

## FEASIBILITY STUDY CONFIRMS OUTSTANDING PROJECT ECONOMICS FOR T3 COPPER MINE

**MOD Resources Ltd (ASX/LSE: MOD)** is pleased to announce compelling results of the completed Feasibility Study ("FS") for the T3 Copper Project ("T3" or "T3 Project") which includes a proposed 11.5-year open pit mine, 3Mtpa conventional processing plant and all associated infrastructure.

The T3 Copper Project Feasibility Study is modelled on the T3 Ore Reserve as announced on 25 March 2019.

### Key Outcomes of the T3 Copper Project Feasibility Study

#### Strong Project Economics

- Estimated LOM revenue of US\$2.3 billion and EBITDA of US\$1.1 billion
- NPV (pre-tax) of US\$368 million and an IRR of 33%. Long term US\$3.08/lb Cu and 8% real discount rate
- Pre-tax free cashflows of US\$777 million, inclusive of development capital
- Payback 3.7 years from production start
- LOM All-In Sustaining costs (AISC) of US\$1.56/lb Cu after deducting silver credits

#### Lowest Quartile Capital Intensity

- Development capital of US\$182 million includes mine development, process plant and infrastructure

#### Robust Project Parameters

- Ore Reserve containing 342.7kt Cu and 14.6Moz Ag
- 11.5-year mine life targeting first production Q1 2021
- Average open pit mine grade of 1.0% Cu and 13.2g/t Ag
- LOM average annual production of ~28kt (61mlb) Cu and 1.1Moz Ag
- Averaging over 30kt (66mlb) Cu in the first 7 years of full production<sup>1</sup>

#### High Grade Concentrate Production

- Average LOM concentrate grade 30.4% Cu and 383g/t Ag, strong interest from metal traders and smelters

#### T3 Funding Options

- Received written, formal Expressions of Interest from many global, top-tier debt institutions, several have commenced preliminary due diligence and completed site visits
- MOD is advancing discussions with a number of potential strategic parties for non-debt funding

<sup>1</sup> Following ramp-up and from 2022 through to 2028

## MOD's Managing Director Julian Hanna, said:

*"On behalf of the MOD team, I am delighted to deliver the compelling results of the T3 Copper Project Feasibility Study. The strong economics clearly demonstrate the value of this high-quality asset located within the excellent mining and investment jurisdiction of Botswana."*

*"There are a number of outstanding operational and financial outcomes of the Feasibility Study, however several stand out when compared to other emerging global copper developers and producers. Firstly, the T3 Project represents a relatively straightforward open pit mine and processing plant, requiring moderate capital expenditure to bring into production. Then, due to the very favourable geometry, grade and metallurgical characteristics of the orebody, the Feasibility Study has demonstrated that even at copper prices much lower than today's spot price, the T3 Copper Project is expected to generate excellent returns."*

*"T3 also provides the possibility for future production expansion from other potential deposits in the surrounding area, where MOD has already demonstrated early drilling success. Drilling is expected to focus on this satellite potential during 2019 to take advantage of the capital invested into T3."*

## Commentary

MOD's 100% owned T3 Project is a significant new sediment hosted copper and silver deposit in the under-explored Kalahari Copper Belt in Botswana. Over the past three years the Company has progressed T3 from the discovery drill hole, announced in March 2016, to completion of a FS. The FS has demonstrated the opportunity to develop a copper mine that is expected to generate revenue of US\$2.3 billion at a margin of over 47% across the 11.5-year mine life using a long-term consensus copper price of \$3.08/lb.

The T3 Project is based on the T3 Resource, announced on 16 July 2018, and the T3 open pit is modelled on the T3 Ore Reserve announced 25 March 2019. The FS identified that the T3 Copper Project is underpinned by strong fundamentals including an LOM average copper grade of 1.0%, an orebody geometry that facilitates a simple, six-stage open pit design and metallurgy that requires a relatively moderate capital investment, producing high grade copper concentrates with an average copper grade of 30.4%. This premium grade concentrate contains minimal deleterious elements, presenting an opportunity to blend and improve lower quality smelter feedstock, which has generated significant interest from numerous metal traders and smelters.

The proposed six stage open pit (Figure 1) will utilise conventional equipment to support an average annual mining rate of 3.0Mtpa of ore with a LOM strip ratio of 5.7 to 1.

Pre-strip activities are expected to commence during the first half of 2020 and ore from the first stage of the open pit is targeted to be processed during the first quarter of 2021. The bulk of waste movement is expected between 2020 and 2024 resulting in a higher strip ratio during these early years. Following this, the strip ratio will reduce to an average of 2 to 1 and mining costs should follow this general downward trend (Figure 7).

The open pit is located less than 1 kilometre from the process plant. Ore will be either directly fed into the primary crusher or directed to a Run of Mine ("ROM") stockpile, providing surge capacity and opportunity for ore blending.

The T3 orebody is comprised of metallurgically favourable chalcopryite, bornite and chalcocite. Ore will be processed through a conventional process plant with an annual throughput of up to 3.2 million tonnes at a head grade of 1.0% copper and 13.2g/t silver. The flow sheet (Figure 10) includes a primary crusher / SAG / Ball mill comminution circuit to achieve a grind size of P<sub>80</sub> 180µm, a natural pH flotation circuit, rougher flotation with a regrind circuit to achieve a grind size of P<sub>80</sub> 90µm and a cleaner flotation circuit.

LOM metallurgical recoveries are 92.9% copper and 88.0% silver, producing a concentrate with grades that peak at 34.7% Cu and 601 g/t Ag, averaging 30.4% Cu and 383 g/t Ag.

The Project Execution Schedule defines a 19-month design, construction and commissioning timeframe targeting first concentrate production before the end of the first quarter of 2021.



Average annual production over the life of mine is expected to be ~28kt of copper and 1.1Moz of silver however for the first seven full years of production (between 2021 and 2028), plant throughput, feed grades and recoveries are expected to be higher than LOM average and support copper production averaging over 30kt.

All-In Sustaining Costs over the life of mine are highly dependent on mining costs and waste movement. Over the life of mine, average AISC are expected to be in the lowest quartile of the cost curve at a very competitive \$1.56 per pound of copper produced, after silver credits.

The estimated direct capital cost for the process plant is US\$49 million. Project indirect costs, including engineering, procurement and construction costs, are estimated at US\$32 million. Site infrastructure costs, which include site preparation, a 14km all-weather unsealed access road to the A3 highway, the expansion to a 400-person accommodation camp in Ghanzi and administration buildings are estimated at US\$23 million.

The current estimated direct and indirect capital cost for the establishment of the mine, the construction of the process plant and associated infrastructure is US\$142 million (excluding mining pre-strip costs).

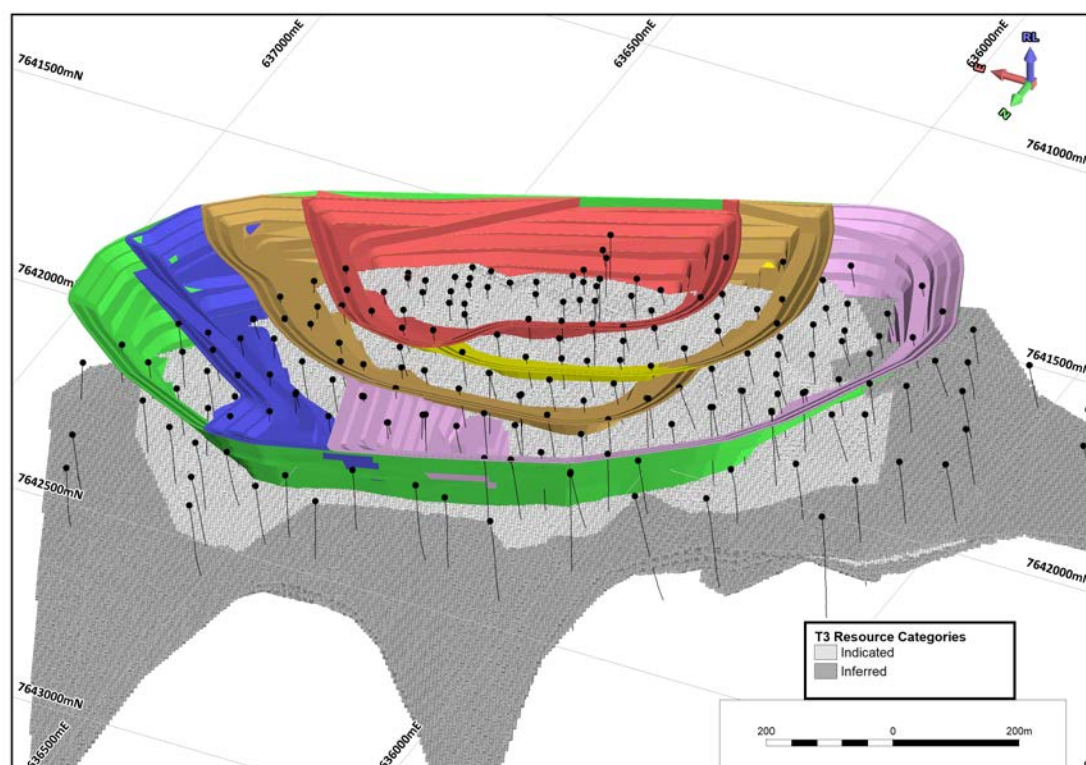
### T3 Copper Project Funding Update

The T3 Project has generated strong interest from global, top-tier, debt providers to fund a large part of the development capital. Formal Expressions of Interest have now been received from a number of selected financial institutions who have already commenced preliminary due diligence and conducted site visits. A Request for Proposal will be sent to financial institutions following the release of the FS.

In parallel with the debt funding process, MOD is advancing discussions with potential strategic partners to assist with funding the non-debt component of the T3 Copper Project.

The strong interest and positive engagements from both debt and non-debt institutions provides the Board with confidence in the availability of funding options for the T3 Project.

**Figure 1 - T3 Open Pit Design – Showing 6 Development Stages and Resource Drill Holes**



### T3 Project FS Economics

Capital Expenditure		US\$m
Mine Establishment		1
Process Plant (direct costs)		49
Site Infrastructure		23
Tailings Storage (inc surface water management)		14
Project Indirects (based on EPC)		32
Corporate and Owners		11
Contingency <sup>2</sup>		12
Mining Pre-strip		40
<b>Development Capital</b>		<b>182</b>
<b>Sustaining Capital</b>		<b>84</b>
Operating Costs	US\$/t milled	US\$/lb
Mining Costs	17.60	0.86
Power Cost	2.48	0.12
Processing Cost (excluding power costs)	3.61	0.18
Site Administration	2.18	0.11
Logistics	3.88	0.19
Treatment and Refining Charges	3.76	0.18
Silver By-Product Credit	(5.96)	(0.29)
<b>Operating Costs (C1 Cash Costs)</b>	<b>27.55</b>	<b>1.35</b>
Key Outcomes		
Life of Mine (Processing)		11.5 years
Ore Tonnes Mined		34.4Mt
Waste: Ore ratio (including pre-strip)		5.7
Copper Grade		1.0%
Copper cut-off grade		0.22%
Silver Grade		13.2g/t
Processing Plant Capacity <sup>3</sup>		3.0Mt/a
Metallurgical Recovery Cu – LOM (%)		92.9
Metallurgical Recovery Ag – LOM (%)		88.0
Copper in concentrate – LOM		318.4kt
Copper in concentrate – LOM		702Mlb
Life of Mine Financial Economics		
Copper Price (Bloomberg March 2019 consensus long term average)		\$3.08lb <sup>4</sup>
Revenue (net of payability)		\$2,301m
Unit Revenue (Net of payability)		\$2.98/lb
C1 Cash Costs <sup>5</sup>		\$1.35/lb
All in Sustaining Costs <sup>6</sup>		\$1.56/lb
EBITDA		\$1,083m
Net Cash Flow (pre-tax)		\$777m
Undiscounted Cash Breakeven Copper Price		\$2.15/lb
Pre-tax NPV (8% real)		\$368m
IRR (pre-tax)		33%
Capital Payback Period (from first production)		3.7 years

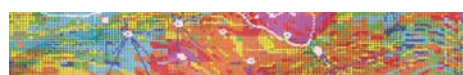
<sup>2</sup> No contingency applied to pre-strip costs.

<sup>3</sup> Process plant designed to treat up to 3.2 Mtpa.

<sup>4</sup> Copper prices in year 1, 2 and 3 of production averages 3.11 US\$/lb Cu (2021), 3.16 US\$/lb (2022) and 3.11 US\$/lb (2023).

<sup>5</sup> Includes operating cash costs including mining, processing, geology, OHSE, site G&A, concentrate transport, TC and RC costs less by-product credits, divided by copper in concentrate produced (100% payable basis).

<sup>6</sup> All-in sustaining cash costs are cash operating costs (C1 cash cost including royalties) plus sustaining capital.





For and on behalf of the Board.

**Julian Hanna**  
Managing Director

**Mark Clements**  
Executive Chairman and Company Secretary

**Jeff Sansom**  
Investor Relations  
+61 89322 8233  
[IR@modresources.com.au](mailto:IR@modresources.com.au)

**Jos Simson / Emily Fenton (UK PR & IR)**  
Tavistock  
+44 207 920 3150  
[MOD@tavistock.co.uk](mailto:MOD@tavistock.co.uk)

**Subscribe at:** [www.modresources.com.au](http://www.modresources.com.au)

**Follow us on:**   

## About MOD Resources

MOD Resources Ltd (**ASX/LSE: MOD**) is a dual listed copper exploration and development company with a dominant land position within the Kalahari Copper Belt in Botswana. The Company is focussed on the 100% MOD owned T3 Copper Project, expected to be a high-margin, low-cost copper mine. In parallel with the development of the T3 Copper Project, MOD continues its exploration program across several priority drill targets and within untested areas of interesting and potentially significant Cu-Zn soil anomalies.

A substantial in-fill drilling program is in progress with the objective to upgrade a portion of T3 Indicated Mineral Resources to the higher confidence Measured Resource category subsequent to this FS announcement.

The Company is continuing to advance discussions with interested parties in relation to T3 funding opportunities and is targeting to commence development of the T3 Copper Project in the second half of 2019, with a vision of first copper concentrate production in the first half of 2021. In the mid-term MOD will focus on generating value for shareholders.

MOD has a social licence to operate within Botswana as well as within the host community of Ghanzi. MOD will continue to work collaboratively with regulators and members of the Ghanzi District to ensure that any social investments and developments are targeted to create a positive and lasting legacy.

## Cautionary Statement

The FS is based on Probable Ore Reserves derived from Indicated Mineral Resources only. No Inferred or Measured Mineral Resources were included in the estimation of Ore Reserves. The FS was prepared to an overall level of accuracy of  $\pm 15\%$ . It is based on material assumptions outlined elsewhere in this announcement and in the Reserve update, announced 25 March 2019. There is no certainty that the FS or the Ore Reserve from which it was derived will result in commercial production or the assumptions used in the FS and resulting economic outcomes that are included in this announcement will be realised. Given the uncertainties involved, investors should not make any investment decisions based solely on the FS. The Company has concluded it has a reasonable basis for providing the forward-looking statements included in this announcement.

## Previously Reported Information

This announcement includes information that relates to the T3 Mineral Resource and T3 Ore Reserve which were prepared in accordance with the requirements of the JORC Code (2012). This information was included in the Company's previous announcements as follows:

ASX announcement dated 25 March 2019, MOD Delivers 61% Increase in T3 Ore Reserve to 34.4Mt.

ASX announcement dated 16 July 2018, 13% Increase to T3 Indicated Resource Category

These announcements are available at the Company's website [www.modresources.com.au](http://www.modresources.com.au)



## Forward Looking Statements and Disclaimers

This announcement includes forward-looking statements that are only predictions and are subject to risks, uncertainties and assumptions, which are outside the control of MOD.

