (1 & 2)																														
Build Construction Camp																														
Mining Offices																														
Change House and Lamp Room																														

Table 11: Project Execution Schedule.

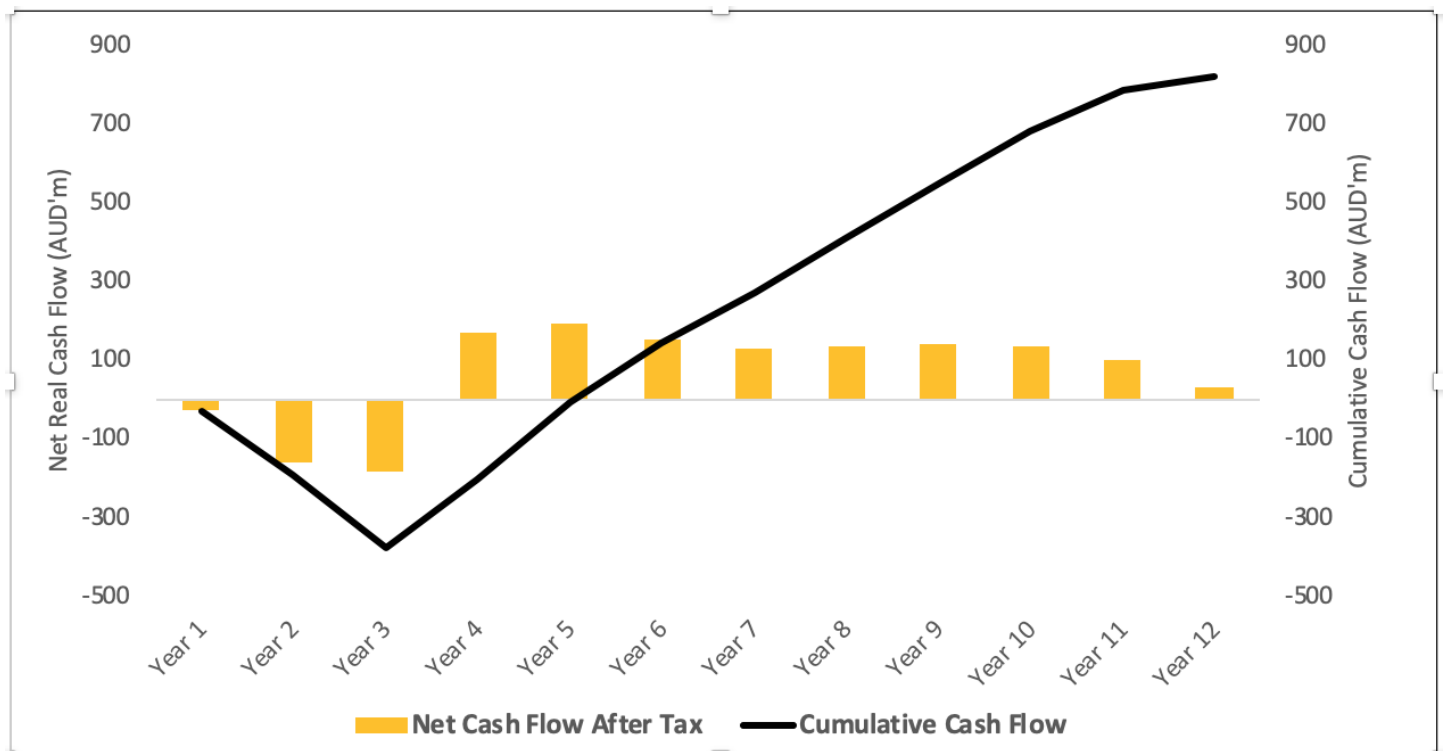
## Financial Evaluation

The Foundation Phase is expected to generate AUD836M of post-tax free cash-flow, with the CAPEX program, production profile and expected cash flows as shown in the tables and figures below.

Parameter	Unit	Phase 1	Capex Yr1	Capex Yr2	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ROM Tonnage (Processed)	Mtonnes	20.83			1.49	2.44	2.33	2.40	2.43	2.40	2.40	2.40	1.95	0.57
Concentrates Sold - Zn	tonnes	1,175,713			71,618	126,476	141,695	142,212	137,593	138,802	145,078	139,019	121,783	11,436
Concentrates Sold - Cu	tonnes	788,811			55,973	90,200	85,864	88,910	87,832	90,407	91,035	90,917	72,439	35,235
Metal Contained - Zn	tonnes	579,677			34,301	63,238	70,848	71,106	68,796	69,401	72,539	69,510	55,689	4,249
Metal Contained - Cu	tonnes	189,002			12,213	21,648	20,607	21,338	21,080	21,698	21,848	21,820	17,485	9,264
Revenue (Post-NSR)	AUD '000	3,479,424			216,199	392,183	403,704	411,596	402,476	410,246	420,671	411,754	317,754	92,842
Selling & Realisation Charges	AUD '000	-195,015			-12,651	-21,499	-22,606	-22,955	-22,386	-22,758	-23,450	-22,830	-19,297	-4,583
<b>Net Revenue</b>	<b>AUD '000</b>	<b>3,284,409</b>			<b>203,547</b>	<b>370,683</b>	<b>381,098</b>	<b>388,641</b>	<b>380,090</b>	<b>387,488</b>	<b>397,221</b>	<b>388,924</b>	<b>298,457</b>	<b>88,259</b>
Mining, Development, Services Cost	AUD '000	-1,002,438		-6,412	-115,536	-123,112	-115,314	-113,241	-107,696	-107,571	-110,646	-110,322	-79,971	-12,617
Processing Cost	AUD '000	-335,869			-24,469	-37,955	-36,526	-37,362	-37,781	-37,366	-37,428	-37,391	-34,863	-14,726
General & Administration	AUD '000	-138,454		-2,143	-15,066	-15,152	-15,152	-15,152	-15,152	-15,152	-15,152	-15,152	-11,801	-3,382
Off-mine Costs	AUD '000	-77,088	-2,048	-2,295	-9,765	-7,932	-7,705	-7,724	-7,705	-7,282	-6,841	-6,847	-5,933	-5,011
Royalties (Govt.)	AUD '000	-118,699			-941	-1,689	-1,697	-8,362	-20,070	-20,943	-21,404	-20,588	-16,615	-6,392
<b>Cash Operating Costs</b>	<b>AUD '000</b>	<b>-1,672,549</b>	<b>-2,048</b>	<b>-10,850</b>	<b>-165,778</b>	<b>-185,839</b>	<b>-176,394</b>	<b>-181,841</b>	<b>-188,403</b>	<b>-188,314</b>	<b>-191,472</b>	<b>-190,301</b>	<b>-149,182</b>	<b>-42,128</b>
<b>Cash Operating Profit</b>	<b>AUD '000</b>	<b>1,611,860</b>	<b>-2,048</b>	<b>-10,850</b>	<b>37,769</b>	<b>184,844</b>	<b>204,704</b>	<b>206,800</b>	<b>191,687</b>	<b>199,174</b>	<b>205,750</b>	<b>198,623</b>	<b>149,276</b>	<b>46,131</b>
Project Capital	AUD '000	-401,778	-25,337	-150,411	-220,457	-3,466						-2,107		
Sustaining Capital	AUD '000	-83,480		-178	-2,131	-10,129	-10,481	-10,419	-10,163	-10,136	-10,293	-10,275	-7,753	-1,524
<b>Net Cashflow pre-Tax</b>	<b>AUD '000</b>	<b>1,126,602</b>	<b>-27,385</b>	<b>-161,439</b>	<b>-184,820</b>	<b>171,249</b>	<b>194,223</b>	<b>196,381</b>	<b>181,524</b>	<b>189,038</b>	<b>195,457</b>	<b>186,242</b>	<b>141,523</b>	<b>44,608</b>
Income Tax	AUD '000	-308,003						-44,676	-50,827	-52,931	-54,728	-52,148	-39,626	-13,067
<b>Net Cashflow After Tax</b>	<b>AUD '000</b>	<b>818,599</b>	<b>-27,385</b>	<b>-161,439</b>	<b>-184,820</b>	<b>171,249</b>	<b>194,223</b>	<b>151,705</b>	<b>130,698</b>	<b>136,108</b>	<b>140,729</b>	<b>134,094</b>	<b>101,897</b>	<b>31,541</b>

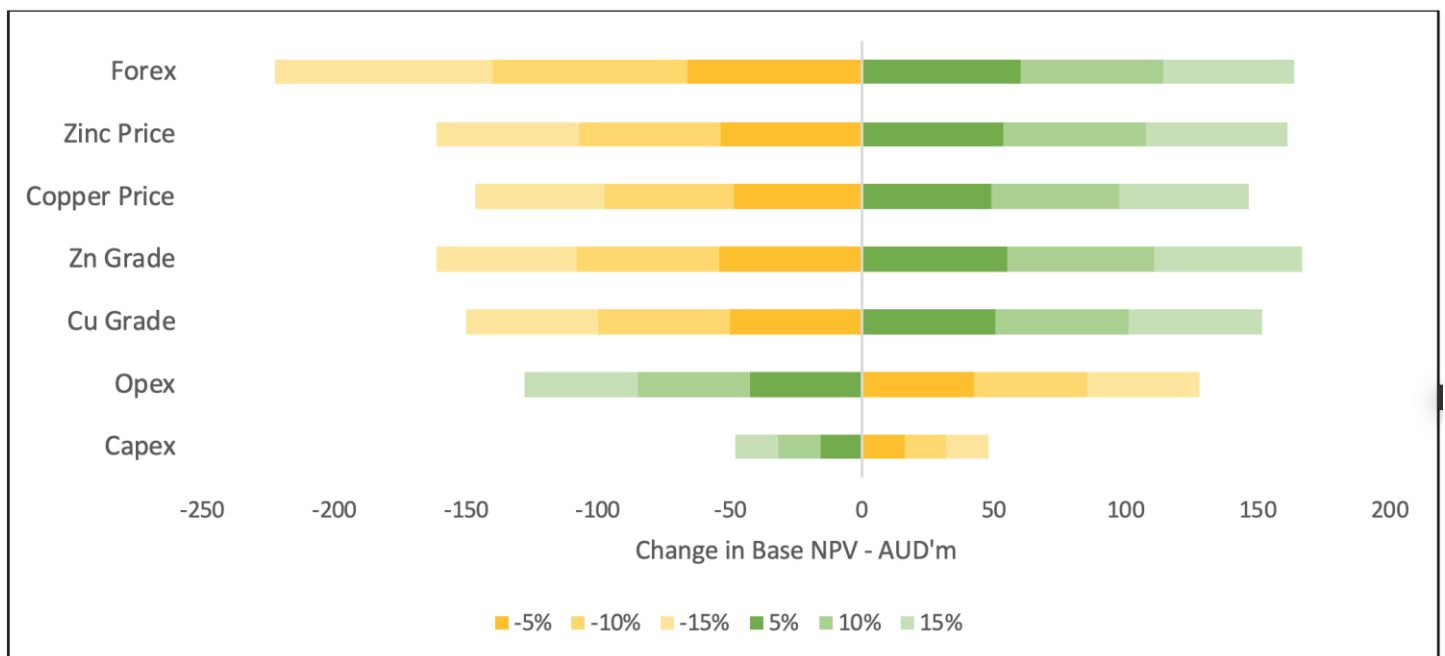
Table 12: Project production and cashflow profiles for the Foundation Phase.





**Figure 10: Project net cashflow post-tax profile.**

The higher cash flow in the early years of production are due to low tax and royalty rates due to the carry-over of capital costs. The Foundation Phase NPV estimate is most sensitive to the ZAR-USD exchange rate, followed by zinc price and copper price as shown below.



**Figure 11: Chart of the sensitivity of pre-tax NPV to variances in key input elements.**

Copper contributes 54% of the net revenue (after allowing for concentrate logistics, treatment costs and refining charges). The main production and financial metrics for the Project are shown in Table 12.

## Risk Assessment

Headline risks were identified during a facilitated inter-disciplinary risk assessment workshops for the Project. These are summarised in the accompanying table.

