

A modern mining company



24 August 2017

The Manager, Companies  
Australian Securities Exchange  
Companies Announcement Centre  
20 Bridge Street  
Sydney NSW 2000

Dear Sir/Madam,

**OZ Minerals Carrapateena Update**

Please find attached the:

- OZ Minerals Carrapateena Project Update ASX Release;
- Carrapateena Feasibility Study Update; and
- Carrapateena Update presentation slide deck.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'Robert Mancini', with a long horizontal flourish extending to the right.

**Robert Mancini**  
Company Secretary and Head of Legal

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24 August 2017

## Development green light for OZ Minerals Carrapateena copper gold mine

- Board approves ~\$916 million development of Carrapateena copper gold mine<sup>i</sup>
- Feasibility Study update has progressed to a stage which confirms economic robustness with NPV increase of 18 % to approximately \$910 million<sup>ii</sup>
- Ore Reserve tonnage estimate increased by 13% to 79 Mt with copper equivalent grade of 2.31%<sup>iii</sup>
- Internationally saleable concentrate to be produced – Concentrate Treatment Plant removed from base case
- Cost certainty has increased with 50% of pre-production capital in lump sum contracts near finalisation
- Construction certainty increased through engagement of experienced construction partners
- Phased work program starts September 2017 with commissioning Q4 2019
- Expansion optionality identified and preserved
- OZ Minerals can fund Carrapateena development from cash on hand and expected cash flow from the Prominent Hill Project whilst maintaining its dividend policy without the need for debt

OZ Minerals' Chairman, Rebecca McGrath, announced today that the Board had approved development of the approximately \$916 million Carrapateena mine, Australia's largest undeveloped copper project, located 160 km north of Port Augusta in South Australia.

"The Board decision represents the next stage in the company's development. This is an exciting time for OZ Minerals. Carrapateena will be a robust, cash generating asset with expansion potential that sets OZ Minerals up for further growth. This decision is a significant enabling step in realising our strategy to become a low cost multi asset copper miner delivering value for all stakeholders," she said.

OZ Minerals Chief Executive Officer, Andrew Cole said "Our confidence in the economics, constructability and operability of the Carrapateena project as a long life low cost mine has been further reinforced through the feasibility study phase.

"Carrapateena is now firmly established as a high quality project in its own right with opportunities identified including expanding the existing cave footprint and accessing satellite deposits. It also serves as a base for potential district development of nearby Fremantle Doctor and Khamsin. These future expansion options have been enabled by the improved mine design, but remain as upside to the current valuation.

"As at 30 June 2017, OZ Minerals' cash on balance sheet was \$625 million. The project is expected to be fully funded from cash reserves and future cash flow from the Prominent Hill Project, whilst maintaining OZ Minerals' dividend policy.

"Since the Pre-Feasibility Study the NPV of Carrapateena has increased 18 per cent to approximately \$910 million due to increased metal production, higher consensus commodity prices and removal of Concentrate Treatment Plant (CTP) costs. Over the past 12 months, additional test work, including a continuous flotation pilot plant, has improved confidence in a consistent and predictable downgrade of impurities from ore to concentrate. We are confident from early discussions that Carrapateena concentrate will be a sought after product in the international concentrate market.

"The project value improvements more than offset an increase in capital costs resulting from improved pricing and scope definition.

"The Early Contractor Involvement process is near completion. It will result in 50 per cent of pre-production capital in lump sum contracts near finalisation with experienced construction partners, primarily Ausenco-Downer JV and NRW.

"In line with our agile approach to project development, construction will progress in two phases. This approach also serves to smooth and lower on-site construction personnel thereby enabling a 30 per cent reduction in the size of the camp.

"Phase one is scheduled to begin next month with construction of enabling infrastructure including the accommodation village and airstrip and continuing development of the dual access decline. The Mining Lease approval process continues and State and Federal Government departments are working to an agreed schedule, which should see the Mining Lease granted within six months.

