Orion Minerals

ASX/JSE RELEASE: 26 June 2019 – This Release includes additional JORC Code information

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

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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) of 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 at 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 ± 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

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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. The Ore Reserves and Mineral Resources underpinning the Production Target have been prepared by competent persons in accordance with the requirements in Appendix 5A (JORC Code).

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-

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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[1].

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%))[2], 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.

[1] Metal price assumptions based on CIBC Analyst commodity long-term forecast (29 April 2019).

[2] Method used to determine Cu equivalent Zn grades:

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

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.

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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 ± 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.

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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.

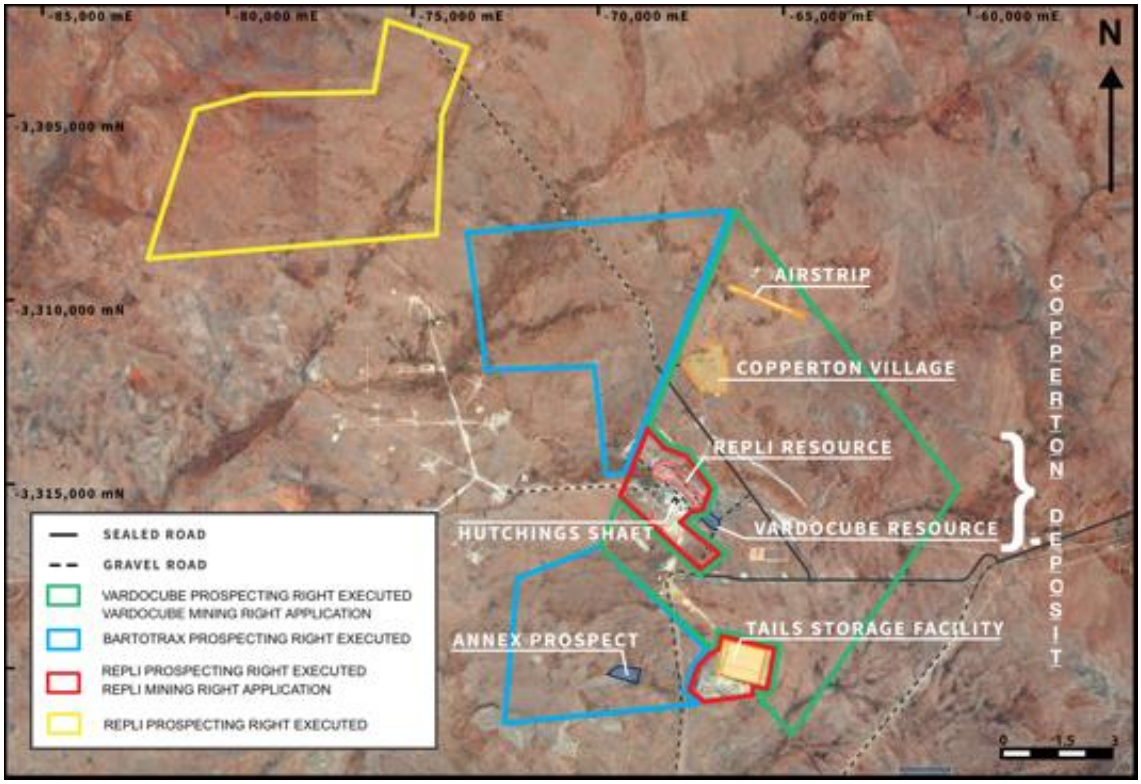

Figure 2: Mineral Tenement Map for the Project Area.

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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[3]. 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.

[3] Note that these were historical estimates not compiled in accordance with JORC Code guidelines.

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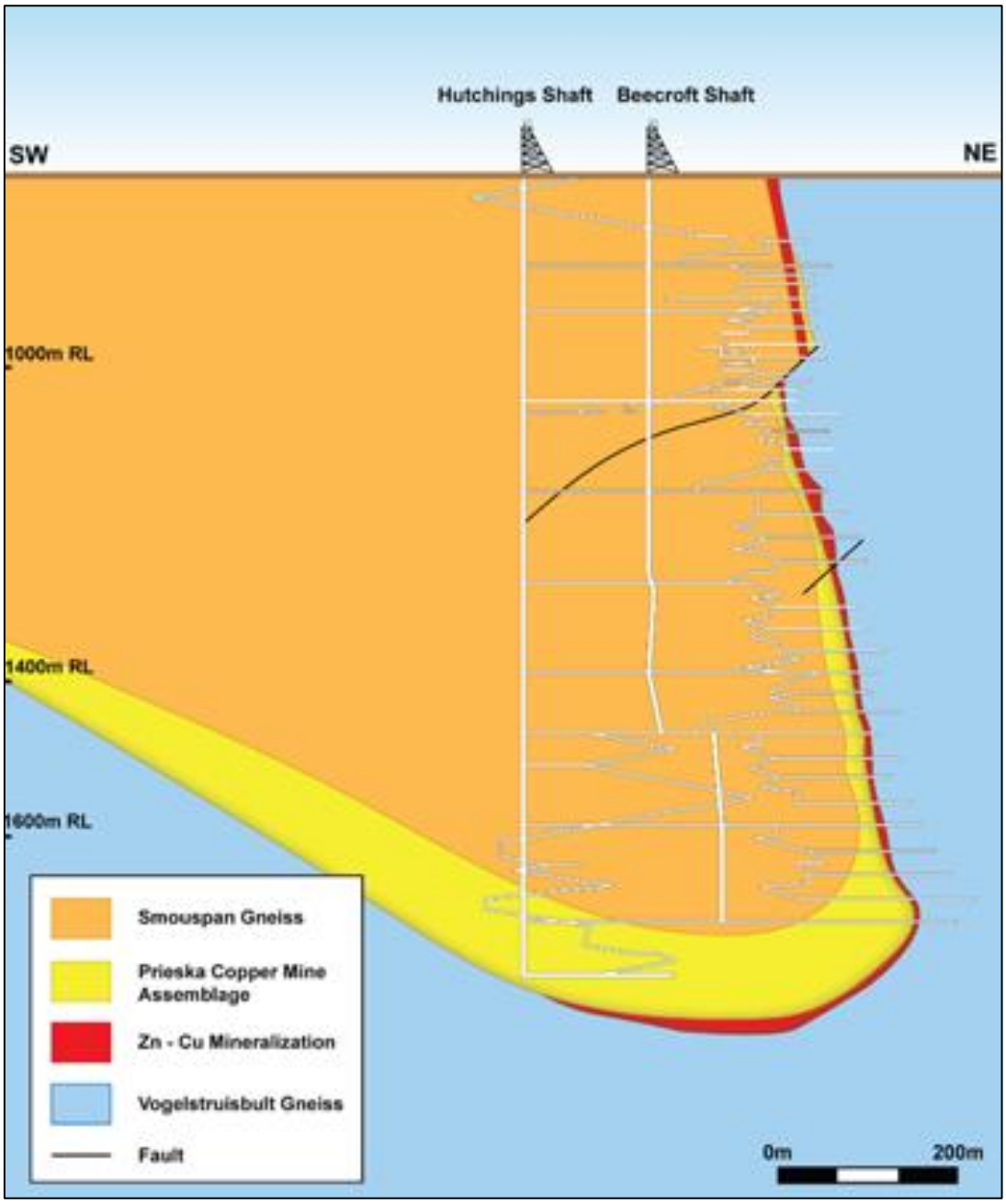

Figure 3: Geological cross-section through the Prieska Deposit. (modified after Theart et al, 1989 and Wagner and Van Schalkwyk, 1986).

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).

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Deep Sulphide Mineral Resource for Repli + Vardocube Tenements (Effective Date: 15 December 2018)[4]						
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	1.09	270,000	3.86
	Total	**22,050,000**	**249,000**	**1.13**	**779,000**	**3.53**
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
	Total	**6,676,000**	**85,000**	**1.27**	**305,000**	**4.57**
Deep Sulphide Total	Indicated	18,507,000	217,000	1.17	667,000	3.60
	Inferred	10,219,000	117,000	1.14	417,000	4.08
	Total	**28,726,000**	**334,000**	**1.16**	**1,084,000**	**3.77**
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)[5]						
Classification	**Mineralised Zone**	**Tonnes**	**Cu (metal tonnes)**	**Cu (%)**	**Zn (metal tonnes)**	**Zn (%)**
Indicated	Supergene	624,000	10.000	1.54	19,000	3.05
	Total	**624,000**	**10,000**	**1.54**	**19,000**	**3.05**
Inferred	Oxide	511,000	3,000	0.6	4,000	0,9
	Supergene	627,000	14,000	2.2	11,000	1.8
	Total	**1,138,000**	**17,000**	**1.5**	**16,000**	**1.4**
Total	**+105 Mineral Resource**	**1,762,000**	**27,000**	**1.5**	**35,000**	**2.0**
+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.

[4] *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. 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.*

[5] *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. 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.*

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Combined Prieska Project Mineral Resource for Repli + Vardocube Tenements (Effective Date: 11 January 2019)[5]						
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
Total	Indicated	19,131,000	227,000	1.18	686,000	3.59
	Inferred	11,357,000	134,000	1.2	433,000	3.8
Grand Total		**30,488,000**	**361,000**	**1.2**	**1,119,000**	**3.7**

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 (refer ASX releases 16 January 2019 and 25 February 2019).

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).

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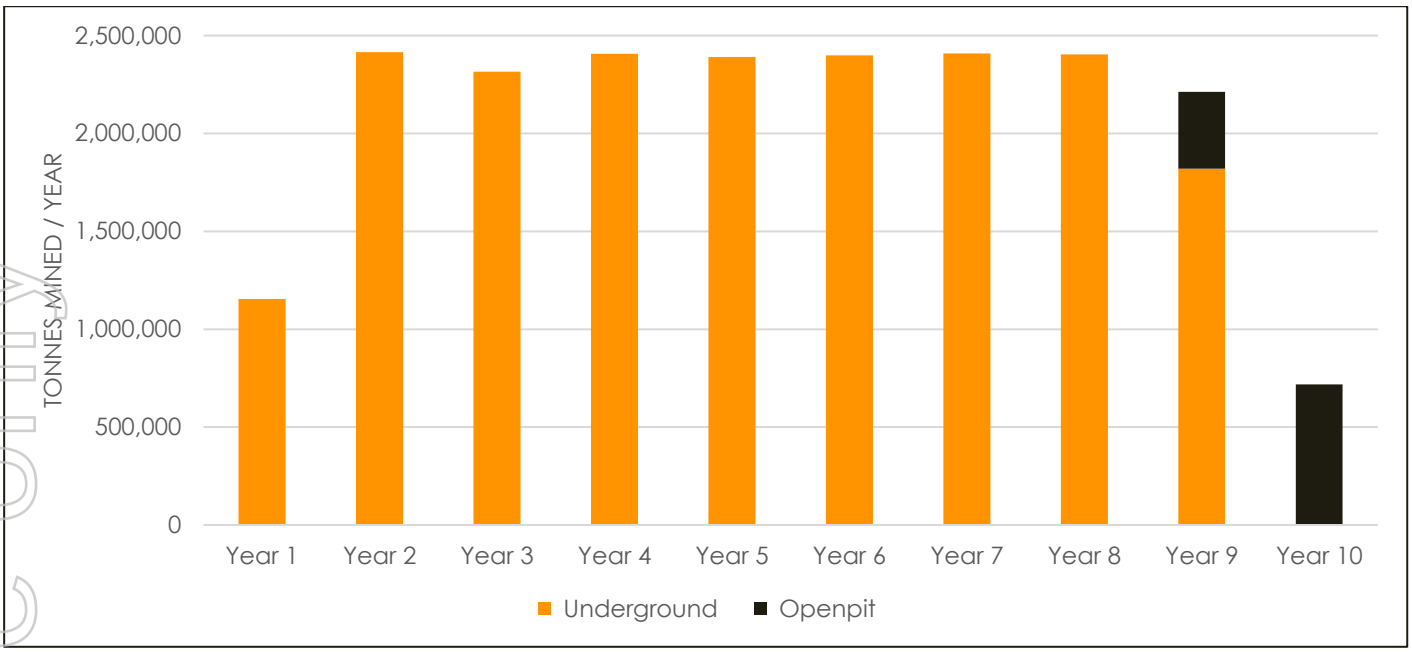

Figure 4: Project mine production profile.

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.

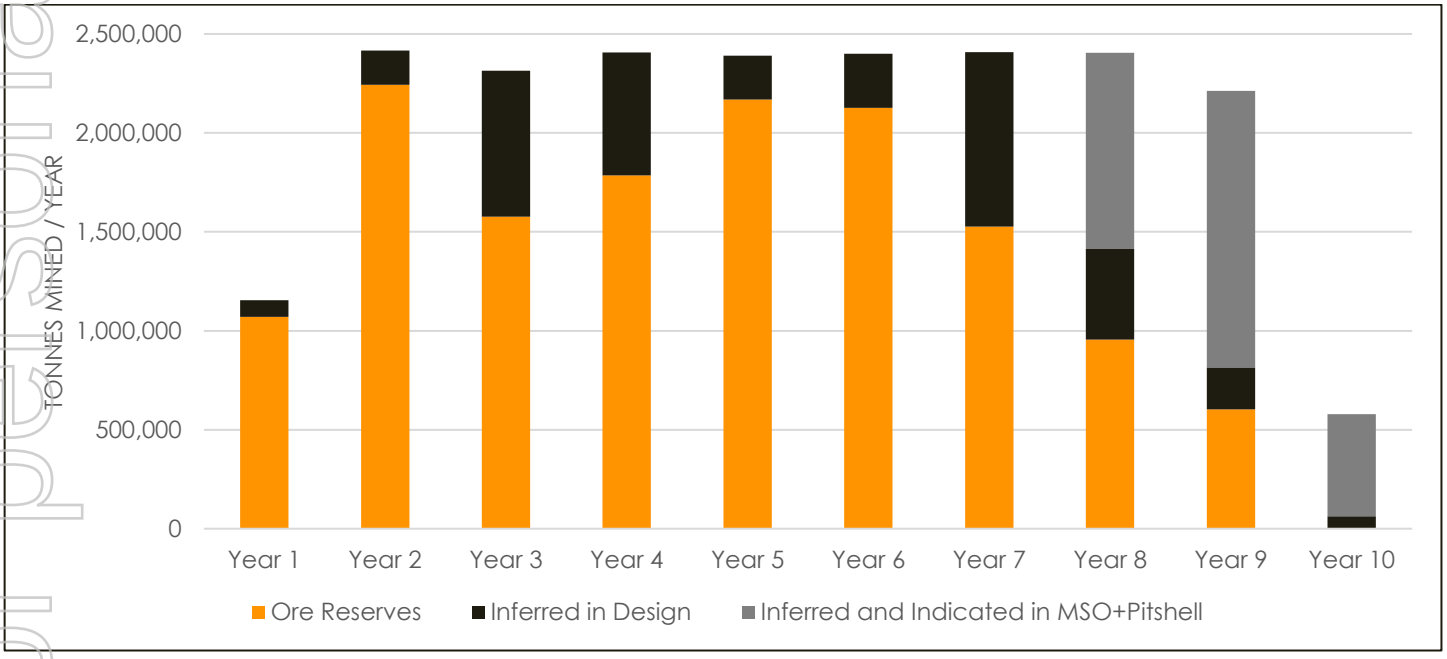

Figure 5: Production profile illustrating the comparative contributions from Ore Reserves, Indicated Mineral Resources and Inferred Mineral Resources.

Tunnel development remaining from the previous mining operations allows for early access to underground production mining areas. A combination of Longhole Open Stoping 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.

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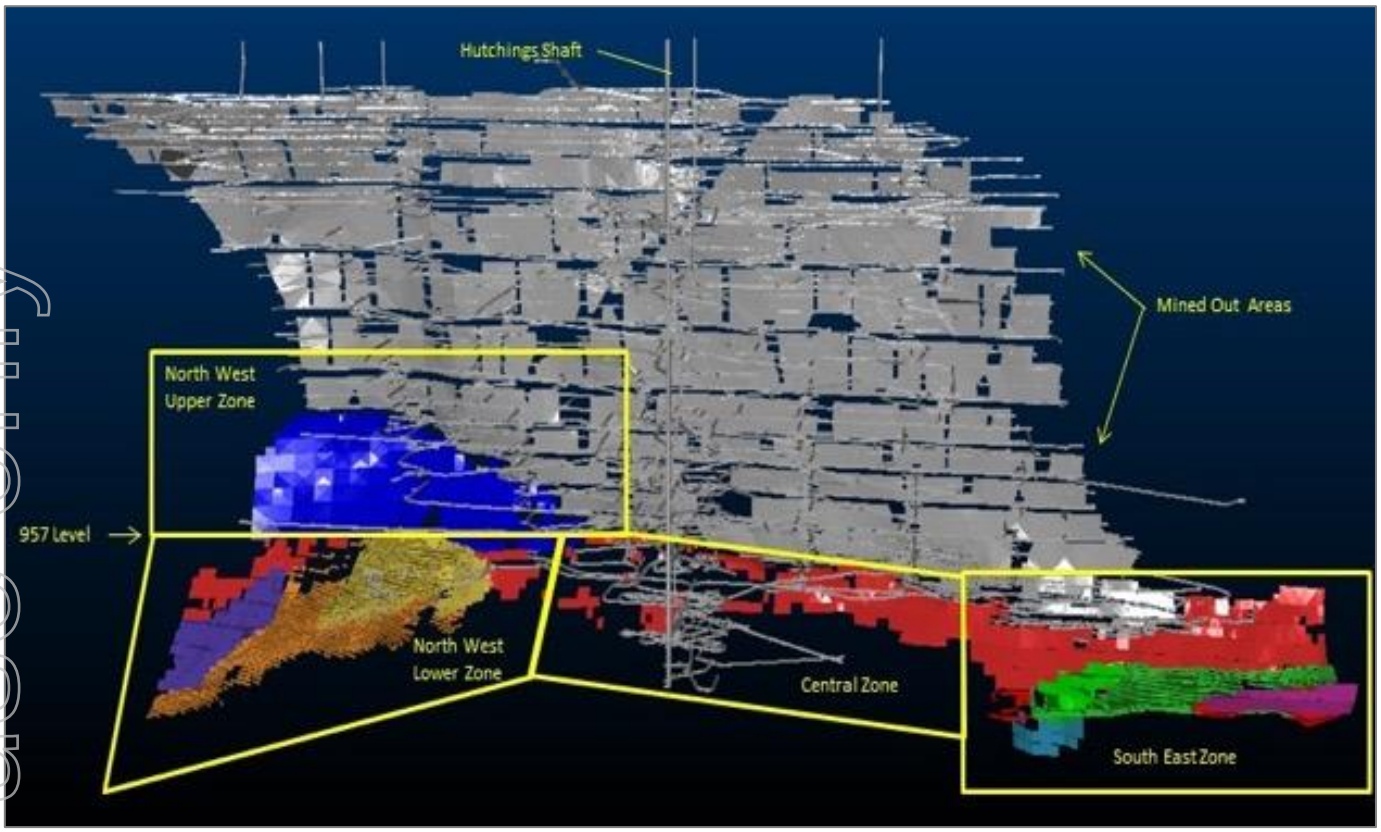

Figure 6: Planned underground mining zones.