Actual values, results, interpretations or events may be materially different to those expressed or implied in this announcement. Given these uncertainties, recipients are cautioned not to place reliance on forward-looking statements in the announcement as they speak only at the date of issue of this announcement. Subject to any continuing obligations under applicable law and ASX Listing Rules, MOD does not undertake any obligation to update or revise any information or any of the forward-looking statements in this announcement or any changes in events, conditions or circumstances on which any such forward-looking statement is based.

This announcement has been prepared by MOD. The document contains background information about MOD current at the date of this announcement. The announcement is in summary form and does not purport to be all-inclusive or complete. Recipients should conduct their own investigations and perform their own analysis in order to satisfy themselves as to the accuracy and completeness of the information, statements and opinions contained in this announcement.

The announcement is for information purposes only. Neither this announcement nor information contained in it constitutes an offer, invitation, solicitation or recommendation in relation to the purchase or sale of shares in any jurisdiction. The announcement may not be distributed in any jurisdiction except in accordance with legal requirements applicable in such jurisdiction. Recipients should inform themselves of the restrictions that apply to their own jurisdiction as a failure to do so may result in a violation of securities laws in such jurisdiction.

This announcement does not constitute investment advice and has been prepared without taking into account the recipient's investment objectives, financial circumstances or particular needs and the opinions and recommendations in this announcement are not intended to represent recommendations of particular investments to particular persons.

Recipients should seek professional advice when deciding if an investment is appropriate. All securities transactions involve risks, which include (among others) the risk of adverse or unanticipated market, financial or political developments. To the fullest extent of the law, MOD, its officers, employees, agents and advisers do not make any representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of any information, statements, opinion, estimates, forecasts or other representations contained in this announcement. No responsibility for any errors or omissions from the announcement arising out of negligence or otherwise is accepted.

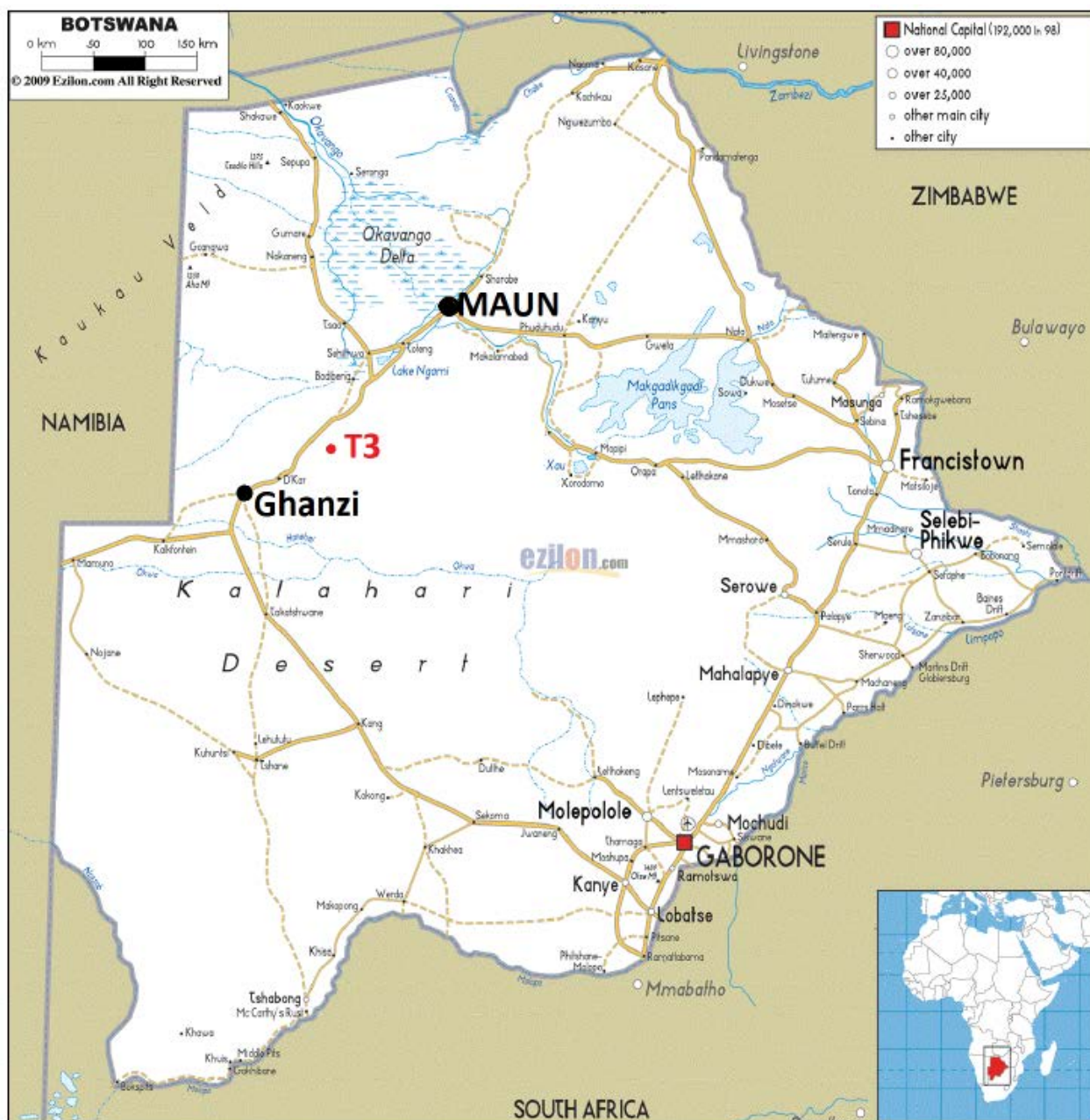


## FEASIBILITY STUDY SUMMARY

### Background

The proposed T3 mine site is located approximately 80 km north-east of Ghanzi and 200 km south-west of Maun, in the western side of Botswana (Figure 2).

**Figure 2 - T3 Project Site Botswana**

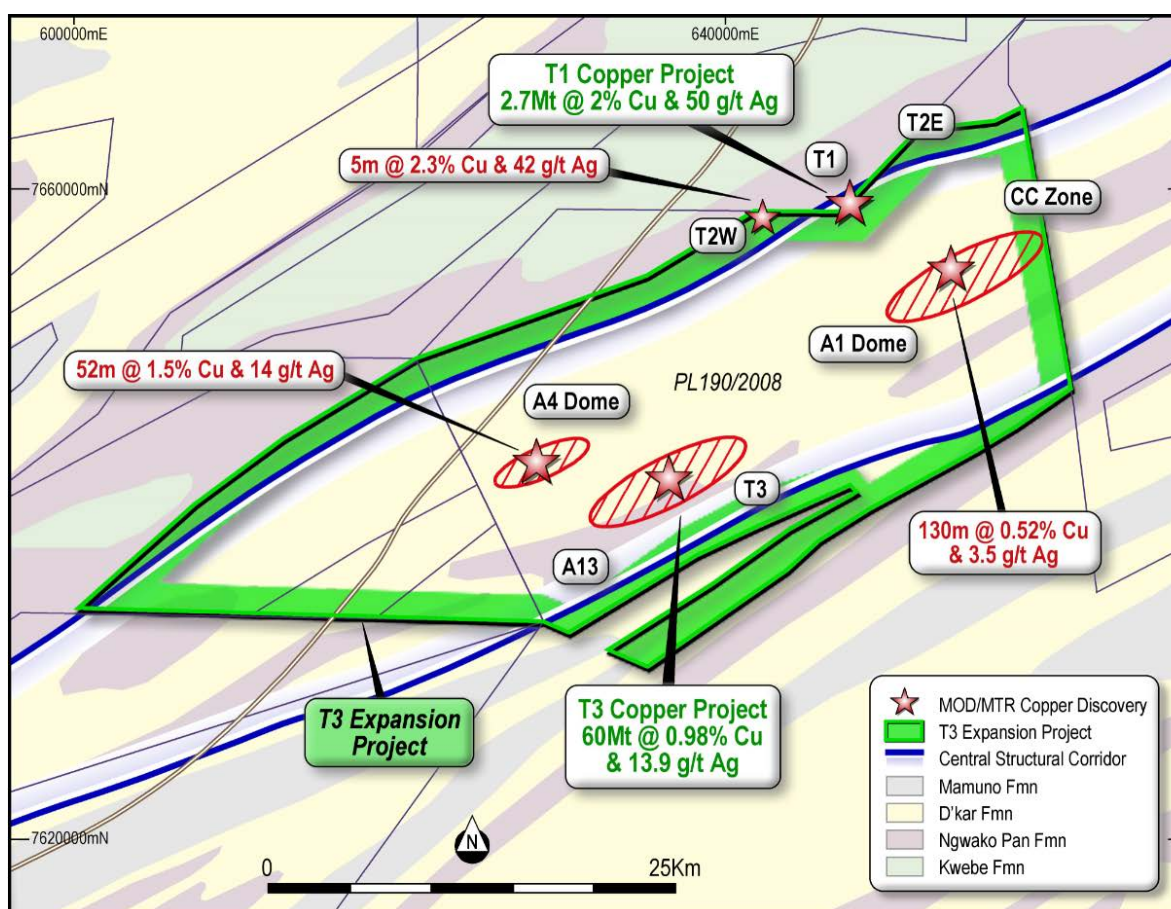


The T3 deposit is located within freehold Farm 153-NL. The farm is located in Prospecting Licence (“PL”) 190/2008. Tshukudu Metals Botswana (Pty) Ltd (“Tshukudu Metals”), a full subsidiary of MOD, has a binding agreement to acquire 100% of the ~25km<sup>2</sup> area of the PL on which the T3 Project is located. The balance of PL190/2008 is held by Tshukudu Metals in trust for the Joint Venture entity Tshukudu Exploration (Pty) Ltd (“Tshukudu Exploration”). The PL forms part of the regionally extensive Kalahari Copper Belt and is one of many copper deposits that extend 1,000 kilometres along the Neoproterozoic age Damara Mobile Belt and is located entirely within Ghanzi District.





**Figure 3 - T3 Expansion Project Area showing location of T3 Copper Project**



## Study Parameters

The FS is based on the following key parameters:

- JORC Code (2012) compliant T3 Mineral Resource of 60.2 Mt at 0.98 % Cu and 13.9 g/t Ag, containing 590.4 kt Cu and 26.9 Moz Ag (cut-off grade 0.4% Cu)
- Open pit earthmoving mining operations conducted by mining contractors
- Process plant and infrastructure built under an Engineering, Procurement and Construction (“EPC”) contract and Owner operated
- Power supplied from the national power grid (currently being expanded from Maun to Ghanzi)
- Raw water available from pit-dewatering activities and on-site bore field to provide sufficient process and potable water, with contingency bores to draw on if required
- Management of project implementation by the MOD Owners Team

## Study Team

The FS was managed by MOD working in conjunction with several specialised consultants as listed below to complete studies on all aspects of the Project. The FS was limited to investigating the technical and economic viability of an open pit operation. The FS was also limited to processing ore from the T3 deposit only and excluded the potential of processing ores from T3 underground and other regional ore bodies (apart from design of the layout of the ROM pad where consideration has been made for future haulage access).





Contributing consultants were as follows:

- Sedgman Pty Ltd – Process plant, associated infrastructure
- SRK Consulting (Aus) – Mine planning and optimisation
- SRK Consulting (UK) – Mine geotechnical engineering
- CSA Global – Resource model
- LOCI Environmental (Botswana) – Environmental, stakeholder engagement, baseline studies and Environmental and Social Impact Assessment (“ESIA”) preparation
- Knight Piesold - Tailings dam design, water modelling, surface water management, geochemical investigations and plant site geotechnical studies.
- Water Surveys Botswana (Pty) Ltd - Borefield testing and modelling
- Rescology Environmental Consultants (Australia) – Closure planning and cost estimating
- Minescope Services - Environmental consulting
- Mr P Geddes (GoldFern Consulting, Australia) - Mining engineering consultant
- Ms Lizelle van Wyk – Financial modelling
- Mr B Parker (Chemech Consulting) – Metallurgical consultant
- ALS Laboratories – Metallurgical testwork (comminution)
- Metallurgy Pty Ltd – Metallurgical testwork (flotation)
- Pocock Industrial Inc – Thickening and filtration testwork
- Jenike & Johanson – Materials handling testwork
- Discovery Drilling – Water bore drilling
- BPDT & Co – TC / RC’s and concentrate market

## Project Approvals

The permitting and approvals process in Botswana is well defined, well understood, involves public participation and is transparent. Land access and landowner agreements are in place and ongoing engagement and consultation continues with key stakeholders. Strategic plans to support the Environmental Social Management System are in the development phase and will address impacts identified in the draft Environmental Social Impact Assessment.

During the FS, a draft ESIA was submitted to the Department of Environmental Affairs (“DEA”) on 24 December 2018. The ESIA is currently under review by the DEA and their appointed review committee. The DEA provided feedback on the draft ESIA on 11 March 2019. MOD is currently responding to the comments received.

Once the ESIA is updated, the second draft will be resubmitted to the DEA and, if all is satisfactory, is expected to be issued for public review. Following a 4-week public review process, the DEA may elect to issue final approval. Upon final ESIA approval (and completion of the FS), a mining license application can be made.

## Project Funding Options

Given the robust economics of the T3 Copper Project, there has been strong interest and engagement from a range of potential financial institutions. Several are conducting preliminary due diligence, including being granted access to a data room and attending site visits to Botswana.

The MOD Board and senior management has continued to proactively engage with these potential financial institutions. During the first quarter of 2019 the Company requested Expressions of Interest (“EOI”) from selected global, top-tier debt providers for the T3 Copper Project. To date, the Company has received very strong and positive indicative support from a number of financial institutions. Following the release of the FS, the Company will issue a Request for Proposal to create a short-list, targeting the finalisation of debt agreements by the end of the third quarter of 2019.



The Company is also engaging with independent technical experts and expects to confirm the appointment of an Independent Technical Engineer and Independent Environmental & Social Consultant shortly after release of the FS.

In addition, the Company and its advisers continue to advance non-debt funding options while simultaneously progressing discussions with a range of other interested parties that can provide debt and/or equity funding including corporates, private equity funds, metal traders, smelters, royalty companies and other potential strategic partners and will update the market with any material developments.