"The second phase, subject to mining lease approval, is scheduled to commence in Q2 2018. This phase includes construction of the processing plant and other above ground infrastructure, installation of the underground materials handling system, construction of the tailings storage facility, Western Access Road and power line.

"Our caving knowledge has been enhanced with recruitment of a number of experienced cave miners into key operational roles including general management, technical services and mining, and the engagement of caving experts for the revised mining study and mine plan.

"There is strong community support for the project. A Native Title Mining Agreement, underpinned by the landmark partnering agreement, is now in place with the Kokatha Aboriginal Corporation following a community meeting at the end of July," Andrew Cole said.

Development of the access decline has now reached a total of 2,594metres and the second conveyor decline has broken through to the completed box cut as scheduled this week.

**A comprehensive feasibility update document is attached as is the Carrapateena Reserve update. A summary of key metrics is provided on the following page.**

## Key Financial and Production Metrics:

Net Present Value*	~ \$910 million
Internal Rate of Return*	~ 20%
Project Payback	2024
Pre-production capital**	~ \$916 million
Average annual net cash flow	~ \$265 million
Mining production	4.25 Mtpa
Mine life	20 years
LOM annual metal production	65,000 t Copper / 67,000 oz Gold
Annual metal full production years 1-3	66,000 t Copper / 80,000 oz Gold
LOM All-in sustaining cost	~ US 99c/lb
LOM C1 Cost	~ US 62c/lb
Commissioning date	Q4 2019

\* At consensus pricing (unlevered, post-tax), 9.5% real discount rate. Please refer to the assumptions and commentary in the Carrapateena Feasibility Study Update released on and the Carrapateena Ore Reserve Statement as at 4 August 2017 released on 24 August 2017

\*\* Including \$66 million in contingency; excluding \$63 million in sunk costs from 1 July 2016

\*\*\* The production targets referred to in this announcement are based on [94]% Probable Ore Reserves and [6]% Inferred Mineral Resources. 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 production targets themselves will be realised.

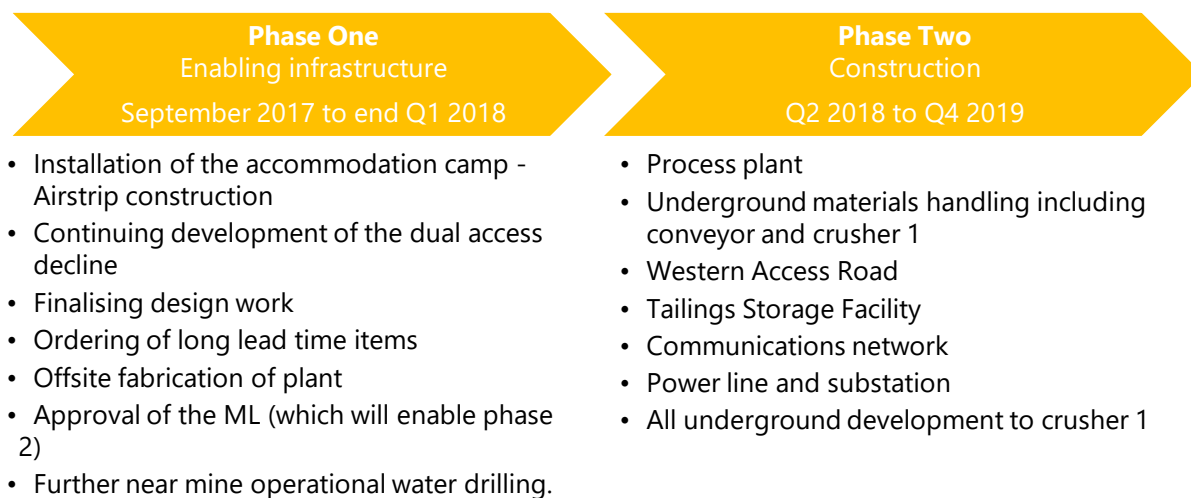
The Ore Reserve estimate has increased by 13 per cent to 79 Mt based on the mine design update.<sup>iv</sup>