Risk	Mitigation
1. Mine equipment and activities exceeding the Square Kilometre Array (SKA) electromagnetic Interference (EMI) protection levels, resulting in the authorities placing operating restrictions on the mine.	<ul style="list-style-type: none"> <li>Electromagnetic Capability (EMC) Plan was formulated.</li> <li>Written approval of the EMC plan was received from SKA authorities.</li> <li>Designing taking into account key EMI emitters is planned.</li> <li>Submission of the AMA permit application will be done within the prescribed timeframe.</li> <li>Appointment of specialist consultants to assist in the permit application process has been done.</li> </ul>
2. Influx of people from outside of the Prieska Municipal area looking for employment negatively affecting the local community.	<ul style="list-style-type: none"> <li>A community liaison office has been established. As has a Stakeholder Engagement Forum with broad community representation. A collaboration agreement has been entered into with local government (Siyathemba Municipality). These platforms will assist with identifying and dealing with migrant population challenges.</li> <li>Preferential hiring of local residents will be encouraged.</li> </ul>
3. Number of employment and business opportunities created by the Project for Siyathemba Municipality residents and businesses not meeting public expectations and causing disharmony.	<ul style="list-style-type: none"> <li>Informing, training and upskilling of the local community has commenced.</li> <li>An on-line procurement management portal, Supply Chain Network™, is being used to allow potential local suppliers to the Project to register with the Project.</li> <li>Procurement procedures to prioritise local businesses.</li> </ul>
4. Delays to the shaft de-watering and shaft and mine refurbishment	<ul style="list-style-type: none"> <li>40% contingency allowance made to water volumes expected to have accumulated in the mine workings.</li> <li>Shaft examined by experts; continuous tests and examinations as dewatering progresses. Pilot trials commenced to test various activities relating to dewatering. Delayed Start-up insurance included in the capital budget.</li> </ul>
5. Mine production rates assumed in financial modelling are not achieved in practice.	<ul style="list-style-type: none"> <li>A practical and achievable production plan is in place.</li> <li>A monthly mining plan has been prepared.</li> <li>Contract mining to be used to establish the mine, whereby skilled and experienced operators will operate the underground mine to ensure a high productivity start-up.</li> </ul>
6. Potential for mud and water rushes while dewatering and cleaning out the lower mining levels.	<ul style="list-style-type: none"> <li>Pumping plan for safe dewatering has been prepared.</li> <li>Level inspection procedures will be developed.</li> </ul>
7. Unplanned power interruptions and escalation of power tariffs. Delays in availability of power for the Project.	<ul style="list-style-type: none"> <li>Temporary power from the Cuprum Sub-station (15 MVA) is planned. Emergency (diesel) power installed - currently set at 5MW. Investigating renewable energy sources as an alternative source to grid power. Operating shutdown procedure in place.</li> </ul>
8. Ability to attract and retain skills at a remote site.	<ul style="list-style-type: none"> <li>Attractive salary levels set.</li> <li>Provision of suitable accommodation and recreational facilities.</li> <li>Staff Turnover Plan. Attractive roster system and allowance for FIFO employees.</li> </ul>
9. Availability of service providers and goods suppliers to meet Mining Charter III Procurement policies	<ul style="list-style-type: none"> <li>Proactive engagement with service providers meeting MCIII criteria as BEE entities. Use of online procurement portal to keep register of businesses. ERP tools to record procurement spend on compliant suppliers.</li> </ul>
10. Production grades are lower than planned.	<ul style="list-style-type: none"> <li>Peer reviews of the Mineral Resource estimates done.</li> <li>Comprehensive grade control program planned.</li> <li>Blasting design to minimise overbreak.</li> </ul>
11. Availability of specialised crane for installation of head gear and the Koepe winder.	<ul style="list-style-type: none"> <li>Identify the specialised crane required as early as possible</li> <li>An early contract is required for a 500-tonne crane.</li> </ul>

**Table 13: Headline risks.**

## Opportunities

Several opportunities to improve on the base case mining plan have been identified. These are being followed up as part of operational readiness activities or will be investigated as part of mine operations. Key opportunities include:

#### Mineral Resources Extension Potential

- Conversion of delineated Inferred Resources into the mining plan;
- Extensional exploration and 'out of resource' mineralisation;
- Near-mine and satellite exploration potential; and
- Remnant pillar extraction.

#### Mining Operations Opportunities

- Fleet Automation and Diesel versus Electric Trade off Studies; and
- Mine to Market Optimisation studies.

#### Ore Processing and By-products Opportunities

- Cyanide Substitution potential;
- Barite By-product Processing Potential;
- Pyrite from Tailings Retreatment and By-product Potential; and
- Pre-sorting of ore trials.

#### Mine Services and Infrastructure Opportunities

- Renewable energy power supply options; and
- Water treatment for offsite discharge Investigations.

### Operational Readiness and Way Forward

Mine construction is targeted to begin late 2019 or early 2020, subject to permitting and funding. Production would then begin 27 months later. A project execution strategy has been formulated and discussions with key service providers well advanced.

### Project Funding

Orion is listed on the Australian Securities Exchange (ASX: ORN) and has a secondary listing on the Johannesburg Stock Exchange (JSE: ORN). Orion currently intends to fund the development of the Project by means of a combination of debt and equity. Endeavour Financial have been engaged to assist in the evaluation of funding options for the Project.

### Future Activities

Following the positive outcomes of the BFS, Orion is targeting a Final Investment Decision for the Prieska Project development during the second half of CY2019. This would put the Company in a position to commence construction in late 2019 or early 2020.

In addition, Orion is also progressing key commercial work streams, including permitting, concentrate marketing and project financing.

In parallel with these programs, Resource extension drilling is planned to be undertaken from underground drilling platforms targeting opportunities to further extend the projected 10-year mine life.



Errol Smart  
**Managing Director and CEO**

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## Competent Person's Statements

The information in the ASX release of 24 June 2019 that relates to the Ore Reserves is based on mining-related information incorporated under the supervision of Mr William Gillespie, a Competent Person who is a fellow of the Institute of Materials, Minerals and Mining (IMMM), (a Recognised Overseas Professional Organisation, (ROPO)). Mr Gillespie takes overall responsibility for the Ore Reserve aspects of the release as Competent Person. Mr Gillespie is an employee of A & B Global Mining Consultants which contracts to Orion. Mr Gillespie has sufficient experience that is relevant to the type of mining and type of deposit under consideration and to the activities being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the JORC Code. Mr Gillespie consents to the inclusion in this release of the matters based on his information in the form and context in which it appears.

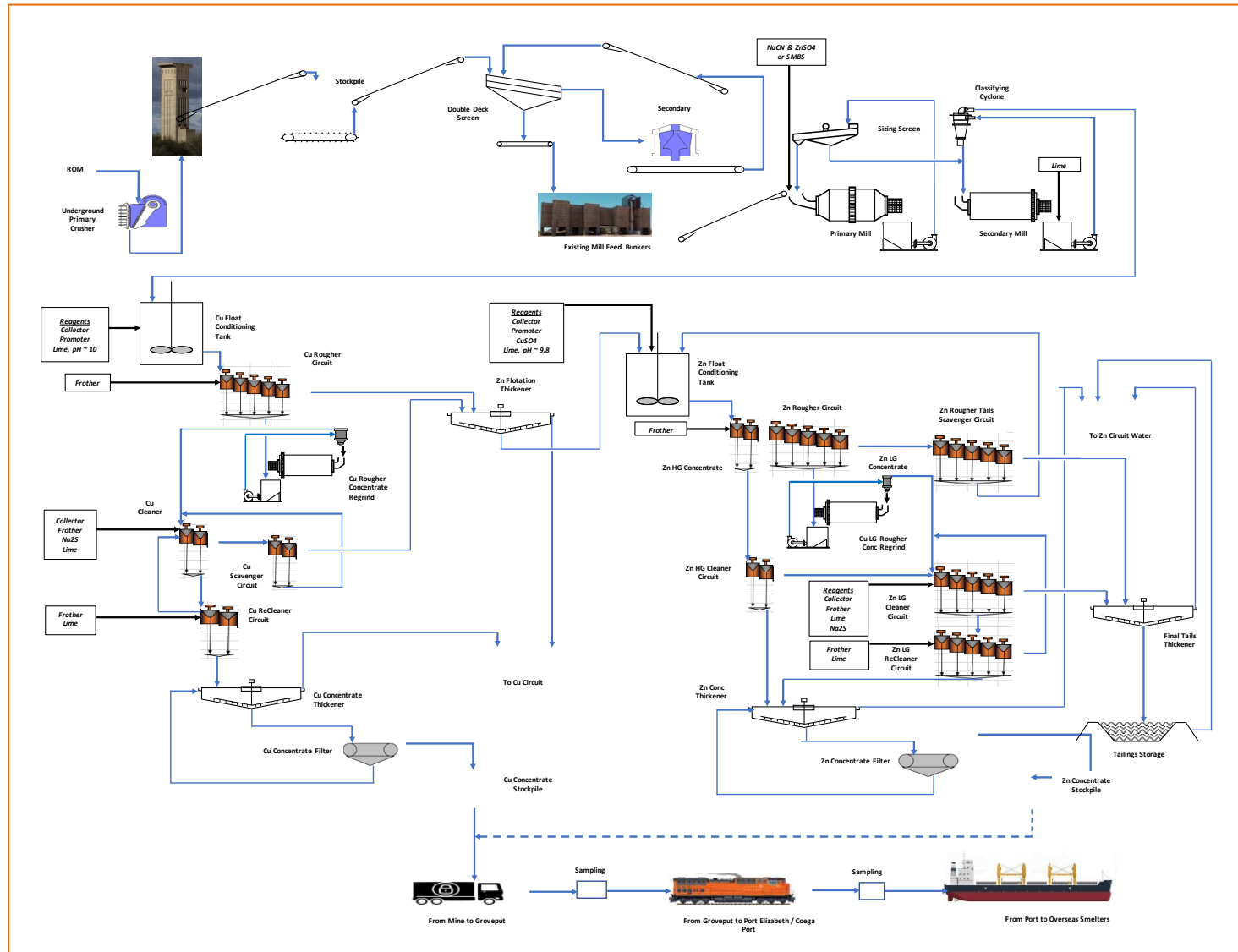
The information in the ASX release of 24 June 2019 that relates to the Metallurgy is based on mining information independently reviewed by Mr. Val Coetzee (an employee of DRA), a registered Professional Engineer with the Engineering Council of South Africa, a Recognised Overseas Professional Organisation, (ROPO), as Competent Person. Mr Coetzee consents to the inclusion in this release of the Metallurgical and Processing matters based on his information in the form and context in which it appears.

## Disclaimer

This release may include forward-looking statements. Such forward-looking statements may include, among other things, statements regarding targets, estimates and assumptions in respect of metal production and prices, operating costs and results, capital expenditures, mineral reserves and mineral resources and anticipated grades and recovery rates, and are or may be based on assumptions and estimates related to future technical, economic, market, political, social and other conditions. These forward-looking statements are based on management's expectations and beliefs concerning future events. Forward-looking statements inherently involve subjective judgement and analysis and are necessarily subject to risks, uncertainties and other factors, many of which are outside the control of Orion. Actual results and developments may vary materially from those expressed in this release. Given these uncertainties, readers are cautioned not to place undue reliance on such forward-looking statements. Orion makes no undertaking to subsequently update or revise the forward-looking statements made in this release to reflect events or circumstances after the date of this release. All information in respect of Exploration Results and other technical information should be read in conjunction with Competent Person Statements in this release (where applicable). To the maximum extent permitted by law, Orion and any of its related bodies corporate and affiliates and their officers, employees, agents, associates and advisers:

- disclaim any obligations or undertaking to release any updates or revisions to the information to reflect any change in expectations or assumptions;
- do not make any representation or warranty, express or implied, as to the accuracy, reliability or completeness of the information in this release, or likelihood of fulfilment of any forward-looking statement or any event or results expressed or implied in any forward-looking statement; and
- disclaim all responsibility and liability for these forward-looking statements (including, without limitation, liability for negligence).

## APPENDIX 1: Processing Plant Flowsheet





## APPENDIX 2

### Section 4 Estimation and Reporting of Ore Reserves – Underground

(Criteria listed in Section 1, and where relevant in Section 2 and 3, also apply to this section.)

Criteria	JORC Code explanation	Commentary
<b>Mineral Resource estimate for conversion to Ore Reserves</b>	<ul style="list-style-type: none"> <li>Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.</li> <li>Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.</li> </ul>	<ul style="list-style-type: none"> <li>The Ore Reserves are based on the total underground Mineral Resources for the Prieska Project of 28.73Mt 3.77% Zn and 1.16% Cu, classified and reported in terms of JORC 2012<sup>9</sup> in ASX release 18 December 2018.</li> <li>The Mineral Resources are based on drilling data available as at 30 November 2018.</li> <li>The Competent Person for the Mineral Resource is Mr Sean Duggan of Z* Consultants, RSA.</li> <li>The mineral resource estimate was prepared by mining industry consultants Z Star Mineral Resource Consultants (Pty) Ltd using variogram Modelling, Neighbourhood optimization and Ordinary Kriging to estimate the zinc and copper grades into the geological domains constrained by wireframes.</li> <li>The Mineral Resources are reported inclusive of the Ore Reserves.</li> </ul>
<b>Site visits</b>	<ul style="list-style-type: none"> <li>Comment on any site visits undertaken by the Competent Person and the outcome of those visits.</li> <li>If no site visits have been undertaken indicate why this is the case.</li> </ul>	<ul style="list-style-type: none"> <li>The Competent Person, William Gillespie, Principal Mining Consultant of A&amp;B Global Mining Consultants and Fellow of IMMM visited the site on 16th May 2019. The visit included site familiarization: discussions with site personnel, inspection of the surface facilities, review of selected drill core, inspection of the proposed open pit operation and an underground visit including and inspection of some of the accessible facilities and the rock condition of the upper ramp, drives and crosscut</li> <li>A visual inspection of the shaft and steelwork was carried out at the 294 level station. Shaft lining and steelwork looked visually competent.</li> <li>The 310 level Pumping station settlers on the 294 level were visited and looked structurally competent.</li> <li>The previous underground mining at Prieska consisted of Long Hole Sub Level Open Stopping leaving Sill and Rib pillars intact.</li> <li>The waste collecting drive and stope draw-points were inspected on the 210. Roof and sidewall conditions were good.</li> <li>Limited support was installed in the ramps, drives and crosscuts in these upper levels other than for unconformities.</li> </ul>
<b>Study status</b>	<ul style="list-style-type: none"> <li>The type and level of study to enable Mineral Resources to be converted to Ore Reserves.</li> <li>The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that the material Modifying Factors have been considered.</li> </ul>	<ul style="list-style-type: none"> <li>A BFS Technical Report has been completed.</li> <li>The BFS has been prepared to an accuracy level of <math>\pm 15\%</math> using Indicated and Inferred Mineral Resources; appropriate mine planning and modifying factors have been applied commensurate to a BFS level of accuracy and are deemed to have reasonable prospects of being technically achievable and economically viable.</li> <li>Section 4 of JORC Table 1 is being completed as part of the BFS requirement to disclose material modifying factors and assumptions underpinning the Ore Reserves, existing Production Target estimates linked to updated forecast financial information.</li> </ul>
<b>Cut-off parameters</b>	<ul style="list-style-type: none"> <li>The basis of the cut-off grade(s) or quality parameters applied.</li> </ul>	<ul style="list-style-type: none"> <li>The cut-off grade, in this case the break-even grade, was estimated based on a Zn Eq basis using all OPEX including Stay-</li> </ul>

<sup>9</sup> Mineral Resource reported in ASX release of 18 December 2018: “Landmark Resource Upgrade Sets Strong Foundation for Development of Prieska Zinc-Copper Project” available to the public on [www.orionminerals.com.au/investors/market-news](http://www.orionminerals.com.au/investors/market-news). Competent Person Orion’s exploration: Mr. Pottie Potgieter. Competent Person: Orion’s Mineral Resource: Mr. Sean Duggan. Orion is not aware of any new information or data that materially affects the information included above. For the Mineral Resource, the company confirms that all material assumptions and technical parameters underpinning the estimates in the ASX release of 18 December 2018 continue to apply and have not materially changed. Orion confirms that the form and context in which the Competent Person’s findings are presented here have not materially changed.