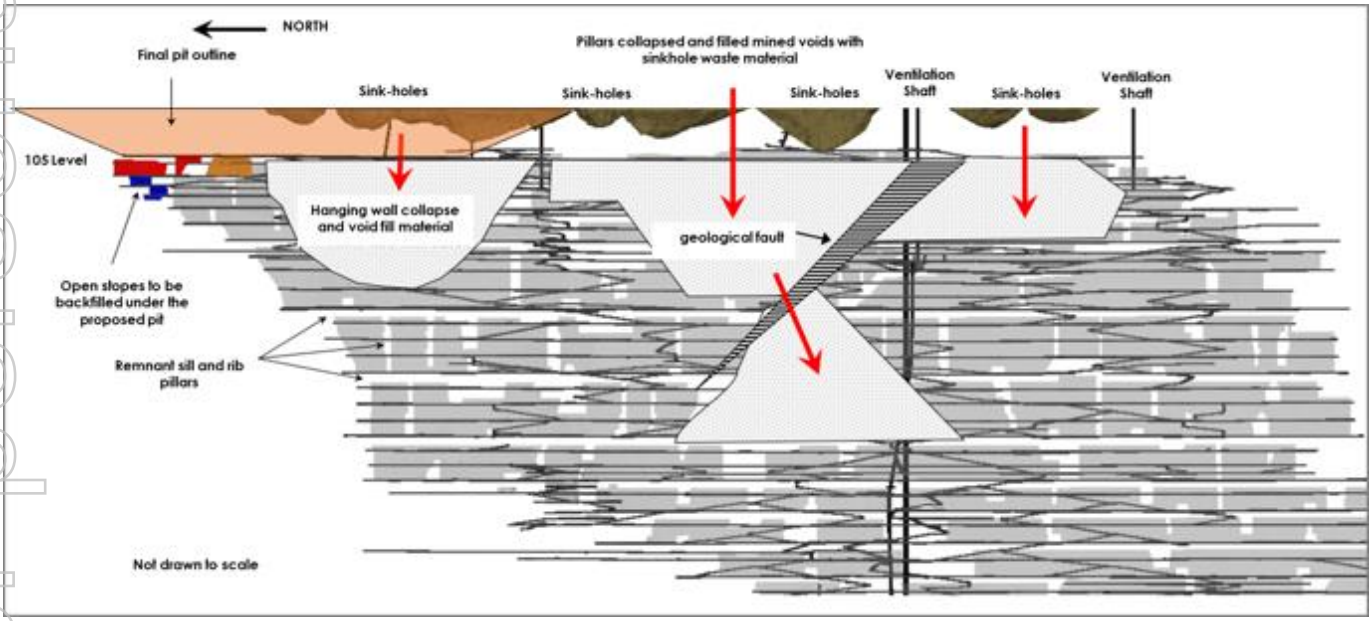

Figure 7: Longitudinal section showing location of proposed open pit and voids.

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.

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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[6]	
			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
Total	**Probable**	**13.14**	**136**	**1.0**	**417**	**3.2**	**257**	**2.0**

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[7]	
			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
Total	**Probable**	**484**	**7**	**1.5**	**16**	**3.3**	**11**	**2.2**

+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%).**

[6] Method used to determine Cu equivalent Zn grades:
1% Zn = (Zn price x Zn payability) x (Zn plant recovery) = (2,756 x 71.3%) x (84.4%) = 0.29% Cu grade
(Cu price x Cu payability) (Cu plant recovery) (6,834 x 98.7%) (83.9%)
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.

[7] 1% Zn = (Zn price x Zn payability) x (Zn plant recovery) = (2,756 x 53.7%) x (59.4%) = 0.2% Cu
(Cu price x Cu payability) (Cu plant recovery) (6,834 x 91.2%) (66.7%)
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.

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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
Total	**Probable**	**13.62**	**143**	**1.1**	**433**	**3.2**	**268**	**2.0**

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.

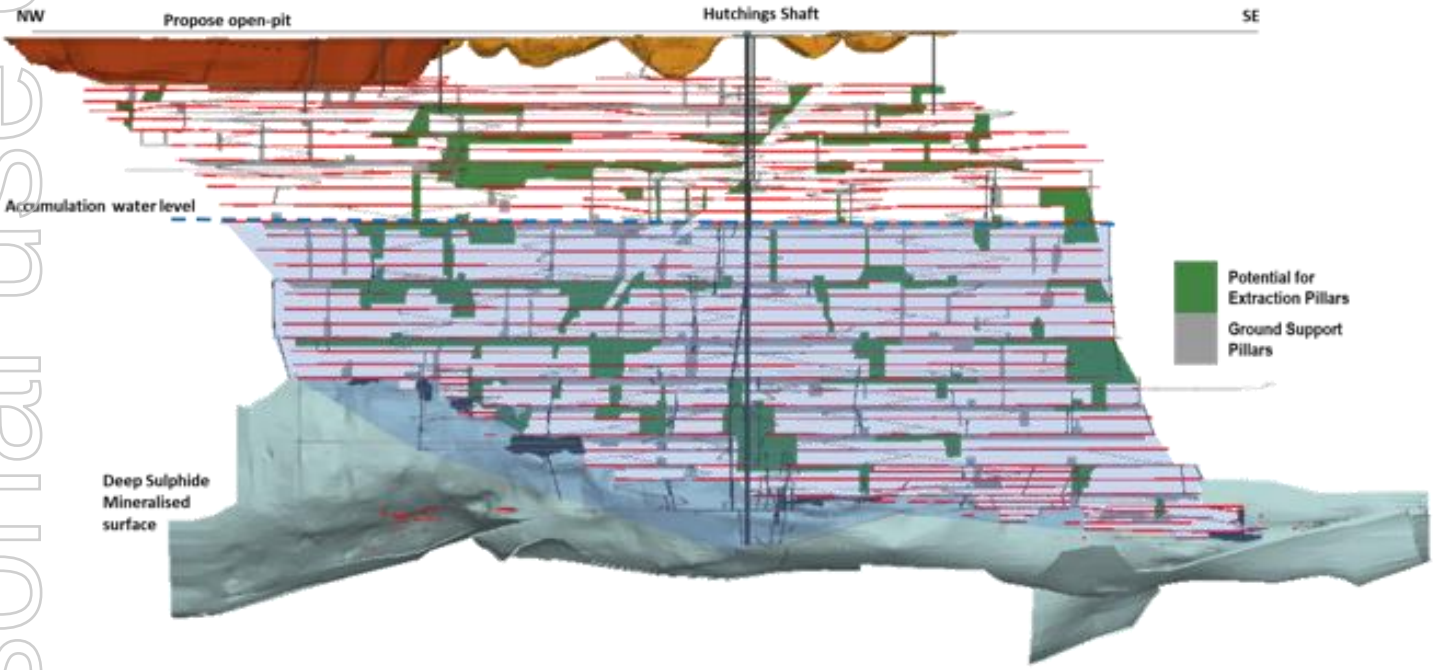

Figure 8: Views showing the remnant pillars and the accumulated water level.

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^3 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^3 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.

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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 Groveput, 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.

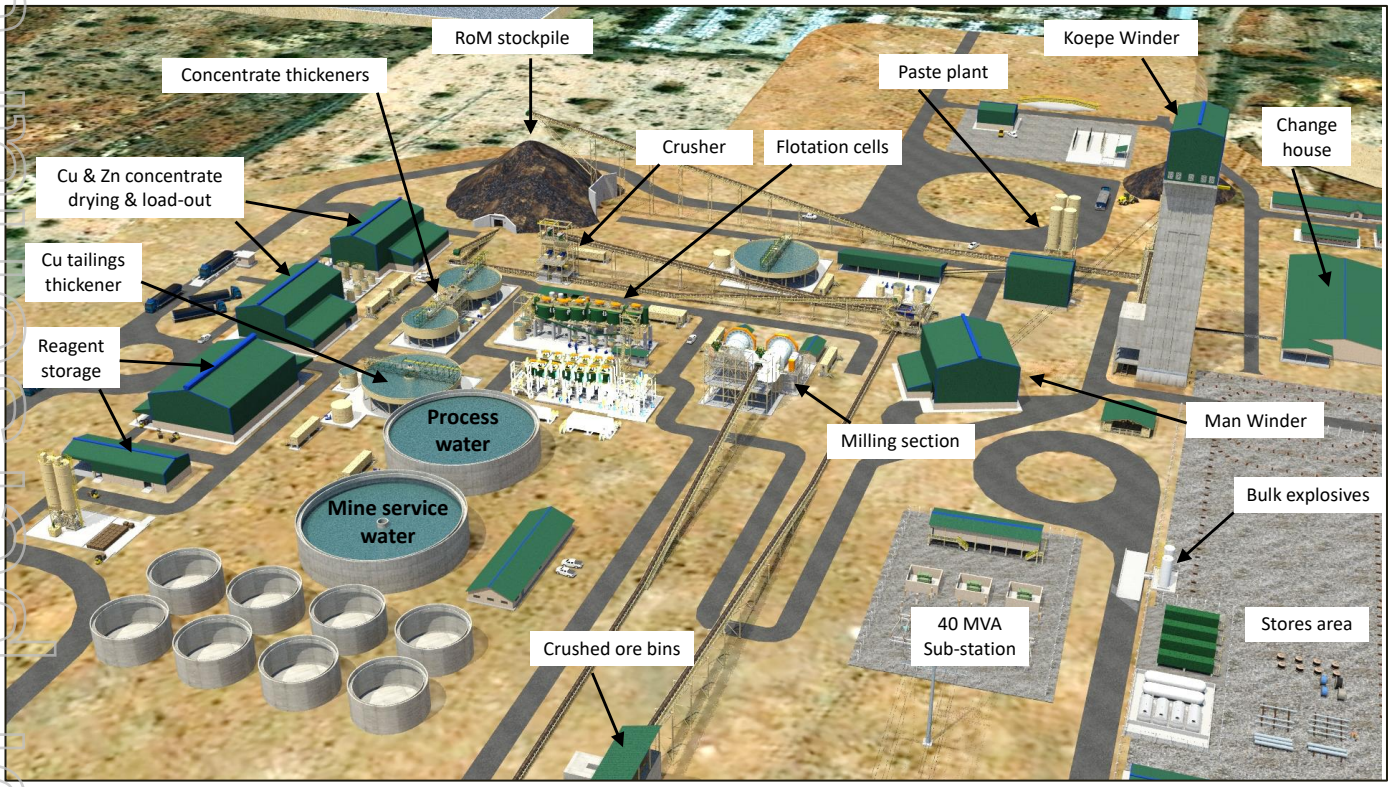

Figure 9: Project site general layout.

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.

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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
Total	**93.70**

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.

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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
Subtotal	**365.3**
Contingency 10%	36.5
Total Capex	**401.8**

Table 9: Capital Expenditure.

Parameter	Unit	Total	Year 1	Year 2	Year 3	Year 4	Year 10
Project Capital	AUD million	**401.8**	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.

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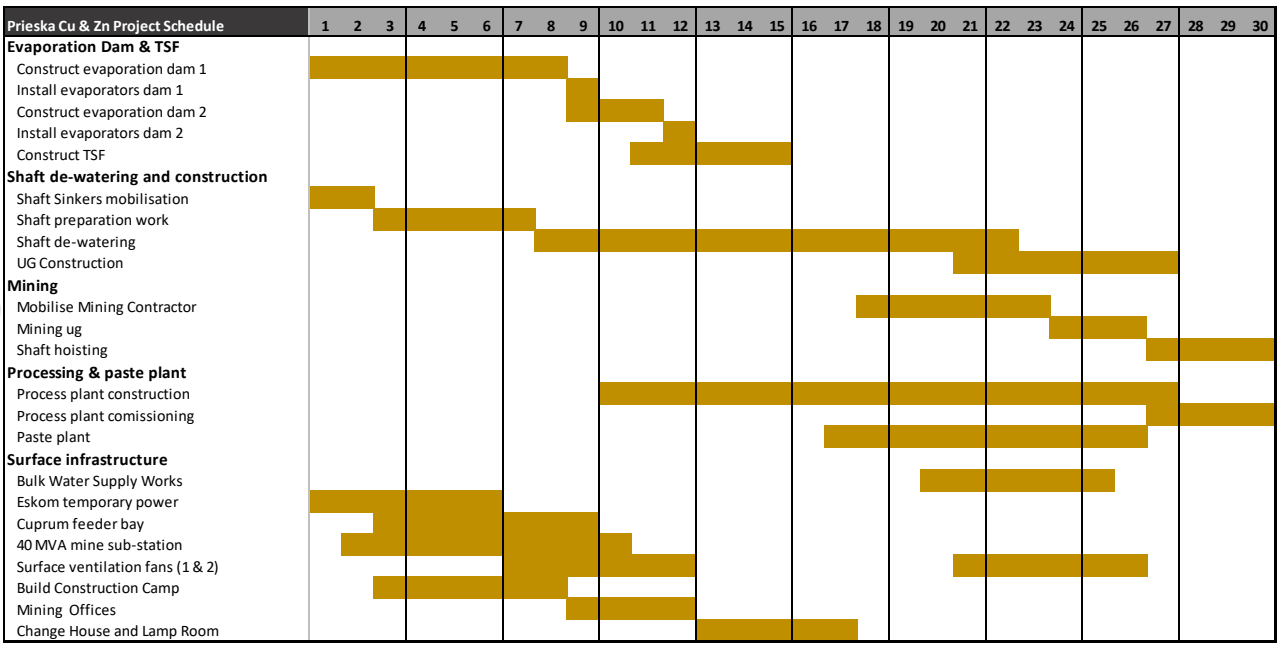

Table 11: Project Execution Schedule.

Financial Evaluation

The Foundation Phase is expected to generate AUD819M 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
Net Revenue	**AUD '000**	**3,284,409**			**203,547**	**370,683**	**381,098**	**388,641**	**380,090**	**387,488**	**397,221**	**388,924**	**298,457**	**88,259**
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
Cash Operating Costs	**AUD '000**	**-1,672,549**	**-2,048**	**-10,850**	**-165,778**	**-185,839**	**-176,394**	**-181,841**	**-188,403**	**-188,314**	**-191,472**	**-190,301**	**-149,182**	**-42,128**
Cash Operating Profit	**AUD '000**	**1,611,860**	**-2,048**	**-10,850**	**37,769**	**184,844**	**204,704**	**206,800**	**191,687**	**199,174**	**205,750**	**198,623**	**149,276**	**46,131**
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
Net Cashflow pre-Tax	**AUD '000**	**1,126,602**	**-27,385**	**-161,439**	**-184,820**	**171,249**	**194,223**	**196,381**	**181,524**	**189,038**	**195,457**	**186,242**	**141,523**	**44,608**
Income Tax	AUD '000	-308,003						-44,676	-50,827	-52,931	-54,728	-52,148	-39,626	-13,067
Net Cashflow After Tax	**AUD '000**	**818,599**	**-27,385**	**-161,439**	**-184,820**	**171,249**	**194,223**	**151,705**	**130,698**	**136,108**	**140,729**	**134,094**	**101,897**	**31,541**

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

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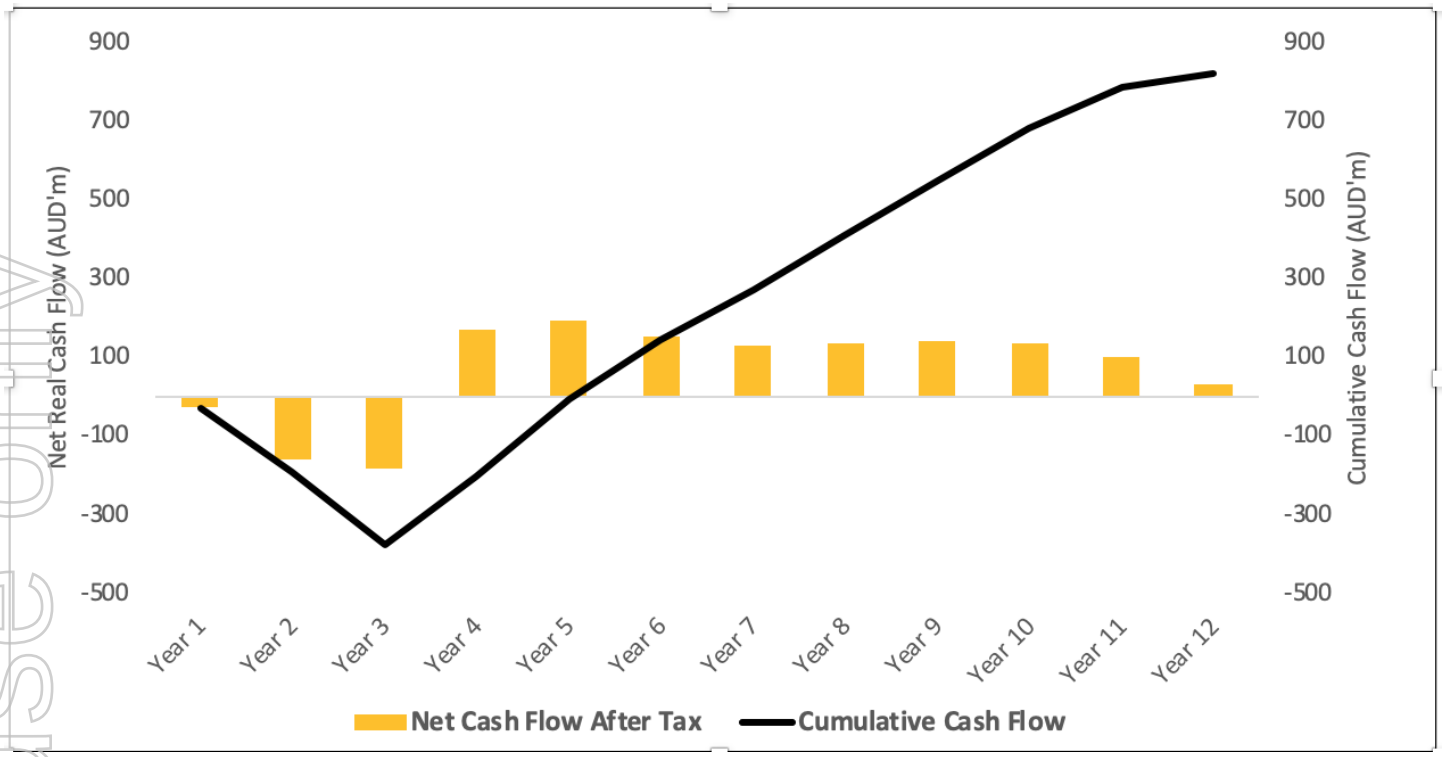

Figure 10: Project net cashflow post-tax profile.