Ore Reserve	Tonnes (Mt)	Cu (%)	Au (g/t)	Ag (g/t)	Cu (kt)	Au (koz)	Ag (Moz)
Proved	0	0	0	0	0	0	0
Probable	79	1.8	0.7	8.5	1,400	1,800	22
<b>Total</b>	<b>79</b>	<b>1.8</b>	<b>0.7</b>	<b>8.5</b>	<b>1,400</b>	<b>1,800</b>	<b>22</b>

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## Two phased construction

The two-phased work program is scheduled to start next month.



## Cost and constructability certainty

Cost certainty has increased with 50 per cent of the total pre-production capital in lump sum contracts near finalisation with experienced construction partners:

- Ausenco-Downer JV – processing plant, non-processing and underground infrastructure
- NRW – Tailings storage facility, civils, western access road and airstrip

Other key work packages are:

- PYBAR – Decline development
- ElectraNet – Build Own Operate and Maintain agreement including installation of an additional transmission line and substation being negotiated
- Purchase, transport and installation of the accommodation village

## Improvements since PFS

Changes made since the PFS to improve economics and manage risk include:

- Moving all underground capital development to footwall host rocks on the south west from the north east and out of the mineralised zone
- Refining the mining footprint and cave draw rates to compensate for the minor reduction in grades between the 2015 and 2016 Mineral Resource estimates.
- Adding a third permanent underground crusher to enhance productivity. Temporary surface crusher removed
- Reduced primary ventilation rises through to the surface from 10 down to four with the dual decline and rationalisation
- Improving level layouts to reduce traffic interactions and improve productivity
- Optimising cave footprint, including the addition of a new level to maximise early ore
- Improving materials handling system with a conveyor located in a separate decline
- Optimising plant footprint and layout, reducing energy consumption and adding capacity for greater automation to improve productivity and lower costs
- Improved confidence in achieving a consistent and predictable downgrade of uranium from ore to concentrate to ensure Carrapateena concentrate is able to be internationally saleable without attracting penalties for the first eight years of production. Accordingly CTP is no longer included in the Carrapateena Base case.

## **PFS v FS costs**

During the Feasibility Study pre-production capital has increased by approximately \$80 million primarily accounted for by:

- Commissioning pushed back by three months to Q4 2019
- Better definition of mining and material handling systems
- Accommodation village increase of ~ \$14 million from the original plan which was to relocate excess Prominent Hill accommodation units
- Access road, an additional ~ \$23 million due to lack of suitable road base material proximal to road construction requiring construction material to be sourced from an off-site quarry
- Tailings dam increase of ~ \$16 million due to higher than estimated contract unit rates
- Airstrip of ~ \$8 million now included to reduce construction road traffic movements and enhance road safety.

## **Risks**

There are risks specific to the Carrapateena Project and risks which are relevant to the mining industry in general which may cause the project's actual results to differ materially from the results expressed or anticipated in this announcement. These are discussed in the Carrapateena Feasibility Study Update released on 24 August 2017 which should be read in full together with this announcement.

## **Risk mitigation**

- Water – construction water supply has been secured. However, a portion of the operational water supply is affected by higher salinity levels and opportunities are being explored to secure higher quality water close to the operation.
- Decline advance rate – more than 2 km of development has been completed with the advance rate remaining on schedule to reach the top of the orebody in Q2 2019. Any deceleration in decline advance has the potential to delay the commissioning of the mine.
- Caveability – risk has been significantly reduced by optimising the sub level cave footprint and through identification of various pre-conditioning methods that can be progressively or selectively applied.
- Power – 55 MW transmission connection agreement is now unconditional, but a power purchasing agreement has yet to be agreed. Exposure to price remains but downside is moderated by increased supply optionality coming into the market.