## **Project Execution**

The development of the T3 Copper Project will be managed by the Owners Team who will utilise the services of experienced contractors during the construction phase. The three main contractor's responsible for the development will be:

- EPC Contractor – Design, procurement, construction and commissioning of the process plant and associated infrastructure.
- Mining Contractor – Supply of pre-strip and mining activities
- Tailings Dam Contractor – Installation of tailings dam and associated earthworks

Local contractors will be engaged to undertake works as required to de-risk the project schedule and provide the best commercial outcome. This includes early works to prepare for the Contractors arrival to site including:

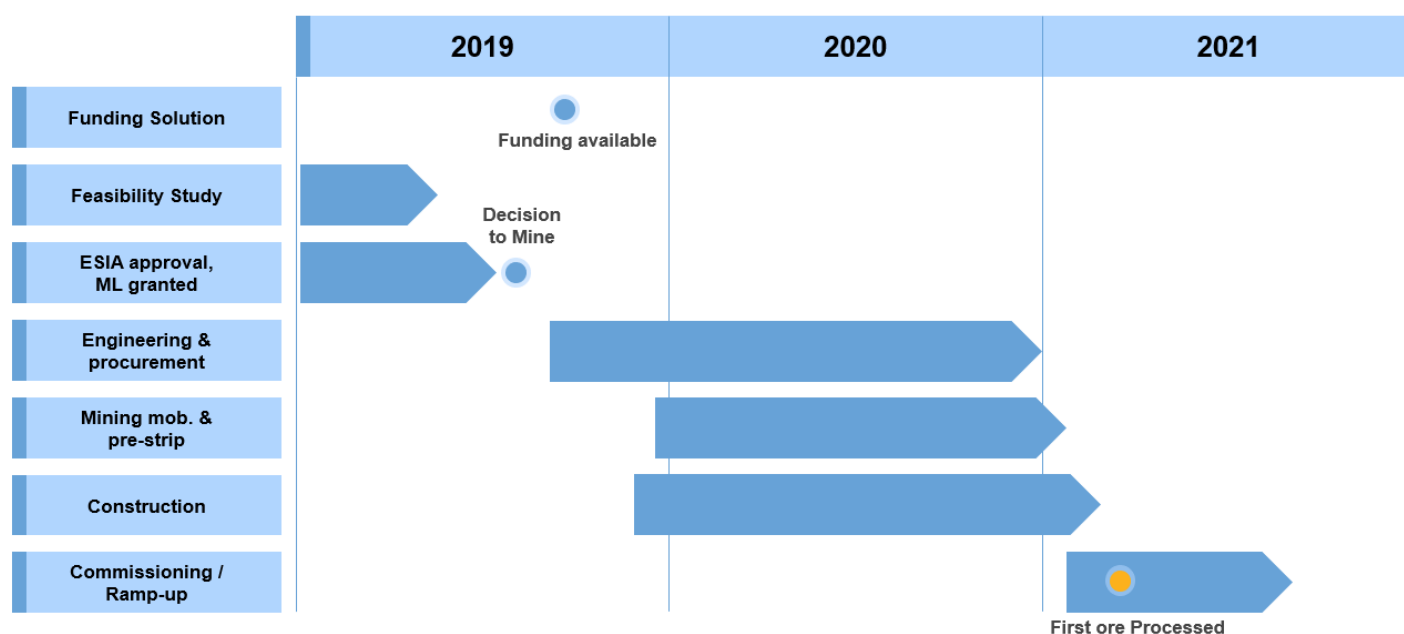
- Accommodation Camp construction
- Game fence construction
- Site access road

The Owners Team will manage the interface between the contractors as well as external and government stakeholders to ensure the Project is delivered safely, on-time and within budget. A suite of project management documents will be developed, that define how the Project will be designed, constructed and commissioned. These documents will form part of each of the Contractor's scope to ensure consistency and quality standards are met.

An Operational Readiness Plan will be developed to ensure that MOD will have all the systems, standards and procedures in place and an operations team recruited, trained and ready to accept care, custody and control of the Project assets when handed over by the development team.

The Project Execution Schedule is based on a three-month early works programme followed immediately by a 19-month design, construction and commissioning timeframe with the objective of achieving first concentrate production during the first quarter of 2021. The schedule assumes a Mining Licence and MOD board approval will be granted by the end of the second quarter of 2019 and Project Finance will be available in the third quarter of 2019.



**Figure 4 - Targeted Execution Schedule<sup>7</sup>**


### T3 Ore Reserves

SRK Consulting completed the production schedule defining the updated Ore Reserve tonnes and grade. The Ore Reserve was defined in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, JORC Code 2012, supported by Competent Persons acting under the JORC 2012 Code, taking responsibility for their areas of expertise.

The Ore Reserves are presented in the following table.

**Table 1 - Open Pit Ore Reserve (25 March 2019)**

Ore Reserve Category	Tonnes (Mt)	Copper		Silver	
		Grade (%)	Kt	Grade (g/t)	Moz
Proven	-	-	-	-	-
Probable	34.4	1.0	342.7	13.2	14.6
<b>Total Ore Reserve</b>	<b>34.4</b>	<b>1.0</b>	<b>342.7</b>	<b>13.2</b>	<b>14.6</b>

Notes:

1. The Probable Ore Reserve is based on the Indicated category of the Mineral Resource. No Inferred category has been included.
2. In a scheduling period, the lowest average grade of ore added to the process plant feed was 0.22% Cu.
3. Ore Reserves are calculated based on a copper price of US\$2.91/lb and a silver price of US\$16.81/oz.
4. Ore loss and dilution were applied to the Mineral Resource model in a two-step process which resulted in an ore loss of approximately 9% and a diluted tonnage addition of approximately 8%.
5. Metallurgical testwork recoveries were applied in accordance to the recovery algorithms developed from the variability testwork program conducted during the feasibility study.
6. Appropriate modifying factors were applied.

### T3 Geology and Geological Interpretation

The copper and silver mineralisation which is the basis for the T3 Mineral Resource is interpreted to be a vein related sediment hosted deposit which is different to other known deposits and mines in the central Kalahari Copper Belt in Botswana.

<sup>7</sup> Schedule based on DEA approving ESIA and mining license approved in Q2 2019



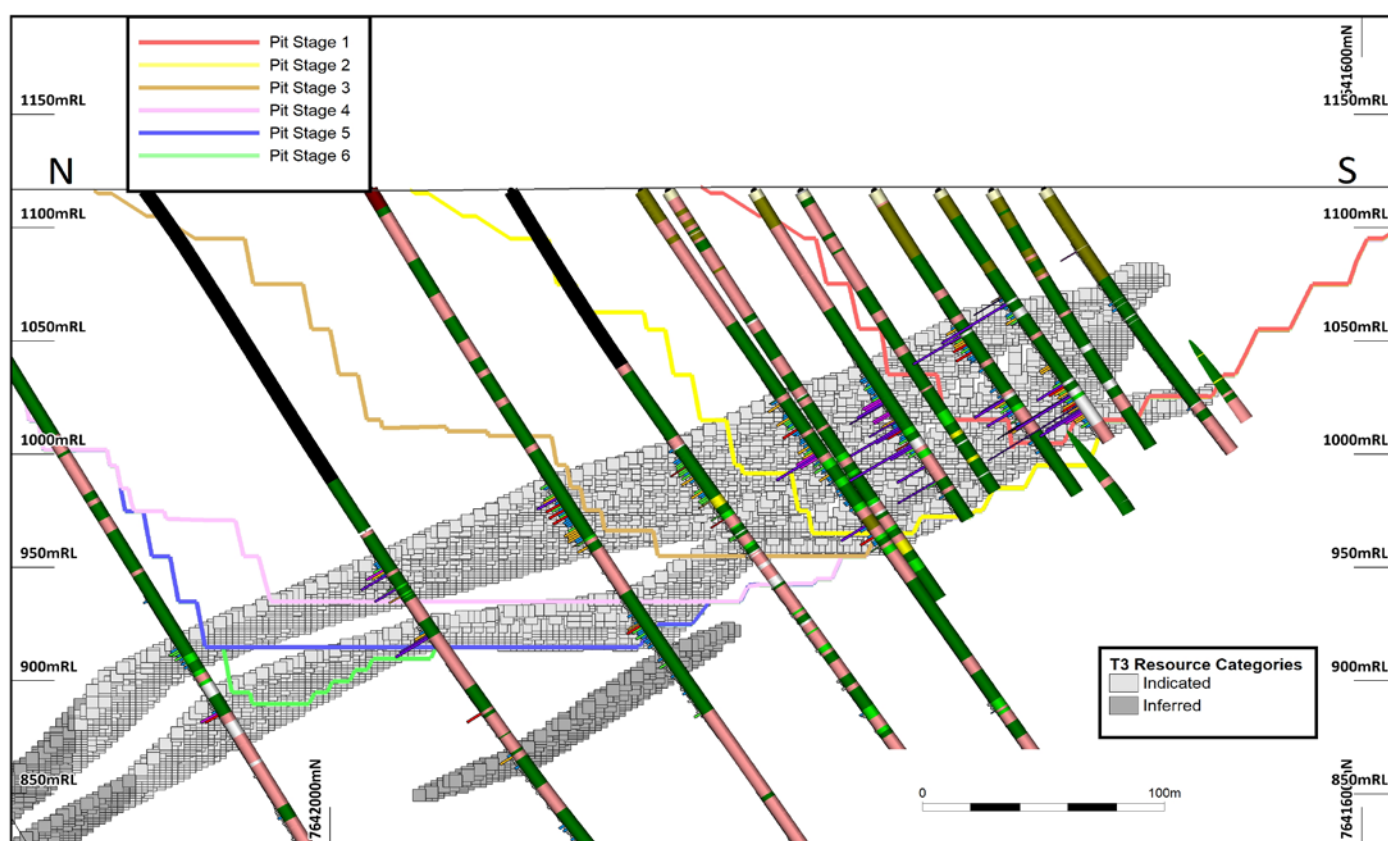
The Mineral Resource is defined along a >1.5km long strike length and the copper and silver sulphide mineralisation occur in veins and disseminations within host rocks that include mudstone, siltstone, sandstone and marl units considered part of the D'Kar Formation. Footwall to the copper/silver resource is generally defined by low-grade disseminated lead and zinc mineralisation within sediments also considered part of the D'Kar Formation.

Mineralisation is highly continuous and is dominated by chalcopyrite with chalcocite and bornite copper sulphides occurring in lesser amounts. Mineralisation extends from shallow depth (~25 metres below surface) to the limit of drilling to date at ~480 metres vertical depth, well below the planned open pit. Minor malachite and chrysocolla oxide mineralisation occurs near surface between ~25-50 metres depth.

The T3 mineralisation type can be described as a sheeted vein deposit dipping at 20-30 degrees to the northwest (Figure 5) with varying widths of disseminated mineralisation around the veins. The deposit may represent multiple stacked, mineralised veins and units, thrust one upon the other.

This interpretation opens up potential for resource extensions along strike east and west, as well as at depth towards the north and down dip. Drilling continues to test for potential underground extensions at depth across the T3 deposit.

**Figure 5 - Cross-Section of the T3 open pit**



## Geotechnical Assessment

SRK carried out a review of all the relevant data sources for the deposit and subsequently designed a geotechnical ground investigation programme to collect information for the FS. The investigation consisted of eight geotechnical drill holes for detailed geotechnical logging that were surveyed using Acoustic Televiewers ("ATV") for detailed structural logging. A further nine drill holes were used to define the location and nature of the Pit Thrust C Fault located in the footwall ("FW") of the final pit. A suite of geomechanical testing was undertaken to develop an understanding of the rock mass strength.





Weathering influences the engineering characteristics of the rock mass and the bench design for the upper two slopes has accounted for this. The weathering profile is generally restricted to between 10 metres and 15 metres below ground level and, below this, has little impact on the overall slope design. The rock mass structure has been interpreted from structural logging and is characterised by the moderately dipping bedding and five other joint sets. The deposit is in a low risk seismic area and therefore seismicity will have no impact on the pit. A major structural model has been developed for the deposit.

A geotechnical model was created utilising all the data and the rock types have been thoroughly analysed and classified using internationally recognised standards. The rock mass strength has been assessed using the various data sources and representative design parameters have been assigned to each geotechnical domain to carry out the geotechnical design.

Planar failure and limit equilibrium analysis have been utilized to assess the overall stability of the proposed T3 pit. Factors of safety for the site are considered high overall, suggesting that overall slope angles should be driven primarily by the kinematic constraints.

To minimize risks to the main ramp entrance on the FS, it is advised that pore pressure monitoring be installed in the Thrust C Fault to ensure proper depressurization.

Slope design recommendations have been based on the kinematics and overall pit slope analysis. The structure is the limiting factor for the design and the berm widths presented are to ensure that the inter ramp angles is no more than 41° for the FW and 61° for the HW.

The geotechnical parameters have been applied uniquely to three zones. The Hanging wall, Footwall and the top 20m of material. The Footwall is relatively shallow at an Overall Slope Angle ("OSA") of 35°, effectively following the base of the ore zone after approximately the first 100 vertical metres of mining. The Hanging wall OSA is considerably steeper at 57°. The top 20 metres in all three zones has an OSA of 27° to address the unconsolidated sands and weathered material.

The open pit designs are based on the recommended geotechnical design parameters and assume dry slopes based on the assumption of adequate dewatering and/or depressurisation ahead of mining.

The Footwall Final Pit walls are established with the initial stages of mining. The likely performance of the Hanging wall zone can be assessed by the interim Hanging walls of the pit stages and adjusted as required.

## Open Pit Mining

The T3 Copper Project is in relatively sparse bushland utilised for free-range cattle farming activities. The topography is flat with the difference in height across the mining area of less than 5m. From a mining perspective, accessing and developing the mining operation will not be impeded due to topography.

The T3 deposit is proposed to be mined utilising a mining contractor and conventional truck and excavator (backhoe configuration) open pit mining methods, with MOD maintaining orebody definition, quality control and medium to long term mine planning functions and management.

The proposed contractor based mine operations model offers MOD the following advantages:

- Minimises the upfront capex requirements by MOD as the contractor will supply the mobile fleet and required supporting infrastructure
- The contractor brings specialised open pit mining knowledge, systems and experience, lowering operational risk



The general mining method is summarised as follows:

- Clearing and stripping of suitable material from all disturbed areas into discrete stockpiles for later use in rehabilitation activities
- Systematic pit mapping to demarcate ore boundaries
- Drilling and blasting of ore and waste on 10 metre benches
- Load and Haul utilising 120-250 tonne excavators and 140 tonne capacity haul trucks mining on ~2.5-metre-high flitches in ore zones and ~3.5-metre-high flitches in bulk waste zones
- Ore will be direct fed to the crusher or placed on stockpiles for future rehandle as required
- Pit dewatering is expected to be minimal and will be managed by a collection of external dewatering and depressurising bores (if required) and in-pit sumps for use within the mining operation

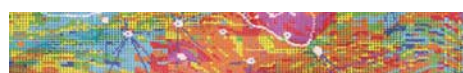
RC grade control will be utilised on a predominantly 12 metre by 6 metre angled RC drill pattern, and is campaigned during the mine life, with technical and management direction from MOD.

Open pit optimisation studies to identify the mineralised material inventory to guide final pit designs utilised a set of cost, processing and design criteria based on most up to date parameters. The final optimisation parameters are tabulated below in Table 2.

**Table 2 - Pit Optimisation Parameters**

Parameter <sup>8</sup>	Unit	Value
Copper Price	US\$ / lb	2.91
Silver Price	US\$ / Troy oz	16.81
Transport Cost	US\$ / t conc.	140.00
Copper Refining Cost	US\$ / lb	0.08
Silver Refining Cost	US\$ / Troy oz	0.40
Treatment Charge	US\$ / t conc.	80.80
Copper Payability	%	96.5
Silver Payability	%	90.0
Copper Royalties	%	3
Silver Royalties	%	5
Process Copper Recovery	%	variable
Process Silver Recovery	%	variable
Whittle input PCAF (Processing Cost Adjustment Factor)	US\$ / t ore	10.41
Estimated Dilution at a 0.4% Cu cutoff	%	9%
Estimated Ore Loss at 0.4% Cu cutoff	%	8%
Reference Mining Cost – Above RL 1,114.5 m	US\$ / t mined	Varies by elevations; Above RL 1,114.5 m, US\$1.35/t; Below RL 1,114.5 m, US\$ 2.11/t.
General and Administration Cost	US\$ / t mined	0.41
Incremental Mining Cost Adjustment per 10m below RL 1,116.5 m	US\$ / t mined	0.023
Overall Slope Angle		Varies by zones & elevation; Above RL 1,095 m, 27°; Below RL 1,095 m, 57° (Hanging Wall) 35° (Foot Wall).

<sup>8</sup> Optimisation Parameters may differ from final FS Study outcomes due to timing



The Ore Reserve is supported by a mining cost estimate, mining productivities and all other parameters required as inputs to the mineral resource optimisation process, pit design and production scheduling of the deposit.

The selected mining method, design and extraction sequence suit the orebody characteristics, minimise dilution and ore loss, defer waste movement, conform to maximum rates of vertical mining advance and utilise planned process plant capacity in a safe manner. The open pit has been scheduled based on realistic mining productivity, consistent material movements, taking into consideration operational realities and safe access to stages.