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.

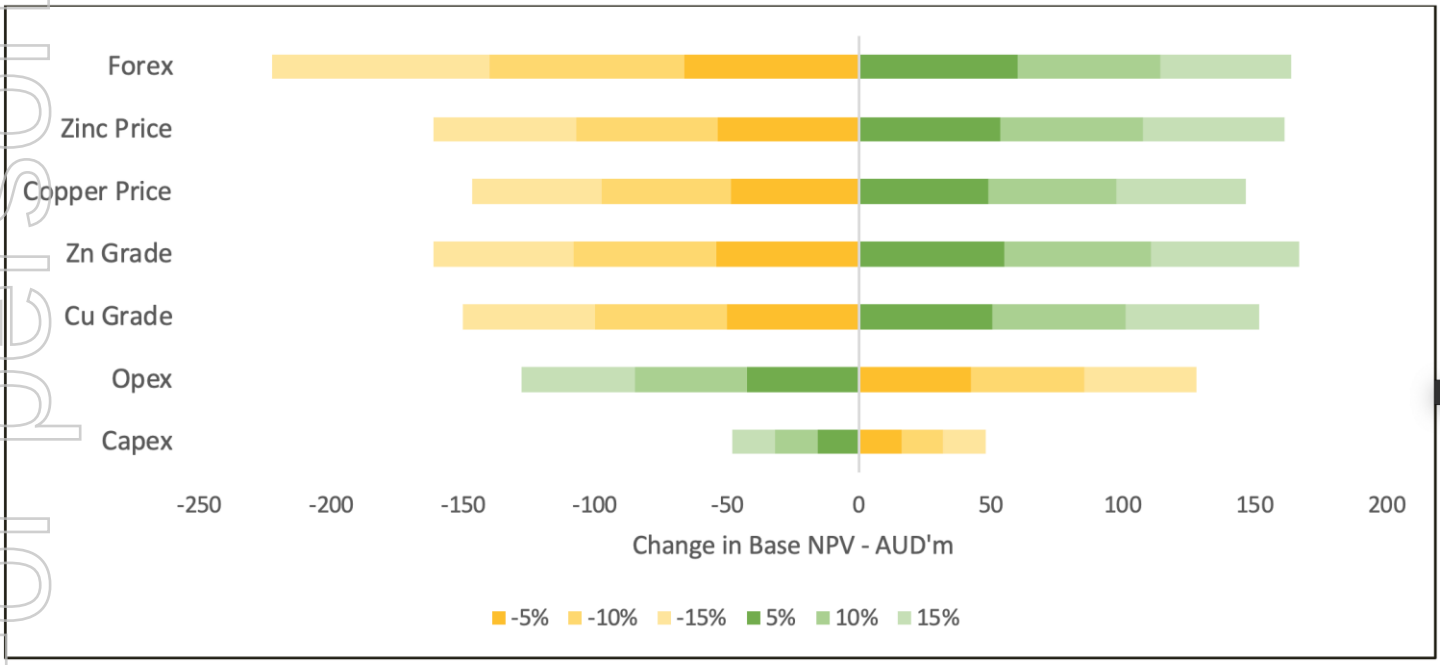

Figure 11: Chart of the sensitivity of pre-tax NPV to variances in key input elements.

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.

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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.	• Electromagnetic Capability (**EMC**) Plan was formulated. • Written approval of the EMC plan was received from SKA authorities. • Designing taking into account key EMI emitters is planned. • Submission of the AMA permit application will be done within the prescribed timeframe. • Appointment of specialist consultants to assist in the permit application process has been done.
2. Influx of people from outside of the Prieska Municipal area looking for employment negatively affecting the local community.	• 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. • Preferential hiring of local residents will be encouraged.
3. Number of employment and business opportunities created by the Project for Siyathemba Municipality residents and businesses not meeting public expectations and causing disharmony.	• Informing, training and upskilling of the local community has commenced. • 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. • Procurement procedures to prioritise local businesses.
4. Delays to the shaft de-watering and shaft and mine refurbishment	• 40% contingency allowance made to water volumes expected to have accumulated in the mine workings. • 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.
5. Mine production rates assumed in financial modelling are not achieved in practice.	• A practical and achievable production plan is in place. • A monthly mining plan has been prepared. • 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.
6. Potential for mud and water rushes while dewatering and cleaning out the lower mining levels.	• Pumping plan for safe dewatering has been prepared. • Level inspection procedures will be developed.
7. Unplanned power interruptions and escalation of power tariffs. Delays in availability of power for the Project.	• 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.
8. Ability to attract and retain skills at a remote site.	• Attractive salary levels set. • Provision of suitable accommodation and recreational facilities. • Staff Turnover Plan. Attractive roster system and allowance for FIFO employees.
9. Availability of service providers and goods suppliers to meet Mining Charter III Procurement policies	• 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.
10. Production grades are lower than planned.	• Peer reviews of the Mineral Resource estimates done. • Comprehensive grade control program planned. • Blasting design to minimise overbreak.
11. Availability of specialised crane for installation of head gear and the Koepe winder.	• Identify the specialised crane required as early as possible • An early contract is required for a 500-tonne crane.

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:

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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.

Summary of Material Assumptions and Outcomes of Feasibility Study

Overview

The Project is based on mining ore at 2.4Mtpa from underground and then at a rate of 1.2Mtpa from an open pit, processing the ore onsite by concentrating the value metals into two products, a copper-rich concentrate and a zinc-rich concentrate. Trace amounts of gold and silver are expected to also be concentrated into the copper-rich concentrates as a by-product. A Mineral Resource Estimate of 30.49Mt @ 1.2% copper and 3.7%

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zinc, classified as 65% Indicated and 35% Inferred, provides the geological support for the mining plan. The Mineral Resource Estimates were prepared by Competent Persons using the Ordinary kriging method for grade block estimation and in accordance with the requirements in Appendix 5A (JORC Code) (refer ASX Release 19 January 2019).

Some of the Mineral Resources were converted to Ore Reserves using detailed underground mine designs that considered the level of confidence in the estimation of Mineral Resources and the practicalities of mining. Detailed open pit designs were also prepared to convert some of the Mineral Resources near the surface to Ore Reserves. The Ore Reserves Estimates were prepared by a Competent Person in accordance with the requirements in Appendix 5A (JORC Code).

In addition to the Ore Reserves, some Inferred Mineral Resources, either taken out as part of mining the Ore Reserves or evaluated as economic to mine and proximal to established mine infrastructure, have been included in the mining plan, though not prioritised in the early stages of the mine. The Ore Reserves account for 65% of the tonnage to be processed in the plan. Be aware 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 converting these to Indicated Mineral Resources or that the portion of the production target reliant on Inferred Mineral Resources will be realised.

Using the assumptions for copper and zinc prices that are being used by a reputable financial institution (CIBC April 2019 long-term commodity price forecasts) and having sought offers from several potential buyers of the products, the net revenues to be expected from selling the products was estimated.

The metal prices assumed for planning were:

- copper – US$6,834/t;
- zinc – 2,756/t;
- silver – 17/oz;
- gold – USD1,300/oz.

Capital Expenditure

The estimation of the costs for building (CAPEX) the mine has been compiled assuming the mine build would be managed by an Orion Owner's team working with an Engineer, Procure and Construction Management (EPCM) contractor to manage the works until the project is handed over for operating. The capital estimate was compiled by Professional Cost Consultants (PCC) based in Johannesburg. The basis of estimate allows for the following:

- The CAPEX Estimate was developed to a level of accuracy (at a range of +15% to -15%) suitable for a feasibility study;
- The base date for this estimate is December 2018;
- The base currency in which the majority of costs where estimated is South African Rand (ZAR). Prices obtained in other currencies were converted to South African Rands (ZAR) using the foreign currency exchange (FOREX) rates quoted by vendors, or as otherwise indicated in the CAPEX Estimate;
- Orion's expected foreign currency exchange rates, used to calculate FOREX allowances in the CAPEX estimate and then in financial evaluation are:
    - ZAR:USD = 14.5;
    - ZAR:AUD = 10.0;
    - AUD:USD = 1.45.
- The capital budget has been prepared according to work packages reflecting how the Project is planned to be constructed and managed;
- Am allowance for unknowns (Contingency) has been estimated at an additional 10% of the underlying CAPEX items;
- The underground mining fleet is excluded from these numbers as this is planned to be part of the Mining Contractor's offering;
- A summary of the CAPEX follows:

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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
Subtotal	**365.3**
Contingency 10%	36.5
Total Capex	**401.8**

Operating Costs

The estimation of costs to operate the mine (OPEX) for all disciplines were built up as follows:

- from first principles and using up to date consumable prices and rates. Labour is included within each discipline which is taken from the Project wide labour build-up schedule. A detailed cost to company salary build-up was used to compile these labour costs.
- Underground mining costs were estimated by PCDS, a Mining Consulting company employed by Orion. The costs were built up from first principles in Candy Estimating Software.
- The running cost of the trackless fleet was calculated from drill rates and hauling rates based on metrics deemed applicable for the planned Project.
- Processing plant working costs were compiled by DRA from first principles including labour, reagent prices based on estimated consumption rates per tonne treated and milling and crushing consumables based on planned wear rates based on the ore hardness determined during the metallurgical test work. Power makes up the largest proportion of costs followed by labour, crushing and milling and flotation reagents.
- Surface and In-directs costs consist of the management and administration staff and other staff not directly assigned to a production discipline. This category includes stores and purchasing, safety, health, environmental management, human resources management, general surface engineering and security. Off mine costs include Corporate and Marketing costs, local economic development and other cost not related to operational or management activities. Insurance costs are also allocated to this category.
- The Project has allocated stay-in-business CAPEX as an effective operating cost. The amount of general SIB CAPEX has been estimated based on a combination of costs for individual areas on the shaft and winders and factors in other areas. Overall the SIB CAPEX equates to 6% of operating costs.
- Costs for open pit mining were obtained from quotes received from several mining contractors.
- A summary of the total OPEX structure for the Project, on a per tonne of ore treated basis, is shown in the table 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
Total	**93.70**

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Criteria used for the Classification of Ore Reserves

Only Indicated Mineral Resources were used to determine Probable Ore Reserves.

Mining

Shaft & underground refurbishment and de-watering

The Project's business case is based upon mining ore remaining at the lower levels and below the Hutching Shaft (1024m deep) which remains in place from the mining activities that took place between 1971 and 1991 under previous owners. Since the mine was closed, it has filled up with water to approximately 330 metres below surface. The first phase of the project is to de-water the mine and refurbish and replace various steel members in the shaft. Including shaft preparation and installation of temporary winders required to access the shaft, the pumping and refurbishment exercise is planned to take place over 20 months. The existing steelwork has been inspected and tested and found to be in good order. Specialist shaft engineers have determined an amount of steel to be replace, mainly being buntons and shaft guides. Following the shaft work, refurbishment of the underground will take place which will involve installation of rock hoisting equipment, conveyors, a crusher, a trackless workshop, rail infrastructure and underground mining services. In conjunction with the underground refurbishment, two winders will be installed on surface for rock hoisting and man and material transport. The underground equipping phase will take approximately seven months and during this time underground mining will commence in order to build up an underground stockpile for readiness when shaft hoisting can commence.

Underground Mining

The mineralisation of the Deeps Resource shows considerable variations in both thickness and dip resulting in the use of a variety of stoping methods to maximise extraction and minimise dilution. Based on the analysis of the Resource it has been demarcated into four zones and shown in the following figure;

1. The North-west Upper Zone is situated above the 957 Level and will be extracted by Longitudinal Long-hole Stoping with Fill (LLHOSF);
2. The North-west Lower Zone is situated below the 957 Level and will be mined by a combination of Long-hole-Stoping with Fill (LHOSF) methods and Drift-and-Fill (D&F);
3. The South-east Zone is situated below the 957 Level and will be extracted by a combination of LHOSF methods and D&F; and
4. The Central Zone is located centrally below 957 Level and will be extracted by LHOSF methods.

A breakeven grade was calculated for the three mining methods stated above as they each have different cost structures. The breakeven grades have been calculated on the both a copper and zinc equivalent basis as outlines in the JORC Table 1.

Trackless mining methods will be used for drilling and blasting with LHD and Truck haulage to deliver rock to passes where it will be tipping onto a train haulage level. The train system will tram rock back to the shaft for hoisting. Tunnel development and declines will provide access to the ore-body for production activities. Tunnel dimensions are planned to be 5.5m wide x 5m high for declines and 5m x 5m for access tunnels and production drilling drives. Paste back-filling will take place to fill the stopes once they have been mined out which assists in maximising ore extraction. Based on the selected mining method, appropriate levels of dilution material have been allowed for the mine planning. The dilution can be in the form of low-grade mineralisation directly adjacent to the stope boundaries and back-fill which can enter the ore stream from mining next to previously filled stopes.

Modifying Factors – Development	Declines (%)	Waste Access (%)	Ore Drives (%)
Dilution from Geology (tonne)	0.0		
Overbreak (tonne)	8.6	9.2	0.0
Overbreak grade (% Zn_Eq.)	0.0	0.0	0.0
Mining Recovery (tonnes)	100		

Modifying Factors - Stoping	LLHOS (%)	TLHOS (%)	D&F (%)
Dilution from Geology (tonne)		0.0	
Overbreak in backfill (tonne)	0.3	2.2	1.5
Overbreak grade (% Zn_Eq.)		0.0	
Mining Recovery (tonnes)	95	95	100

Mining cycle times were built up from first principles in order to determine productivity rates for the mine scheduling. These productivity rates also govern the mining fleet requirements. Orion is proposing a mining contractor strategy whereby a reputable contracting company will bring experienced staff and operators along with tried and tested working procedures and methodologies. Operating costs for the underground mining have been built up from first principles along with a detailed labour schedule for the required labour complement.

Open-pit Mining

At the conclusion of the underground mining phase an open-pit is planned to commence. This phase of mining is based on mineralised material remaining from the historical mining activities. This shallow material was originally left as part of the pillar supporting the upper levels of the mine excavations. Exploration drilling has defined a relatively small Mineral Resource of 1.76mt implying a short mine life.

No break-even or cut-off grade is calculated for the open-pit as the Whittle 4D© Pit Optimisation process used in the planning process takes account of all relevant costs and values per mining block net of plant recovery factors, treatment and refining charges and including waste stripping. The net result of these factors will then determine if a Resource block can be brought into an economic pit-shell.

The planned pit sits above previously mined out stopes (voids) which will be required to be back-filled using the paste back-fill plant described above for the underground mining. A detailed survey and void investigation exercise was carried out to determine the volumes required to be filled and approximately 70,000 m^3 is needed to be filled which is expected to take place over a seven month period. This includes drilling 300mm holes from surface into the voids to allow for the back-fill to be placed. Once a two-month period has been allowed for the back-fill to cure, mining in the planned open-pit will take place.

Mining will take place with conventional open-pit methods of drilling, blasting, loading and hauling. As with the underground phase, a suitable mining contractor will be utilised who will also supply the mining fleet. Therefore the operating costs used in the financial evaluation of the open-pit were based on the tendered contractor rates. The open-pit will mine approximately 100,000 tonnes of ore and 850,000 to 1 million tonnes of waste a month. This phase will have a relatively short life of 17 months. Dilution of 5% and mining extraction of 90% has been applied to the ore tonnes mined from the pit.

In addition to the above underground and open-pit mining parameters, other modifying factors such as metallurgical, environmental, social, regulatory and revenue factors were included when compiling the Ore Reserves for the Prieska Project.

The combined Ore Reserves for the underground and open-pit are outlined in the following table;

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
Total	**Probable**	**13.62**	**143**	**1.1**	**433**	**3.2**	**268**	**2.0**

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.

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The Ore Reserves have been compiled by team of various consultants and subject matter experts under the guidance of the Orion Owners Team. An independent Competent Person as prescribed by the JORC Code (2012) – Appendix 5, signed off the Ore Reserves.

Mineral Processing

The ore processing flowsheets, product grades and metal recoveries into the products were derived from having completed metallurgical test work using rock samples obtained from across the areas of the deposit that are planned for mining. Underground mined material (hypogene) requires a slightly different flowsheet to the near-surface material to be mined by open pit (supergene). Information that is still available from when the mine previously operated for 20 years and successfully processed 46Mt of ore to produce high grade concentrates was assessed to support the test-work carried out by Orion. Speaking with technical personnel who worked on the mine also assisted with designing the processing flowsheet, which can be described as follows:

- Mined material is to be crushed underground to a top size of 250mm, then hoisted and conveyed to the processing plant area. Here the material is to be crushed further to a size of less than 32mm.
- The crushed material is to then be milled to a slurry via two ball mills in series.
- Reagents are added to the slurry to suppress zinc-rich particles whilst promoting the floating of copper-rich sulphide particles. This slurry is passed through flotation tanks that allow the copper-rich sulphides to be skimmed off the top whilst the remaining material is reconditioned to re activate the remaining zinc-rich particles.
- The zinc-rich particles are then skimmed off the top in a separate flotation stream.
- The concentrated products are thickened and then dried to form separate concentrates of copper and of zinc.
- Copper and zinc concentrates from underground are anticipated to be at average grades of 24% Cu and 50% Zn, whilst those from the open pit are anticipated to be 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. Average metal recovered into concentrates are anticipated to be 84.4% for copper and 83.9% for zinc from treating underground mined material and 66.7% and 59.4% for copper and zinc respectively whilst treating open-pit mined material.
- The concentrates will be trucked to Groveput, 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.

Ownership and Mineral Tenements

Orion through two subsidiaries Repli Trading No. 25 (Pty) Ltd and Vardocube (Pty) Ltd holds prospecting rights over the Project area. Both subsidiaries have applied for the rights to mine copper and zinc within their respective prospecting right areas. Repli has also signed land access agreements with land-owners to facilitate mining operations.

A Mining Charter and local regulations prescribe how local economic development and Black Economic Empowerment (BEE) is to be promoted from mining developments. Stipulated Social and Labour Plans (SLPs) have been prepared and submitted to the South African regulatory authorities for endorsement. The SLPs are currently being evaluated.