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		<p>In-Business (SIB) capital and government Royalties. The reason Zn_Equivalent grade was used is because the results of the Scoping Study indicated that the Zn would be the main revenue generator (refer ASX release 19 December 2018). Revenue used for the calculations is the received Zn metal price net of concentrate logistics costs and treatment and refining charges. Consequently, all Cu grades in the geological block model are converted into Zn_Eq grades using the ratios of the zinc and copper metal prices, plant recoveries and the zinc and copper Net Smelter Returns (NSRs).</p> <ul style="list-style-type: none"><li>The cut-off grade table is shown below and the Zn equivalent grade estimation below that.</li></ul> <table><tr><th>Cost and Revenue Parameters</th><th>Units</th><th>LHOSF (without trucking)</th><th>LHOSF (with trucking)</th><th>D&amp;F</th></tr><tr><td>On-mine OPEX</td><td>ZAR/t</td><td>575</td><td>664</td><td>816</td></tr><tr><td>Royalty</td><td>ZAR/t</td><td>98</td><td>98</td><td>98</td></tr><tr><td>SIB CAPEX</td><td>ZAR/t</td><td>32</td><td>32</td><td>32</td></tr><tr><td>Marketing costs</td><td>ZAR/t</td><td>5</td><td>5</td><td>5</td></tr><tr><td>Concentrate transport costs</td><td>ZAR/t</td><td>170</td><td>170</td><td>170</td></tr><tr><td><b>Total cash OPEX per tonne treated</b></td><td><b>ZAR/t</b></td><td><b>880</b></td><td><b>969</b></td><td><b>1,121</b></td></tr><tr><td>FX (ZAR-US\$)</td><td></td><td>14.00</td><td>14.00</td><td>14.00</td></tr><tr><td><b>Total cash operating cost per tonne treated</b></td><td><b>US\$/t</b></td><td><b>62.9</b></td><td><b>69.2</b></td><td><b>80.1</b></td></tr><tr><td>Zn price</td><td>US\$/t</td><td>2,866</td><td>2,866</td><td>2,866</td></tr><tr><td>Zn NSR</td><td></td><td>74.33%</td><td>74.33%</td><td>74.33%</td></tr><tr><td>Net Zn price received</td><td>US\$/t</td><td>2,130</td><td>2,130</td><td>2,130</td></tr><tr><td>Unplanned mining dilution</td><td></td><td>10.0%</td><td>10.0%</td><td>7.1%</td></tr><tr><td>Zn plant recovery factor</td><td></td><td>85.00%</td><td>85.00%</td><td>85.00%</td></tr><tr><td><b>Break-even in-situ Zn_Eq grade</b></td><td></td><td><b>3.9%</b></td><td><b>4.3%</b></td><td><b>4.8%</b></td></tr><tr><td><b>Break-even-in-situ Cu_Eq grade</b></td><td></td><td><b>1.3%</b></td><td><b>1.5%</b></td><td><b>1.6%</b></td></tr></table> <p>The calculation for the conversion of Cu to Zn_Eq grade is as follows:</p> $1\% \text{ Cu} = \frac{(\text{Cu price} \times \text{Cu NSR})}{(\text{Zn price} \times \text{Zn NSR})} \times \frac{(\text{Cu PRF})}{(\text{Zn PRF})}$	Cost and Revenue Parameters	Units	LHOSF (without trucking)	LHOSF (with trucking)	D&F	On-mine OPEX	ZAR/t	575	664	816	Royalty	ZAR/t	98	98	98	SIB CAPEX	ZAR/t	32	32	32	Marketing costs	ZAR/t	5	5	5	Concentrate transport costs	ZAR/t	170	170	170	<b>Total cash OPEX per tonne treated</b>	<b>ZAR/t</b>	<b>880</b>	<b>969</b>	<b>1,121</b>	FX (ZAR-US\$)		14.00	14.00	14.00	<b>Total cash operating cost per tonne treated</b>	<b>US\$/t</b>	<b>62.9</b>	<b>69.2</b>	<b>80.1</b>	Zn price	US\$/t	2,866	2,866	2,866	Zn NSR		74.33%	74.33%	74.33%	Net Zn price received	US\$/t	2,130	2,130	2,130	Unplanned mining dilution		10.0%	10.0%	7.1%	Zn plant recovery factor		85.00%	85.00%	85.00%	<b>Break-even in-situ Zn_Eq grade</b>		<b>3.9%</b>	<b>4.3%</b>	<b>4.8%</b>	<b>Break-even-in-situ Cu_Eq grade</b>		<b>1.3%</b>	<b>1.5%</b>	<b>1.6%</b>
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		$= \frac{(6,614^{10} \times 93.7\%^{11})}{(2,866^1 \times 74.3\%^2)} \times \frac{85.0^{12}\%}{84.3^3\%}$ $= 2.9\% \text{ Zn}$ <p>Therefore, the Zn equivalent grade = [Zn grade + (2.9 x Cu grade)]</p> <ul style="list-style-type: none"> <li>The payability factors stated in the above estimates assume recovery of silver (Ag) and gold (Au) from the two concentrate streams. It is estimated from metallurgical test work that the Cu concentrate will produce 144 to 176g/tonne Ag and 2 to 3g/tonne of Au. Concentrate specifications were derived from testwork undertaken at Mintek Laboratories under the supervision of DRA.</li> </ul>																		
<b>Mining factors or assumptions</b>	<ul style="list-style-type: none"> <li>The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).</li> <li>The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.</li> <li>The assumptions made regarding geotechnical parameters (e.g. pit slopes, stope sizes, etc.), grade control and pre-production drilling.</li> <li>The major assumptions made, and Mineral Resource model used for pit and stope optimisation (if appropriate).</li> <li>The mining dilution factors used.</li> <li>The mining recovery factors used.</li> <li>Any minimum mining widths used.</li> <li>The way Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.</li> <li>The infrastructure requirements of the selected mining methods.</li> </ul>	<ul style="list-style-type: none"> <li>The JORC (2012) Ore Reserve estimate is classified and reported as Probable Ore Reserve for the Underground hypogene Deep Sulphides; this includes 0% Inferred Mineral Resources for the purposes of determining Ore Reserves. Inferred Mineral Resources were only considered for the mining plan.</li> <li>The BFS used Datamine© Mining Software and a Mine Shape Optimiser (MSO) as detailed in the body of the report. Deductions were made for material excluded by the MSO, geological and pillars losses and a mining extraction factor. Dilution is included during the MSO process. The Mineral Resource conversion factors are listed below:</li> </ul> <p>Mineral Resources Conversion Factors for Production Scheduling</p> <table border="1"> <thead> <tr> <th>Parameter</th><th>Source</th><th>Factor</th></tr> </thead> <tbody> <tr> <td>Mineral Resources (below Cut-off: 4.0% Zn Eq.) &amp; Mine Design Losses</td><td>MSO</td><td>37%</td></tr> <tr> <td>Design stope dilution</td><td>MSO</td><td>16%</td></tr> <tr> <td>Geological/pillar Losses</td><td>Assumed</td><td>0%</td></tr> <tr> <td>Mining extraction factor – D&amp;F</td><td>Assumed</td><td>100%</td></tr> <tr> <td>Mining extraction factor - LHOSF</td><td>Assumed</td><td>95%</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>The above factors result in a 46% conversion of Mineral Resource tonnes to tonnes used in the production scheduling.</li> <li>The modifying factors, preliminary designs and schedules were done using the Mineral Resources classified and released in December 2018 for the Hypogene Deep Sulphides (refer ASX release 18 December 2018).</li> <li>Material assumptions regarding timeframe for development and production: <ul style="list-style-type: none"> <li>It is assumed that the BFS is positive, water may be realistically and economically pumped from underground and</li> <li>That the Mining Right is granted by the authorities.</li> </ul> </li> </ul>	Parameter	Source	Factor	Mineral Resources (below Cut-off: 4.0% Zn Eq.) & Mine Design Losses	MSO	37%	Design stope dilution	MSO	16%	Geological/pillar Losses	Assumed	0%	Mining extraction factor – D&F	Assumed	100%	Mining extraction factor - LHOSF	Assumed	95%
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<sup>10</sup> Metal prices assumed for the purposes of mine planning

<sup>11</sup> Calculated from Project estimates concentrate grades and: smelter terms

<sup>12</sup> Project estimated plant recovery factors

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		<ul style="list-style-type: none"><li>The mine model scenario for the BFS can be summarised as the establishment of underground operations to extract the extensions of the Indicated Ore Resource from the hypogene Deep Sulphides (the Deeps) at &gt; 600m accessed via existing underground mine infrastructure which would require dewatering and some refurbishment. Observations and non-destructive testing studies conducted by specialists on shaft steelwork as well as water quality tests has determined that 82 of the 220 total bunton sets should be replaced. It was also recommended that 10% of the shaft guides are replaced (refer to the ASX release 2 February 2018 which describes the shaft analysis work carried out).</li><li>During historical operations, water was not required to be pumped from the mine. The current water-level is at 330m and it is assumed that successful dewatering of the operation will then reveal the actual conditions for mining at &gt;600m. This factor has been built into the mine schedule and anticipated costs.</li><li>Gas hazards, equipment, backfill design, crushing and hoisting, mine ventilation and underground rehabilitation of existing structures also formed part of these mining studies.</li><li>Mining Method: Historically a tabular body of mineralisation was almost continuously economically mined over a strike length of 2,400m, between 1971 and 1991, from levels -100m to approximately -850m using the LHOS mining method. Assuming successful dewatering, refurbishment and new mine infrastructure are realised, mining scenarios propose Long-hole-open-stoping-with-fill (LHSF), either Longitudinal LHOSF or Transverse LHOSF (an estimated 57% of production) for the steeper sections. Drift-and-fill (D&amp;F) (an estimated 43% of production) for the flatter dipping sections - based on the shape and layout of the Mineral Resource. Blasted rock from both operations is loaded either into trucks or tipped directly into ore passes by LHD. The trucked blasted rock is hauled to rock pass systems on 926 level for loading into rail transport system on 957 level. Loaded trains transport rock to the respective ore and waste pass systems at the shaft.</li><li>Geotechnical: Observations from the existing tunnels in the upper levels of the historical mine indicate competent rock with very little tunnel-support. Localised roof bolting was carried out in fractured sections. Geotechnical studies were carried out by the Middindi Consulting (Pty) Ltd. 30 compressive and tensile strength tests were carried out on the hangingwall, mineralised zone and footwall rocks from 8 drill holes to estimate rock mass ratings at depth. The results indicate competent rock for all three rock-types.</li><li>Primary and Secondary Support recommendations:</li></ul> <table><tr><th rowspan="2"></th><th rowspan="2">Excavation</th><th rowspan="2">Type</th><th colspan="3">Primary support - tendons</th><th colspan="4">Secondary support</th></tr><tr><th>Specifications</th><th>Spacing</th><th>Application</th><th>Type</th><th>Specifications</th><th>Spacing</th><th>Application</th></tr><tr><td rowspan="16">Development excavations</td><td rowspan="4">Decline</td><td rowspan="4">Rebar</td><td>2.4m length</td><td rowspan="4">1.5m x 1.5m</td><td rowspan="4">HW</td><td colspan="4" rowspan="4">N/A</td></tr><tr><td>20mm diameter</td></tr><tr><td>160kN tensile strength</td></tr><tr><td>Full column resin</td></tr><tr><td rowspan="4">Gathering haulage</td><td rowspan="4">Rebar</td><td>1.5m length</td><td rowspan="4">1.5m x 1.5m</td><td rowspan="4">HW</td><td colspan="4" rowspan="4">N/A</td></tr><tr><td>18mm diameter</td></tr><tr><td>120kN tensile strength</td></tr><tr><td>Full column resin</td></tr><tr><td rowspan="4">Level access crosscut</td><td rowspan="4">Rebar</td><td>1.5m length</td><td rowspan="4">1.5m x 1.5m</td><td rowspan="4">HW</td><td colspan="4" rowspan="4">N/A</td></tr><tr><td>18mm diameter</td></tr><tr><td>120kN tensile strength</td></tr><tr><td>Full column resin</td></tr><tr><td rowspan="2">All intersections</td><td rowspan="2">Rebar</td><td>As per individual excavations</td><td rowspan="2">1.5m x 1.5m</td><td rowspan="2">HW</td><td rowspan="2">Cable anchor</td><td>4.5m length</td><td rowspan="2">2.5m x 2.5m</td><td rowspan="2">HW</td></tr><tr><td>38t tensile strength</td></tr><tr><td rowspan="5">Ore drive, drill drive, transport drift, stope / loading cross cut</td><td rowspan="5">Split set</td><td>15mm - 16mm diameter</td><td rowspan="5">2.0m x 2.0m</td><td rowspan="5">HW</td><td rowspan="5">Shotcrete</td><td>Full column grout</td><td rowspan="5">N/A</td><td rowspan="5">HW + 1.5m overlap to SW. 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		<p>Mining Dilution Factors: Hangingwall and footwall dilution in LHOS was designed into the planned stope shapes – an average of 25cm overbreak in both the hangingwall and footwall. Dilution from backfill in adjacent stopes was as follows:</p> <ul style="list-style-type: none"> <li>• 0.4% for Longitudinal LHOS</li> <li>• 3.8% for Transverse LHOS</li> <li>• 1.5% FOR DAF</li> </ul> <ul style="list-style-type: none"> <li>• Mining Recovery Factors: <ul style="list-style-type: none"> <li>• 95% for LHOS</li> <li>• 100% FOR DAF</li> </ul> </li> <li>• Minimum Mining Widths: <ul style="list-style-type: none"> <li>• Drift-and-Fill: 5m by 4m high stope dimensions with access drives of 5m by 4m.</li> <li>• LHSF: 5-15m with a strike span of 40m giving approximate stope capacities ranging between 20,000 tonnes and 60,000 tonnes per stope (estimated at approximately 130,000 tonnes/month). Inter-level spacing is designed at 30m.</li> </ul> </li> <li>• Tunnel dimensions designed at 5.5m by 5m high for main ramps and 5m by 5m for footwall tunnels and stope access drives.</li> <li>• Infrastructure Requirements for the chosen mining methods: <ul style="list-style-type: none"> <li>○ <u>Existing Infrastructure (remaining from previous mine operation)</u>: The project area is well serviced by infrastructure that was originally established for the historical mine; this includes the old mine roads on the site itself, some accommodation, telecommunications, water and electricity provision which are in use. On surface there remain the Hutchings Shaft, the main portal and decline which is operational. Underground, the mine tunnels and stopes are mainly accessible to 330m. It is assumed that the old mine infrastructure below water level at 330m such as the existing underground workshop at 957 Level, the crushing and shaft loading arrangement at 920 Level and the pre-existing mine ventilation facilities (Boehmka and Beecroft Shafts (note the surface structure and fans have been removed and the shaft collars made safe) would be refurbished or rebuilt. Mining studies on these aspects have been included in the BFS process to inform the BFS.</li> <li>○ <u>Additional Infrastructural Requirements for the chosen mining methods</u>: the following were considered as part of the BFS. The refurbishment and rebuilding of existing mine infrastructure including Koepe winders for rock hoisting and men and material hoisting for the Hutchings Shaft, a new processing plant, additional bulk water and electrical supply from existing infrastructure; installation of new ventilation fans; additional (potential) power from neighbouring renewable solar and wind plants; water dams (including effluent dams, potable water facilities, sewerage treatment plant, process water and storm water management) are planned. New buildings and facilities including management and office block, change-house/s and ablution facility, mine rescue room, training centre, central control room for the mine and processing plant; engineering workshop; a bunded diesel storage area; security and access control for mine safety.</li> <li>○ <u>Explosives Magazine</u>: Existing magazines remain from the historical mine and are in excellent condition. These will be used for storage of cartridges, booster and detonators. Bulk emulsion which is planned for the underground mine will be stored near the shaft in dedicated silos.</li> </ul> </li> </ul>
<b>Metallurgical factors or assumptions</b>	<ul style="list-style-type: none"> <li>• <i>The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.</i></li> <li>• <i>Whether the metallurgical process is well-tested technology or novel in nature.</i></li> <li>• <i>The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.</i></li> <li>• <i>Any assumptions or allowances made for deleterious elements.</i></li> </ul>	<p>The design of the processing plant allows for treatment of the hypogene (underground) feed and the optional, later stage, supergene (open-pit) feed with modifications. Unit processing costs and plant design and equipment assumes underground feed only in the initial phase of the Project.</p> <ul style="list-style-type: none"> <li>• <u>Metallurgical Process</u>: conventional, crushing, grinding and differential froth flotation processing is proposed for the hypogene material which should produce saleable concentrates of Zn and Cu with the potential for Ag and Au as by-products.</li> <li>• <u>Appropriateness</u>: appropriate for the type of material anticipated from the mining operation.</li> </ul>