A total of six stages have been designed based on Whittle pit shells, early waste minimisation assessments and staging logic with a primary driver to minimise the capitalised pre-strip, minimise variability in total material movement while maintaining process plant throughput and monitoring feed grades. A minimum cutback mining width of 100 metres has been targeted between stages to ensure full production rates can be maintained safely. The stage designs have focused on reducing the impact of narrow mining areas between stages.

The Stage 1 pit design is well within the first identified economic Whittle pit shell which is effectively the Stage 2 pit design. Stage 1 has been implemented to give early access to sustained ore production, to minimise capitalised pre-strip.

The Final Pit design (Stage 6) is based on a Whittle pit shell defined by a Revenue Factor of 0.85. The selection of the 0.85 Revenue Factor by MOD achieves the targeted ore tonnes and grade, while also being within MOD's risk profile for the Project.

The pit designs have been geotechnically reviewed by the developer of the geotechnical parameters to ensure the parameters and intent of these geotechnical parameters have been adhered to. There were no material issues identified by this review of the pit designs.

The inventory and layouts of staged pit designs are illustrated in Table 3 and Figure 5.

**Table 3 - Mining Inventories for Each Stage**

Pit design	Ore (Mt)	Waste (Mt)	Total Movement (Mt)	Strip ratio	Cu grade (%)	Ag grade (g/t)	Pb grade (%)	Zn grade (%)	S grade (%)
Stage 1	2.9	24.2	27.1	8.2	1.02	9.9	0.13	0.14	0.94
Stage 2	4.0	16.9	20.9	4.2	1.07	14.2	0.05	0.07	0.99
Stage 3	4.0	24.4	28.4	6.1	1.10	12.1	0.05	0.06	0.85
Stage 4	8.9	65.3	74.2	7.4	1.11	16.8	0.08	0.07	0.67
Stage 5	9.0	36.0	45.0	4.0	0.89	11.7	0.07	0.07	0.62
Final Pit	5.7	29.1	34.7	5.1	0.89	12.5	0.06	0.06	0.62
<b>Total</b>	<b>34.4</b>	<b>195.9</b>	<b>230.4</b>	<b>5.7</b>	<b>1.00</b>	<b>13.2</b>	<b>0.07</b>	<b>0.07</b>	<b>0.73</b>

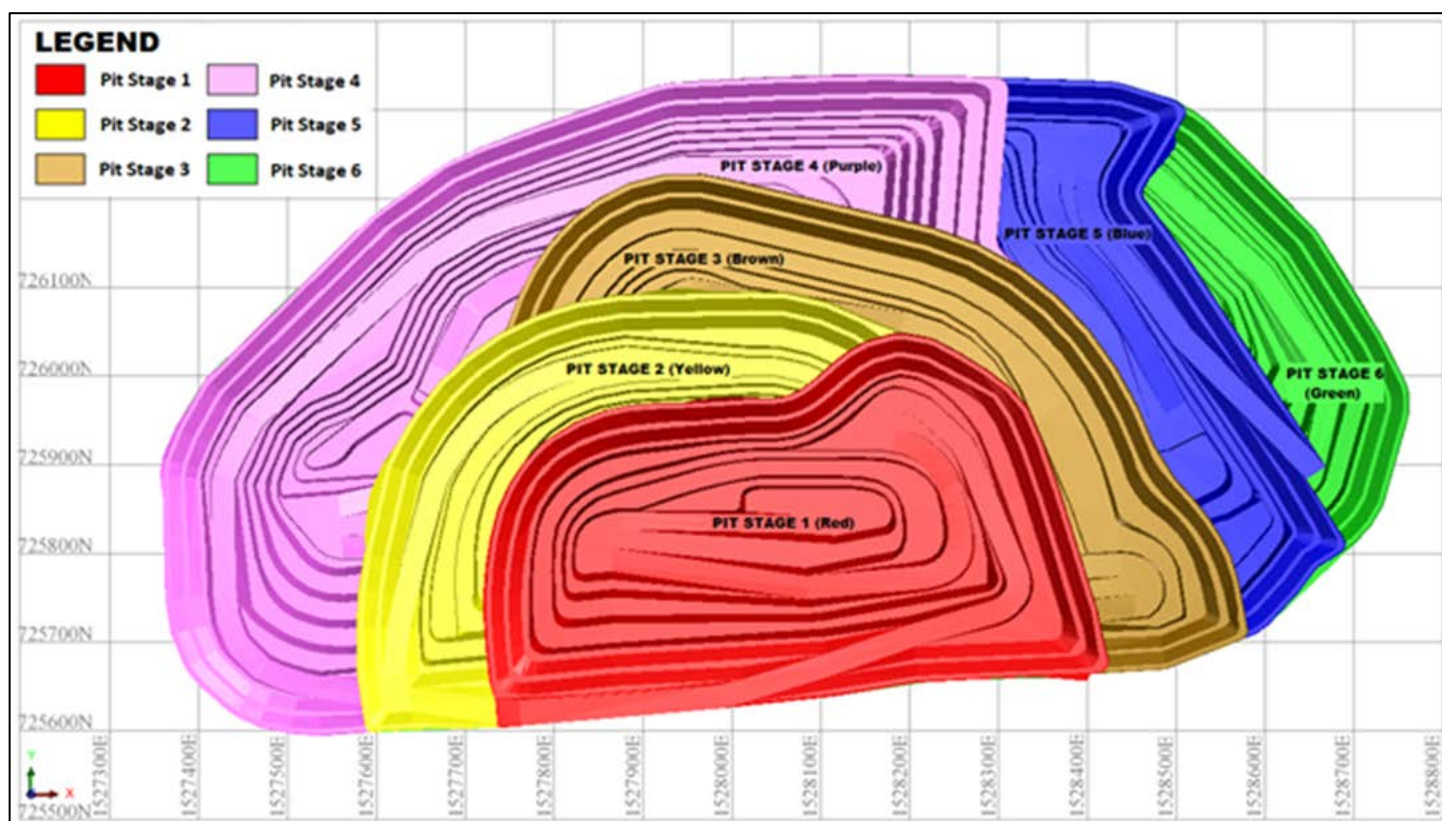
The Final Pit is approximately 1,400 metres in length, 700 metres wide and 250 metres deep.

The in-pit ramp system has been designed to minimise haulage distances to the ROM Pad and the Waste Dump ("WD") and is based on the operability and safety aspects anticipated during mining operations. Catch berms above ramps have been utilised for some stages where subsequent stages were assessed as posing an elevated risk when operating above these ramps.

The mining operating costs have been provided by contractor quotes based on a detailed Request for Quotation. These quotes were reviewed and validated internally by a shadow estimation process. The shadow estimate costing was used for the financial model and was within 5% of the costs utilised for the Whittle optimisation process.



**Figure 6 - Staged Pit Design**



## Mining Ore Loss and Dilution

Mining ore loss and dilution modifying factors were implemented by regularising the mineral resource model to a Selective Mining Unit ("SMU") with a block size of 5mE x 5mN x 2.5mRL. The impact on the magnitude of ore loss and dilution due to differing SMU sizes was tested as part of a sensitivity assessment. The ore loss and dilution of the selected SMU was also checked for reasonableness utilising an ore zone 'skinning' logic at 0.5 metre and 1 metre 'skins' of ore loss or dilution to confirm volumetric consistency of the mineral resource model being regularised to the SMU block size. This SMU model is classed as a diluted Mining Model suitable for optimisation and production scheduling.

The regularisation to an SMU of 5mE x 5mN x 2.5mRL resulted in an ore loss of approximately 9% and a diluted tonnage addition of approximately 8%. When using a 0.4% copper grade cut-off to create a grade shell, a 1 metre 'skin' around this grade shell is approximately volumetrically the same as the dilution and ore loss volume presented by the selected SMU block size of 5mE x 5mN x 2.5mRL. There is approximately a 2.7% loss of copper metal due to the SMU regularising process.

## Cut-off grade

The production schedule has targeted producing at a 0.25% copper cut-off (slightly above the marginal break-even grade) over the life of mine. This adds a level of conservatism to the production schedule, giving contingency access to ore tonnes if required to maintain feed to the process plant when in operation. The marginal break-even grade to cover processing costs is variable based on copper and silver grades with the associated metal recoveries and costs, and is in the range of 0.18% to 0.20% Cu. Material between the marginal break-even grade and 0.25% Cu grade is classed as Low Grade, and while economically viable, is stockpiled separately and only utilised to maintain process plant feed rates during periods of high waste movement and to maintain a steady total material movement between periods.





There are localised zones of high lead/zinc mineralisation associated with copper identified within the Final Pit. This material has the potential to elevate the lead/zinc levels in copper concentrate to a point where penalties are incurred on the sale of the concentrate. To manage this issue material with a low copper to lead + zinc ratio (less than 1) was separately identified in the production schedule and blended to the crusher opportunistically. The remainder of this elevated lead/zinc material was classed as Mineralised Waste and is being mined and dumped separately to the rest of the waste so that control of this mineralised waste can be effectively managed from an environmental and mine closure perspective.

## **Mining Infrastructure**

The proposed mine plan includes a single pit with haul roads connected to a single waste rock dump, mineralised waste dump, low grade stockpile and a ROM pad. There are surface water diversion channels, surface dewatering bores, light and heavy vehicle workshop facilities, explosives storage, processing facilities, supply facilities, technical services facilities, and administration facilities.

The mining contractor will construct the mining infrastructure required to maintain mining operations. MOD will supply services such as power and water.

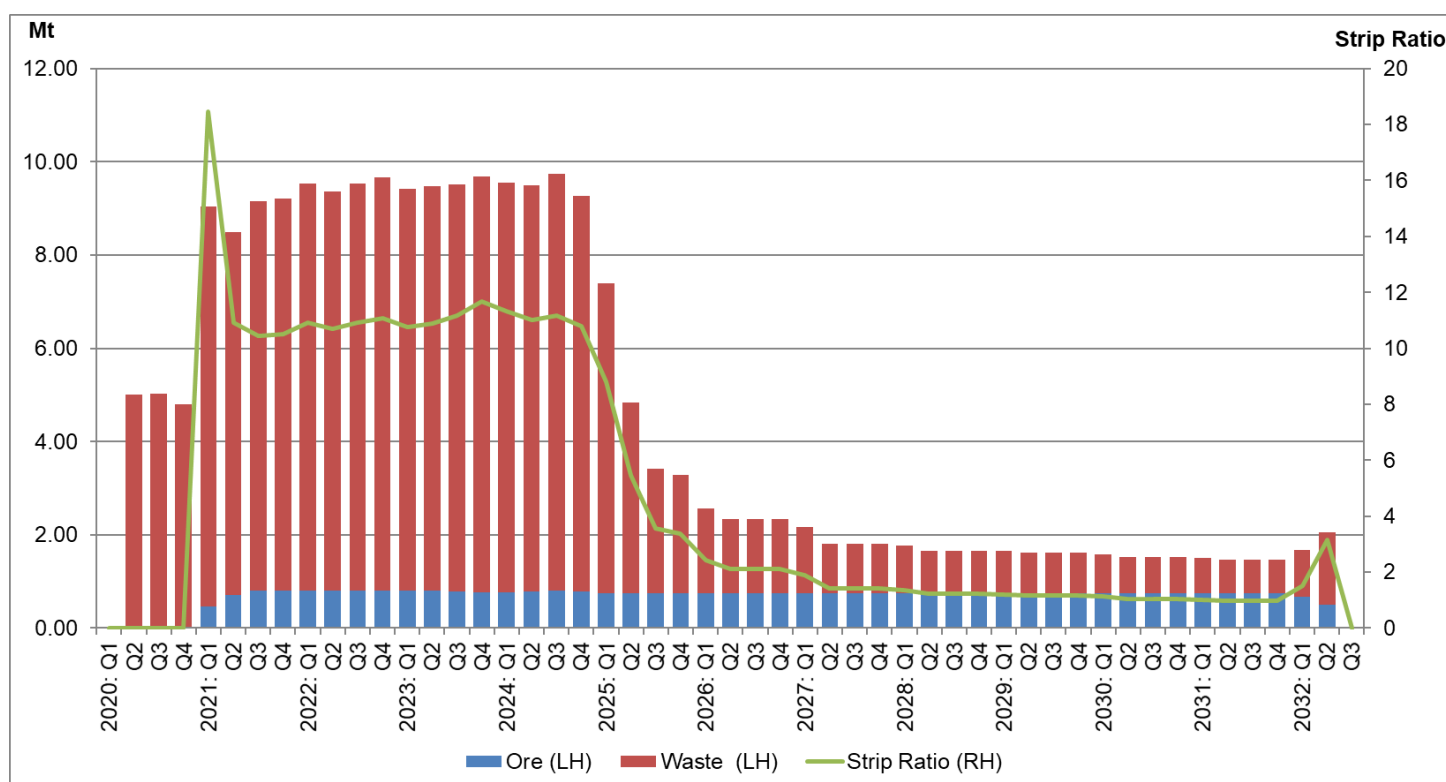
## **Mining Schedule**

Initial mine development and pre-stripping activities are scheduled to limit capital expenditure and land disturbance and to provide sufficient material required to construct the Tailings Storage Facility ("TSF"), site roads and ROM pad. There are over 12 years of mining with the first year defined as capitalised pre-strip prior to the ramp up of the process plant to full production.

The mining schedule adopts the following key parameters and assumptions:

- A primary loading fleet consisting of a maximum of five hydraulic excavators in the 120-250 tonne classes which is considered the optimal option that could achieve the required productivity, maintain a degree of selectivity when required and minimise the number of units required for practical separation of loading and hauling units.
- The ore and waste haulage fleet will consist of 140 tonne mechanical drive haul trucks and will be capable of direct tipping to the primary crusher.
- There is a step change to a lower annualised total material movement ("TMM") after Year 5. A peak TMM of 39Mt (annualised) was maintained during the first four years of the schedule requiring 24 trucks and 5 excavators to ensure continuous ore supply. TMM dropped to 6Mtpa after Year 6 and was generally maintained for the remaining LOM. The production schedule is presented in Figure 7, showing ore and waste movement by quarter
- The mining schedule has been constrained by setting a maximum vertical advance rate of 120 metres per annum to allow sufficient time for dewatering, grade control, drill and blast and load and haul
- The maximum vertical lag between benches is set at 50 metres
- The production schedule achieves the target process plant throughput rates both during ramp-up and during steady state operations of 3.0Mtpa to 3.2Mtpa (Peak)



**Figure 7 - Quarterly Ore and Waste Movement**


## Metallurgy

A comprehensive metallurgical testwork program was implemented for the FS with the specific objective of verifying technical feasibility and providing data for resource estimation.

The major copper sulphide minerals in the T3 orebody are chalcopyrite, bornite and chalcocite in varying blends. Minor copper minerals include digenite, malachite, chrysocolla and occasionally native copper. Other sulphides present include galena, sphalerite, molybdenite, bismuthinite, pyrite, tetrahedrite/tennantite, arsenopyrite and cobaltite. Gangue minerals are silicates such as quartz, as well as muscovite, biotite, albite, potassium feldspar and chlorite, or oxides in the form of calcite, apatite and titanite.

Metallurgical testwork was conducted by Metallurgy Pty Ltd in Perth, Australia and commenced early Q3 2018 and completed in Q1 2019.

A total of 34 samples were selected for comminution testwork to support the FS. Samples were selected on the basis of lithological domain and spatial representivity across the T3 pit. Due to limited sample mass and particle size available for the comminution samples, 11 additional samples were selected for specific testing including Bond Abrasion Index and Bond Rod Work Index testing. As with the main comminution samples, the additional samples were selected based on lithology type and spatial representivity across the T3 resource.