Several significant social investment initiatives proposed in the SLP 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.

Environmental licence applications are also under review by the authorities.

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Financial Evaluation

Financial evaluation was undertaken by constructing financial models that allowed various cost and revenue scenarios to be assessed. Inputs into the financial modelling included the mine production and ore processing schedules, expected product sale terms, commodity prices, FOREX assumptions, CAPEX, OPEX and

The key financial outcomes from the financial evaluation undertaken for the full mine plan include:

- Undiscounted free cashflows of AUD1.1 billion;
- Project Pre-Tax NPV of at a discount rate of 8% of 574M (AUD408M post-tax);
- Internal Rate of Return (IRR) pre-tax of 38% (33% post-tax);
- Peak funding requirements of AUD378M;
- Period at which the project cashflows payback the start-up CAPEX of 2.9 years; and
- All-in-sustaining cost of AUD5,470/t of copper equivalent metal sold.

Note that Ore Reserves were evaluated by themselves to demonstrate that a business case exists for the project in spite of the inclusion of portions of the Inferred Mineral Resources into the plan. Ore Reserves would support a 6.5 year mine life.

Mining Right and environmental authorisation applications were lodged with the South African regulatory authorities in April 2018 and granting of them is now imminent.

Errol Smart
Managing Director and CEO

ENQUIRIES

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Competent Person's Statements

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

The information in this report that relates to Exploration Results is not in contravention of the JORC Code and has been compiled and assessed under the supervision of Mr Sean Duggan, a Director and Principal Analyst at Z Star Mineral Resource Consultants (Pty) Ltd. Mr Duggan (PrSciNat) is registered with the South African Council for Natural Scientific Professionals (Registration No. 400035/01), an ROPO for JORC purposes and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the JORC Code. Mr Duggan consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears.

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The information in this report 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 this report 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:

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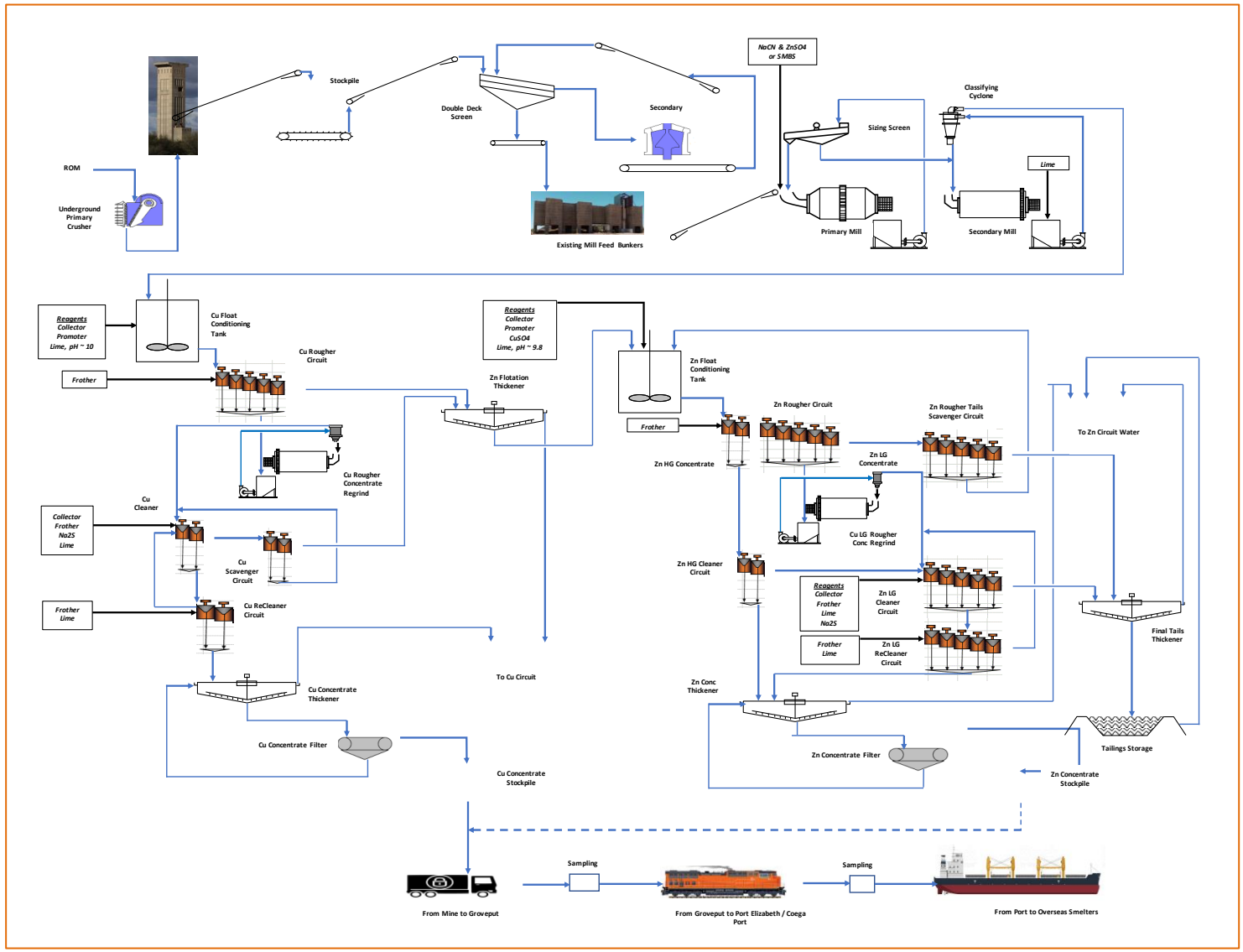
APPENDIX 1: Processing Plant Flowsheet



APPENDIX 2

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling. • Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used. • Aspects of the determination of mineralisation that are Material to the Public Report. • In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	• Drilling and sampling by Anglovaal Ltd (also known as the Anglovaal Group, (Anglovaal) has been undertaken during two distinct periods since the discovery of mineralisation. These are pre-mine exploration (1968 -1971) and during mine operations (1972-1984) drill holes ("V", "D", and "F" prefixed holes). • Since 2017 diamond drilling and sampling at the Deep Sulphide Target was done on two adjacent prospecting rights held by Repli Trading No. 27 (Pty) Ltd (**Repli)** and Vardocube (Pty) Ltd (**Vardocube**), both subsidiary companies of Orion Minerals Ltd (**Orion**). Anglovaal: • For diamond drilling carried out by Anglovaal between 1968 and 1984, there is limited information available on sampling techniques for core. However, with exploration and resource management being carried out under the supervision of Anglovaal, it is considered by the Competent Person that there would be procedures in place to the industry best practice standard at that time. This is based on the Competent Persons knowledge of exploration carried out by Anglovaal and discussions with personnel employed by Anglovaal. • The mineral resource management were under the professional supervision of Dr Danie Krige an internationally recognised expert of the time who published peer reviewed papers based on the sampling data. The sampling was successful in defining a resource estimate which was used as the basis of successful mine development and operation over a 20-year period. • Drilling of the original surface exploration holes was carried out 200 – 250m line spacing. Underground exploration holes were not drilled on a regular spacing. • Surface drill exploration samples were all sent to Anglovaal Research Laboratory at Rand Leases Mine, and underground drill samples to the mine laboratory for analyses. • No records on the sampling methodology. • Although no formal QA/QC samples were inserted at the time by the geologists on the exploration site or the mine the Anglovaal Research Laboratory developed their own standards, certified by other commercial laboratories and those were used internally in the

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Criteria	JORC Code explanation	Commentary
		laboratory. Duplicate samples were also inserted to check for repeatability. Orion: • Diamond drill core was geologically logged, and zones of mineralisation are identified and marked on the core. The core was marked for cutting using the "low point" of the stratigraphy, marking the downhole direction on each core piece to ensure that the cut core was returned to the tray correctly. Half core was sampled. Following cutting, the core was returned to the core tray. The sampling process was undertaken by a qualified geologist, who checked that all core was returned in the correct order by turning the core to face upward, fitting the core together and marking the metre intervals on the cut face. • The core sample intervals were marked with due consideration of the percentage of sulphide mineralisation, lithological contacts, and minimum and maximum sample intervals (nominally 50cm to 1.0m). The sampling details were captured onto a paper log sheet that records sample depths, sample number (derived from a standardised sample register) recoveries, mineralisation percentage, sulphide minerals and mineralisation style. A comments field is used to capture ancillary observations or associations. • Drilling at the Deep Sulphide Target was initially carried out aiming to define an approximate 100m x 100m pattern by use of "mother" holes and deflections from these holes. In specific areas the drill density was increased to improve the level of confidence of the resource. • Percussion / reverse circulation pre-collars (where used) were sampled on a composite basis. • Sampling carried out under supervision of a qualified geologist using procedures outlined below including industry standard QA/QC. • Samples submitted for analysis to ALS Chemex (Pty) Ltd (**ALS**) were pulverised in its entirety at ALS and split to obtain a 0.2g sample for digestion and analysis. • Downhole electromagnetic (**EM**) survey were carried out in selected drill holes using standard techniques.
Drilling techniques	• *Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).*	Anglovaal: • Records for core size are not available. • No record on core orientation Orion: • Diamond core drilling using single tube NQ and BQ sized core. BQ core was only drilled where problems were encountered in the original NQ

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Criteria	JORC Code explanation	Commentary
		drilled drill hole and the drilling could not continue with NQ size. • In the near surface weathered zone HQ core was drilled. • Pre-collar drilled using percussion drilling on certain holes (above mineralisation). • Core was orientated in holes selected for geotechnical studies.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	Anglovaal: • All mineralised intersections were done with core drilling. • Core recoveries were measured for each drill "run" and recorded on assay sheets. • In most V holes and all D and F holes, intersections were in hard rock and recoveries were generally good through the mineralisation. Orion: • All mineralised intersections were done with core drilling. • Core stick-ups reflecting the depth of the drill hole were recorded at the rig at the end of each core run. • A block with the depth of the hole written on it was placed in the core box at the end of each run. • At the core yard, the length of core in the core box was measured for each run. The measured length of core was subtracted from the length of the run as recorded from the stick-up measured at the rig to determine the core lost. • Core recovery in all the mineralised intersections are good. • No grade variation with recovery noted.

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Criteria	JORC Code explanation	Commentary
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.* • *The total length and percentage of the relevant intersections logged.*	Anglovaal: • All relevant intersections for V surface holes have been logged and all of this information is available. It is understood from historical reports that all intersections for D and F holes were logged but not all information is currently available. • Downhole geotechnical information is available for some of the D and F holes only. Downhole mineralogical logs are available for some D and F holes. Orion: • Pre-collar percussion holes were logged on 1m intervals using visual inspection of washed drill chips. A hand held XRF instrument was used to determine the presence of any metals. • Core of the entire hole length was geologically logged and recorded on standardised log sheets by a qualified geologist. • Qualitative logging of colour, grain size, weathering, structural fabric, lithology, alteration type and sulphide mineralogy was carried out. • Quantitative estimate of sulphide mineralogy. • Logs were recorded at the core yard and entered into digital templates at the project office.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in-situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	Anglovaal: • Details of sub-sampling techniques not available. Orion: • Samples from percussion pre-collars were collected by spear sampling. • Sampling on site aimed to generate a < 2kg sub sample to enable the entire sample to be pulverised without further splitting. • Water was used in the dust depression proses during percussion drilling, resulting in wet chip samples. • BQ and NQ core cut at core yard and half core taken as sample. with maximum of 1m sample length • With core samples, the entire sample length was cut and sampled. • Sample preparation was undertaken at ALS an ISO accredited laboratory. ALS utilises industry best practise for sample preparation for analysis, involving drying of samples, crushing to <5mm if required and then pulverising so that +85% of the sample passes 75 microns.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument*	Anglovaal: • Surface drill exploration samples were all sent to Anglovaal Research Laboratory at Rand Leases Mine. • Atomic Adsorption method was used with a Nitric-bromide digest.

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Criteria	JORC Code explanation	Commentary
	make and model, reading times, calibrations factors applied and their derivation, etc. • *Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.*	Underground drill hole samples were sent to the mine laboratory, where the same analytical method was used. • Underground drill hole samples were sent to the mine laboratory, where the same analytical method was used. • Although no formal QC samples were inserted with the drill samples of the exploration holes the Anglovaal Research Laboratory developed their own standards, certified by other commercial laboratories and those were used internally in the laboratory. Duplicate samples were also inserted to check for repeatability. Orion: • Samples were submitted to ALS and analysed for base metals, Au and Ag. Analysis was by the Inductively Coupled Plasma and Optical Emission Spectroscopy ("ICP-OES") methodology. Initially a three-acid digest was used but since November 2018 an Aqua-regia digest was used. • Certified Reference Material (CRM), blanks and duplicates were inserted and analysed with each batch. Insertion rates for the current reporting was: CRM = 10%, blanks = 5%, field duplicates = 2% and pulp repeat duplicates = 3.9% • ALS has their own internal QA/QC protocols which include CRM's (5%), blanks (2.5%) and duplicates (2.5%). • CRM samples showed high accuracy and tight precision with no consistent bias. • Blank samples indicated no contamination, within the pre-determined thresholds, during the sample preparation process. • Field duplicate samples showed acceptable precision with no obvious bias. • Laboratory samples showed excellent accuracy and precision. • External laboratory checks by Genalyses showed excellent repeatability with the primary laboratory. • Down hole EM surveys were carried out in selected holes, using a 3 component Digi-Atlantis probe and ultra high power transmitter. • Loop size of 1800m x 600m were used with continuous measurements taken as the probe travels into the hole and out again. • Surface TDEM surveys were carried out using a Supracon Jesse Beep squid sensor and ultra-high-power transmitter with a Smartem 24 receiver.

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Criteria	JORC Code explanation	Commentary
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	Anglovaal: • No records available Orion: • Orion's Executive: Exploration personally supervised the drilling and sampling along with a team of experienced geologists. • The Executive: Exploration reviewed the raw laboratory data and confirmed the calculation of the significant intersections. • Twin holes were drilled to verify historical drill intersections from Anglovaal. • Data entry from the primary hard copies was done on Excel spreadsheets by the geologists logging the core. The data was then imported in to an Access database by the geologist responsible for the database. Validation of the data is done during importing into the Access database by running queries, and when the resource geologist imports the data into to the modelling software. • All drilling data has been transferred to a secure Geobank database. • For the EM survey, data was collected on site and validated by a geophysical technician daily. Data (raw and processed) was sent to a consultant geophysicist for review, quality control and processing. • No adjustments have been made to the assay data.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	Anglovaal: • All surface and underground hole collars were surveyed by qualified surveyors using a theodolite. • The historic mine survey data is in the old national Lo 23 Clarke 1880 coordinate system. • Downhole surveys were carried out for most of the V holes and all of the D and F holes. Methodology of the downhole surveys is not recorded on the available hardcopy information but plans and sections are meticulously plotted and signed off by a certified surveyor. • Both Eastman and Sperry Sun instruments were used in the downhole surveys. • Significant deflections in the dips of the holes have been noted, especially for the deeper holes. V holes with no downhole surveys are shallower holes drilled earlier on in the initial exploration phase. These holes intersected areas where the mineralisation is now largely mined out. • All hole positions have been converted to Lo23 WGS84 coordinates. • Underground D and F holes are recorded in local "V" line and "O" distance coordinates with local mine datum elevations. Level plans have

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Criteria	JORC Code explanation	Commentary
		both the local V/O grid and Lo23 Clark 1880 grids plotted and this has been used to define transformation parameters from local grid to geographical coordinates. All hole positions have been converted to Lo23 WGS84 coordinates. Orion: • Drill hole collar positions were laid out using a handheld GPS. • After completion of the Orion drilling all collars were surveyed by a qualified surveyor using a Trimble R8 differential GPS. • Downhole surveys were completed in all drill holesusing a North-Seeking Gyro instrument. • All survey data is in the WGS84 ellipsoid in the WG23 Zone with the Hartebeeshoek 1994 Datum. The coordinates are also supplied in Clarke 1880 and in UTM WGS84 Zone 34 (Southern Hemisphere).
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	Anglovaal: • Original exploration holes (V) were drilled on 200 - 250 m spacing. • Underground drilled holes (D, F and R) were not drilled on a regular spaced grid. Orion: • At the Deep Sulphide Target drill holes were initially aimed to intersect mineralisation on approximately 100m x 100m spacing with infill drilling to be carried out in areas of interest as determined by results. In specific areas the drill density was increased to improve the level of confidence of the resource. • Variography studies were carried out toguide the drill spacing for Mineral Resource estimates. • No sample compositing has been applied before assaying.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• Most of the historical drilling and all current drilling was oriented perpendicular, or at a maximum achievable angle to, the attitude of the mineralisation. • As a result, most holes intersect the mineralisation at an acceptable angle. • No sampling bias is anticipated as a result of hole orientations. • EM surveys by Orion were completed in an orientation perpendicular to the interpreted or intersected mineralisation.
Sample security	• *The measures taken to ensure sample security.*	Anglovaal: • No details of sample security available. However, during the mining operations the site was fenced and gated with security personnel employed as part of the staff.

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Criteria	JORC Code explanation	Commentary
		Orion: • Chain of custody was managed throughout. Samples were stored on site in a secure locked building and then freighted directly to the laboratory. • All coarse and pulp rejects returned from the laboratory are stored within secured locked buildings.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	Anglovaal: • No records of audits or reviews are available. Orion: • SRK has reviewed the sampling techniques being practiced. • The sampling process is governed by well-established industry and company procedures and protocols.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• The Deep Sulphide Target is located on two Prospecting Rights held by Repli and Vardocube, which are subsidiaries of Orion (Figure 1A). • The Prospecting Right areas covers a strike of 2,460m for the Deep Sulphide mineralisation. • All of the required shaft infrastructure and lateral access underground development is available within the two Prospecting Rights.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• The Anglovaal exploration resulted in the delineation and development of a large mine.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The Copperton deposit is a Volcanogenic Massive Sulphide (**VMS**) deposit which is situated in the southernmost exposures of the north-northwest trending Kakamas Terrain, which forms part of the Mid-Proterozoic Namaqualand Metamorphic Complex. • The deposit is hosted by the Copperton Formation of the Areachap Group. The Areachap Group, also hosts several other but smaller VMS deposits such as the Areachap, Boks Puts, Kantien Pan, Kielder, and Annex Vogelstruisbult deposits. • The structural sequence at the mine consists of a footwall Smouspan Gneiss Member, Prieska Copper Mines Assemblage (PCMA), which hosts the sulphide mineralisation, and the hangingwall Vogelstruisbult Gneiss Member. • The historically mined section of the deposit is confined to a tabular,

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Criteria	JORC Code explanation	Commentary
		stratabound horizon in the northern limb of a refolded recumbent synform, the axis of which plunges at approximately 5° to the south-east. • The mineralised zone outcrop has a strike of 2,400m, is oxidised and / or affected by leached and supergene enrichment to a depth of approximately 100m and crops out as a well-developed gossan. It has a dip of between 55° and 80° to the northeast at surface and a strike of 130° to the north. Current drilling indicates that the Deep Sulphides has a strike length of at least 2860m in depth. • The thickness of the mineralised zone exceeds 30m in places but averages between 7m and 9m. The mineralised zone persists to a depth of 1,100m (as deep as 1,228m in one section) after which it is upturned due to the folding. • The Deep Sulphide Target area located below the historical mined area, comprises the steep down dip continuity ("steep limb and hinge zone") and from where it upturns to its subsequent synformal structure ("trough zone"). • The morphology of the mineralised horizon in the eastern limb is well mapped out by drilling and historic mining while the western limb up dip extent is poorly tested and mapped.

Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:*
	  ○ *easting and northing of the drill hole collar*
	  ○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar*
	  ○ *dip and azimuth of the hole*
	  ○ *down hole length and interception depth*
	  ○ *hole length.*
	• *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*
		Anglovaal:
		• Historical drilling results used in the Deeps Mineral Resource estimation were reported in the ASX releases of 16 July 2018 and 18 November 2015.
		Orion:
		• All drill hole intersections used in the the Deep Sulphide Mineral Resource estimation have been reported in the ASX releases of 5 November 2018, 15 October 2018, 18 September 2018, 16 July 2018, 19 February 2018, 1 February 2018, 12 December 2017, 8 November 2017, 9 October 2017, 5 October 2017, 17 September 2017, 6 September 2017, 27 July 2017, 17 July 2017.
		• Other relevant diagrams have been included in the abovementioned ASX releases relating to the drilling results at the Prieska Project.

Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	Anglovaal: • Individual intersections were weighted by sample width. • No truncations have been applied. • All grade and density information are incorporated in the Orion database, and due to the large number of intersections made it is in the Competent Person view that it should not be included in this reporting. Orion: • Significant intersections for the Deep Sulphide Target reported to the ASX

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Criteria	JORC Code explanation	Commentary
		are calculated by average of assays result > 0.3% copper or 0.5% zinc and weighted by the sample width and specific gravity of each sample. • In general, the significant intersections correspond strongly to geological boundaries (massive sulphides) and are clearly distinguishable from country rock / surrounding samples. • No truncations have been applied. • No metal equivalent values were considered. • Significant intersections made by Orion were reported in previous ASX releases relating to drilling of the Deep Sulphide Target.

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Section 2-1 Selected Images illustrating the Mineral Resource and sampling presented.

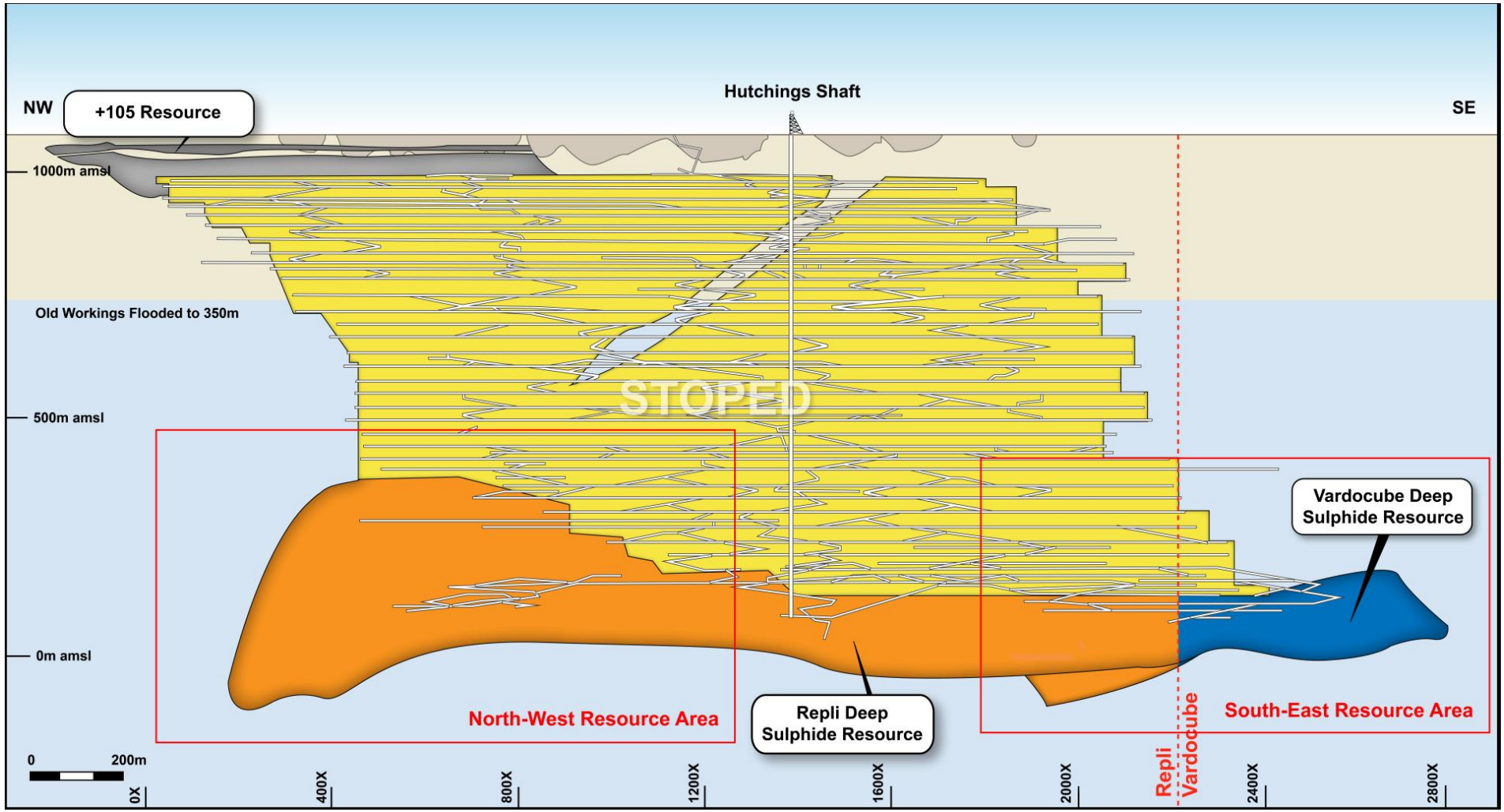

Figure 1A: Longitudinal section of showing the historically mind area and the Deep Sulphide Resource at the Prieska Project, with the Deep Sulphide Resource subdivided into the Repli and Vardocube Resource areas.

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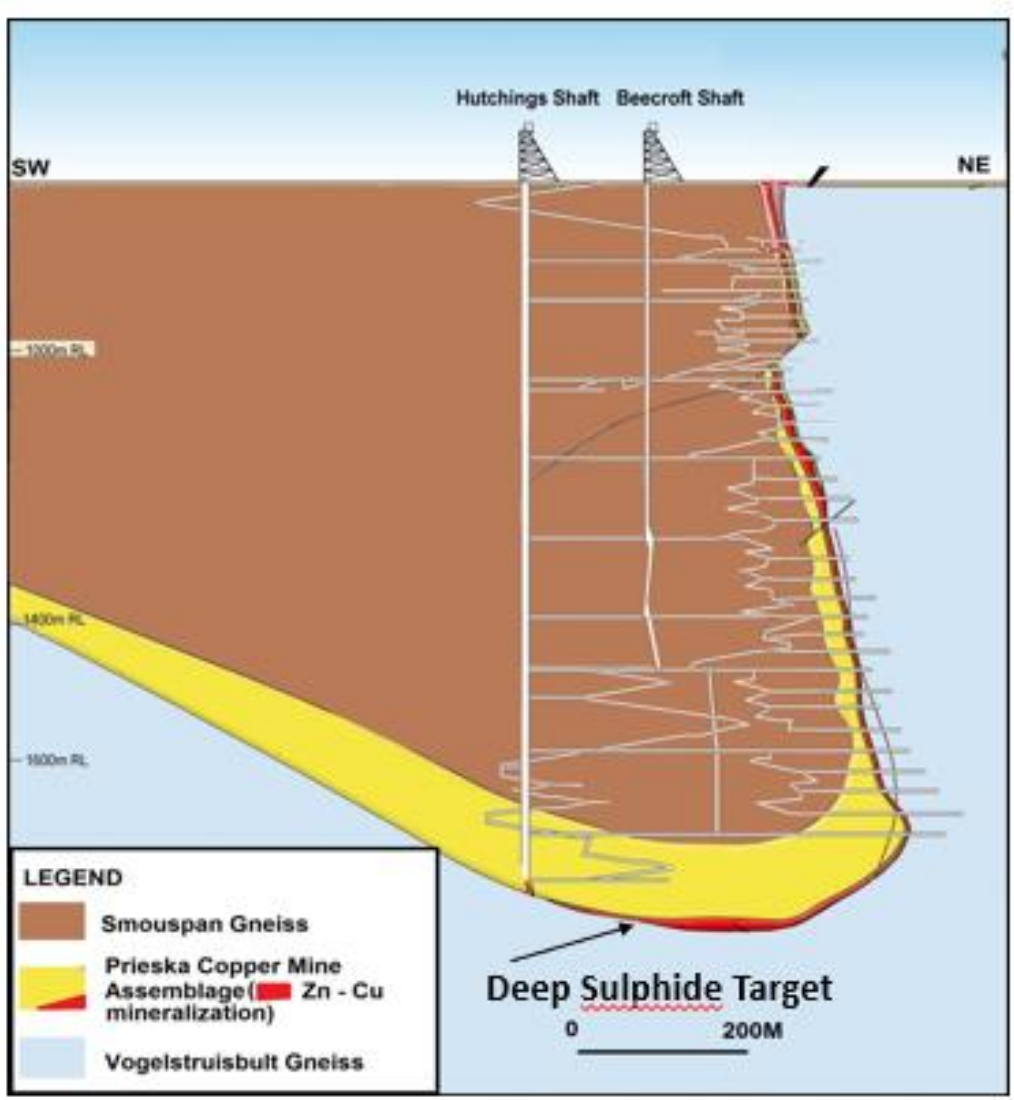

Figure 2A: Simplified geological section through Prieska Project showing structure and locality of the Deep Sulphide Target below the old workings.

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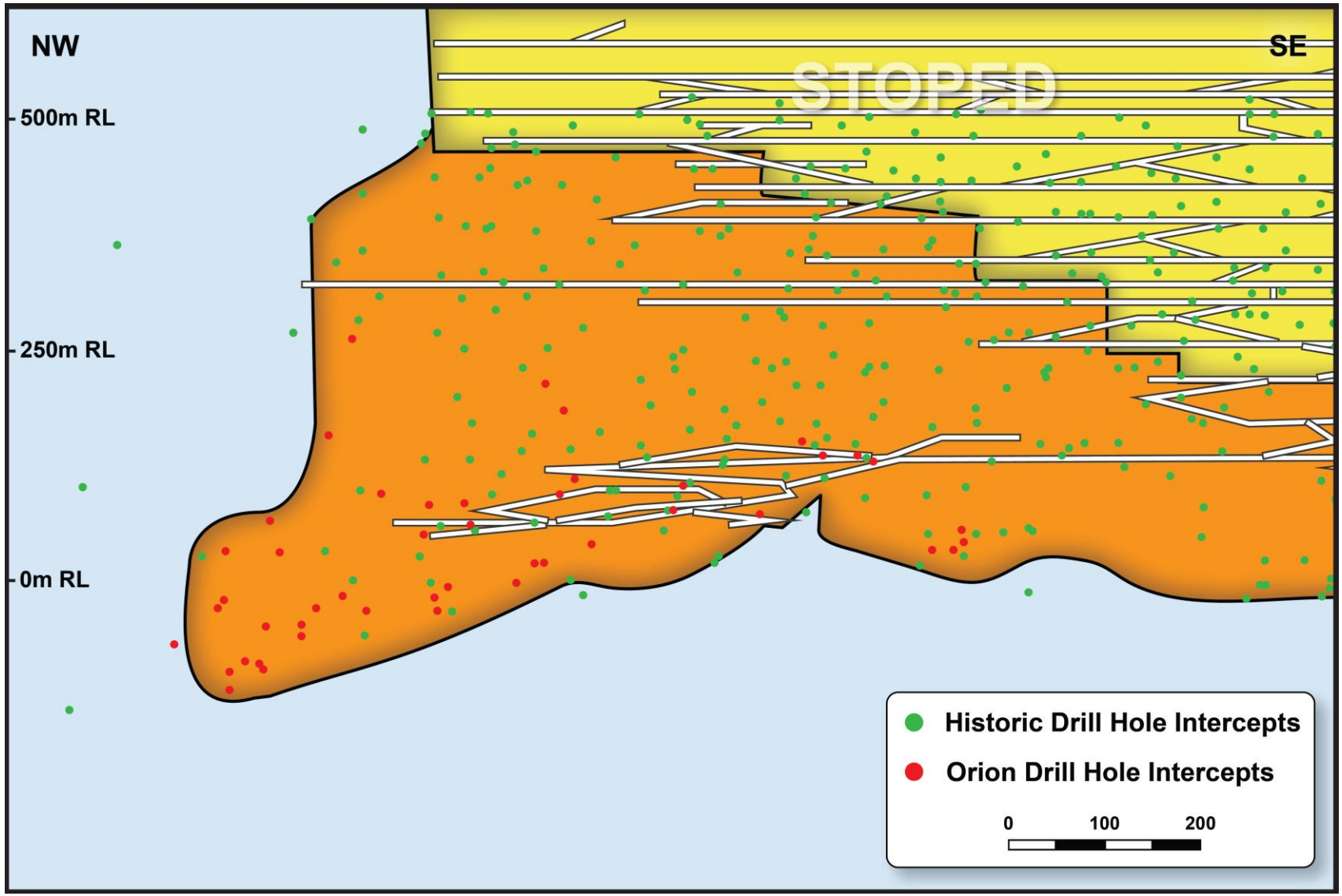

Figure 3A: Longitudinal projection of the North-West Resource area of the Prieska Project, showing the intersection points of the drill holes used in this Mineral Resource release.

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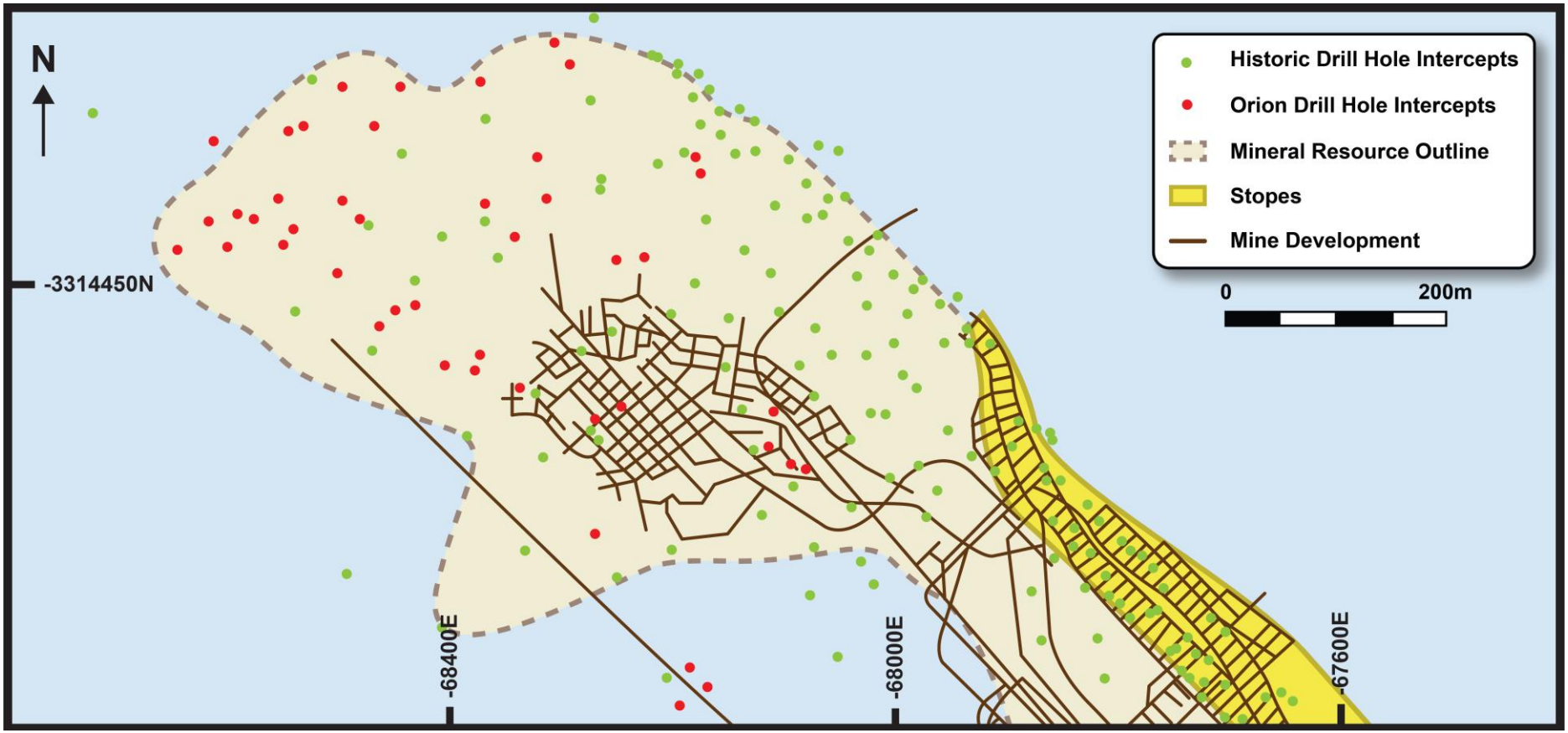

Figure 4A: Plan of the North-West Resource area of the Prieska Project, showing the intersection points of the drill holes used in this Mineral Resource release.