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	<ul style="list-style-type: none"><li><i>The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole.</i></li><li><i>For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?</i></li></ul>	<ul style="list-style-type: none"><li><b>Tested Technology:</b> Not only is the technology in common use in the industry but it was successfully used during the previous operation of the Prieska Mine. Over the 20-year mine life, metal recoveries averaged 85% for both zinc and copper into concentrate grades ranging between 28% to 30% for copper (in the copper concentrates) and 51% to 53% for zinc (in the zinc concentrates) (refer ASX release 15 November 2017).</li><li><b>Metallurgical Test work:</b> Specialists: Mintek Laboratories under the guidance of the DRA Metallurgical team undertook the metallurgical testing. Open and closed circuit test work on the copper-circuit and zinc-circuit. Process flow tests to determine the optimal recovery processes based on the metallurgical characteristics of the material. 800kg of test sample was used from 7 drill holes ensuring representivity from various zones of the deposit (the NE and SW zones). These hypogene zones contain, in decreasing order of abundance, pyrite, sphalerite, chalcopyrite, pyrrhotite, barite and minor amounts of galena. Accessory minerals include magnetite, molybdenite, marcasite, arsenopyrite, minor gold and silver. Test work on underground samples with an average iron grade aligned to the expected mined grade (c.15% Fe) achieved similar recoveries to that achieved for historical operations. Flow-sheet development was carried out on blended samples and a comprehensive variability programme focused on testing a range of feed blends aligned to the mine plan.</li><li><b>Recovery Factors:</b> Test work data was used to derive grade-recovery correlations with expected recovery rates, into concentrate, of between 80 to 88% dependent on feed grades and target concentrate grades. Zinc and copper concentrates of 45-53% and 20 to 26%, respectively, will be targeted.</li><li><b>Assumptions or allowances made for deleterious elements:</b> historical sales of the PCM concentrates were recorded as clean with low concentrations of penalty elements. Detailed elemental analyses of the concentrates confirmed that several key deleterious elements are at negligible levels with, notably amongst others, arsenic, bismuth, cadmium, cobalt, tellurium, thorium and uranium at levels well below thresholds that may attract material penalty charges from most smelters or exclude some markets. Based on more recent discussions with concentrate off-takers, Cl &amp; Fl, Pb &amp; Zn have been noted as penalty elements in the Cu concentrate. Fe and Cl &amp; Fl are penalty elements in the Zn concentrate and have been accounted for in the NSR calculations.</li></ul> <table><tr><th>Parameter</th><th>Metric</th><th>Copper</th><th>Zinc</th></tr><tr><td>Metal price</td><td>US\$/t</td><td>6,834</td><td>2,756</td></tr><tr><td>Concentrate grade (Target)</td><td>%</td><td>24,0</td><td>50,0</td></tr><tr><td>Revenue per tonne of concentrate</td><td>US\$/t concentrate</td><td>1,640</td><td>1,378</td></tr><tr><td>Payability</td><td>%</td><td>95,8%</td><td>83,7%</td></tr><tr><td>Payability deduction</td><td>US\$/t concentrate</td><td>-68</td><td>-220</td></tr><tr><td>TCs &amp; RCs</td><td>US\$/t concentrate</td><td>-103</td><td>-163</td></tr><tr><td>By-product credits</td><td>US\$/t concentrate</td><td>172</td><td>0</td></tr><tr><td>Total penalties</td><td>US\$/t concentrate</td><td>-22</td><td>-11</td></tr><tr><td>Net Smelter Return (NSR)</td><td>US\$/t concentrate</td><td>1,619</td><td>984</td></tr><tr><td><b>NSR Percentage</b></td><td><b>%</b></td><td><b>98,7%</b></td><td><b>71,4%</b></td></tr></table> <ul style="list-style-type: none"><li></li><li>With respect to minerals that are defined by a specification and used in the Production Target estimate, the metallurgical test work was done to produce saleable concentrate products.</li><li>Metallurgical testing is completed and results are reported in the BFS to 22 October 2018. Metallurgical results were released to the ASX on 17 November 2017, 8 February 2018, 1 March 2018, 12 June 2018 and 22 October 2018.</li></ul>	Parameter	Metric	Copper	Zinc	Metal price	US\$/t	6,834	2,756	Concentrate grade (Target)	%	24,0	50,0	Revenue per tonne of concentrate	US\$/t concentrate	1,640	1,378	Payability	%	95,8%	83,7%	Payability deduction	US\$/t concentrate	-68	-220	TCs & RCs	US\$/t concentrate	-103	-163	By-product credits	US\$/t concentrate	172	0	Total penalties	US\$/t concentrate	-22	-11	Net Smelter Return (NSR)	US\$/t concentrate	1,619	984	<b>NSR Percentage</b>	<b>%</b>	<b>98,7%</b>	<b>71,4%</b>
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<b>Environmental</b>	<ul style="list-style-type: none"> <li>The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.</li> </ul>	<ul style="list-style-type: none"> <li>The previous mine owner, PCML, obtained a Conditional Closure Certificate in 1996 from the authorities in terms of the Minerals Act, 1991, in terms of which rehabilitation of the old mine is legally considered complete; with the condition that a fund, be provided to rehabilitate any residual or deleterious aspects related to the closure of the mine and the remaining old Tailings Storage Facility (TSF) which potentially may occur in the future. The Nature Conservation Trust No. 723/89 Fund currently stands at AUDR2.2 (end May 2019 Balance Sheet).</li> <li>The existing Repli Prospecting Right has an Approved EMP (Environmental Management Plan) and the Vardocube Prospecting Right has the newer, Environmental Authorisation (EA), which form part of the prospecting rights and compliance therewith.</li> <li>The new Mining Right Application (MRA) of the Repli Prospecting Right area was submitted on 6 April 2018 together with an Environmental Authorisation Application in terms of the NEMAct, 1998, which runs concurrent to the Mining Right Application. Similarly, the EA application linked to the Vardocube MRA was submitted to the authorities on 27 September 2018. Specialist studies to inform the Environmental Impact Reports (EIR), Environmental Impact Assessments (EIA) and EMPr (Environmental Management Programme), Integrated Water and Waste Management Plan (IWWMP) and Water Use Licenses (WUL) for the EA application process were submitted as part of the EA process including the EIA&amp;EMPr. The EA process also integrates the concerns raised during the Public Participation Process and incorporates mitigation measures for issues raised by affected parties. Some agreements have already been concluded including for the solar energy projects located nearby.</li> <li>The estimate agreed with the Department of Mineral Resources for the Financial Provision is AUD13.1 million and AUD21.8 million is estimated for the LoM closure rehabilitation cost). This total amount is in line with specialist recommendations and the EIA;</li> <li>In accordance with legislated timelines, the grant decision by the authorities for the Environmental Authorisations are anticipated by Q3 2019 for both the Repli EA the Vardocube EA.</li> </ul>
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>The existence of appropriate infrastructure; availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided or accessed.</li> </ul>	<ul style="list-style-type: none"> <li>The combined area for the Repli and Vardocube Prospecting Rights upon which the mine and mine infrastructure is planned, is approximately 6,766 hectares in extent.</li> <li><u>Surface Rights:</u> Repli Trading No. 27, an indirect subsidiary of Orion Minerals Ltd, and the entity which holds the Prospecting Right and the Mining Right application, controls the surface use for the farm Vogelstruis Bult 104 and Slimes Dam 154 (Prieska District, Northern Cape Province) primarily in the form of direct surface right ownership (97.5% shareholding in PCML (Prieska Copper Mining Limited); servitude rights written into the property deed for land owned by the Request Trust as well as a long-term Surface Users Agreement signed in November 2018 between the latter in which users rights for prospecting and mining operations are guaranteed and the land-owner compensated. In addition, the holder of a prospecting and mining right is entitled to carry out the relevant operations for the winning of minerals in terms of Section 54 of the MPRDAct, 2002. To date, Orion is aware of no Land Claims that have been registered for the properties. The Company has used reasonable endeavours to confirm that land is therefore available for the building of new or use of any existing infrastructure.</li> <li>Infrastructure Requirements: <ul style="list-style-type: none"> <li><u>Existing Infrastructure (remaining from previous mine operation):</u> This is discussed in the body of the report.</li> <li>It is assumed that the old mine infrastructure below the 330masl water level would be refurbished or rebuilt. Preliminary mining studies on these aspects have been included in the BFS process and inform the BFS study.</li> <li><u>Additional Infrastructural Requirements:</u> This is discussed in the body of the report.</li> </ul> </li> </ul>
<b>Costs</b>	<ul style="list-style-type: none"> <li>The derivation of, or assumptions made, regarding projected capital costs in the study.</li> <li>The methodology used to estimate operating costs.</li> <li>Allowances made for the content of deleterious elements. The derivation of assumptions made of metal or commodity price(s), for the principal minerals and co-products.</li> <li>The source of exchange rates used in the study.</li> </ul>	<ul style="list-style-type: none"> <li><u>Capital Cost (CAPEX) Assumptions:</u></li> <li>CAPEX used: AUD402 million.</li> <li>Construction Schedule – 33 months.</li> <li>Life of Mine (LoM) - approximately 10 years when Inferred resources are incorporated.</li> <li>Contingency of 10% of the underlying capital cost items.</li> <li>Target accuracy of ±15%.</li> <li>The base currency is the South African Rand (ZAR) and an exchange rate has been fixed at ZAR 14.50 : USD 1 and</li> </ul>