Comminution test results are reported in Table 4. Findings from the testwork show that the ore is moderately competent, abrasive and hard.



**Table 4 - Comminution Testwork Results**

Parameter	Units	No of Tests	Minimum	Maximum	Average	Design
DWi	kWh/m <sup>3</sup>	38	3.99	9.38	6.43	7.6
A*b		38	28.8	70.3	44.4	36.8
Ai	g	12	0.014	0.319	0.087	0.087
BRMWi	kWh/t	13	15.8	21.0	18.1	19.4
BBMWi	kWh/t	45	7.6	18.8	13.8	15.6

Flotation flowsheet development testwork confirmed copper and silver can be recovered using conventional flotation techniques. The optimum flotation circuit was found to include rougher flotation followed by single stage cleaner and cleaner scavenger. Optimised flotation conditions include a primary grind size P<sub>80</sub> 180µm with rougher flotation at natural pH, rougher concentrate regrind size P<sub>80</sub> 90 µm and pH11 cleaner flotation .

Following the flowsheet development testwork, 49 variability tests were carried out to evaluate metallurgy performance with variations to copper mineralisation, deleterious elements, copper head grades, and spatial distribution. Findings of the variability test results are reported in Table 5.

**Table 5 - Flotation Variability Test Results**

Component	Final Concentrate Grades				Final Concentrate Recoveries, %			
	Minimum	Average (49)	Average <sup>9</sup> (53)	Maximum	Minimum	Average (49)	Average (53)	Maximum
Wt %	-	-	-	-	1.1	3.9	3.8	9.4
Cu %	16.2	29.9	30.4	50.0	54.4	94.3	94.4	98.8
Ag g/t	45	343	348	1,225	67.0	86.9	87.2	97.6
Mo g/t	40	3,235	3,213	34,081	16.2	54.9	55.8	91.7
Zn %	0.02	1.12	1.25	6.24	2.1	36.2	38.9	84.3
Pb %	0.03	2.37	2.40	21.2	28.0	78.1	79.1	98.1
As g/t	14	870	910	7,076	16.5	61.1	61.9	86.8

From the variability tests, recovery and grade algorithms were developed for copper, silver, and sulphur, as well as the penalty elements lead, zinc, molybdenum, arsenic and bismuth. A mass recovery algorithm was developed for final concentrate recovery. Recovery and grade algorithms for copper and silver are reported in Figure 8 and Figure 9.

**Figure 8 - Recovery Models for Copper and Silver**

$$Cu Rec (\%) = 101.1 - 0.91 \left( \frac{Feed\% ASCu}{Feed \% Cu} \times 100 \right)$$

$$Ag Rec (\%) = 78.43 + 3.49 \ln(Feed Ag g/t) - 0.54 \left( \frac{Feed\% ASCu}{Feed \% Cu} \times 100 \right) - 2.29 \ln(Feed As ppm) + 1.85 \ln(Feed(Pb + Zn)ppm)$$

<sup>9</sup> Includes 4 production composites



**Figure 9 - Concentrate Grade Models for Copper and Silver**

$$Cu \text{ Grade (\%)} = 38.82 + 12.24 \ln(\text{Feed \%Cu}) - 8.94(\text{Feed \%S}) - 0.18 \left( \frac{\text{Feed \% ASCu}}{\text{Feed \% Cu}} \times 100 \right)$$

$$Ag \text{ Grade (g/t)} = 172 + 188.1 \ln(\text{Feed Ag g/t}) - 87.3 \ln(\text{Feed As ppm})$$

Applying the recovery and grade algorithms to the production schedule the life of mine final weighted copper recovery averaged 92.9% and silver weighted recovery averaged 88.0%. The life of mine final weighted copper concentrate grade averaged approximately 30.4%. The final copper recovery was strongly related to the proportion of acid soluble copper present in the feed.

Final concentrate silver grades averaged 383 g/t, and penalty elements, lead and zinc averaged 1.72% and 1.09% respectively. Lead and zinc recovery were variable and some blending of ores and or final concentrates may be required to minimise their effects. The blending strategy developed to manage the impact of lead and zinc can be applied to arsenic, bismuth and molybdenum.

Locked cycle tests (“LCT”) were carried out on four production composites representative of the staged pit development. The tests were done to verify copper and silver recovery and evaluate how deleterious minerals behave in recycled streams within the optimised flowsheet. Results of the locked cycle tests are reported in Table 6.

**Table 6 - Locked Cycle Test (LCT) Results**

Component	Final Concentrate Grades				Final Concentrate Recoveries, %			
	P1	P2	P3	P4	P1	P2	P3	P4
Wt %	-	-	-	-	2.9	2.2	2.6	2.7
Cu %	32.0	36.7	39.2	33.3	96.0	94.8	97.0	92.7
Ag g/t	345	426	441	415	91.1	92.1	91.9	88.5
Mo g/t	1,579	2,446	1,309	6,399	60.5	64.0	64.9	74.5
Zn %	3.40	1.92	2.10	3.80	78.3	60.5	70.7	80.7
Pb %	2.58	2.02	2.69	3.66	92.5	87.4	92.3	92.6
As g/t	2,990	589	721	1,170	86.2	58.3	68.7	70.0

Outcomes from the LCT show that the optimised flowsheet can produce a saleable copper concentrate with silver credits.

In addition to the flotation testwork, ancillary testwork to determine flotation tails and concentrate thickening parameters, slurry rheology properties, concentrate filtration parameters, and final concentrate transportable moisture limits (“TML”) and maritime shipping properties were carried out.

Thickening testwork concluded that underflow densities of 74% solids (w/w) to 78% solids (w/w) could be obtained for the final concentrate and 68% solids (w/w) to 72% solids (w/w) could be obtained for the flotation tailings. Pressure filtration of the flotation concentrate could achieve a final moisture content of 8.0%. The transportable moisture limit (TML) of the final concentrate was found to be 9.9%.

## Ore Processing and Production

The unit operations selected to process the T3 ore are well proven in the minerals processing industry. The overall approach was to provide a robust process plant flowsheet that is simple to operate and maintain, while being able to handle variability in metallurgical performance.





The T3 process flowsheet incorporates the following major process operations:

- Primary crushing
- Coarse ore stockpile with reclaim system
- Open circuit semi-autogenous grinding (“SAG”) with ball mill operating in closed circuit
- Rougher flotation
- Rougher concentrate regrind mill
- Cleaner flotation
- Cleaner scavenger flotation
- Final concentrate and flotation tails thickening
- Concentrate filtration
- Fresh water and tailings reclaim water supply
- Reagent preparation and distribution.

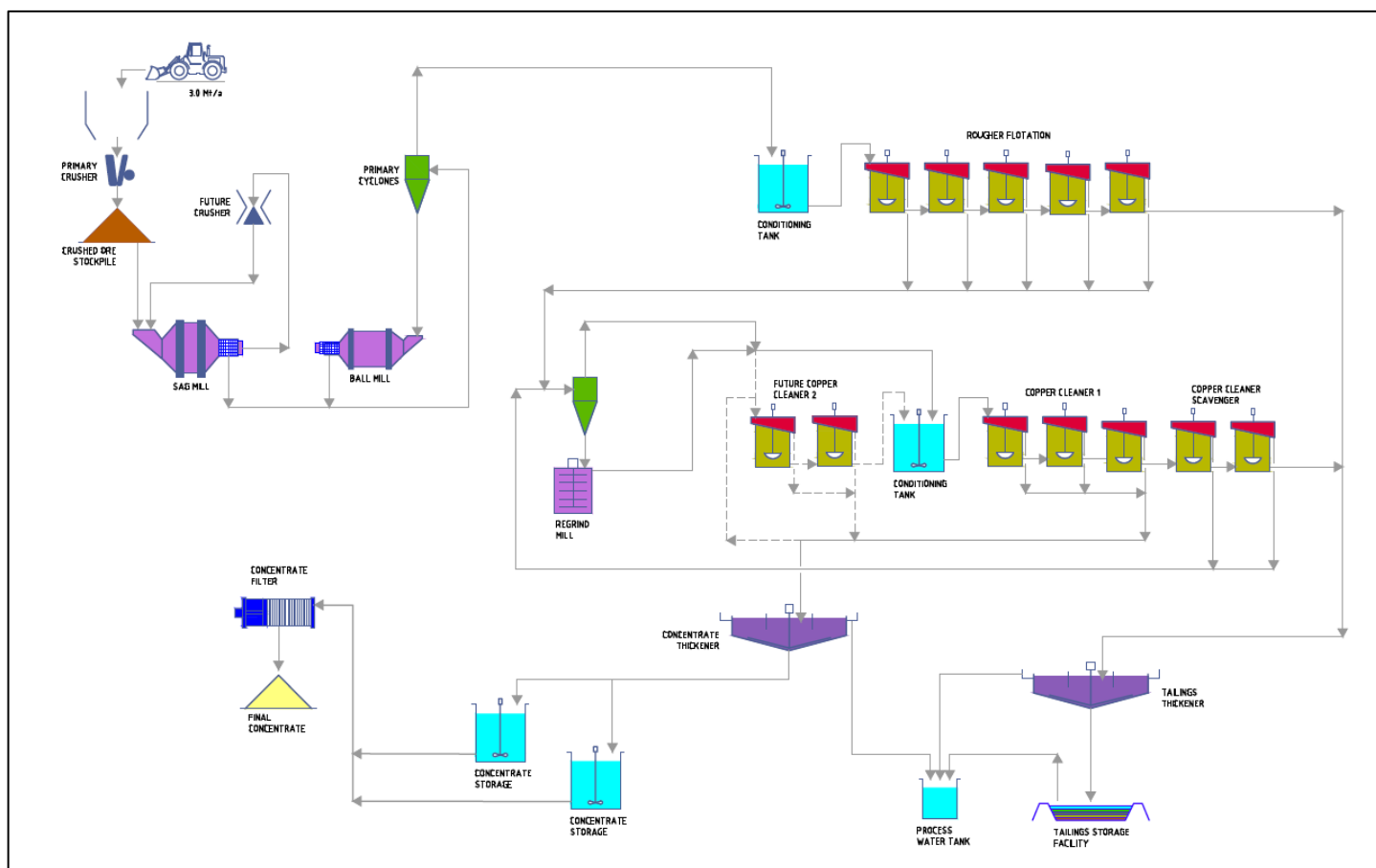
The process design criteria incorporated outcomes from the testwork program and mine schedule as well as benchmark data for similar operations. The key criteria selected for the plant design are:

- The mill will process a total of 34.4Mt of ROM ore for 11.5 years
- The annual ROM treatment is 3.0Mtpa with a peak treatment rate of 3.2 Mt/a, at a primary grind size of 80% passing 180µm
- Design availability of 91.5% with standby equipment in critical areas
- Design copper head grade of 1.3%. This head grade allows for grade variation from the life-of-mine average grade of 1.0% copper.
- 85th percentile of comminution ore properties
- Ore specific gravity of 2.8 t/m<sup>3</sup>
- laboratory rougher flotation residence of 6.0 minutes, and cleaner 1 and cleaner 1 scavenger residence time of 2.0 minutes and 8.0 minutes respectively
- rougher concentrate mass recovery of 6.2% (w/w) for regrind circuit sizing and final concentrate mass recovery of 3.6% (w/w) for thickener and filter sizing

The proposed process flowsheet is given in Figure 10.



**Figure 10 - Proposed T3 Process Flowsheet**

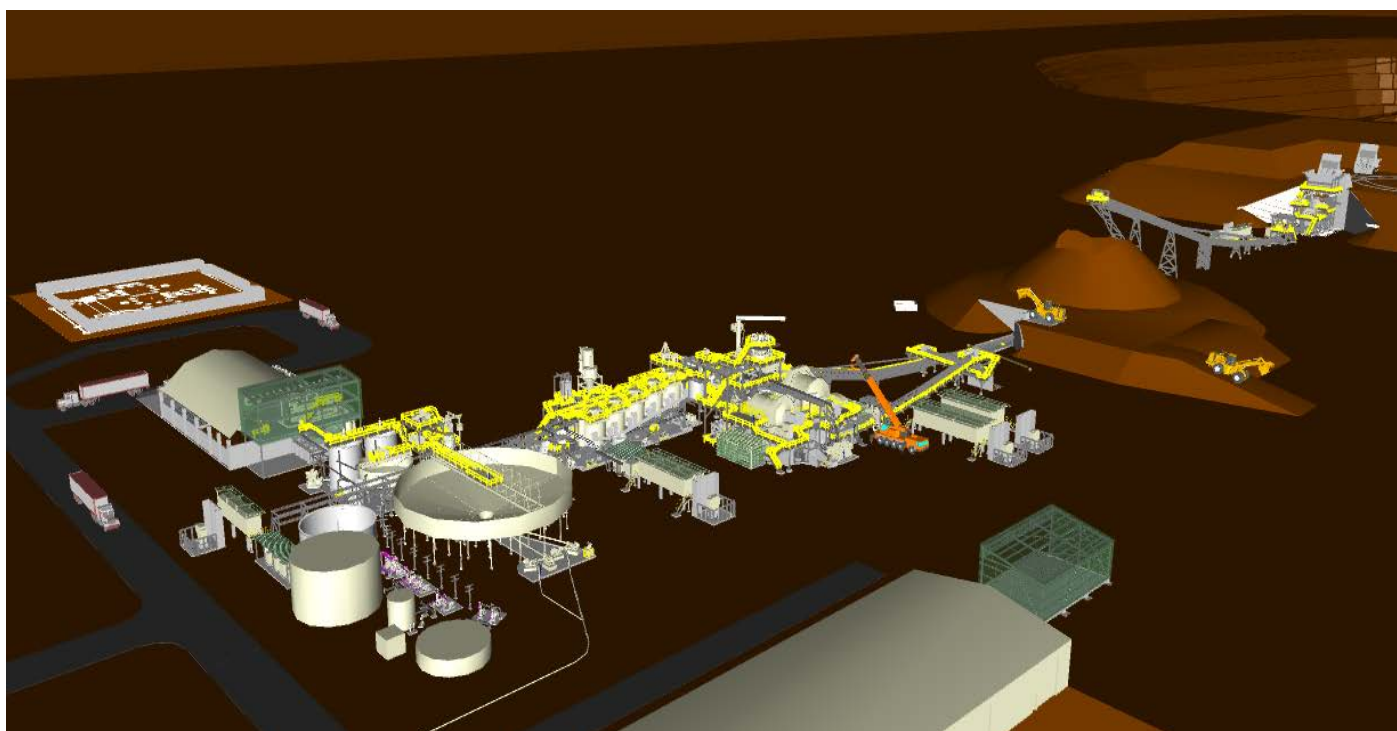


The copper recovery plant and associated service facilities will process ROM ore delivered to a single stage primary crusher. The crushed ore will be stockpiled from where it is fed to a two-stage grinding circuit using SAG and ball milling. Copper minerals in the ground ore will be concentrated in a conventional copper flotation circuit, made up of roughing, regrind and a single stage of cleaning. Concentrate from the cleaning stage will be thickened then filtered on site prior to transporting to Walvis Bay in Namibia. From Walvis Bay the concentrate will be shipped to third-party smelters.

Tailing from the roughing and cleaning stages will be pumped to the TSF located south of the proposed mine. The TSF is designed to store approximately 34.4 Mt of conventional thickened tailing - enough for the 11.5 years of the Project life. The process plant layout as developed for the FS is illustrated in Figure 11.