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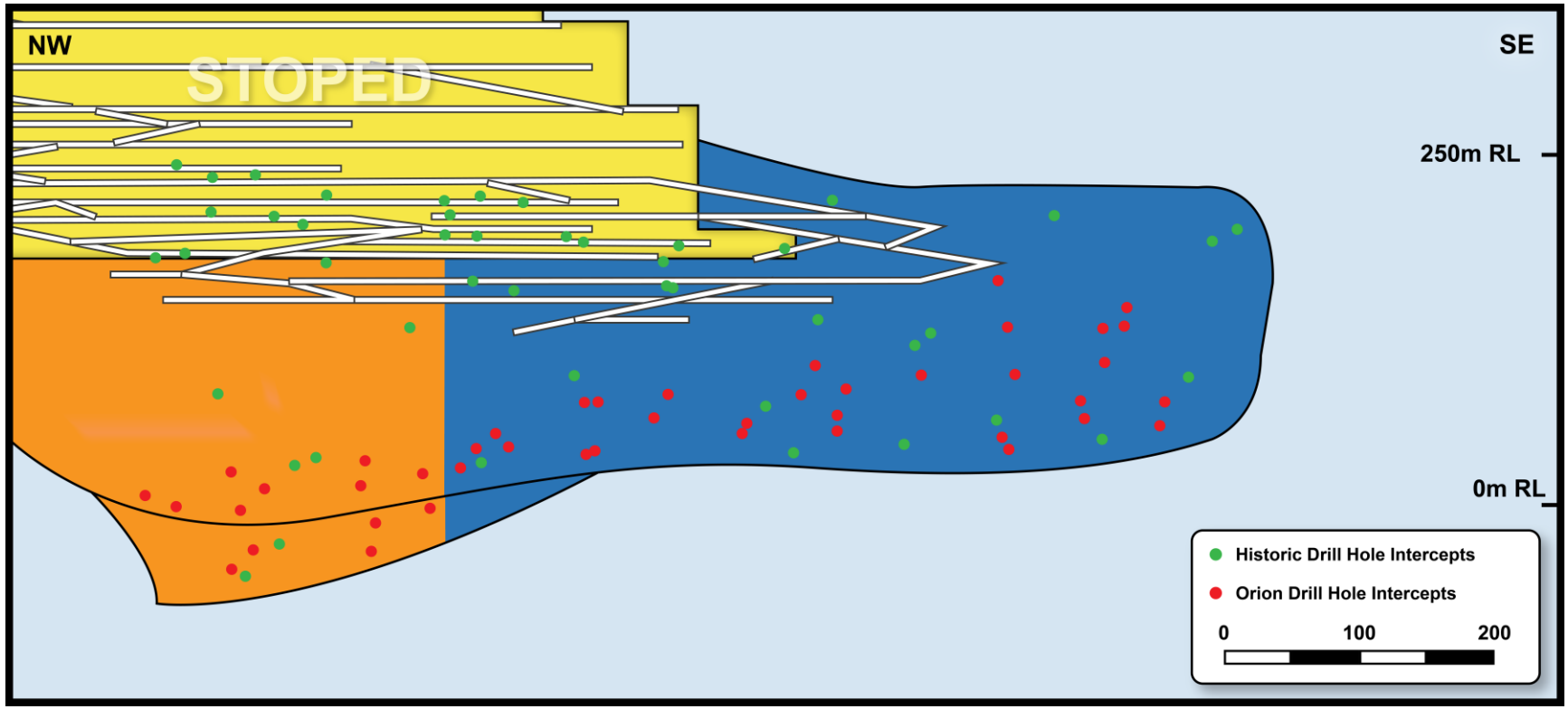

Figure 5A: Schematic longitudinal projection of the South-East Resource area of the Prieska Project, showing the intersection points of the drill holes used in this Mineral Resource release.

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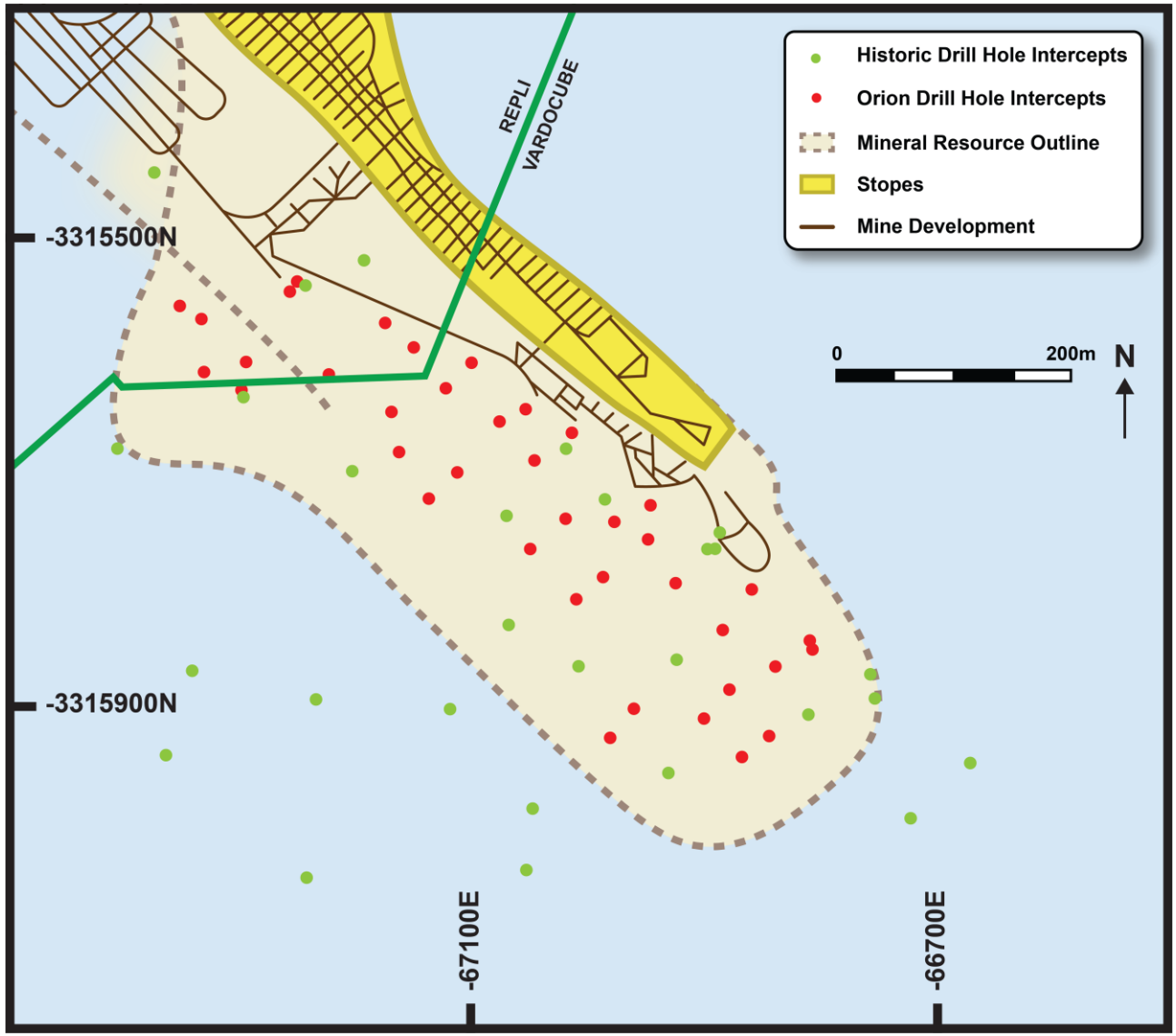

Figure 6A: Plan of the South-East Resource area of the Prieska Project, showing the intersection points of the drill holes used in this Mineral Resource release.

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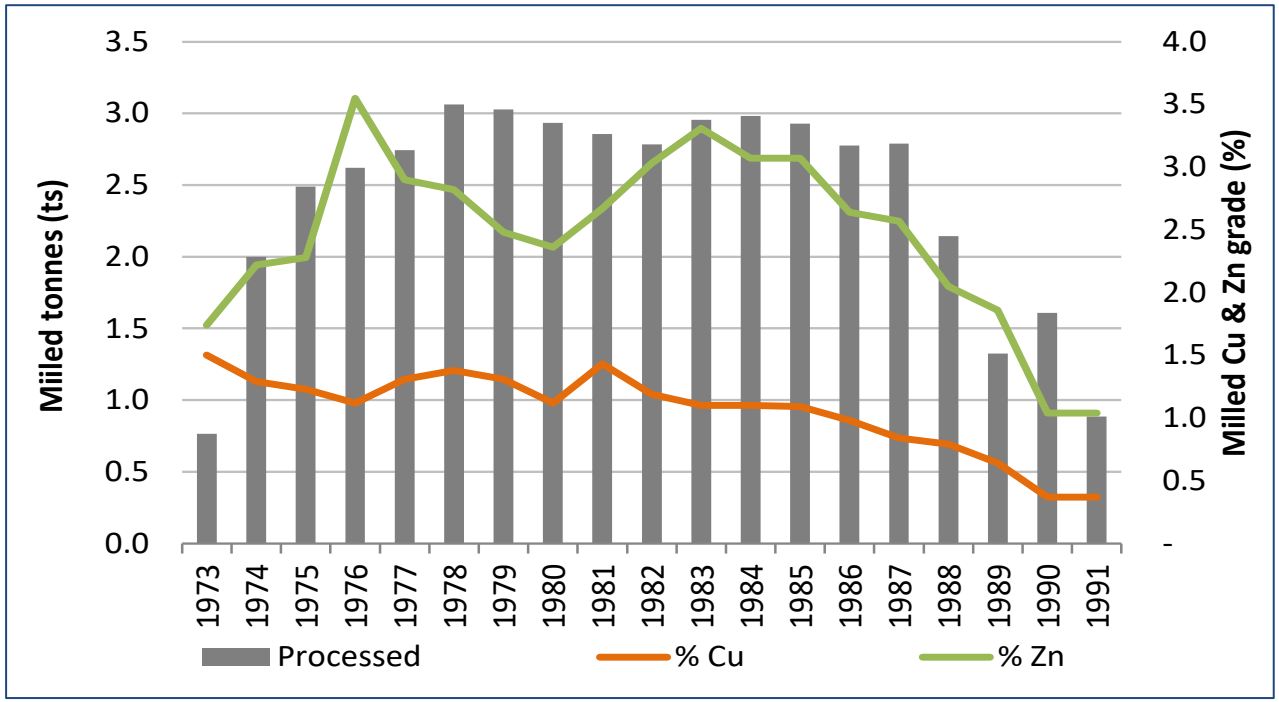

Figure 7A: Graphic presentation of the tonnes and grades milled at the Prieska Copper Mine from 1973 to 1991 (Source: Mine Records).

Section 3 Estimation and Reporting of Mineral Resources

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

Criteria	JORC Code explanation	Commentary

Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.*
	• *Data validation procedures used.*
		• All drill hole and sample data are stored by Orion in a robust Geobank™ database.
		• Validation includes the following:
		  ○ Ensuring that all drill holes have appropriate XYZ coordinates.
		  ○ Comparing the maximum depth of the hole against the final depth indicated in the collar file.
		  ○ Comparing the final depth in the survey file against final depth in the collar file.
		  ○ Comparing the final depths of all geology, assay, core recovery against the final depth in the collar file.
		  ○ Checking for duplicate drill holes.
		  ○ Checking that each depth interval has a main lithology.
		  ○ Checking that all fields that were set up as mandatory fields contain entries.
		  ○ The core recoveries were checked for unrealistic percentages.
		  ○ Density results are checked for unrealistic values.
		• A further check was performed when the drill hole data was imported into the Geovia SurpacTM (Surpac) modelling software. The data was validated for duplicates, gaps, overlaps, impossible intervals in down-hole sequence for assay, collar coordinates, geology data and survey data. The drill holes were also visually checked in plan and section in Surpac.

Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• Z* Star Mineral Resource Consultants (Pty) Ltd (**Z***) were requested by Orion Services South Africa (Pty) Ltd (**Orion SA**) to estimate and classify a mineral resource for the Deep Sulphide deposit. Z* visited the Prieska Project from 17 to 19 October 2017. • The visit included a review of the drilling and sampling operations, discussion on the geology and associated mineralisation, review of the planned drill holes and examination of the assay data and a high level spatial analysis.
Geological interpretation	• *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* • *Nature of the data used and of any assumptions made.* • *The effect, if any, of alternative interpretations on Mineral Resource estimation. The use of geology in guiding and controlling Mineral Resource estimation.* • *The factors affecting continuity both of grade and geology.*	• The Deep Sulphide mineralisation is the depth extension of the strata-bound, stratiform VMS Prieska Cu-Zn deposit and is hosted by the 3km thick Copperton Formation of the Areachap Group. The massive sulphide mineralisation is characterised by abundant rounded fragments of gangue material of various sizes contained in a matrix of sulphide minerals. The gangue includes fragments of both hanging- and footwall material.

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Criteria	JORC Code explanation	Commentary
		• No clear metal zonation is evident from the modelling. High Cu are generally not in the same place as the high Zn (with a few exceptions). • Geological data and conclusions reached were based on observations made in drill core from recent drilling and sampling program. • Like many other VMS deposits domaining for estimation is not possible using the geology, and the best method is therefore to utilise the assay data. • There is a sharp decrease in the Zn and Cu grades on the boundary of the massive sulphide unit. For the construction of the wireframes a Zn equivalent cut-off of 3.0% (Zn Eq = Zn% + (Cu%*2) for the mineralised zones was used. The Zn_Eq cut-off was used a guide for modelling rather than a strict threshold.
Dimensions	• *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	• Within the prospecting right areas, the strike length of the mineralisation is 2600m, horizontal width varies from 410m to 870m and the down dip extent is 1 228m below shaft collar. True thickness of the orebody varies between <1m to 30m with an average of 7m.

Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters, and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.*
	• *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.*
	• *The assumptions made regarding recovery of by-products.*
	• *Estimation of deleterious elements or other non-grade variables of economic significance (e.g. sulfur for acid mine drainage characterisation).*
	• *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.*
	• *Any assumptions behind modelling of selective mining units.*
	• *Any assumptions about correlation between variables.*
	• *Description of how the geological interpretation was used to control the resource estimates.*
	• *Discussion of basis for using or not using grade cutting or capping.*
	• *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*
		• The estimation of the Deep Sulphides included the following steps:
		  ○ The creation of a wireframe model for the Deep Sulphide target using a 3.0% Zn equivalent cut-off as a guide. In addition, the lithology was utilised;
		  ○ Data validation and selection of samples within the Deep Sulphide target and analysis of the variables to be estimated, i.e. Cu%, Zn%, and SG;
		  ○ Exploratory Data Analysis (EDA) that included:
		  ○ Compositing the data to 1m;
		  ○ Capping four Cu% outliers and no capping of Zn% values; an
		  ○ Exclusion of two samples with extreme lengths.
		  ○ Creation of a suitable block model with estimation blocks (30m x 30m x 5m) and with sub-cells of 0.5m x 0.5m x 0.5m;
		  ○ A spatial analysis of estimation variables followed by a neighbourhood analysis taking cognisance of the folding;
		  ○ Estimation using an appropriate method and modelled parameters, i.e. Ordinary kriging for local block estimation supplemented by zonal estimation;
		  ○ Validation of block estimates including statistical and visual methods as well as comparison with the results of a second method (moving average);
		  ○ The software used for estimation was Isatis™.
		• Orion declared a Mineral Resource for the Deep Sulphide target on the

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Criteria	JORC Code explanation	Commentary
		Repli and Vardocube Prospecting Rights on 8 February 2018 and 9 April 2018, respectively. • There are no previous mine production plans for the Deep Sulphide target. • No assumptions have been made regarding the recovery of by-products. • No deleterious elements or non-grade variables were estimated.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• No moisture content was calculated, and the core was naturally dried when logged and sampled. The estimated tonnages are therefore based on a natural basis.
Cut-off parameters	• *The basis of the adopted cut-off grade(s) or quality parameters applied.*	• The Deep Sulfide Mineral Resource is declared at a zero cut-off but using a wireframe that mostly excludes sample values below a 3% Zn equivalent. • The cut-off was on the recommendation of Orion's Chief Operating Officer (**COO**) which is based on historical data from the Prieska Mine and a dataset of parameters from similar operations in the region.
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	• Minimum mining thickness of 2m and cut-off of 4% Zn equivalent were proposed by Orion's COO, as based on historical data from the Prieska Mine and a dataset of parameters from similar operations in the region. • The minimum thickness is based on long hole open stope and drift and fill mining methods. • A preliminary mine design which will form the basis of a Bankable Feasibility Study (**BFS**) is in progress.
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	• The mine operated from 1972 to 1991 and is reported to have milled a total of 45.68 Mt of ore at a grade of 1.11% copper and 2.62% zinc, recovering 0.43 Mt of copper and 1.01 Mt of zinc. • Detailed production and metallurgical results are available for the life of the mine. • In addition, 1.76 Mt of pyrite concentrates and 8,403 t of lead concentrates as well as amounts of silver and gold were recovered. • Copper and zinc recoveries averaged 84.9% and 84.3% respectively during the life of the mine. • Metallurgical test work on the Deep Sulphide mineralisation revealed good concentrate recoveries, similar to those reported for the historical Anglovaal operation. • Additional metallurgical test work as part of a BFS is in progress.

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Criteria	JORC Code explanation	Commentary
Environmental factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.*	• The Deep Sulphide Resource is on the environmental footprint of the historic Prieska Copper Mine site. Environmental impact assessment studies form part of the on-going BFS.
Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* • *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* • *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	• Bulk densities (**BD** t/m^3) were determined using the water displacement method. The entire sample (normally 1m length) was measured. Cognisance of the change in lithology was taken in the selection of samples for bulk density measurements. • No moisture content was determined. • Local block estimates of BD t/m^3 were produced using Ordinary kriging within the mineralised wireframe. A second pass with longer search radii was utilised to populate the remaining blocks. The tonnage per block was determined using the volume (as per the wireframe model) and the BD on a block by block basis.
Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.* • *Whether appropriate account has been taken of all relevant factors, i.e. relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data.* • *Whether the result appropriately reflects the Competent Person(s)' view of the deposit.*	• The classification of the Deep Sulphide Mineral Resource takes cognisance of the uncertainty associated with the geology with the focus being on the definition of the mineralised domain and therefore the volume estimate. The classification also takes cognisance of the fact that there is more than one drilling and sampling program, and the historical Anglovaal data has a lack of available supporting documentation. A further important consideration is the methodology used to estimate Cu%, Zn%, and BD t/m^3 and an assessment of the results (refer to discussion of relative accuracy and confidence below). In particular the Slope of Rgression (SOR), the Kriging Efficieny (KE) and the drilling density were utilised to identify blocks of lower levels of uncertainty • The Deep Sulphide Resource is classified at an Indciated and an Inferred level of confidence. • The results conform to the view of the Competent Persons.
Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• SRK carried out a review on the Deep Sulphide Mineral Resource Estimate.