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	<ul style="list-style-type: none"><li>Derivation of transport charges.</li><li>The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.</li><li>The allowances made for royalties payable, both Government and private.</li></ul>	<p>ZAR 10 : AUD 1.</p> <p><u>Source of CAPEX estimated costs:</u></p> <ul style="list-style-type: none"><li>The estimate is base dated to December 2018.</li><li>Process Plant: estimates were made from measured and quantified each unit cost element from the engineering layout drawings, Process Flow Diagrams (PFDs), Mechanical Equipment List (MEL), motor lists and electrical Single Line Diagrams (SLD).</li><li>Surface Infrastructure: Items sized and quantified off general arrangement (GA) diagrams. Costs determined from vendor quotations pricing. Evaporation dam and TSF costed by a specialist design and engineering consultancy; Bulk power supply priced in detail by an electrical design and engineering company. Bulk water supply facilities and pipe-line upgrade costs are from a specialist consultant.</li><li>Underground Mining: quotes received for the underground fleet. The rock and man winders costed based on available second-hand units in the market, Surface ventilation fans were priced by a ventilation consulting company. Underground equipment has been priced from quotations and a specialist shaft and underground operator.</li><li>General: EPCM costs are based on a detailed build-up of man hours and related costs. Transport costs were quoted by suppliers in their quotations. First fills and commissioning spares have been priced by vendors in the quotations. Project owner’s costs are detailed from Orion Minerals. Construction power is based on the planned electrical kWhr using 2019 Eskom electricity tariffs.</li></ul> <p><u>Operating Cost (OPEX) Methodology and Assumptions:</u></p> <table><tr><th>Operating cost element</th><th>AUD/t ROM</th></tr><tr><td>Mining</td><td>48.10</td></tr><tr><td>Processing</td><td>16.10</td></tr><tr><td>Surface and In-directs</td><td>6.70</td></tr><tr><td>Concentrate Transport</td><td>9.40</td></tr><tr><td>Corporate Costs</td><td>1.40</td></tr><tr><td>Off-mine Costs</td><td>2.30</td></tr><tr><td>Royalty (Government)</td><td>5.70</td></tr><tr><td>Sustaining CAPEX</td><td>4.00</td></tr><tr><td><b>Total</b></td><td><b>93.70</b></td></tr></table> <ul style="list-style-type: none"><li>Operating costs are based on an AISC (all-in-sustaining-costs) of AUD94/tonne treated.</li><li>OPEX costs have been compiled from zero-based build-ups .</li><li>A Total Operating Cost Summary is provided in the body of the report along with tables for mining, processing, in-directs costs and off-site costs.</li><li>All labour costs across the various disciplines are built up from a detailed Project wide labour schedule showing detail per individual with detailed cost to company wage rates and allowances.</li><li>Underground Mining: Development and production costs were built-up from first principles compiled in Candy Model software by PCDS. A 15% margin was added to cater for a contractor rate with a further allowance to for fleet financing. Grade control drilling was costed by the Orion on-site geological staff. Back-fill costs were built up from underlying power and cement consumption rates by DRA using back-fill volumes supplied by Orion. Shaft</li></ul>	Operating cost element	AUD/t ROM	Mining	48.10	Processing	16.10	Surface and In-directs	6.70	Concentrate Transport	9.40	Corporate Costs	1.40	Off-mine Costs	2.30	Royalty (Government)	5.70	Sustaining CAPEX	4.00	<b>Total</b>	<b>93.70</b>
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		<p>operating costs were compiled by DRA based on previous experience including power consumption based on the selected winders using 2019 Eskom electricity tariffs.</p> <ul style="list-style-type: none"><li>○ Material Processing: Operating costs were compiled by DRA using planned reagent and crushing and milling wear component consumption rates and industry pricing. Processing power costs are based on 2019 Eskom electricity tariffs.</li><li>○ Surface and Indirect costs (General and Admin): These costs are primarily built up from the detailed labour schedule and quoted accommodation costs from the selected camp vendor.</li><li>○ Off-mine costs: This includes Orion Corporate office costs which have been built up in detail from current company costs. Marketing costs are a fixed amount of AUD1.2m pa based on discussions with a concentrate logistics management company. SLP costs</li></ul> <ul style="list-style-type: none"><li>● <u>Exchange Rate</u>: Base currency is ZAR with a fixed exchange rate at ZAR 14.50:USD 1 and ZAR 10 : AUD 1. The rates of exchange used have been empirically estimated and are based on exchange rates at the time of this report.</li><li>● <u>Commodity price assumptions and source</u>: see “revenue below”.</li><li>● <u>Transport charges</u>: For the purposes of this Study it is assumed that the concentrate will be trucked from the processing plant at the mine to Groveput Rail Siding (50km from the mine) daily and railed via De Aar to the Ngqura Port. Total transport and logistics charges are estimated at AUD9.30 per tonne of concentrate.</li><li>● <u>Penalties and allowances for deleterious elements</u>: refer to the NSR estimate detailed in this release.</li><li>● <u>Government Royalties</u>: the royalties were set at the formula for “unrefined minerals”, in terms of the Royalties Act, 2010, linked to the MPRDA, 2002. Where <math>Y = 0.5 + [EBIT / (\text{gross sales of unrefined minerals}) \times 9] \times 100</math> {maximum Y is 7.0%}.</li><li>● <u>Private Royalties</u>: No private royalties were included in the estimate.</li><li>● The estimates are for the total project and do not take into account the percentage of the Company’s ownership of the right holding companies at 70%. The BEE partners are responsible to raise equity for their 20%. The remaining 10%, in line with the Mining Charter III is in the form of community and employee trusts which recoup costs prior to pay-out.</li></ul>																								
Revenue factors	<ul style="list-style-type: none"><li>● <i>The derivation of or assumptions made regarding revenue factors including head grade, metal or commodity price(s), exchange rates, transportation and treatment charges, penalties, net smelter returns, etc.</i></li><li>● <i>The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.</i></li></ul>	<ul style="list-style-type: none"><li>● Head Grade Assumptions: Mining modifying factors were applied to Mineral Resources grades as covered in the report.</li><li>● Metal Price Assumptions<table><tr><th>Metal Prices</th><th>USD/tonne</th><th>USD/lb</th><th>Source</th></tr><tr><td>Copper</td><td>6,834</td><td>3.10</td><td>CIBC</td></tr><tr><td>Zinc</td><td>2,756</td><td>1.25</td><td>CIBC</td></tr><tr><th>Precious Metals</th><th>USD/oz</th><th></th><th>Source</th></tr><tr><td>Gold</td><td>1,300</td><td>n/a</td><td>Orion</td></tr><tr><td>Silver</td><td>17</td><td>n/a</td><td>Orion</td></tr></table></li><li>● <u>Metal Price assumptions were based on CIBC Analyst Long term Price Forecasts (April 2019)</u></li><li>● Contribution by the co-products of silver and gold were included in the estimates for the BFS.</li></ul>	Metal Prices	USD/tonne	USD/lb	Source	Copper	6,834	3.10	CIBC	Zinc	2,756	1.25	CIBC	Precious Metals	USD/oz		Source	Gold	1,300	n/a	Orion	Silver	17	n/a	Orion
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		<ul style="list-style-type: none"><li><u>Foreign Currency Exchange Rate Assumptions:</u><table><tr><th>FX Rate</th><th>USD</th><th>AUD</th><th>ZAR</th></tr><tr><td>USD</td><td>1.00</td><td>1.45</td><td>14.50</td></tr></table><p>The rates of exchange used have been empirically estimated and are based on exchange rates at the time of this report.</p></li><li><u>NSR</u>: the NSR is estimated at 98.7% and 71.4% for Cu and Zn respectively. The details of the calculation are shown in the main report.</li></ul>	FX Rate	USD	AUD	ZAR	USD	1.00	1.45	14.50
FX Rate	USD	AUD	ZAR							
USD	1.00	1.45	14.50							
Market assessment	<ul style="list-style-type: none"><li>The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.</li><li>A customer and competitor analysis along with the identification of likely market windows for the product.</li><li>Price and volume forecasts and the basis for these forecasts.</li></ul>	<ul style="list-style-type: none"><li><u>Demand, supply and stock situation for zinc and copper</u>: the global supply and demand balance for zinc is at a deficit forecasted to be balanced by an increase in smelter production and several new mines. It is anticipated that there will be an overall strong demand for zinc concentrates over the coming years. Copper is consistently in demand. The supply of copper is presently in surplus but reserve depletion in existing mines is anticipated to create an increase in demand after 2020.</li><li><u>Customer Analysis</u>: historically the concentrates produced from the PCM were regarded as clean products with few and low-levels of impurities. Current assay results support this and it is concluded that the concentrates will be in demand to blend down impurities in other concentrates. With the assistance of an external concentrate marketing consultant, the Company conducted a competitive process for the Project’s copper and zinc concentrates offtake, involving most of the largest smelting and trading groups from around the world. The market was widely canvassed and the assumptions used in the financial model are based on these findings. In the initial stage, expressions of interest in the Project’s concentrates were sought and expressions of interest (EOIs) to enter into offtake agreements for the zinc and/or copper concentrates were received. Whilst not specifically sought, some of the proposals included offers to contribute to project financing in some form or other, ranging from participation in the primary project debt financing through to provision of working capital and cost overrun facilities. Shortlisted Parties, selected on strength of offtake terms and/or willingness to provide financing to the Project, reviewed and refreshed their initial EOIs offers. Based on these revised offers, the Company anticipates progressing negotiations with up to three parties with a view to concluding final offtake terms in advance of a final review by the Company’s financiers.</li><li>A high-level competitor analysis for VMS deposits has been included at the BFS stage.</li></ul>								
Economic	<ul style="list-style-type: none"><li>The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.</li><li>NPV ranges and sensitivity to variations in the significant assumptions and inputs.</li></ul>	<ul style="list-style-type: none"><li>Sensitivity analysis for the economics shows the Project most sensitive to the ZAR-USD exchange-rate. Cu and Zn prices and grade almost have an identical impact on the sensitivity as shown in the diagram below.</li></ul>								

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		<p>At -15% the NPV is 37 and at +15% the NPV is 361.</p>
<b>Social</b>	<ul style="list-style-type: none"> <li>The status of agreements with key stakeholders and matters leading to social licence to operate.</li> </ul>	<ul style="list-style-type: none"> <li><b>Surface Use:</b> The Company, through Repli Trading No. 27 (Pty) Ltd controls Prieska Copper Mines Limited which owns a portion of the surface rights. The Company has a long-term Surface user Agreement, signed November 2018, with the remaining surface right holder for the area of the proposed mine infrastructure.</li> <li><b>Social License to operate:</b> <ul style="list-style-type: none"> <li>This aspect is guided by the Mining Charter and regulated by the Social and Labour Plan (SLP) which was compiled and submitted as part of the Repli and Vardocube Mining Right Applications. The SLP is currently being evaluated by the South African regulatory authorities.</li> <li>The Company signed an MOU (Memorandum of Understanding) with the Siyathemba Municipality for the Prieska District in February 2018 in which the Municipality endorsed the Repli SLP.</li> <li>Several significant social investment initiatives proposed in the SLP, designed to and agreed between the Company and the Siyathemba Municipality have already been started including the provision of internet facilities to the public in Prieska assisting the local community with application for work and/or as service providers for the proposed mining operation. The Company views the SLP as being a dynamic document that will continue to be revised as the Project develops and the needs and understanding of the local community change.</li> </ul> </li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserve</li> <li>Any identified material naturally occurring risks.</li> <li>The status of material legal agreements and marketing agreements.</li> <li>The status of governmental agreements and approval critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the pre-feasibility of Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.</li> </ul>	<ul style="list-style-type: none"> <li><b>Identified material natural occurring risks:</b> nil.</li> <li><b>Status of material legal agreements:</b> all agreements are current and active. Detail of the status of the legal agreements was not addressed in the BFS Technical Report. An independent legal review of the BFS document by Falcon &amp; Hume Attorneys at Law was undertaken in June 2019 and returned no material concerns.</li> <li><b>Status of material marketing agreements:</b> agreements in the process of negotiation and no signed off-take agreements are in place at the BFS stage.</li> <li><b>Tenement Status:</b> Mineral tenure in South Africa is regulated by the MPRDA (2002) with the environmental aspects regulated by NEMA (1998), both managed under the authority of the DMR. The Project mineral tenure or tenement holding comprises a set of contiguous prospecting rights surrounding the old PCM area: the Repli-Copperton Prospecting Right (Repli Prospecting Right), the Vardocube Prospecting Right, the Bartotrax Prospecting Right and the Repli-Doonies Pan Prospecting Right. Applications for mining rights have been submitted to the DMR for both the Repli Prospecting Right area and the Vardocube Prospecting Right area. The primary tenement licenses and applications are detailed below:</li> </ul>