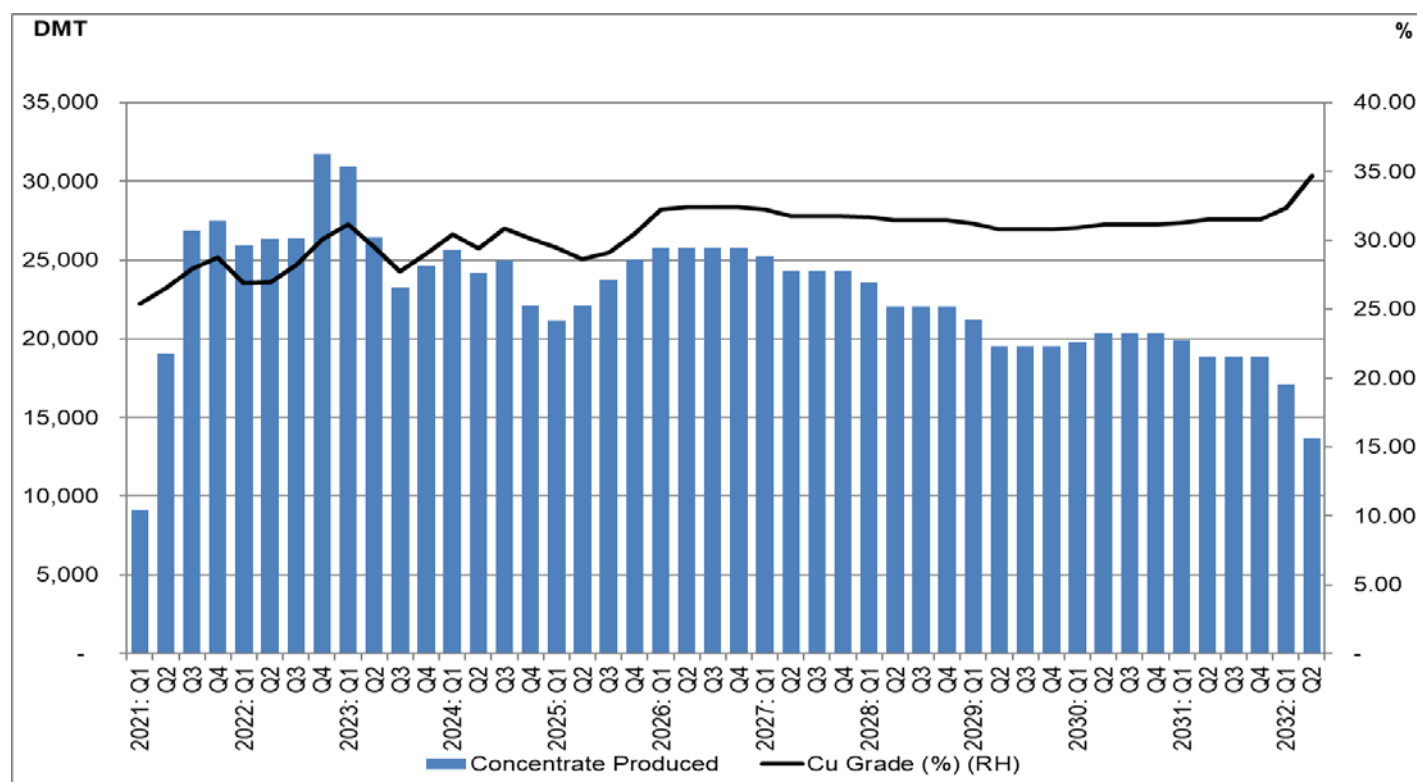


**Figure 11 - Process Plant Layout (developed for FS)**



The process plant is forecast to produce a LOM annual average copper in concentrate of 28kt, with average grades for Cu and Ag of 30.4% and 383g/t respectively. Forecast quarterly concentrate production and copper grade are shown in Figure 12.

**Figure 12 - Forecast Concentrate Production and Cu Concentrate Grade**



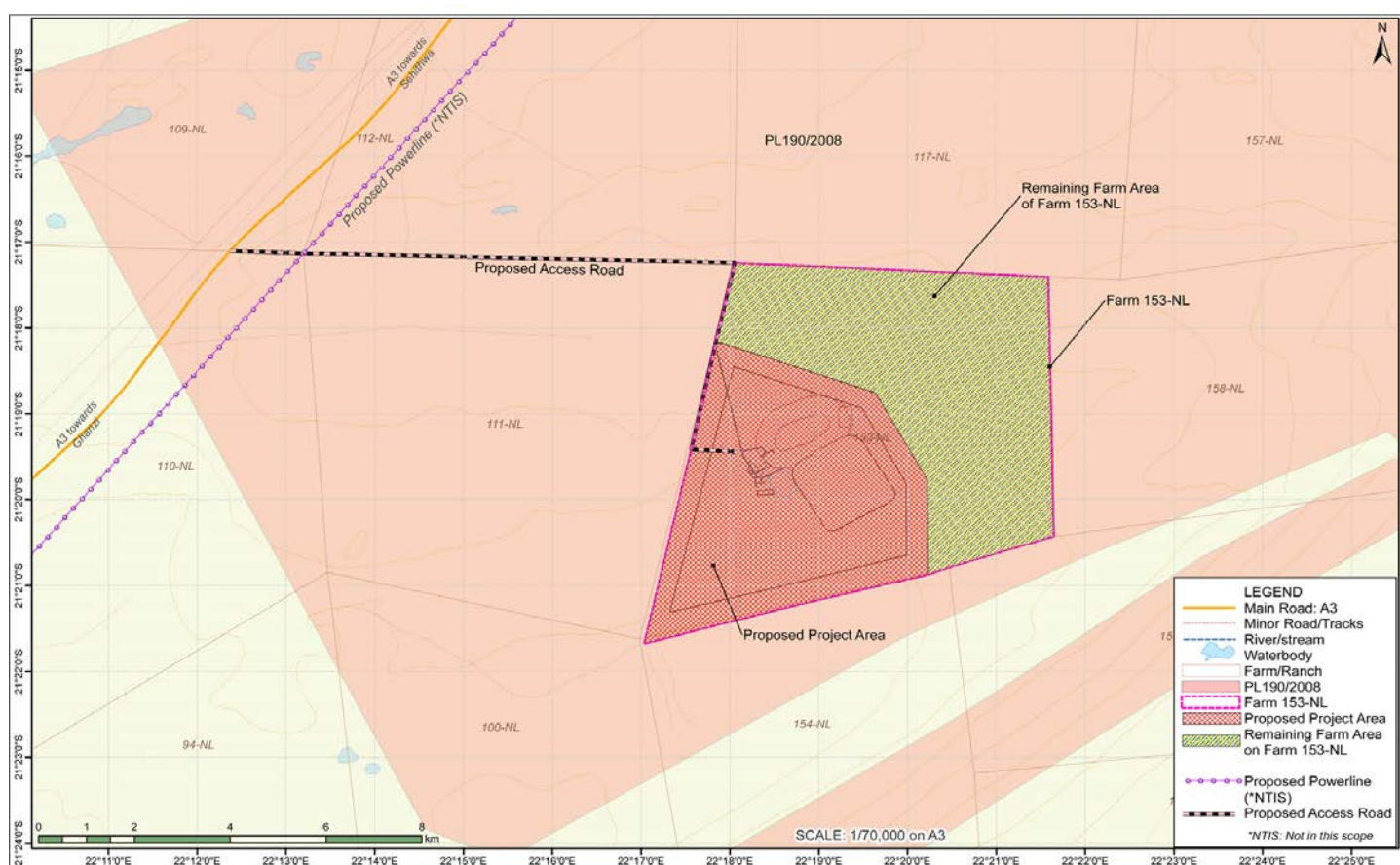
## Infrastructure, Transport and Services

### Road Access and Accommodation

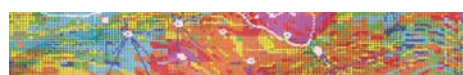
The T3 Copper Project is located within the Kalahari Copperbelt, in the Ghanzi Region, close to the northern edge of the Kalahari Desert and within the Kalahari basin. The most direct access route to the Project site is a two-hour drive from Maun, east of Ghanzi, along the A3 highway. Direct flights into Maun from Johannesburg occur daily with a flying time of approximately 2 hours. The A3 is a sealed dual lane highway with gazetted average speed limit between 80 km/h and 120 km/h.

The T3 Copper Project site is 14 kilometres by road off the A3 highway (Figure 13), the turn-off is approximately 70 kilometres from Ghanzi and an all-weather, unsealed access road from the A3 highway to the Project site is scheduled to be built early in the Project's development. The current access road is a series of farm tracks that will be upgraded to a 12-metre-wide carriageway, of gravel construction utilising crushed and screened calcrete for pavement. The calcrete will be sourced during the pre-strip phase of the mine development. The road will be fenced on both sides with gates installed at locations to allow farmers access for movement of livestock.

**Figure 13 - T3 Copper Project**



At the end of 2018 Tshukudu Metals completed the construction of a 40-person self-contained accommodation camp located approximately 6 kilometres east of Ghanzi on the A3. The accommodation camp is inclusive of kitchen/dining facilities, a laundry area, office block, potable water treatment plant and covered carpark area.





**Figure 14 - Accommodation Camp Development**



As the T3 Copper Project moves into a production phase the workforce will either reside locally in nearby townships or commute and reside at a dedicated camp in Ghanzi during rostered days on. To meet the increase in workforce the existing accommodation camp will be expanded to house an additional 360 persons. The level of accommodation will be split into three categories, being:

- Junior accommodation consisting of 240 beds. The junior accommodation is split into 12 blocks each with 10 rooms and suitable to house 20 persons per block. In addition to the rooms 5 ablution blocks will be installed
- Senior accommodation consisting of 120 beds. Senior accommodation is split into 30 blocks each block with 4 rooms. Ablutions will be included with each block.
- Management accommodation, consisting of the existing 40 self-contained units.

During the implementation phase, the expanded accommodation camp will be upgraded to accommodate a total of 760 beds. This will occur by adding beds to the new rooms, which are sized for the expansion. Surplus construction labour will be housed in a temporary 300-person camp located next to the expanded camp and a second temporary 100-person camp located at the T3 Copper Project site.

The Ghanzi accommodation camp is located approximately 70 kilometres from the T3 project site. Buses will be used to mobilise the Tshukudu and mine contractor employees to and from the accommodation camp and the T3 Copper Project site each day.



## Power

The T3 Copper Project has an installed maximum power demand of 11.5 MW. Following a review of the various forms of energy supply (diesel generation, grid connection, solar and wind), it was concluded that grid connection provided the best combination of capital and operating cost with the least environmental impact.

The Botswana Government has awarded contracts for the extension of 220kV grid power transmission line along the A3 highway that joins Toteng and Ghanzi, near the T3 Copper Project, scheduled to be available during Q1 2020. MOD has maintained regular communication the Botswana with Power Corporation (“BPC”) to confirm the scheduled availability of power.

The key aspects of the high-voltage network are:

- A new connection station at the intersection of the A3 highway and 3 site access road for the connection to the grid
- 132 kV overhead transmission line, 14 km long, from A3 highway to the principal substation at the process plant
- The principal substation will be equipped with two 132/11 kV stepdown transformers of 20 MVA capacity and associated switchgear
- The plant 11kV MV Substation, located in the grinding area, will be supplied from the HV substation via 11kV buried cables. From here all the grinding motors, plant MCC transformers, office minisubs and overhead powerlines will be reticulated
- The 11kV overhead line will be extended from the 11kV MV Substation located at the grinding area to the crushing MCC, plant workshop minisub, mining workshop minisub, tailings decant water pump station and the explosives facilities

## Borefields and Water Supply

Test pumping and groundwater modelling of the nineteen water bores installed to date indicate that groundwater has the potential to meet the Project water demand. Nineteen water bores were installed and tested to depths of between 120 metres and 220 metres with eleven of the bores (eight dewatering bores and three water supply bores) having estimated yields of between 20m<sup>3</sup>/hr and 110m<sup>3</sup>/hr (6 L/s to 31 L/s) and averaging 67 m<sup>3</sup>/hr (19 L/s). The groundwater is fresh with total dissolved solids (TDS) concentrations ranging from 445 mg/L to 764 mg/L, and slightly alkaline with pH values ranging from 7.3 to 8.

A three-dimensional numerical groundwater (MODFLOW) model was developed based on the test pumping data to predict the pit dewatering requirement of the initial pit stages and the ability to meet the 287 m<sup>3</sup>/hr (80 L/s) mine water supply borefield requirement. The Pit Stage 1 dewatering operation is predicted to require fourteen pit dewatering bores, of which eight have already been installed. The dewatering borefield supply will need to be supplemented by the existing water supply borefield to the west. Pumping tests will be undertaken on all newly installed bores and longer-term pumping tests will be undertaken on selected bores before commencing pit dewatering and pre-stripping activities.

The mine water supply will be sourced from dewatering bores and a dedicated water supply borefield located up to 2 kilometres to the west of the open pit. This will provide raw water to supplement the water demand required for the processing of ore, fire water supply, and feed to a Reverse Osmosis (“RO”) plant in the process plant area. The RO plant will deliver 30m<sup>3</sup> per day of fresh water to the change house, on-site buildings, and safety showers.



The configuration of bores will involve:

- 4 x existing water supply bores
- 14 x pit dewatering bores consisting of:
  - 8 x existing pit de-watering bores
  - 6 x new pit de-watering bores to replace existing bores as they become redundant during pre-strip.

The borehole pumps will be powered from local generators installed next to each bore pump starter panel. These pump starters will be equipped with soft starters to lessen the effect of starting current on the generator.

### **Geotechnical Assessment – Tailings Storage Facility (TSF) & Plant Site**

A geotechnical site investigation has been undertaken for the TSF and Plant Site, comprising of drilling 10 boreholes and excavation of 49 test pits across the major infrastructure footprint areas. Disturbed samples were recovered and underwent classification and geotechnical testing. Rock is present at shallow depth and the maximum excavation depth at the TSF and Plant Site is expected to be limited to a few metres. Aeolian sands are present across the site to an average depth of approximately 1.3 metres (2.6 metres maximum depth encountered). Risks due to collapsible sands present on the site will be mitigated during earthworks construction. Therefore, the Plant Site and TSF locations are considered suitable for the construction of the infrastructure.

### **Tailings Storage Facility (TSF)**

The T3 Copper Project area comprises an expansive low relief plain and there are no major surface drainage channels in the immediate area of the mine site. The area drains toward the north at an incline of approximately 1V:500H. The proposed process plant site is located west of the open pit and the proposed Waste Rock Dump (“WRD” or “WD”) is situated immediately south of the pit. The TSF is abutting the southern wall of the Waste Dump (Figure 15).