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Criteria	JORC Code explanation	Commentary
Discussion of relative accuracy/confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource 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 resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* • *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 the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	• The Deep Sulphide target was originally modelled on the historic Anglovaal drilling only. It is important to recognise that the Orion holes that targeted this Deep Sulphide deposit intersected the mineralised zone at the expected depths. The Orion holes have not altered the shape of the original Deep Sulphide deposit significantly. The compatibility of the two drilling campaigns thus adds considerable support in terms of including the Anglovaal drilling. • The results of a comparative analysis between Anglovaal and Orion drilling and sampling data do not justify exclusion of historical data. There is a reasonable compatibility between the histograms (despite a significant difference in the number of assays). • In general, the variogram models for Cu% and Zn% for both Anglovaal and Orion data compare very favourably. • Ordinary kriging was undertaken on Cu%, Zn%, and BD t/m^3) using a 30m x 30m x 5m blocks, utilising the capped 1m composite input datasets, the modelled variograms and the search neighbourhood parameters. The results from the first pass for Cu%, Zn% and BD t/m^3 populate between 68% and 86% of the blocks in the Deep Sulphide target. A second kriging pass was utilised for Cu%, Zn% and BD t/m^3, that resulted in 100% of the blocks being populated. • No production data is available.

Section 3 Estimation and Reporting of Mineral Resources

Criteria	JORC Code explanation	Commentary

Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.*
	• *Data validation procedures used.*
		• All drill hole and sample data are stored by Orion in a robust Geobank™ database.
		• Validation includes the following:
		  ○ Ensuring that all drill holes have appropriate XYZ coordinates.
		  ○ Comparing the maximum depth of the hole against the final depth indicated in the collar file.
		  ○ Comparing the final depth in the survey file against final depth in the collar file.
		  ○ Comparing the final depths of all geology, assay, core recovery against the final depth in the collar file.

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Criteria	JORC Code explanation	Commentary
		○ Checking for duplicate drill holes. ○ Checking that each depth interval has a main lithology. ○ Checking that all fields that were set up as mandatory fields contain entries. ○ The core recoveries were checked for unrealistic percentages. ○ Density results are checked for unrealistic values. • Additional validation was undertaken when the drill hole data was imported into the Geovia SurpacTM (**Surpac**) modelling software. The data was checked for duplicates, gaps, overlaps, impossible intervals in down-hole sequence for assay, collar coordinates, geology data and survey data. The drill holes were also visually checked in plan and section in Surpac. • Additional validation was also undertaken when the data was imported into Datamine™ and then when the de-surveyed data was imported to Isatis™ for the EDA and the estimation.
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• Z* Star Mineral Resource Consultants (Pty) Ltd were requested by Orion Services South Africa (Pty) Ltd to estimate and classify a mineral resource for the Deep Sulphide and +105m Level Target deposits. They visited the site from 17 to 19 October 2017 and during February 2018. The visits included a review of the drilling and sampling operations, discussion on the geology and associated mineralisation, review of the planned drill holes and examination of the assay data and a high level spatial analysis.
Geological interpretation	• *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* • *Nature of the data used and of any assumptions made.* • *The effect, if any, of alternative interpretations on Mineral Resource estimation. The use of geology in guiding and controlling Mineral Resource estimation.* • *The factors affecting continuity both of grade and geology.*	• The +105m Level Mineral Resource comprises four defined geological zones above the primary sulphides. These are: ○ Haematite-goethite-quartz oxide zone (gossan) from surface to approximately 33m. ○ Clay (kaolinite) zone developed in places below 33m. ○ Chalcocite dominant supergene zone between approximately 42m and 70m. ○ Mixed Supergene-sulphide zone between approximately 70 and 90m below surface. This has a relatively sharp contact with the fresh underlying massive sulphides. • Of the above four zones, the first and the third are considered as being suitable for inclusion as part of the Mineral Resource. These two are referred to as the Oxide and Supergene zones, respectively. • The boundaries of the mineralisation are relatively sharp irrespective of the geology. Therefore, wireframes for the Oxide and Supergene zones were created by interpretation of the Zn% and Cu% values along 31 sections across the deposit. The wireframes were constructed utilising Zn%

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Criteria	JORC Code explanation	Commentary
		values greater than or equal to 0.6% and Cu% values greater than or equal to 0.3%. Where possible both values were utilised during modelling, but greater emphasis was placed on the copper values as the zinc was leached out towards surface. In places, this resulted in the inclusion of mineralised areas based only on high Cu% values. • In the NW part of the deposit, mineralisation occurs in two lenses. It is unclear whether this is stacked mineralisation formed during deposition or a structural duplication due to thrusting or isoclinal folding and will be investigated with detail grade control drilling should open pit mining be approved. The upper lens does not seem to have depth extent and is part of the oxide zone. • Geological data and conclusions reached are based on observations in drill core. • The oxide and supergene zones are treated separately in the resource estimation.
Dimensions	• *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	• The strike length is 867m and the depths below surface to the upper limits are from 5m to 20m and to the lower limits from 61m to 104m below surface. • Thickness of the mineralised zone varies from 1.5m to 23m.
Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters, and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.* • *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* • *The assumptions made regarding recovery of by-products.* • *Estimation of deleterious elements or other non-grade variables of economic significance (e.g. sulfur for acid mine drainage characterisation).* • *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* • *Any assumptions behind modelling of selective mining units.* • *Any assumptions about correlation between variables.* • *Description of how the geological interpretation was used to control the resource estimates.* • *Discussion of basis for using or not using grade cutting or capping.* • *The process of validation, the checking process used, the*	• Density weighting is standard practice for VMS deposits. However, in the Oxide and Supergene zones the density measurements do not correlate well with the assay values and density weighting was therefore not included. The poor correlation is probably due to the friable nature of the core. • The distribution of composites for each of the variables (Zn%, Cu%, and density) were assessed and a decision was taken to utilise the Parker methodology for capping outliers. The process involved capping the relevant outliers for each variable to a chosen threshold. • No Zn%, Cu% or density values were capped in the Oxide Zone however capping was applied to two Zn% assays and one Cu% assay in the Supergene Zone. • Datamine™ was utilised to create a block model and measure individual block volumes within each zone and these data were imported into Isatis™ for further analysis. • The Oxide and Supergene zones were analysed independently to ensure that the plane for estimation had an optimal orientation. • Variograms for all variables were created from the laboratory assay capped composites only and modelled in two directions, downhole (along the drill hole) and omni-directionally on the plane of the mineralisation. Assessment of the variogram models was preferentially

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Criteria	JORC Code explanation	Commentary
	comparison of model data to drill hole data, and use of reconciliation data if available.	focused on the Zn and Cu spatial structure. • Repli (2014) stated a near-surface Oxide Mineral Resource of 1.2Mt at 1.02% Cu and 1.13% Zn for the north-west oxide and leached zone, based on 12 diamond drill holes. • No mining production took place above the 105 level of the mine. • No assumptions have been made regarding the recovery of by-products. • No deleterious elements or non-grade variables were estimated. • A block model was created to allow estimation into 40m x 40m x 5m blocks with sub-cells of 2.5m x 2.5m x 2.5m. • Ordinary kriging (OK) was undertaken on all variables on a 40m x 40m x 5m block scale, utilising the capped composite input datasets and the modelled variograms. Estimation runs on two different neighbourhoods were utilised for all variables and the first estimation run in each case has smaller searches (equivalent to the variogram ranges), particularly in the Z direction. This ensures that the variography and therefore the nature of the mineralisation is honoured and ensures that negative weights are minimised. The neighbourhood of the second kriging run was expanded to allow population of most of the remaining blocks. The 2nd pass kriging run failed to populate all the blocks in the Oxide and Supergene Zones, particularly in areas where the peripheral dip of the deposit was different to the best fit plane. A decision was taken to utilise the "grid filling" option in IsatisTM using a moving average interpolator. • No assumptions were made regarding selective mining methods. • The Oxide and Supergene zones were reported independently in the mineral resource statement.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• No moisture content was calculated, and the core was naturally dried when logged and sampled. The estimated tonnages are therefore based on a natural basis.
Cut-off parameters	• *The basis of the adopted cut-off grade(s) or quality parameters applied.*	• A Cu% cut-off of 0.3% was used for the Mineral Resource Statement that corresponds with the wireframe modelling. • The cut-off was on the recommendation of Orion's Chief Operating Officer (COO) which is based on historical data from the Prieska Mine and a dataset of parameters from similar operations in the region.

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Criteria	JORC Code explanation	Commentary
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	• The assumption is to use open cast mining methods with 10m benches. • The major risk is mining between sinkholes and above the partly collapsed crown pillar of the underground mined-out stopes. • Whittle pit optimisation study and detail pit design, as part of a Bankable Feasibility Study, is in progress.
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	• Metallurgical test work indicated that a separate copper and zinc concentrate of the supergene mineralisation is achievable, test work of the oxide mineralisation however was unsuccessful. • The oxide mineralisation has a reasonable prospect for eventual economic extraction as it occurs close to the surface and treatment of this type of ore by means of leaching is well known in the industry.
Environmental factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.*	• The Deep Sulphide Resource is on the environmental footprint of the historic Prieska Copper Mine site. Environmental impact assessment studies form part of the on-going BFS.
Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* • *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* • *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	• Due to the poor core recoveries the density data in the Oxide Zone is sparse with only 14 samples available. There are 134 density measurements in the Supergene Zone. • Bulk Densities were determined using the water displacement method. A representative sample of full core at 15cm length was collected per metre length, taking cognisance of the change in lithology. • A total of 33% of the samples lying within the wireframe used for the estimation of the supergene mineralisation were re-done for relative density using the wax relative density method. These results show excellent precision and no obvious bias when comparing with the original relative densities.

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		• No moisture content was determined.
		• Core is mostly weathered in the Oxide Zone with obvious core loss. The representative samples selected for density measurement were sprayed with a clear lacquer spray and allowed to dry prior to being weighed.
		• The low number of samples and the lack of a variogram model for density samples in the Oxide Zone resulted in a different approach to estimation. The estimation methodology for density in this zone is as follows:
		  o Calculation of a length weighted average BD per drill hole
		  o Calculation of the average density per spatial area from the drill holes (declustering).
		  o Calculation of the average of the spatial areas (declustered mean). This marginally lower but more representative mean BD value was applied as a zonal estimate for all blocks within the Oxide Zone, i.e. 2.59 t/m^3.
		• The density in the Supergene Zone were estimated using Ordinary Kriging.

Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.* • *Whether appropriate account has been taken of all relevant factors, i.e. relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data.* • *Whether the result appropriately reflects the Competent Person(s)' view of the deposit.*	• The geology of the two zones making up the +105m Level Mineral Resource is relatively uncomplicated, and the key issues relate to the delineation of the domain boundaries (not geology). The assay data used for estimation is reliable and has been acquired with good governance associated with all processes. With one exception (BD in the Oxide) the variables were estimated using independent variogram models and Ordinary Kriging. • Oxide Zone: Inferred Mineral Resource - the geological model is defined to a reasonable level and there is sufficiently accurate data to produce local block estimates using Ordinary Kriging, albeit there is a limited number of samples. There is a high level of uncertainty associated with the zonal estimation of density due to a low number of samples (and a possible bias in the methodology) as well as possible inaccuracies associated with core loss. The collapse breccia (part of sinkhole) will also have the largest effect on this zone and this has not been well defined. • Supergene Zone: Inferred and Indicated Mineral Resources - the geological model is defined to a reasonable level and there is sufficiently accurate data coverage to produce local block estimates using Ordinary Kriging. In parts of the Supergene Zone there are sufficient data for reasonably accurate local block estimates of grade (~69% of volume populated by 1st Pass kriging). The low number of density samples is a concern but local block estimation with reasonable accuracy was possible. The kriging performance parameters, e.g. slope of regression, were utilised to make a distinction between the Indicated and Inferred

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		levels of confidence. • The results conform to the view of the Competent Person.
Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• MSA Consulting reviewed the +105m Level Mineral Resource • A review of the +105m Level Mineral Resource by SRK is planned for the first quarter of 2019.
Discussion of relative accuracy/confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource 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 resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* • *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 the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	• Final estimates for all variables in both zones were validated by comparing the mean composite grades to the mean estimate grades. The data for Zn and Cu with the 1st Pass and final estimates are within 5% of the composites mean for the Supergene Zone and within 8% for the Oxide Zone. • Composite and estimated final grade and density distributions were compared to ensure that the block estimates represent the original data distribution. These were found to be reasonably compatible. • SwatheTrend plots were created in the Y, X and Z directions and all the estimates followed the trend of the composite data. • All estimates were studied graphically and compared to the composite data in three-dimensional space and they compared reasonably well, given the high variability of the sample data. • No production data is are available.

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Section 4 Estimation and Reporting of Ore Reserves – Underground (Deep Sulphide)

Criteria	JORC Code explanation	Commentary
Mineral Resource estimate for conversion to Ore Reserves	• *Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.* • *Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.*	• 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[8] in ASX release 18 December 2018. • The Mineral Resources are based on drilling data available as at 30 November 2018. • The Competent Person for the Mineral Resource is Mr Sean Duggan of Z* Consultants, RSA. • 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. • The Mineral Resources are reported inclusive of the Ore Reserves.
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• The Competent Person, William Gillespie, Principal Mining Consultant of A&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. • A visual inspection of the shaft and steelwork was carried out at the 294 level station. Shaft lining and steelwork looked visually competent. • The 310 level Pumping station settlers on the 294 level were visited and looked structurally competent. • The previous underground mining at Prieska consisted of Long Hole Sub Level Open Stoping leaving Sill and Rib pillars intact. • The waste collecting drive and stope draw-points were inspected on the 210L. Roof and sidewall conditions were good. • Limited support was installed in the ramps, drives and crosscuts in these upper levels other than for unconformities.
Study status	• *The type and level of study to enable Mineral Resources to be converted to Ore Reserves.* • *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.*	• A BFS Technical Report has been completed. • The BFS has been prepared to an accuracy level of ± 15% 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. • 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.
Cut-off parameters	• *The basis of the cut-off grade(s) or quality parameters applied.*	• The cut-off grade, in this case the break-even grade, was estimated based on a Zn Eq basis using all OPEX including Stay-In-Business (SIB) capital and government Royalties. The reason Zn_Equivalent

[8] 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*. 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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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).

- The cut-off grade table is shown below and the Zn equivalent grade estimation below that.

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
Total cash OPEX per tonne treated	**ZAR/t**	**880**	**969**	**1,121**
FX (ZAR-US$)		14.00	14.00	14.00
Total cash operating cost per tonne treated	**US$/t**	**62.9**	**69.2**	**80.1**
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%
Break-even in-situ Zn_Eq grade		**3.9%**	**4.3%**	**4.8%**
Break-even-in-situ Cu_Eq grade		**1.3%**	**1.5%**	**1.6%**

The calculation for the conversion of Cu to Zn_Eq grade is as follows:

$$1\%\ Cu = \frac{(Cu\ price \times Cu\ NSR)}{(Zn\ price \times Zn\ NSR)} \times \frac{(Cu\ PRF)}{(Zn\ PRF)}$$

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<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
<tr><td></td><td></td><td>
$$= \frac{(6{,}614^{9} \times 93.7\%^{10})}{(2{,}866^{1} \times 74.3\%^{2})} \times \frac{85.0^{11}\%}{84.3^{3}\%}$$
$$= 2.9\% \text{ Zn}$$
Therefore, the Zn equivalent grade = [Zn grade + (2.9 x Cu grade)]
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.
</td></tr>
<tr><td>Mining factors or assumptions</td><td>
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).
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.
The assumptions made regarding geotechnical parameters (e.g. pit slopes, stope sizes, etc.), grade control and pre-production drilling.
The major assumptions made, and Mineral Resource model used for pit and stope optimisation (if appropriate).
The mining dilution factors used.
The mining recovery factors used.
Any minimum mining widths used.
The way Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.
The infrastructure requirements of the selected mining methods.
</td><td>
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.
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:

Mineral Resources Conversion Factors for Production Scheduling
<table>
<tr><th>Parameter</th><th>Source</th><th>Factor</th></tr>
<tr><td>Mineral Resources (below Cut-off: 4.0% Zn Eq.) & 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&F</td><td>Assumed</td><td>100%</td></tr>
<tr><td>Mining extraction factor - LHOSF</td><td>Assumed</td><td>95%</td></tr>
</table>

The above factors result in a 46% conversion of Mineral Resource tonnes to tonnes used in the production scheduling.
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).
Material assumptions regarding timeframe for development and production:

</td></tr>
</table>

[9] Metal prices assumed for the purposes of mine planning
[10] Calculated from Project estimates concentrate grades and: smelter terms
[11] Project estimated plant recovery factors

Criteria	JORC Code explanation	Commentary
		• It is assumed that the BFS is positive, water may be realistically and economically pumped from underground and • That the Mining Right is granted by the authorities. • 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 > 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). • 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 >600m. This factor has been built into the mine schedule and anticipated costs. • Gas hazards, equipment, backfill design, crushing and hoisting, mine ventilation and underground rehabilitation of existing structures also formed part of these mining studies. • 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&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. • 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. • Primary and Secondary Support recommendations:

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Criteria	JORC Code explanation	Commentary

	Excavation	Primary support - tendons				Secondary support			
		Type	Specifications	Spacing	Application	Type	Specifications	Spacing	Application
Development excavations	Decline	Rebar	2.4m length 20mm diameter 160kN tensile strength Full column resin	1.5m x 1.5m	HW	N/A			
	Gathering haulage	Rebar	1.5m length 18mm diameter 120kN tensile strength Full column resin	1.5m x 1.5m	HW				
	Level access crosscut	Rebar	1.5m length 18mm diameter 120kN tensile strength Full column resin	1.5m x 1.5m	HW	N/A			
	All intersections	Rebar	As per individual excavations Full column resin	1.5m x 1.5m	HW	Cable anchor	4.5m length 38t tensile strength 15mm - 16mm diameter Full column grout	2.5m x 2.5m	HW
	Ore drive,drill drive,transport drift, stope / loading cross cut	Split set	1.8m length 46mm diameter 39-45mm hole diameter Galvanised, ungrouted	2.0m x 2.0m	HW	Shotcrete	Unreinforced Minimum 25mm thick	N/A	HW + 1.5m overlap to SW. From ore intersection back 15m towards haulage

- 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:
  - 0.4% for Longitudinal LHOS
  - 3.8% for Transverse LHOS
  - 1.5% FOR DAF
- Mining Recovery Factors:
  - 95% for LHOS
  - 100% FOR DAF
- Minimum Mining Widths:
  - Drift-and-Fill: 5m by 4m high stope dimensions with access drives of 5m by 4m.
  - 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.
- Tunnel dimensions designed at 5.5m by 5m high for main ramps and 5m by 5m for footwall tunnels and stope access drives.
- Infrastructure Requirements for the chosen mining methods:
  - Existing Infrastructure (remaining from previous mine operation): 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

Criteria	JORC Code explanation	Commentary
		refurbished or rebuilt. Mining studies on these aspects have been included in the BFS process to inform the BFS. ○ Additional Infrastructural Requirements for the chosen mining methods: 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. ○ Explosives Magazine: 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.
Metallurgical factors or assumptions	• *The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.* • *Whether the metallurgical process is well-tested technology or novel in nature.* • *The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.* • *Any assumptions or allowances made for deleterious elements.* • *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.* • *For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?*	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. • Metallurgical Process: 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. • Appropriateness: appropriate for the type of material anticipated from the mining operation. • Tested Technology: 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). • Metallurgical Test work: 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. • Recovery Factors: 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.