Criteria	JORC Code explanation	Commentary
		<p><b>Repli Prospecting Right:</b></p> <ul style="list-style-type: none"> <li>NC 30/5/1/1/2/2105PR (NC10445PR): A prospecting right renewal and a Section 102 (addition of further minerals), have been granted to Repli, in terms of section 17(1) of the MPRDA for copper, zinc, lead, silver, gold, sulphur, cobalt, barytes, limestone, stone aggregate, gravel, sulphur in pyrite, pyrite, molybdenum ore, tungsten ore, sand (general) and iron ore in respect of the farm Vogelstruis Bult No 104, portion RE25 and portion 26 and the farm Slimes Dam 154, in the Prieska District, Northern Cape Province. The date of expiry is 2 November 2019 by which time Repli is anticipating having been granted the Mining Right which has been applied for.</li> <li>Orion effectively holds a 70% interest in the project, with the remaining 30% as 20% BEE ownership + 5% Community Trust + 5% Employee Trust in compliance with Mining Charter III and existing legislation.</li> </ul> <p><b>Vardocube Prospecting Right:</b></p> <ul style="list-style-type: none"> <li>NC 30/5/1/1/2/11841PR: Vardocube has been awarded a prospecting right, in terms of section 17(1) of the MPRDA, for copper ore, zinc ore, lead, gold, cobalt, sulphur in pyrite, barytes, limestone, pyrite, tungsten and molybdenum in respect of the farm Vogelstruis Bult No 104, portion RE1 in the Prieska District, Northern Cape Province. The date of grant is 25 April 2018; valid for five (5) years. The Prospecting Right has been notarially executed and registration is in process.</li> </ul> <p>Orion effectively holds a 70% interest in the project, with the remaining 30% as 20% BEE ownership + 5% Community Trust + 5% Employee Trust in compliance with Mining Charter III and existing legislation.</p> <p><b>Repli Mining Right Application</b></p> <ul style="list-style-type: none"> <li>Mining Right: NC30/5/1/2/2/10138MR. The Repli Mining Right Application (MRA), in terms of Section 22 of the MPRDA, 2002, for the Repli Prospecting area and commodities was submitted to the authorities, together with the pre-requisite EA application, on 6 April 2018. The application includes the proposed Mine Works Program and the SLP. The MRA application has been officially accepted and is in process.</li> </ul> <p><b>Vardocube Mining Right Application</b></p> <ul style="list-style-type: none"> <li>Mining Right: NC30/5/1/2/2/10146MR. The Vardocube Mining Right Application (MRA), in terms of Section 22 of the MPRDA, 2002, for the Repli Prospecting area and commodities was submitted to the authorities, together with the pre-requisite EA application, on 27 September 2018. The application includes the proposed Mine Works Program and the SLP. The MRA application is in process.</li> </ul> <ul style="list-style-type: none"> <li>Tenure Compliance: At the time of writing, the prospecting rights were compliant with statutory fee payments, annual reporting and financial provision audits up to date.</li> <li>According to the Department of Land Restitution and Reform, there are no land claims on any of the properties covered by the prospecting rights.</li> <li>The Conditional Closure Certificate is discussed under “environmental”, above.</li> <li>Government and statutory approvals: There are reasonable grounds to expect that all necessary government approvals will be received within the timeframes anticipated in the BFS.</li> <li>Status of government agreements: Apart from the tenement status (addressed above) the Company is not aware of any government agreements necessary for the project to continue.</li> <li>Discussions continue with the South African Department of Science and Technology to ensure compliance with technical aspects which may impact on the Square Kilometre Array (SKA) radio telescope, being built near Carnarvon over 40km from the Project.</li> <li>In 1987, Armaments Corporation of South Africa (SOC) Ltd (Armscor), a State-owned enterprise for acquiring defence capabilities for the South African Defence Force and other State agencies, established the Alkantpan ballistic test range on ground neighbouring the Project area (Alkantpan) These surface rights are unlikely to interfere with mine development and operating activities.</li> </ul>

Criteria	JORC Code explanation	Commentary
		<ul style="list-style-type: none"> <li>• A MoU is in place with the Siyathemba Municipality regarding the supply of bulk water to the mine. Final water tariffs are under negotiation.</li> <li>• The engineering design of the planned construction of the Feeder Bay within the Cuprum Sub-station has been approved by the Eskom Technical Evaluation Forum which took place in December 2018. Repli has paid all fees required to date to Eskom to allow the process to continue for Eskom to sign the long-term power agreement.</li> <li>• Repli is in the process of engaging with Transnet for rail transport logistics from the Groveput rail siding to Ngqura Port.</li> <li>• <u>Unresolved matters with 3<sup>rd</sup> parties which would materially affect the results of the BFS – none.</u></li> </ul>
<b>Classification</b>	<ul style="list-style-type: none"> <li>• <i>The basis for the classification of the Ore Reserves into varying confidence categories.</i></li> <li>• <i>Whether the result appropriately reflects the competent Person's view of the deposit.</i></li> <li>• <i>The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).</i></li> </ul>	<ul style="list-style-type: none"> <li>• Indicated Resources were converted into Probable Ore Reserves based on the mine planning process using appropriate modifying factors.</li> <li>• There are no Measured Mineral Resources.</li> </ul>
<b>Audits or reviews</b>	<ul style="list-style-type: none"> <li>• <i>The results of any audits or reviews of the Ore Reserve estimates.</i></li> </ul>	<ul style="list-style-type: none"> <li>• At the time of writing a review of the mining plan and the reserves is in progress with SRK Consulting of Johannesburg</li> </ul>
<b>Discussion of relative accuracy/confidence</b>	<ul style="list-style-type: none"> <li>• <i>Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors which would affect the relative accuracy and confidence of the estimate.</i></li> <li>• <i>The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and procedures used.</i></li> <li>• <i>Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage.</i></li> <li>• <i>It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The level of accuracy for the BFS Technical Report is <math>\pm 15\%</math>.</li> <li>• For the Deep Sulphide Mineral Resource (underground mining), a 100% Indicated Mineral Resource and 0% Inferred Mineral Resource was used for the purposes of the JORC reporting.</li> <li>• A Base Case 2 business plan is also presented that contains 30% Inferred Mineral Resources.</li> <li>• Mining studies for a Bankable Feasibility Study have been completed and further Optimisation Studies are in progress.</li> <li>• It is noted that there is a level of inaccuracy around the Transnet costs for rail freight for the concentrate transport as negotiations with Transnet are still in progress.</li> </ul>

## JORC Table 1: Section 4 Estimation and Reporting of Ore Reserves – Open Pit

(Criteria listed in Section 1, and where relevant in Section 2 and 3, also apply to this section.)

Criteria	JORC Code explanation	Commentary
<b>Mineral Resource estimate for conversion to Ore Reserves</b>	<ul style="list-style-type: none"> <li>Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.</li> <li>Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.</li> </ul>	<ul style="list-style-type: none"> <li>The Ore Reserves are derived from the use of the total Mineral Resources for the Prieska Open-pit of 1.76Mt at 1.5% Cu and 2.0% Zn, classified and reported in terms of JORC 2012<sup>13</sup> in ASX release 15 January 2019.</li> <li>The Mineral Resources are based on drilling data available as at 30 November 2018.</li> <li>The Competent Person for the Mineral Resource is Mr Sean Duggan of Z* Consultants, RSA.</li> <li>The mineral resource estimate for was prepared by mining industry consultants Z Star Mineral Resource Consultants (Pty) Ltd using Variogram Modelling, Neighbourhood optimization and Ordinary Kriging to estimate the zinc and copper grades into the geological domains constrained by wireframes.</li> <li>The Mineral Resources are reported inclusive of the Ore Reserves.</li> </ul>
<b>Site visits</b>	<ul style="list-style-type: none"> <li>Comment on any site visits undertaken by the Competent Person and the outcome of those visits.</li> <li>If no site visits have been undertaken indicate why this is the case.</li> </ul>	<ul style="list-style-type: none"> <li>The Competent Person, William Gillespie, Principal Mining Consultant of A&amp;B Global Mining Consultants and Fellow of IMMM visited the site on 16th May 2019. The visit included site familiarization: discussions with site personnel, inspection of the surface facilities, review of selected drill core, inspection of the proposed open pit operation and an underground visit including and inspection of some of the accessible facilities</li> </ul>
<b>Study status</b>	<ul style="list-style-type: none"> <li>The type and level of study to enable Mineral Resources to be converted to Ore Reserves.</li> <li>The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that the material Modifying Factors have been considered.</li> </ul>	<ul style="list-style-type: none"> <li>A BFS Technical Report has been completed.</li> <li>The BFS has been prepared to an accuracy level of <math>\pm 15\%</math> using Indicated and Inferred Mineral Resources; appropriate mine planning and modifying factors have been applied commensurate to a BFS level of accuracy and are deemed to have reasonable prospects of being technically achievable and economically viable.</li> <li>Section 4 of JORC Table 1 is being completed as part of the BFS requirement to disclose material modifying factors and assumptions underpinning the open-pit Ore Reserves and existing Production Target estimates linked to updated forecast financial Information.</li> </ul>
<b>Cut-off parameters</b>	<ul style="list-style-type: none"> <li>The basis of the cut-off grade(s) or quality parameters applied.</li> </ul>	<ul style="list-style-type: none"> <li>No break-even or cut-off grade is calculated for the open-pit as the Whittle 4D© Pit Optimisation process takes account of all relevant costs and the value per mining block net of plant recovery factors, treatment and refining charges and including waste stripping to determine if a Resource block can be brought into an economic pit-shell.</li> </ul>
<b>Mining factors or assumptions</b>	<ul style="list-style-type: none"> <li>The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).</li> <li>The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.</li> </ul>	<ul style="list-style-type: none"> <li>The JORC (2012) Ore Reserve estimate is classified and reported as Probable Ore Reserve for the open-pit Supergene deposit; this includes 0% Inferred Mineral Resource.</li> <li>The BFS Whittle 4D© Pit Optimisation as detailed in the body of the report was used to select the final pit shell for planning purposes.</li> <li>Deductions were made for mining extraction losses and additional dilution material. The Mineral Resource conversion factors are listed below:</li> </ul>

<sup>13</sup> Mineral Resource reported in ASX release of 15 January 2019: “Prieska Total Mineral Resource Exceeds 30Mt @ 3.7% Zn Eq and 1.2% Cu Following Updated Open-pit Resource” available to the public on [www.orionminerals.com.au/investors/market-news](http://www.orionminerals.com.au/investors/market-news). Competent Person Orion’s exploration: Mr. Pottie Potgieter. Competent Person: Orion’s Mineral Resource: Mr. Sean Duggan. Orion is not aware of any new information or data that materially affects the information included above. For the Mineral Resource, the company confirms that all material assumptions and technical parameters underpinning the estimates in the ASX release of 15 January 2019 continue to apply and have not materially changed. Orion confirms that the form and context in which the Competent Person’s findings are presented here have not materially changed.