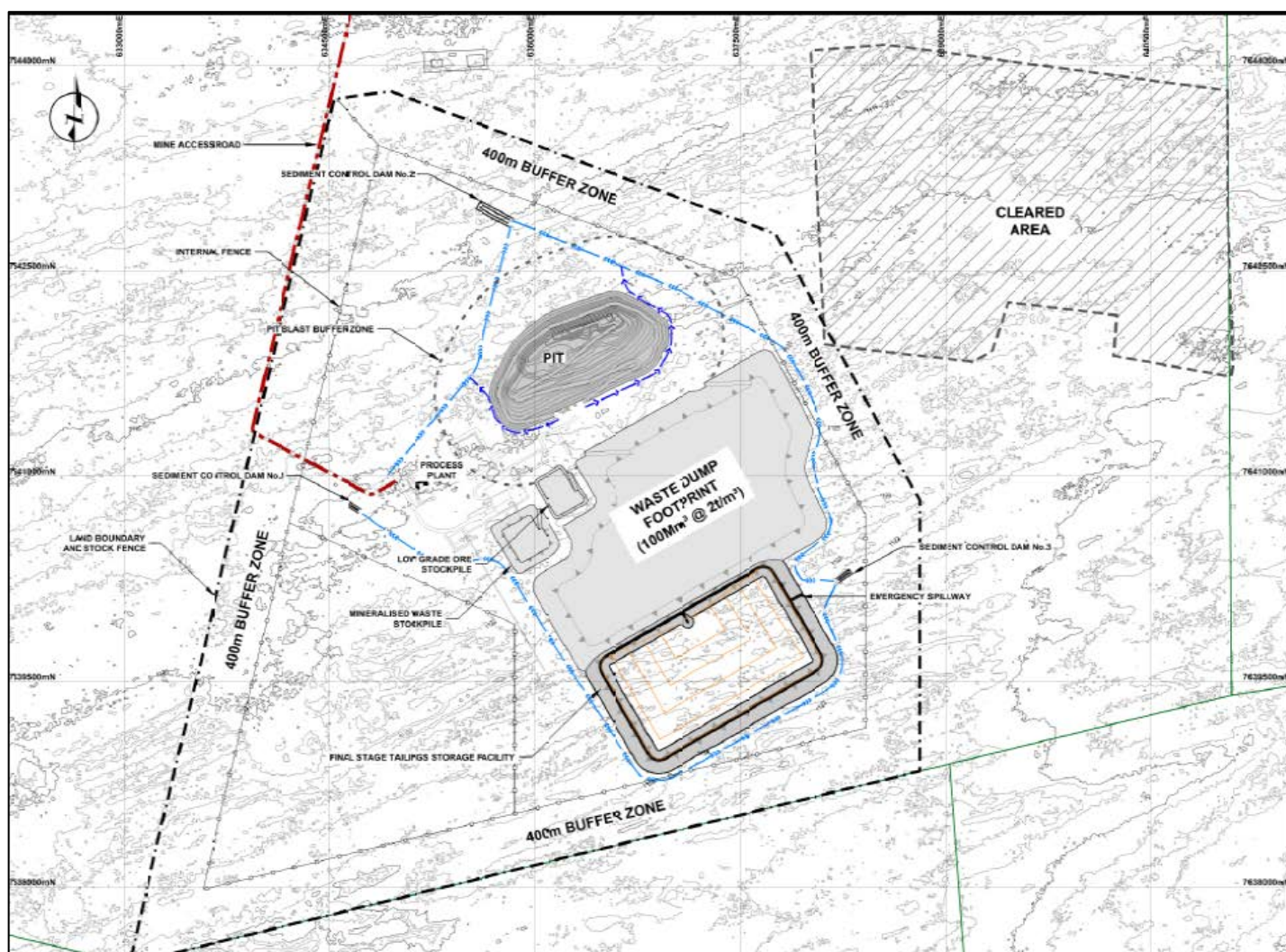
The TSF is designed and will be engineered as a paddock facility and will be formed by a multi-zoned earth-fill embankment with a compacted soil liner throughout the basin area and upstream face. The basin and upstream face of the embankment will be lined with an impermeable High-Density Polyethylene (“HDPE”) geomembrane. The design incorporates an underdrainage system to reduce the pressure head acting on the liner to reduce seepage, increase water recovery, increase tailings densities, and improve the geotechnical stability of the embankments.

The tailings parameters are based on laboratory testing carried out as part of the FS and considers tailings performance on similar projects. The TSF is designed with an ultimate storage capacity of 34.4Mt, based on a production rate of 3.0Mtpa over 11.5 years. The tailings will discharge to the TSF at 68% solids (w/w).





**Figure 15 - Site Layout showing Waste Rock Dump, TSF and Surface Water Management**



Geochemical testing of the tailings sample recorded a moderate number of element enrichments, with the level of enrichment tending to be significant. Bismuth was recorded as highly enriched, whilst silver, boron, copper, molybdenum and antimony were recorded as significantly enriched. Arsenic was also recorded as slightly enriched. Therefore, a closure cover system has been included in the design.

The supernatant was found to have no metals detected above Botswana, International Release or Livestock guidelines. Comparison of the supernatant results with Drinking Water Guidelines indicated that arsenic and antimony exceeded both Botswana and international guidelines, with molybdenum also exceeding World Health Organisation ("WHO") guidelines. Based on the agricultural land use in proximity to the site and the local groundwater, the TSF design currently includes for HDPE liner and an underdrainage system to provide management and control of seepage during operations.

### Surface Water Management - Site General

The surface water management controls the stormwater drainage conditions taking into consideration rainfall events, ground conditions and environmental factors. The site area and associated catchment have few topographic features. The site is relatively flat with the catchment sloping gently in a north-westerly direction. The 100-year Annual Recurrence Interval ("ARI") peak discharge values have been estimated, with consideration of rainfall intensities and assumed runoff coefficients, as a design basis for the surface water management.





A one metre high bund with 1V:3H batters are designed to mitigate inundation of clean runoff to the site area. The surface water management structures within the site comprise a series of trapezoidal channels. Most of the catchments acting on these channels are in contact with the TSF embankments or the waste dumps, therefore stormwater discharge is directed into three sediment control structures to reduce the effects of sediment transport and disturbance to the environment. The structures have been designed to contain particle sizes larger than 0.05 mm.

### **Waste Rock Geochemical Assessment**

Waste Rock Characterisation test work indicates all 67 samples were found to be non-acid forming. Based on these results acid generation and drainage from the waste dumps is unlikely. A low to moderate number of enriched elements were identified. The most commonly enriched elements were silver, arsenic, bismuth, cadmium, copper, lead and zinc. A cover system will likely be required at closure to prevent the waste from being exposed at the external surfaces of the final landform.

### **Surface Water Management - Pb/Zn stockpile management**

The lead and zinc material stockpile will be constructed with a compacted soil liner throughout the base area with a perimeter bund. The base and perimeter will be lined with HDPE geomembrane liner to reduce seepage. Excess run-off will be removed via pumping to the process plant for use in processing.

### **Site Infrastructure**

The following administration and plant buildings will be newly constructed for the T3 Copper Project:

- Gate house
- Main administration building with medical centre, data room, change house, and training room
- Plant crib room
- Plant office
- Plant workshop and warehouse
- Reagent storage
- Crusher control room
- Plant control room
- Laboratory, by contractor

Office space requirements were defined by the proposed departmental staffing structures.

Plant wide communications will be provided on a ringed single-mode-optical-fibre (“SMOF”) network between plant switch rooms, on-site power station, and administration building. Connections to other minor buildings and facilities will be provided on a radial network basis using both SMOF and category six copper cabling.

IP voice and data connectivity will be provided to all offices, plant control room and plant switch rooms.

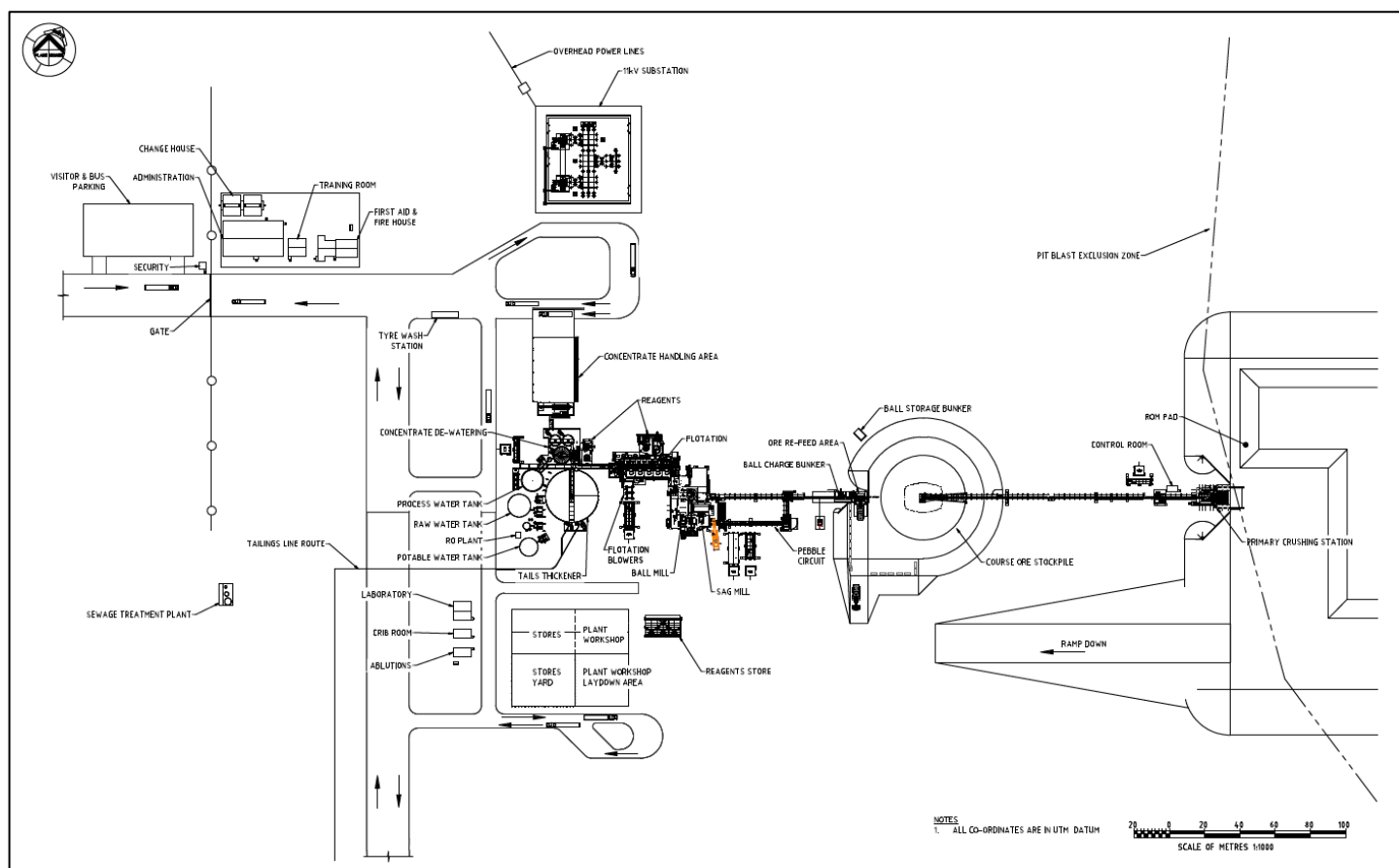
The mine workshop, mine administration and training centre, change house, mine warehouse, and fuel storage facilities will be positioned near the T3 mine. These facilities will be designed for the servicing of surface mining equipment, the trucks and loaders used for transport of ore to the process plant, and the road maintenance fleet and light vehicles. An emulsion plant will be located between the process plant and T3 mine.

The high-explosives magazine and detonator magazine will be located at a convenient and safe location to the west of the TSF.



MOD have engaged a diesel fuel supplier with storage terminals in Walvis Bay, Namibia, and regional storage facilities in Mozambique and South Africa. As part of a potential agreement the fuel supplier will supply and install above ground diesel tanks to international and local standards, with suitable storage for 12 days based on 1.25 million litres per month. In addition, the fuel supplier will supply and install off-loading and supply pumps for re-filling mining equipment and light vehicles.

**Figure 16 - Process Plant Overview**



## Capital Expenditure

The capital cost estimate for the process plant and associated plant infrastructure has an accuracy level of  $\pm 15\%$  as of March 2019 and is reported in US dollars.

The estimated costs include all site preparation, mine pre-strip, process plant and associated ancillaries, first fills, site buildings, road works including site access road, and 400-person permanent accommodation camp located in Ghanzi.

The estimate excludes escalation, capital expenses prior to March 2019, and life of mine sustaining capital and mine closure estimates which have been included as part of the financial model.

Data for these estimates were obtained from numerous sources including:

- Feasibility level engineering design
- Mine plan
- Project execution schedule
- Topographical information obtained from site survey
- Geotechnical investigation



- Budgetary equipment proposals
- Budgetary unit costs from local contractors for civil, concrete, steel and mechanical works, and
- Data from recent completed similar studies and projects

**Table 7 - Capital Cost Estimate Summary**

CAPITAL ITEMS	COST (US\$m)
<b>Direct Costs</b>	
Mine Establishment	1
Process Plant	
Crushing (inc ROM), Stockpile & Reclaim	11
Milling	19
Flotation	6
Tailings Thickening and Disposal	3
Concentrate Filtration and Storage	5
Reagents and Services	5
Site Infrastructure	
Site Preparation, Access Roads and, Fencing	10
General	2
General Buildings	3
HV Power Connection	4
Camp Expansion	4
Tailings and Water Management	
TSF	12
Surface Water Management	1
Pb/Zn Stockpile Liner	1
<b>Indirect Costs</b>	
Project costs (based on EPC)	32
Owners	
Owners Labour (pre start-up, project development, commissioning)	6
Environment Monitoring & Water	1
Corporate and Owners	4
Contingency <sup>10</sup>	12
<b>Mining pre-strip</b>	40
<b>Total Development Capital</b>	<b>182</b>

The capital cost estimate includes:

- Direct costs of the Project development
- Indirect costs associated with the design, construction and commissioning of the new facilities
- Owner's cost associated with the management of the Project from design, engineering, construction up to the handover to operations and Project close-out
- Insurance, operating spares and first fills
- Costs associated with Operational Readiness and pre-production operations
- Contingency on Project scope definition and risks.

The cost estimate was developed with input from Sedgman, SRK, Knight Piesold and MOD.

<sup>10</sup> No contingency has been applied to pre-strip costs



The estimate is based on preliminary engineering, quantity take-offs, tendered price quotations for major equipment, bulk commodities and unit rates for installation. Bulk material quantities and quoted prices were benchmarked against recent similar projects undertaken in Southern Africa, North America and Australia.

### **Sustaining Capital Expenditure**

The Sustaining Capital Expenditure ("Sussex") estimate represents cost expended to sustain and/or maintain the capital assets to perform to the Project design criteria during the LOM and the costs for future tailings dam development. The FS Sussex estimate is \$84 million.

### **Operating Expenditure**

The operating costs estimate was prepared with a base date of March 2019 to an accuracy level of  $\pm 15\%$ .

Costs were estimated for processing the T3 open pit and include costs associated with operating the mine, process plant and general and administration functions.

The operating costs were determined from first principals using inputs from numerous sources including:

- Supplier quotations for mining consumables and maintenance rates
- Detailed scheduling of the fleet requirements
- Grinding power requirements derived from comminution testwork
- Reagent consumption from metallurgical testwork
- Reagent & consumable costs from supplier quotations
- Logistics & transport costs from supplier quotations
- Manning levels developed from typical organisation charts and work rosters
- Personnel salaries & overheads sourced from the Ghanzi region
- Previous study assessments.

Concentrate treatment and refining charges (TC/RC) and copper payability are derived on the basis of recent annual benchmark data, less applicable discounts which is based on indicative non-binding offtake terms, and as adopted by the industry. An allowance has been made for all royalties, including 3% for copper and 5% for silver on a net smelter return basis.





**Table 8 - Operating Cost Estimate Summary (US\$/lb)**

Cost Item	US\$ / lb Cu
Mining Costs	0.86
Power Cost	0.12
Processing Cost	0.18
Site Administration <sup>11</sup>	0.11
Logistics	0.19
Treatment and Refining Charges	0.18
C1 Cost (pre by-product credit)	1.64
Silver By-Product Credit	(0.29)
<b>C1 Cost (post by product credit)</b>	<b>1.35</b>
Royalties	0.09
<b>Total Cash Production Costs (C2)</b>	<b>1.44</b>
Sustaining Capital	0.12
<b>All in Sustaining Costs (AISC)</b>	<b>1.56</b>

## Mine Operating Costs

Mining costs for the Project were estimated and based on the mining schedule prepared by SRK. The operating costs for drilling, blasting, loading and hauling, topsoil removal and crusher feed activities (ROM rehandle) were developed from first principles on the basis of contract mining. This includes operating hours, haul cycles, labour rates, fuel consumption, maintenance requirements and consumables.