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<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
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<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 & Fl, Pb & Zn have been noted as penalty elements in the Cu concentrate. Fe and Cl & Fl are penalty elements in the Zn concentrate and have been accounted for in the NSR calculations.

<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$/t concentrate</td><td>-68</td><td>-220</td></tr>
<tr><td>TCs & RCs</td><td>US$/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>NSR Percentage</td><td>%</td><td>98,7%</td><td>71,4%</td></tr>
</table>

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.
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.

</td></tr>
<tr><td>Environmental</td><td>

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.

</td><td>

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).
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.
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 Environmental Management Programme (EMPr), Integrated Water and Waste Management Plan (IWWMP) and

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Criteria	JORC Code explanation	Commentary
		Water Use Licenses (WUL) for the EA application process were submitted as part of the EA process including the EIA & 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. • 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; • 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.
Infrastructure	• *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.*	• 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. • Surface Rights: 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. • Infrastructure Requirements: o Existing Infrastructure (remaining from previous mine operation): This is discussed in the body of the report. o 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. o Additional Infrastructural Requirements: This is discussed in the body of the report.
Costs	• *The derivation of, or assumptions made, regarding projected capital costs in the study.* • *The methodology used to estimate operating costs.* • *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.* • *The source of exchange rates used in the study.* • *Derivation of transport charges.* • *The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.* • *The allowances made for royalties payable, both Government and private.*	o Capital Cost (CAPEX) Assumptions: o CAPEX used: AUD402 million. o Construction Schedule – 33 months. o Life of Mine (LoM) - approximately 10 years when Inferred resources are incorporated. o Contingency of 10% of the underlying capital cost items. o Target accuracy of ±15%. o 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. Source of CAPEX estimated costs: o The estimate is base dated to December 2018. o 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). o 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

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<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
<tr><td></td><td></td><td>
specialist consultant.
o 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.
o 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.
<u>Operating Cost (OPEX) Methodology and Assumptions:</u>
<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>Total</td><td>93.70</td></tr>
</table>
o Operating costs are based on an AISC (all-in-sustaining-costs) of AUD94/tonne treated.
o OPEX costs have been compiled from zero-based build-ups .
o 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.
o 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.
o 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 operating costs were compiled by DRA based on previous experience including power consumption based on the selected winders using 2019 Eskom electricity tariffs.
o 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.
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<tr><td></td><td></td><td>

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.
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

Exchange Rate: 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.
Commodity price assumptions and source: see “revenue below”.
Transport charges: 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.
Penalties and allowances for deleterious elements: refer to the NSR estimate detailed in this release.
Government Royalties: 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%}.
Private Royalties: No private royalties were included in the estimate.
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.

</td></tr>
<tr><td>Revenue factors</td><td>

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.
The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.

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Head Grade Assumptions:
Mining modifying factors were applied to Mineral Resources grades as covered in the report.
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>

Metal Price assumptions were based on CIBC Analyst Long term Price Forecasts (April 2019)
Contribution by the co-products of silver and gold were included in the estimates for the BFS.

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<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
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<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>
The rates of exchange used have been empirically estimated and are based on exchange rates at the time of this report.

<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.

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<tr><td>Market assessment</td><td>

The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.
A customer and competitor analysis along with the identification of likely market windows for the product.
Price and volume forecasts and the basis for these forecasts.

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<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.

<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.

A high-level competitor analysis for VMS deposits has been included at the BFS stage.

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<tr><td>Economic</td><td>

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.
NPV ranges and sensitivity to variations in the significant assumptions and inputs.

</td><td>

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.

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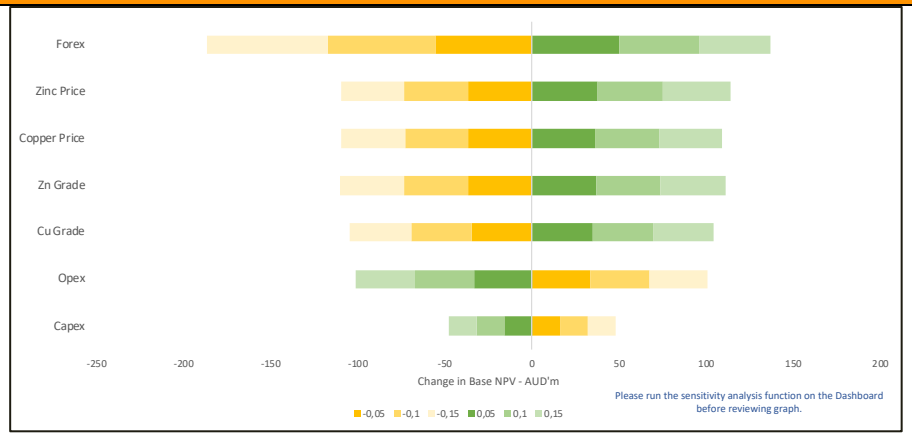
Criteria	JORC Code explanation	Commentary
		 At -15% the NPV is 37 and at +15% the NPV is 361.
Social	• *The status of agreements with key stakeholders and matters leading to social licence to operate.*	• Surface Use: The Company, through Repli Trading No. 27 (Pty) Ltd controls Prieska Copper Mines Limited 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. • Social License to operate: o 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. o 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. o 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.
Other	• *To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserve* • *Any identified material naturally occurring risks.* • *The status of material legal agreements and marketing agreements.* • *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*	• Identified material natural occurring risks: nil. • Status of material legal agreements: 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 & Hume Attorneys at Law was undertaken in June 2019 and returned no material concerns. • Status of material marketing agreements: agreements in the process of negotiation and no signed off-take agreements are in place at the BFS stage. • Tenement Status: 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

Criteria	JORC Code explanation	Commentary
	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.	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: **Repli Prospecting Right:** o 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. o 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. **Vardocube Prospecting Right:** o 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. 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. **Repli Mining Right Application** o 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. **Vardocube Mining Right Application** o 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. • 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. • According to the Department of Land Restitution and Reform, there are no land claims on any of the properties covered by the prospecting rights. • The Conditional Closure Certificate is discussed under "environmental", above. • Government and statutory approvals: There are reasonable grounds to expect that all necessary

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Criteria	JORC Code explanation	Commentary
		government approvals will be received within the timeframes anticipated in the BFS. • 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. • 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. • 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. • A MoU is in place with the Siyathemba Municipality regarding the supply of bulk water to the mine. Final water tariffs are under negotiation. • 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. • Repli is in the process of engaging with Transnet for rail transport logistics from the Groveput rail siding to Ngqura Port. • Unresolved matters with 3rd parties which would materially affect the results of the BFS – none.
Classification	• *The basis for the classification of the Ore Reserves into varying confidence categories.* • *Whether the result appropriately reflects the competent Person's view of the deposit.* • *The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).*	• Indicated Resources were converted into Probable Ore Reserves based on the mine planning process using appropriate modifying factors. • There are no Measured Mineral Resources.
Audits or reviews	• *The results of any audits or reviews of the Ore Reserve estimates.*	• At the time of writing a review of the mining plan and the reserves is in progress with SRK Consulting of Johannesburg
Discussion of relative accuracy/confidence	• *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.* • *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.* • *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*	• The level of accuracy for the BFS Technical Report is ± 15%. • 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. • A Base Case 2 business plan is also presented that contains 30% Inferred Mineral Resources. • Mining studies for a Bankable Feasibility Study have been completed and further Optimisation Studies are in progress. • 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.

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Criteria	JORC Code explanation	Commentary
	current study stage. • *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.*	

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JORC Table 1: Section 4 Estimation and Reporting of Ore Reserves – Open Pit (+105 Level)

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

Criteria	JORC Code explanation	Commentary
Mineral Resource estimate for conversion to Ore Reserves	• *Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.* • *Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.*	• 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[12] in ASX release 15 January 2019. • The Mineral Resources are based on drilling data available as at 30 November 2018. • The Competent Person for the Mineral Resource is Mr Sean Duggan of Z* Consultants, RSA. • 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. • The Mineral Resources are reported inclusive of the Ore Reserves.
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• The Competent Person, William Gillespie, Principal Mining Consultant of A&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
Study status	• *The type and level of study to enable Mineral Resources to be converted to Ore Reserves.* • *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.*	• A BFS Technical Report has been completed. • The BFS has been prepared to an accuracy level of ± 15% 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. • 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.
Cut-off parameters	• *The basis of the cut-off grade(s) or quality parameters applied.*	• 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.
Mining factors or assumptions	• *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).* • *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.* • *The assumptions made regarding geotechnical parameters (e.g. pit slopes, stope sizes, etc.), grade control and pre-production drilling.*	• 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. • 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. • Deductions were made for mining extraction losses and additional dilution material. The Mineral Resource conversion factors are listed below: Mineral Resources Conversion Factors for Production Scheduling;

[12] 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. 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.

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<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
<tr><td></td><td>

- *The major assumptions made, and Mineral Resource model used for pit and stope optimisation (if appropriate).*
- *The mining dilution factors used.*
- *The mining recovery factors used.*
- *Any minimum mining widths used.*
- *The way Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.*
- *The infrastructure requirements of the selected mining methods.*

</td><td>

<table>
<tr><th>Parameter</th><th>Source</th><th>Factor</th></tr>
<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>
</table>

- 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.
- 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).
- Material assumptions regarding timeframe for development and production:
  - It is assumed that the BFS is positive, and the planned underground mine is completed following which the open-pit will commence.
  - That the Mining Right is granted by the authorities.
- 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 70,000m3 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.
- 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.
- 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.
- 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.
- 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.
- 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.

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<tr><td>Metallurgical factors or assumptions</td><td>

- *The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.*
- *Whether the metallurgical process is well-tested technology or novel in nature.*

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The design of the processing plant allows for treatment of the open-pit supergene ore (with modifications after the underground mining is completed).

- Metallurgical Process: crushing, grinding and differential froth flotation processing is proposed for the supergene

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<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
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The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.
Any assumptions or allowances made for deleterious elements.
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.
For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?

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<td>
ore which can produce saleable concentrates of Zn and Cu with the potential for Ag and Au as by-products.

Appropriateness: appropriate for the type of material anticipated from the mining operation.
Tested Technology: 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.
Metallurgical Test work: 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.
Recovery Factors: 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.
Assumptions or allowances made for deleterious elements: 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 & Fl, Pb & Zn have been noted as penalty elements in the Cu concentrate. Fe and Cl & 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&C for determination of the concentrate transportable moisture limit.

<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$/t concentrate</td><td>-68</td><td>-247</td></tr>
<tr><td>TCs & RCs</td><td>US$/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>

Bulk sample test work and representivity: discussed under “test work” above.
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.

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</table>

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Criteria	JORC Code explanation	Commentary
		• 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.
Environmental	• *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.*	• 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). • 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. • 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 & 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. • 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; • 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.
Infrastructure	• *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.*	• 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. • Surface Rights: 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. • Infrastructure Requirements: ○ Existing Infrastructure: required infrastructure will be from the remaining items from the previous mine operation and from the underground phase. ○ Additional Infrastructural Requirements: This was discussed above.
Costs	• *The derivation of, or assumptions made, regarding projected capital costs in the study.* • *The methodology used to estimate operating costs.* • *Allowances made for the content of deleterious elements. The derivation of assumptions made of metal or commodity price(s), for*	○ Capital Cost (CAPEX) Assumptions (for the open-pit only): ○ CAPEX used: AUD2.5 million. ○ Construction Schedule – 9 months (for the void filling prior to open-pit mining starting). ○ Life of Pit - 17 months. ○ Contingency of 10% of the underlying capital cost items.

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<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
<tr><td></td><td>
the principal minerals and co-products.
• The source of exchange rates used in the study.
• Derivation of transport charges.
• The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.
• The allowances made for royalties payable, both Government and private.
</td><td>
○ Target accuracy of ±15%.
○ 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.
<u>Source of CAPEX estimated costs:</u>
○ The estimate is base dated to December 2018.
○ 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).
○ 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.
○ 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.
○ 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.
<u>Operating Cost (OPEX) Methodology and Assumptions:</u>
<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>Total</td><td>100</td></tr>
</table>
○ OPEX costs have been compiled from contractor tendered quotes.
○ 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.
○ 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.
○ 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.
○ 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 Eskom electricity tariffs.
○ 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.
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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.

Exchange Rate: 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.
Commodity price assumptions and source: see “revenue below”.
Transport charges: 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.
Penalties and allowances for deleterious elements: refer to the NSR estimate detailed in this release.
Government Royalties: 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%}.
Private Royalties: No private royalties were included in the estimate.
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.

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<tr><td>Revenue factors</td><td>

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.
The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.

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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>

Contribution by the co-products of silver and gold were included in the estimates for the BFS.
Foreign Currency Exchange Rate Assumptions:

<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>
The rates of exchange used have been empirically estimated and are based on exchange rates at the time of this report.
</td></tr>
<tr><td>Market assessment</td><td>

The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.
A customer and competitor analysis along with the identification of

</td><td>

Demand, supply and stock situation for zinc and copper: 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

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Criteria	JORC Code explanation	Commentary
	likely market windows for the product. • *Price and volume forecasts and the basis for these forecasts.*	create an increase in demand after 2020. Customer Analysis: : 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 canvased 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. • A high level competitor analysis for VMS deposits has been included at the BFS stage.
Economic	• *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.* • *NPV ranges and sensitivity to variations in the significant assumptions and inputs.*	The inputs for the NPV estimation are tabulated in the body of the report; • Valuation Methodology 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: ○ The financial model is in real terms; ○ The model was set up in months for the life of the Project. The financial year ending of the Company is June; ○ No escalation has been applied; ○ The operation is valued as a single tax entity; ○ Royalties were set at the formula applicable for unrefined minerals; ○ No salvage value was included for plant and mining equipment remaining at the end of operations. ○ South Africa corporate tax rate of 28% has been applied. ○ NPV: AUD224m. The NPV is based on a real cash flow with no inflation applied. ○ 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.

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		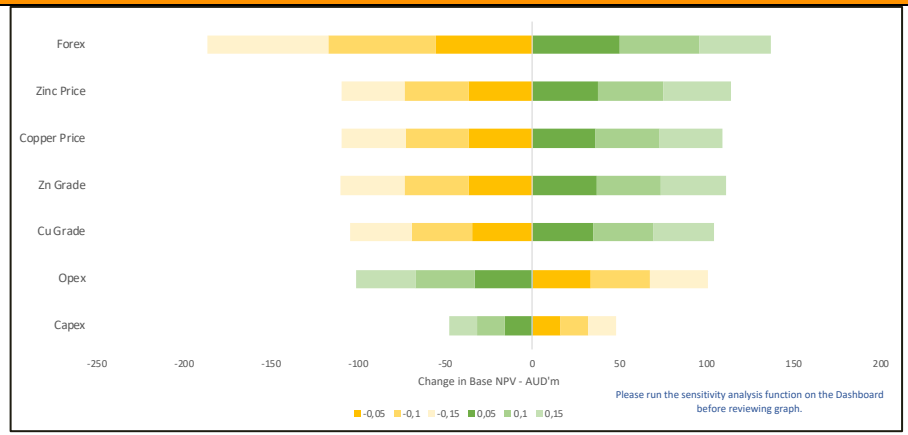 At -15% of FX rate, the NPV is AUD37m and at +15% the NPV is AUD361m.
Social	• *The status of agreements with key stakeholders and matters leading to social licence to operate.*	• Surface Use: The Company, through Repli Trading No. 27 (Pty) Ltd controls Prieska Copper Mines Limited which owns a portion 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. • Social License to operate: ○ 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. ○ 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. ○ 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.
Other	• *To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserve* • *Any identified material naturally occurring risks.* • *The status of material legal agreements and marketing agreements.* • *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.*	• Identified material natural occurring risks: nil. • Status of material legal agreements: 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 & Hume Attorneys at Law was undertaken in June 2019 and returned no material concerns. • Status of material marketing agreements: agreements in the process of negotiation and no signed off-take agreements are in place at the BFS stage. • Tenement Status: 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.

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Criteria	JORC Code explanation	Commentary
		The primary tenement licenses and applications are detailed below: **Repli Prospecting Right:** ○ 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. ○ 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. **Vardocube Prospecting Right:** ○ 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. 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. **Repli Mining Right Application** ○ 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. **Vardocube Mining Right Application** ○ 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. • 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. • According to the Department of Land Restitution and Reform, there are no land claims on any of the properties covered by the prospecting rights. • The Conditional Closure Certificate is discussed under “environmental”, above. • 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. • 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. • 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.

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		• 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. • A MoU is in place with the Siyathemba Municipality regarding the supply of bulk water to the mine. Final water tariffs are under negotiation. • 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. • Repli is in the process of engaging with Transnet for rail transport logistics from the Groveput rail siding to Ngqura Port. • Unresolved matters with 3rd parties which would materially affect the results of the BFS – none.
Classification	• *The basis for the classification of the Ore Reserves into varying confidence categories.* • *Whether the result appropriately reflects the competent Person's view of the deposit.* • *The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).*	• Indicated Resources were converted into Probable Ore Reserves based on the mine planning process using appropriate modifying factors. • There are no Measured Mineral Resources.
Audits or reviews	• *The results of any audits or reviews of the Ore Reserve estimates.*	• At the time of writing a review of the mining plan and the reserves is in progress with SRK Consulting of Johannesburg
Discussion of relative accuracy/confidence	• *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.* • *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.* • *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.* • *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.*	• The level of accuracy for the BFS Technical Report is ± 15%. • 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. • Mining studies for a Bankable Feasibility Study have been completed and further Optimisation Studies are in progress. • 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.