Criteria	JORC Code explanation	Commentary									
	<ul style="list-style-type: none"> <li>The assumptions made regarding geotechnical parameters (e.g. pit slopes, stope sizes, etc.), grade control and pre-production drilling.</li> <li>The major assumptions made, and Mineral Resource model used for pit and stope optimisation (if appropriate).</li> <li>The mining dilution factors used.</li> <li>The mining recovery factors used.</li> <li>Any minimum mining widths used.</li> <li>The way Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.</li> <li>The infrastructure requirements of the selected mining methods.</li> </ul>	<p>Mineral Resources Conversion Factors for Production Scheduling;</p> <table border="1"> <thead> <tr> <th>Parameter</th><th>Source</th><th>Factor</th></tr> </thead> <tbody> <tr> <td>Dilution</td><td>Assumed</td><td>5.0%</td></tr> <tr> <td>Mining extraction factor</td><td>Assumed</td><td>90%</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>The open-pit design resulted in a 36% conversion of Mineral Resource tonnes to Reserve tonnes and a 34% Mineral Resource conversion to Cu equivalent metal.</li> <li>The modifying factors, pit design and schedule were done using the Mineral Resources classified and released in on 15 January 2019 for the supergene deposit (refer ASX release 15 January 2019).</li> <li>Material assumptions regarding timeframe for development and production: <ul style="list-style-type: none"> <li>It is assumed that the BFS is positive, and the planned underground mine is completed following which the open-pit will commence.</li> <li>That the Mining Right is granted by the authorities.</li> </ul> </li> <li>The mine model scenario for the BFS can be summarised as completing a void (historical open-stopes) back-filling program beneath the planned open-pit. This will use back-fill from the existing paste plant used during the underground operation. Once the voids are filled mining of the open-pit will commence. Six stopes, amounting to approximately 70,000m<sup>3</sup> in volume are required to be filled. Additional safety measures will be required as the initial mining will take place next to sink-holes. The details of these measures are outlined in the main report.</li> <li>Mining Method: Conventional open-pit mining will be carried out by a mining contractor. 40t ADTs are planned for the ore mining and CAT777 (90t) or equivalent trucks will be used for the waste mining. A grade control drilling program is planned at 10m intervals and a 20m spacing to delineate the supergene ore from the oxide and waste material.</li> <li>Geotechnical: The open-pit design is based on a geotechnical assessment report carried out by Middindi Consulting (Pty) Ltd (Middindi), MAPTEK 3-D geotechnical survey data, laboratory rock strength tests and geological observations were used to provide the data set. Four rock types were identified: Weathered, Transitional, Poor-Quality and Fresh. The pit slope angles were determined by the position of these four rock types. Pit slope angles ranged from 41° for the Poor-Quality rock to 56° for the Fresh rock.</li> <li>Existing Infrastructure: The project area is well serviced by infrastructure that was originally established for the historical mine; this includes mine roads on the site itself, some accommodation, telecommunications, water and grid electricity which is in use. For the open-pit mining, top-soil, oxide and waste rock dumps will be required to be built.</li> <li>Additional Infrastructure: As the open-pit mining follows on from the underground operation, general surface facilities will already be in place. This will mainly be; the processing plant, TSF, water handling facilities, management and staff office blocks, a change-house, mine rescue room, training centre, central control room for the processing plant; engineering workshop; diesel storage area; security and personal access control.</li> <li>Explosives Magazine: Existing magazines remain from the historical mine and are in excellent condition. These will be used for storage of cartridges, boosters and detonators. Bulk emulsion which is planned for the open-pit mine will be stored near the shaft in dedicated silos which will already be in place from the underground mining.</li> </ul>	Parameter	Source	Factor	Dilution	Assumed	5.0%	Mining extraction factor	Assumed	90%
Parameter	Source	Factor									
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Criteria	JORC Code explanation	Commentary																																												
<b>Metallurgical factors or assumptions</b>	<ul style="list-style-type: none"><li><i>The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.</i></li><li><i>Whether the metallurgical process is well-tested technology or novel in nature.</i></li><li><i>The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.</i></li><li><i>Any assumptions or allowances made for deleterious elements.</i></li><li><i>The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole.</i></li><li><i>For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?</i></li></ul>	<p>The design of the processing plant allows for treatment of the open-pit supergene ore (with modifications after the underground mining is completed).</p> <ul style="list-style-type: none"><li><u>Metallurgical Process</u>: crushing, grinding and differential froth flotation processing is proposed for the supergene ore which can produce saleable concentrates of Zn and Cu with the potential for Ag and Au as by-products.</li><li><u>Appropriateness</u>: appropriate for the type of material anticipated from the mining operation.</li><li><u>Tested Technology</u>: The proposed processing route for open pit material is based on bulk flotation followed by differential cleaner flotation using a relatively novel flowsheet, using known processing technologies, and reagent regime.</li><li><u>Metallurgical Test work</u>: Specialists: Mintek Laboratories under the guidance of the DRA Metallurgical team undertook the metallurgical testing. Bench scale, batch open circuit flotation work was performed to derive the optimal flowsheet for processing of supergene material. Once the optimum flowsheet had been derived, bench scale, batch open circuit flotation variability test work was performed. 602kg of test sample was used from eight drill holes ensuring representivity from the various zones of the deposit. The copper samples produced saleable concentrates although the test-work indicated that zinc material below 2.0% would not produce a saleable concentrate.</li><li><u>Recovery Factors</u>: Test work indicates metallurgical recovery rates of approximately 60% to 70% for copper and 48% to 53% for zinc. The concentrate grades were determined to be 23% to 26% for copper and 28% to 33% for zinc, with notable variability in ore response for open pit material.</li><li><u>Assumptions or allowances made for deleterious elements</u>: historical sales of the PCM concentrates were recorded as clean with low concentrations of penalty elements. Detailed elemental analyses of the concentrates confirmed that several key deleterious elements are at negligible levels with, notably amongst others, arsenic, bismuth, cadmium, cobalt, tellurium, thorium and uranium at levels well below thresholds that may attract material penalty charges from most smelters or exclude some markets. Based on more recent discussions with concentrate off-takers, Cl &amp; Fl, Pb &amp; Zn have been noted as penalty elements in the Cu concentrate. Fe and Cl &amp; Fl are penalty elements in the Zn concentrate and have been accounted for in the NSR calculations. Copper and zinc concentrate samples were supplied to P&amp;C for determination of the concentrate transportable moisture limit.</li></ul> <table><tr><th>Parameter</th><th>Metric</th><th>Copper</th><th>Zinc</th></tr><tr><td>Metal price</td><td>US\$/t</td><td>6,8434</td><td>2,756</td></tr><tr><td>Concentrate grade</td><td>%</td><td>24.6</td><td>35.5</td></tr><tr><td>Revenue per tonne of concentrate</td><td>US\$/t concentrate</td><td>1,750</td><td>978</td></tr><tr><td>Payability</td><td>%</td><td>96.1%</td><td>83,7%</td></tr><tr><td>Payability deduction</td><td>US\$/t concentrate</td><td>-68</td><td>-247</td></tr><tr><td>TCs &amp; RCs</td><td>US\$/t concentrate</td><td>-106</td><td>-186</td></tr><tr><td>By-product credits</td><td>US\$/t concentrate</td><td>48</td><td>0</td></tr><tr><td>Total penalties</td><td>US\$/t concentrate</td><td>-28</td><td>-20</td></tr><tr><td>Net Smelter Return (NSR)</td><td>US\$/t concentrate</td><td>1,595</td><td>526</td></tr><tr><td>NSR Percentage</td><td>%</td><td>91.2%</td><td>53.7%</td></tr></table>	Parameter	Metric	Copper	Zinc	Metal price	US\$/t	6,8434	2,756	Concentrate grade	%	24.6	35.5	Revenue per tonne of concentrate	US\$/t concentrate	1,750	978	Payability	%	96.1%	83,7%	Payability deduction	US\$/t concentrate	-68	-247	TCs & RCs	US\$/t concentrate	-106	-186	By-product credits	US\$/t concentrate	48	0	Total penalties	US\$/t concentrate	-28	-20	Net Smelter Return (NSR)	US\$/t concentrate	1,595	526	NSR Percentage	%	91.2%	53.7%
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		<ul style="list-style-type: none"> <li>• <u>Bulk sample test work and representivity</u>: discussed under “test work” above.</li> <li>• With respect to minerals that are defined by a specification and used in the Ore Reserve estimate, the metallurgical test work was done to produce saleable concentrate products.</li> <li>• Metallurgical testing is completed and results are reported in the BFS. Metallurgical results for the supergene testing were released to the ASX on 15 November 2017, 1 March 2018, and 22 October 2018.</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>• <i>The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The previous mine owner, PCML, obtained a Conditional Closure Certificate in 1996 from the authorities in terms of the Minerals Act, 1991, in terms of which rehabilitation of the old mine is legally considered complete; with the condition that a fund, be provided to rehabilitate any residual or deleterious aspects related to the closure of the mine and the remaining old Tailings Storage Facility (TSF) which potentially may occur in the future. The Nature Conservation Trust No. 723/89 Fund currently stands at AUD2.2 (end May 2019 Balance Sheet).</li> <li>• The existing Repli Prospecting Right has an Approved EMP (Environmental Management Plan) and the Vardocube Prospecting Right has the newer, Environmental Authorisation (EA), which form part of the prospecting rights and compliance therewith.</li> <li>• The new Mining Right Application (MRA) of the Repli Prospecting Right area was submitted on 6 April 2018 together with an Environmental Authorisation Application in terms of the NEMAct, 1998, which runs concurrent to the Mining Right Application. Similarly, the EA application linked to the Vardocube MRA was submitted to the authorities on 27 September 2018. Specialist studies to inform the Environmental Impact Reports (EIR), Environmental Impact Assessments (EIA) and EMPr (Environmental Management Programme), Integrated Water and Waste Management Plan (IWWMP) and Water Use Licenses (WUL) for the EA application process were submitted as part of the EA process including the EIA &amp; EMPr. The EA process also integrates the concerns raised during the Public Participation Process and incorporates mitigation measures for issues raised by affected parties. Some agreements have already been concluded including for the solar energy projects located nearby.</li> <li>• The estimate agreed with the Department of Mineral Resources for the Financial Provision is AUD13.1m and AUD21.8m is estimated for the LoM closure rehabilitation cost – this includes all underground mining prior to ending the open-pit). This total amount is in line with specialist recommendations and the EIA;</li> <li>• In accordance with legislated timelines, the grant decision by the authorities for the Environmental Authorisations are anticipated by Q3 2019 for both the Repli EA the Vardocube EA.</li> </ul>
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>• <i>The existence of appropriate infrastructure; availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided or accessed.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The combined area for the Repli and Vardocube Prospecting Rights upon which the mine and mine infrastructure is planned, is approximately 6,766 hectares in extent.</li> <li>• <u>Surface Rights</u>: Repli Trading No. 27, an indirect subsidiary of Orion Minerals Ltd, and the entity which holds the Prospecting Right and the Mining Right application, controls the surface use for the farm Vogelstruis Bult 104 and Slimes Dam 154 (Prieska District, Northern Cape Province) primarily in the form of direct surface right ownership (97.5% shareholding in PCML (Prieska Copper Mining Limited)); servitude rights written into the property deed for land owned by the Request Trust as well as a long-term Surface Users Agreement signed in November 2018 between the latter in which users rights for prospecting and mining operations are guaranteed and the land-owner compensated. In addition, the holder of a prospecting and mining right is entitled to carry out the relevant operations for the winning of minerals in terms of Section 54 of the MPRDAct, 2002. To date, Orion is aware of no Land Claims that have been registered for the properties. The Company has used reasonable endeavours to confirm that land is therefore available for the building of new or use of any existing infrastructure.</li> <li>• Infrastructure Requirements: <ul style="list-style-type: none"> <li>○ <u>Existing Infrastructure</u>: required infrastructure will be from the remaining items from the previous mine operation and from the underground phase.</li> <li>○ <u>Additional Infrastructural Requirements</u>: This was discussed above.</li> </ul> </li> </ul>
<b>Costs</b>	<ul style="list-style-type: none"> <li>• <i>The derivation of, or assumptions made, regarding projected capital costs in the study.</i></li> </ul>	<ul style="list-style-type: none"> <li>○ <u>Capital Cost (CAPEX) Assumptions (for the open-pit only)</u>:</li> <li>○ CAPEX used: AUD2.5 million.</li> </ul>

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	<ul style="list-style-type: none"><li>• The methodology used to estimate operating costs.</li><li>• Allowances made for the content of deleterious elements. The derivation of assumptions made of metal or commodity price(s), for the principal minerals and co-products.</li><li>• The source of exchange rates used in the study.</li><li>• Derivation of transport charges.</li><li>• The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.</li><li>• The allowances made for royalties payable, both Government and private.</li></ul>	<ul style="list-style-type: none"><li>○ Construction Schedule – 9 months (for the void filling prior to open-pit mining starting).</li><li>○ Life of Pit - 17 months.</li><li>○ Contingency of 10% of the underlying capital cost items.</li><li>○ Target accuracy of ±15%.</li><li>○ The base currency is the South African Rand (ZAR) and an exchange rate has been fixed at ZAR 14.50 : USD 1 and ZAR 10 : AUD 1.</li></ul> <p><u>Source of CAPEX estimated costs:</u></p> <ul style="list-style-type: none"><li>○ The estimate is base dated to December 2018.</li><li>○ Process Plant: estimates were made from measured and quantified each unit cost element from the engineering layout drawings, Process Flow Diagrams (PFDs), Mechanical Equipment List (MEL), motor lists and electrical Single Line Diagrams (SLD).</li><li>○ Surface Infrastructure: Items sized and quantified off general arrangement (GA) diagrams. Costs determined from vendor quotations pricing. Evaporation dam and TSF costed by a specialist design and engineering consultancy; Bulk power supply priced in detail by an electrical design and engineering company. Bulk water supply facilities and pipe-line upgrade costs are from a specialist consultant.</li><li>○ Void filling below the open-pit costs were compiled by PCDS from detailed consumption rates for cement and using quoted price for the raise-bore drilling required.</li><li>○ General: EPCM costs are based on a detailed build-up of man hours and related costs. Transport costs were quoted by suppliers in their quotations. First fills and commissioning spares have been priced by vendors in the quotations. Project owner’s costs are detailed from Orion Minerals. Construction power is based on the planned electrical kWhr using 2019 Eskom electricity tariffs.</li></ul> <p><u>Operating Cost (OPEX) Methodology and Assumptions:</u></p> <table><tr><th>Operating cost element</th><th>AUD/t ROM</th></tr><tr><td>Open-pit mining</td><td>55.1</td></tr><tr><td>Processing</td><td>18.4</td></tr><tr><td>Surface and In-directs</td><td>6.7</td></tr><tr><td>Concentrate Transport</td><td>9.4</td></tr><tr><td>Corporate Costs</td><td>1.4</td></tr><tr><td>Off-mine Costs</td><td>2.3</td></tr><tr><td>Royalty (Government)</td><td>5.7</td></tr><tr><td>Sustaining CAPEX</td><td>1.0</td></tr><tr><td><b>Total</b></td><td><b>100</b></td></tr></table> <ul style="list-style-type: none"><li>○ OPEX costs have been compiled from contractor tendered quotes.</li><li>○ A Total Operating Cost Summary is provided in the body of the report along with tables for mining, processing, in-directs costs, corporate and off-site costs.</li><li>○ All labour costs across the various disciplines are built up from a detailed Project wide labour schedule showing detail per individual with detailed cost to company wage rates and allowances.</li><li>○ Open-pit mining: costs were built-up from tendered prices from a mining contractor. Grade control drilling was costed by the Orion on-site geological staff.</li><li>○ Material Processing: Operating costs were compiled by DRA using planned reagent, crushing and milling wear component consumption rates and industry pricing. Processing power costs are based on 2019</li></ul>	Operating cost element	AUD/t ROM	Open-pit mining	55.1	Processing	18.4	Surface and In-directs	6.7	Concentrate Transport	9.4	Corporate Costs	1.4	Off-mine Costs	2.3	Royalty (Government)	5.7	Sustaining CAPEX	1.0	<b>Total</b>	<b>100</b>
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		<p>Eskom electricity tariffs.</p> <ul style="list-style-type: none"><li>○ Surface and Indirect costs (General and Admin): These costs are primarily built up from the detailed labour schedule and quoted accommodation costs from the selected camp vendor.</li><li>○ Off-mine costs: This includes Orion Corporate office costs which have been built up in detail from current company costs. Marketing costs are a fixed amount of AUD1.2m pa based on discussions with a concentrate logistics management company. SLP costs have been estimated based on planned community projects.</li></ul> <ul style="list-style-type: none"><li>● <u>Exchange Rate</u>: Base currency is ZAR with a fixed exchange rate at ZAR 14.50:USD 1 and ZAR 10 : AUD 1. The rates of exchange used have been empirically estimated and are based on exchange rates at the time of this report.</li><li>● <u>Commodity price assumptions and source</u>: see “revenue below”.</li><li>● <u>Transport charges</u>: For the purposes of this Study it is assumed that the concentrate will be trucked from the processing plant at the mine to Groveput Rail Siding (50km from the mine) daily and railed via De Aar to the Ngqura Port. Total transport and logistics charges are estimated at AUD9.3 per tonne of concentrate.</li><li>● <u>Penalties and allowances for deleterious elements</u>: refer to the NSR estimate detailed in this release.</li><li>● <u>Government Royalties</u>: the royalties were set at the formula for “unrefined minerals”, in terms of the Royalties Act, 2010, linked to the MPRDA, 2002. Where Y = 0.5 + [EBIT/(gross sales of unrefined minerals) x9] x 100 {maximum Y is 7.0%}.</li><li>● <u>Private Royalties</u>: No private royalties were included in the estimate.</li><li>● The estimates are for the total project and do not take into account the percentage of the Company’s ownership of the right holding companies at 70%. The BEE partners are responsible to raise equity for their 20%. The remaining 10%, in line with the Mining Charter III is in the form of community and employee trusts which recoup costs prior to pay-out.</li></ul>																																
Revenue factors	<ul style="list-style-type: none"><li>● <i>The derivation of or assumptions made regarding revenue factors including head grade, metal or commodity price(s), exchange rates, transportation and treatment charges, penalties, net smelter returns, etc.</i></li><li>● <i>The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.</i></li></ul>	<ul style="list-style-type: none"><li>● Metal Price Assumptions<table><tr><th>Metal Prices</th><th>USD/tonne</th><th>USD/lb</th><th>Source</th></tr><tr><td>Copper</td><td>6,834</td><td>3.10</td><td>CIBC</td></tr><tr><td>Zinc</td><td>2,756</td><td>1.25</td><td>CIBC</td></tr><tr><th>Precious Metals</th><th>USD/oz</th><th></th><th>Source</th></tr><tr><td>Gold</td><td>1,300</td><td></td><td>Orion</td></tr><tr><td>Silver</td><td>17</td><td></td><td>Orion</td></tr></table></li><li>● Contribution by the co-products of silver and gold were included in the estimates for the BFS.</li><li>● <u>Foreign Currency Exchange Rate Assumptions</u>:<table><tr><th>FX Rate</th><th>USD</th><th>AUD</th><th>ZAR</th></tr><tr><td>USD</td><td>1.00</td><td>1.45</td><td>14.50</td></tr></table><p>The rates of exchange used have been empirically estimated and are based on exchange rates at the time of this report.</p></li></ul>	Metal Prices	USD/tonne	USD/lb	Source	Copper	6,834	3.10	CIBC	Zinc	2,756	1.25	CIBC	Precious Metals	USD/oz		Source	Gold	1,300		Orion	Silver	17		Orion	FX Rate	USD	AUD	ZAR	USD	1.00	1.45	14.50
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Market assessment	<ul style="list-style-type: none"><li>● <i>The demand, supply and stock situation for the particular</i></li></ul>	<ul style="list-style-type: none"><li>● <u>Demand, supply and stock situation for zinc and copper</u>: the global supply and demand balance for zinc is at a</li></ul>																																