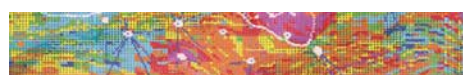
The mining cost estimate incorporates costs from the first quarter of 2021, which is the quarter during which copper production commences. All mining costs incurred prior to this date are classed as capital costs and included in the Capital Cost estimate described above.

**Table 9 - Life-of-Mine Average Mine Operating Costs**

Parameter	LOM <sup>12</sup> (US\$m)	LOM Cost (US\$/t mined)	LOM Cost (US\$/t ore)	LOM Cost (US\$/lb)	Proportional Cost (%)
Load and Haul	426	1.85	12.37	0.61	70
Drill and Blast	156	0.68	4.53	0.22	26
Grade Control	9	0.04	0.26	0.01	2
ROM rehandle	12	0.05	0.35	0.02	2
Mining Other	3	0.01	0.09	0.00	0
<b>TOTAL</b>	<b>606</b>	<b>2.63</b>	<b>17.60</b>	<b>0.86</b>	<b>100</b>

<sup>11</sup> Site administration costs comprise of site G&A, Site administration cost includes: a Metal Tiger Royalty of \$2 million and compensation payments over a 5 year period to operate a processing plant. The royalty is two per cent of revenue, though capped at \$2 million over the LOM. The royalty will be paid in the first year of production and compensation payments.

<sup>12</sup> LOM costs exclude capitalised operating costs (pre-strip)



## Process, General and Administration Operating Costs

The LOM operating cost estimate for process plant and General and Administration costs (“G&A”) are presented in Table 10. The processing costs were split into fixed and variable costs and based on an owner-operated model. G&A includes site and corporate costs relating to the Project.

**Table 10 - Life-of-Mine Average Processing Costs**

Parameter	LOM (US\$m)	Unit Cost (US\$/t ore)	Unit Cost (US\$/lb)	Proportional Cost (%)
Labour	36	1.04	0.05	13
Maintenance	31	0.89	0.04	11
Consumables	58	1.68	0.08	21
Mobile Equipment	7	0.19	0.01	2
Power	85	2.48	0.12	31
G&A	60	1.76	0.09	22
<b>TOTAL</b>	<b>276</b>	<b>8.03</b>	<b>0.39</b>	<b>100</b>

## Financial Modelling and Evaluation

The value of the T3 Copper Project was assessed using an incremental discounted cash flow approach with a base date 1 July 2019. A standalone model was used to derive the physical and financial measures that formed the basis of this evaluation. The evaluation is based on assumptions as listed in Table 11.

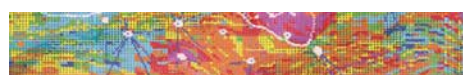
**Table 11 - Key FS Financial Assumptions**

Criteria	Assumption
Discount rate	8% real
Product prices	Consensus commodity price forecast (March 2019)
TC and RC for Cu	TC: US\$72.72/ t concentrate RC: US\$0.072/lb
Taxation	Annual tax rate = 70 minus (1,500/x), where x is taxable income as a percentage of gross income. The minimum annual tax rate is 22%.
Ore reserves	34.4 Mt at 1.0% Cu grade and 13.2 g/t Ag
Processing plant throughput	Capacity constraints were built into the mine plan.
Overall recoveries (Pit to Product)	Cu Recovery: 92.9%, Ag Recovery: 88.0%
Cu grade in concentrate grade (LOM average)	30.4%

Copper and silver prices were based on consensus long term commodity price forecasts from Bloomberg March 2019 (from more than 30 financial institutions). A summary of LOM economics is presented in Table 12.

**Table 12 - Life of Mine Financial Economics**

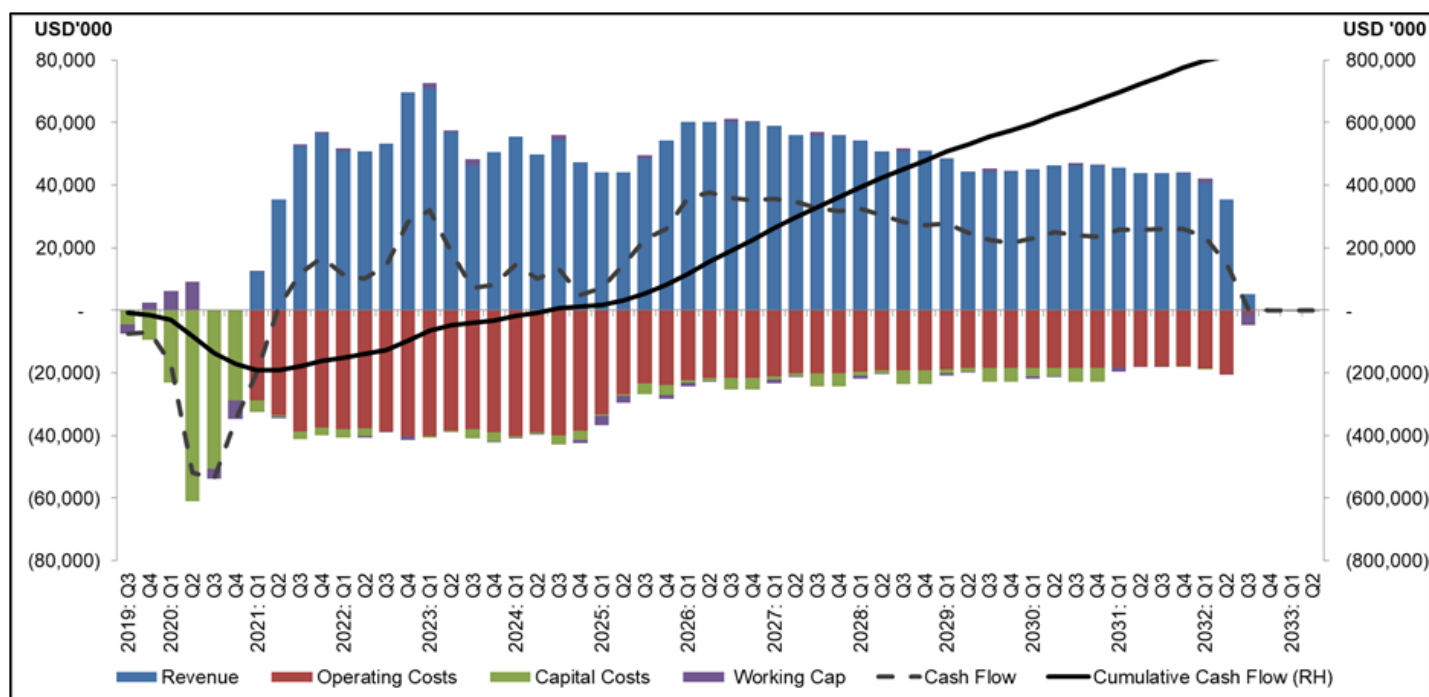
Criteria	Assumption (US\$)
Copper Price (Bloomberg Consensus March 2019)	2021: \$3.11/lb, 2022: 3.16/lb, 2023 : \$3.11/lb LT: \$3.08/lb
Revenue (net of payability)	\$2,301m
Unit Revenue (Net of payability)	\$2.98/lb
C1 Cash Costs	\$1.35/lb
All in Sustaining Costs	\$1.56/lb
EBITDA	\$1,083m
Net Cash Flow (pre-tax)	\$777m
Pre-tax NPV (8% real)	\$368m
Pre-tax IRR	33%



The pre-tax cashflow is presented in Figure 17. Key notes include:

- The T3 Copper Project is expected to generate a positive cumulative cash flow of US\$777 million
- Expected negative cash flows in 2019 to 2020 are due to the capital required to develop the T3 Copper Project
- T3 Copper Project is expected to repay development capital within 3.7 years after production starts

**Figure 17 - Pre-tax cash flow scenario**



Sensitivity analysis was completed on a number of inputs to identify key areas of potential financial variance. Table 13 demonstrates the sensitivity of the pre-tax US\$ NPV<sub>8%</sub> to the key financial drivers.

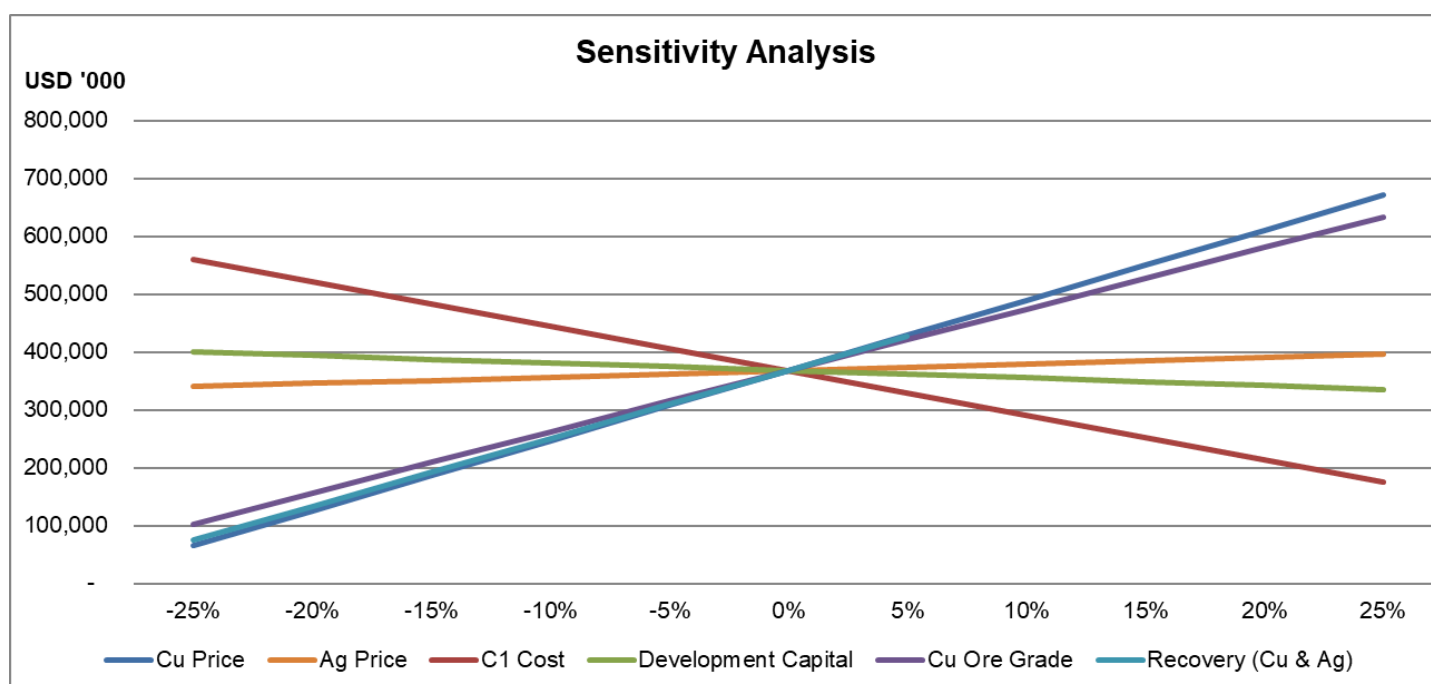
**Table 13 - Sensitivity Analysis (US\$m)**

	-25%	-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%	25%
<b>Cu Price</b>	66	126	187	247	308	368	429	489	550	610	671
<b>Cu Ore Grade</b>	103	156	209	262	315	368	421	474	527	580	633
<b>Recovery (Cu &amp; Ag)</b>	75	134	193	251	310	368	427	-	-	-	-
<b>Ag Price</b>	340	346	351	357	363	368	374	380	385	391	397
<b>Development Capital</b>	401	394	388	381	375	368	362	355	349	342	336
<b>C1 Cost</b>	560	522	484	445	407	368	330	291	253	215	176

Changes in copper price and copper recovery were identified as the major areas of sensitivity on both the upside and downside, followed by copper feed grade as the next most sensitive (Figure 18).



**Figure 18 - Sensitivity Analysis**



## Social and Environmental

Studies and investigations managed by Loci Environmental Consulting have confirmed there were no rare, threatened or priority conservation significant flora or vegetation communities identified during the Environmental and Social Impact Assessment. Habitats suitable for supporting free roaming wildlife including several conservation significant species were identified and mitigation of impacts by mining on these during operations have been adequately addressed in the Draft Environmental and Social Impact Assessment submitted to the Department of Environmental Affairs on 24 December 2018.

Knight Piesold Consulting conducted geochemical test work of tailings, waste rock and mineralised waste and expects that the majority of waste rock characterised may be non-acid forming and not prone to metalliferous drainage. Further column test work to adequately assess leachability of heavy metals is required on mineralised waste (containing elevated levels of lead and zinc mineralisation). MOD propose that any materials identified as potentially acid forming and/or prone to metalliferous drainage will be adequately managed through the engineered design of the waste storage facility.

Further work is required by MOD to assess impacts on the environment by the pit lake at mine closure. A conceptual mine closure plan has been developed with the principle objective being to create safe, stable and non-polluting land forms.

The Botswana permitting and approvals process is well defined, understood, involves public participation and is transparent.

Land access and landowner purchase agreements are in place and ongoing proactive engagement and consultation continues with key stakeholders. Any concerns and issues raised by host communities, farm owners and identified stakeholders during engagement meetings are addressed in the consultation process. A qualitative and quantitative socio-economic impact assessment undertaken as part of the Draft Environmental Social Impact Assessment process has identified community baseline indicators. Strategic plans to support the Environmental and Social Management System are in development phase and will address impacts identified in the Draft Environmental Social Impact Assessment.





MOD continues to demonstrate a strong social licence to operate within Botswana as well as within the host community of Ghanzi. A dedicated community relations office established in Ghanzi town manages Human Resources and Community Relations. It is supported by a highly qualified in-country team that has a strong presence in the local community and is well positioned to continue engaging with its stakeholders and work collaboratively with community groups, government and agencies, workforce and contractors to promote social development. Government relations are well established at both local District and national Botswana levels.

## **Next Steps**

### *ESIA*

The DEA has compiled a list of comments in relation to the first draft of the ESIA that was submitted on 24 December 2018. This includes comments raised at the stakeholder engagement meetings and site visits conducted in January 2019. MOD will respond to these comments and submit a second draft in April 2019. Once the approved ESIA has been issued by the DEA, Tshukudu Metals will submit copies of the FS and ESIA in its application for a mining licence for T3.

### *T3 In-fill Drilling*

MOD continues to progress a planned 60-hole resource infill drilling program within the boundaries of the first two stages of the proposed T3 Copper Project open pit, with the objective of upgrading early production into the higher confidence, JORC compliant Measured Resource category. Testwork will be carried out to confirm the metallurgical response of this ore.

Several drill holes are dedicated to targeting shallower copper mineralisation within the T3 pit.

### *Hydrogeology*

Pumping tests will be undertaken on all newly installed bores and longer-term pumping tests will be undertaken on selected bores before commencing pit dewatering and pre-stripping activities. The hydrogeological model will then be updated.

All bores will be registered, and a water licence will be applied for.

### *Accommodation Camp*

The design of the 400-person camp and associated services will be finalised in the second quarter of 2019 and an EMP will be submitted to the DEA.

### *Implementation Strategy*

A detailed implementation strategy will be developed in the second quarter of 2019. This will include consideration of Front-End Engineering Design ("FEED"), early contractor engagement, tender strategy and the planning of infrastructure pre-works.

### *T3 Underground Study*

A T3 Underground conceptual study was completed in March 2019 with very encouraging preliminary results. Additional drilling will be planned and implemented aimed at delineating an underground resource which will be used as the basis of a Scoping Study planned for completion in the second half of 2019. The aim is to upgrade the underground resource to support the mining of a targeted circa 400-500kt per annum of ore to supplement the T3 open pit ore and potentially increase T3 annual copper production beyond 30kt.