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	<p><i>commodity, consumption trends and factors likely to affect supply and demand into the future.</i></p> <ul style="list-style-type: none"> <li><i>A customer and competitor analysis along with the identification of likely market windows for the product.</i></li> <li><i>Price and volume forecasts and the basis for these forecasts.</i></li> </ul>	<p>deficit forecasted to be balanced by an increase in smelter production and several new mines. It is anticipated that there will be an overall strong demand for zinc concentrates over the coming years. Copper is consistently in demand. The supply of copper is presently in surplus but reserve depletion in existing mines is anticipated to create an increase in demand after 2020.</p> <p><u>Customer Analysis:</u> : historically the concentrates produced from the PCM were regarded as clean products with few and low-levels of impurities. Current assay results support this and it is concluded that the concentrates will be in demand to blend down impurities in other concentrates. With the assistance of an external concentrate marketing consultant, the Company conducted a competitive process for the PCM copper and zinc concentrates offtake (Offtake Process), involving most of the largest smelting and trading groups from around the world. The market was widely canvassed and the assumptions used in the financial model are based on these findings. In the initial stage, expressions of interest in the Projects concentrates were sought and expressions of interest (EOIs) to enter into offtake agreements for the zinc and/or copper concentrates were received. Whilst not specifically sought, some of the proposals included offers to contribute to project financing in some form or other, ranging from participation in the primary project debt financing through to provision of working capital and cost overrun facilities. Shortlisted Parties, selected on strength of offtake terms and/or willingness to provide financing to the Project, reviewed and refreshed their initial EOIs returning offers. Basis these revised offers, the Company anticipating progressing negotiations with up to three parties with a view to concluding final offtake terms in advance of a final review by the Company's financiers.</p> <ul style="list-style-type: none"> <li>A high level competitor analysis for VMS deposits has been included at the BFS stage.</li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li><i>The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.</i></li> <li><i>NPV ranges and sensitivity to variations in the significant assumptions and inputs.</i></li> </ul>	<p>The inputs for the NPV estimation are tabulated in the body of the report;</p> <ul style="list-style-type: none"> <li><u>Valuation Methodology</u> The Discounted Cash Flow (DCF) method of valuation was used to arrive at a Project NPV. For the purposes of this BFS, a discount rate of 8.0% has been used. In generating the financial model, the following parameters and assumptions were used: <ul style="list-style-type: none"> <li>The financial model is in real terms;</li> <li>The model was set up in months for the life of the Project. The financial year ending of the Company is June;</li> <li>No escalation has been applied;</li> <li>The operation is valued as a single tax entity;</li> <li>Royalties were set at the formula applicable for unrefined minerals;</li> <li>No salvage value was included for plant and mining equipment remaining at the end of operations.</li> <li>South Africa corporate tax rate of 28% has been applied.</li> <li>NPV: AUD224m. The NPV is based on a real cash flow with no inflation applied.</li> <li>Sensitivity analysis for the economics shows the Project most sensitive to the ZAR-USD exchange-rate. Cu and Zn prices and grade almost have an identical impact on the sensitivity as shown in the diagram below.</li> </ul> </li> </ul>

Criteria	JORC Code explanation	Commentary
		<p>At -15% of FX rate, the NPV is AUD37m and at +15% the NPV is AUD361m.</p>
<b>Social</b>	<ul style="list-style-type: none"> <li>The status of agreements with key stakeholders and matters leading to social licence to operate.</li> </ul>	<ul style="list-style-type: none"> <li><b>Surface Use:</b> The Company, through Repli Trading No. 27 (Pty) Ltd controls Prieska Copper Mines Limited which owns a portion of the surface rights. The Company has a long-term Surface user Agreement, signed November 2018, with the remaining surface right holder for the area of the proposed mine infrastructure.</li> <li><b>Social License to operate:</b> <ul style="list-style-type: none"> <li>This aspect is guided by the Mining Charter and regulated by the Social and Labour Plan (SLP) which was compiled and submitted as part of the Repli and Vardocube Mining Right Applications. The SLP is currently being evaluated by the South African regulatory authorities.</li> <li>The Company signed an MOU (Memorandum of Understanding) with the Siyathemba Municipality for the Prieska District in February 2018 in which the Municipality endorsed the Repli SLP.</li> <li>Several significant social investment initiatives proposed in the SLP, designed to and agreed between the Company and the Siyathemba Municipality have already been started including the provision of internet facilities to the public in Prieska assisting the local community with application for work and/or as service providers for the proposed mining operation. The Company views the SLP as being a dynamic document that will continue to be revised as the Project develops and the needs and understanding of the local community change.</li> </ul> </li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserve</li> <li>Any identified material naturally occurring risks.</li> <li>The status of material legal agreements and marketing agreements.</li> <li>The status of governmental agreements and approval critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the pre-feasibility of Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.</li> </ul>	<ul style="list-style-type: none"> <li><b>Identified material natural occurring risks:</b> nil.</li> <li><b>Status of material legal agreements:</b> all agreements are current and active. Detail of the status of the legal agreements was not addressed in the BFS Technical Report. An independent legal review of the BFS document by Falcon &amp; Hume Attorneys at Law was undertaken in June 2019 and returned no material concerns.</li> <li><b>Status of material marketing agreements:</b> agreements in the process of negotiation and no signed off-take agreements are in place at the BFS stage.</li> <li><b>Tenement Status:</b> Mineral tenure in South Africa is regulated by the MPRDA (2002) with the environmental aspects regulated by NEMA (1998), both managed under the authority of the DMR. The Project mineral tenure or tenement holding comprises a set of contiguous prospecting rights surrounding the old PCM area: the Repli-Copperton Prospecting Right (Repli Prospecting Right), the Vardocube Prospecting Right, the Bartotrax Prospecting Right and the Repli-Doonies Pan Prospecting Right. Applications for mining rights have been submitted to the DMR for both the Repli Prospecting Right area and the Vardocube Prospecting Right area.</li> </ul>



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		<p>The primary tenement licenses and applications are detailed below:</p> <p><b>Repli Prospecting Right:</b></p> <ul style="list-style-type: none"> <li>NC 30/5/1/1/2/2105PR (NC10445PR): A prospecting right renewal and a Section 102 (addition of further minerals), have been granted to Repli, in terms of section 17(1) of the MPRDA for copper, zinc, lead, silver, gold, sulphur, cobalt, barytes, limestone, stone aggregate, gravel, sulphur in pyrite, pyrite, molybdenum ore, tungsten ore, sand (general) and iron ore in respect of the farm Vogelstruis Bult No 104, portion RE25 and portion 26 and the farm Slimes Dam 154, in the Prieska District, Northern Cape Province. The date of expiry is 2 November 2019 by which time Repli is anticipating having been granted the Mining Right which has been applied for.</li> <li>Orion effectively holds a 70% interest in the project, with the remaining 30% as 20% BEE ownership + 5% Community Trust + 5% Employee Trust in compliance with Mining Charter III and existing legislation.</li> </ul> <p><b>Vardocube Prospecting Right:</b></p> <ul style="list-style-type: none"> <li>NC 30/5/1/1/2/11841PR: Vardocube has been awarded a prospecting right, in terms of section 17(1) of the MPRDA, for copper ore, zinc ore, lead, gold, cobalt, sulphur in pyrite, barytes, limestone, pyrite, tungsten and molybdenum in respect of the farm Vogelstruis Bult No 104, portion RE1 in the Prieska District, Northern Cape Province. The date of grant is 25 April 2018; valid for five (5) years. The Prospecting Right has been notorially executed and registration is in process.</li> </ul> <p>Orion effectively holds a 70% interest in the project, with the remaining 30% as 20% BEE ownership + 5% Community Trust + 5% Employee Trust in compliance with Mining Charter III and existing legislation.</p> <p><b>Repli Mining Right Application</b></p> <ul style="list-style-type: none"> <li>Mining Right: NC30/5/1/2/2/10138MR. The Repli Mining Right Application (MRA), in terms of Section 22 of the MPRDA, 2002, for the Repli Prospecting area and commodities was submitted to the authorities, together with the pre-requisite EA application, on 6 April 2018. The application includes the proposed Mine Works Program and the SLP. The MRA application has been officially accepted and is in process.</li> </ul> <p><b>Vardocube Mining Right Application</b></p> <ul style="list-style-type: none"> <li>Mining Right: NC30/5/1/2/2/10146MR. The Vardocube Mining Right Application (MRA), in terms of Section 22 of the MPRDA, 2002, for the Repli Prospecting area and commodities was submitted to the authorities, together with the pre-requisite EA application, on 27 September 2018. The application includes the proposed Mine Works Program and the SLP. The MRA application is in process.</li> </ul> <ul style="list-style-type: none"> <li>Tenure Compliance: At the time of writing, the prospecting rights were compliant with statutory fee payments, annual reporting and financial provision audits up to date.</li> <li>According to the Department of Land Restitution and Reform, there are no land claims on any of the properties covered by the prospecting rights.</li> <li>The Conditional Closure Certificate is discussed under “environmental”, above.</li> <li>Government and statutory approvals: There are reasonable grounds to expect that all necessary government approvals will be received within the timeframes anticipated in the BFS.</li> <li>Status of government agreements: Apart from the tenement status (addressed above) the Company is not aware of any government agreements necessary for the project to continue.</li> <li>Discussions continue with the South African Department of Science and Technology to ensure compliance with technical aspects which may impact on the Square Kilometre Array (SKA) radio telescope, being built near Carnarvon over 40km from the Project.</li> </ul>

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		<ul style="list-style-type: none"> <li>• In 1987, Armaments Corporation of South Africa (SOC) Ltd (Armscor), a State-owned enterprise for acquiring defence capabilities for the South African Defence Force and other State agencies, established the Alkantpan ballistic test range on ground neighbouring the Project area (Alkantpan) These surface rights are unlikely to interfere with mine development and operating activities.</li> <li>• A MoU is in place with the Siyathemba Municipality regarding the supply of bulk water to the mine. Final water tariffs are under negotiation.</li> <li>• The engineering design of the planned construction of the Feeder Bay within the Cuprum Sub-station has been approved by the Eskom Technical Evaluation Forum which took place in December 2018. Repli has paid all fees required to date to Eskom to allow the process to continue for Eskom to sign the long-term power agreement.</li> <li>• Repli is in the process of engaging with Transnet for rail transport logistics from the Groveput rail siding to Ngqura Port.</li> <li>• Unresolved matters with 3<sup>rd</sup> parties which would materially affect the results of the BFS – none.</li> </ul>
<b>Classification</b>	<ul style="list-style-type: none"> <li>• <i>The basis for the classification of the Ore Reserves into varying confidence categories.</i></li> <li>• <i>Whether the result appropriately reflects the competent Person's view of the deposit.</i></li> <li>• <i>The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).</i></li> </ul>	<ul style="list-style-type: none"> <li>• Indicated Resources were converted into Probable Ore Reserves based on the mine planning process using appropriate modifying factors.</li> <li>• There are no Measured Mineral Resources.</li> </ul>
<b>Audits or reviews</b>	<ul style="list-style-type: none"> <li>• <i>The results of any audits or reviews of the Ore Reserve estimates.</i></li> </ul>	<ul style="list-style-type: none"> <li>• At the time of writing a review of the mining plan and the reserves is in progress with SRK Consulting of Johannesburg</li> </ul>
<b>Discussion of relative accuracy/confidence</b>	<ul style="list-style-type: none"> <li>• <i>Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors which would affect the relative accuracy and confidence of the estimate.</i></li> <li>• <i>The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and procedures used.</i></li> <li>• <i>Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage.</i></li> <li>• <i>It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The level of accuracy for the BFS Technical Report is <math>\pm 15\%</math>.</li> <li>• For the open-pit Supergene Mineral Resource, a 100% Indicated Mineral Resource and 0% Inferred Mineral Resource was used for the purposes of the JORC reporting.</li> <li>• Mining studies for a Bankable Feasibility Study have been completed and further Optimisation Studies are in progress.</li> <li>• It is noted that there is a level of inaccuracy around the Transnet costs for rail freight for the concentrate transport as negotiations with Transnet are still in progress.</li> </ul>