## **Future growth optionality**

The future opportunity profile of the project has improved as a result of both the surface and underground design work being completed. The base case:

- Excludes the known mineralisation zones associated with Fremantle Doctor, Khamsin and The Saddle districts.
- Includes resource drilling to define a potential circa 2 Mt zone of mineralisation adjacent to the sub level cave. Whilst a concept study has been completed on the area, no Ore Reserve estimate has been generated for this zone of mineralisation, and no benefit has been included in the financial evaluation of the Carrapateena project.
- Now sees a surface layout which can accommodate future expansion whilst reducing the overall footprint to reduce construction costs and facilitate maintenance access.

Opportunities also include expansion of the sub level cave footprint to access surrounding mineralisation. The project establishes a base for development of the wider region. There are numerous undrilled anomalies in the area. OZ Minerals holds 370,000 hectares of exploration licences of which only a fraction have been explored.

## Concentrate Treatment Plant

The Concentrate Treatment Plant is now being managed as a separate project, independent of the Carrapateena timeline. The CTP continues to offer opportunities to be a strategic differentiator for OZ Minerals with the capacity to upgrade concentrates to 50-60 per cent copper with negligible impurities making them an attractive feedstock for customers throughout the world.

While not needed for Carrapateena, the project potentially offers future upside for both Carrapateena and Prominent Hill in light of the global trend of decreasing concentrate grades and increasing impurities in the copper concentrate market. Therefore the scope has been expanded to also include Prominent Hill concentrate.

Test work has confirmed the viability of the process and the focus of current studies is on development and optimisation of the various technical options.

For further information, please contact:

### Investors

Tom Dixon

Group Manager – Investor Relations

Telephone: +61 (8) 8229 6628

Mobile: +61 (0) 450 541 389

Email: [tom.dixon@ozminerals.com](mailto:tom.dixon@ozminerals.com)

### Media

Sharon Lam

Group Manager – Communications

Telephone: +61 (8) 8229 6627

Mobile: +61 (0) 438 544 937

Email: [sharon.lam@ozminerals.com](mailto:sharon.lam@ozminerals.com)

<sup>i</sup> The material assumptions used in the estimation of the development cost can be found in the Carrapateena Feasibility Study Update released on 24 August 2017.

<sup>ii</sup> The material assumptions used in the estimation of the production targets and associated financial information referred to in this announcement can be found in the Carrapateena Feasibility Study Update released on 24 August 2017, the Restated 2016 Carrapateena Mineral Resource Statement as at 18 November 2016 and the Carrapateena Ore Reserve Statement as at 4 August 2017 released on 24 August 2017.

<sup>iii</sup>  $CuEq = Cu (\%) + Au (g/t) \times 0.6354 + Ag (g/t) \times 0.009425$ . Based on assumed recoveries of 91% for Cu, 73% for Au and 79% for Ag which are taken and the Carrapateena Ore Reserve Statement as at 4 August 2017 released on 24 August 2017.

<sup>iv</sup> This information is extracted from the report entitled "Carrapateena Ore Reserve Statement as at 4 August 2017" which was released to the market on 24 August 2017 and is available to view at [www.ozminerals.com/media/asx](http://www.ozminerals.com/media/asx). OZ Minerals confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and, in the case of estimates of Ore Reserves that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. OZ Minerals confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

# **CARRAPATEENA**

## **Feasibility Study Update**

CA-MAN-REP-1000

24 August 2017

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**OUR VALUE PROPOSITION**

OZ Minerals unlocks value through innovative thinking, mining and metallurgical processing excellence, trusted relationships and our social performance.



## ACKNOWLEDGEMENTS

### Kokatha Aboriginal Corporation

The Kokatha People have a direct, unbroken and unique relationship with the land on which the Carrapateena Project is located.

OZ Minerals recognises the sense of place and belonging of the Kokatha People is linked to their identity, creation stories, travel, trade, ceremonies, family and places held sacred. We recognise the deep and ongoing feelings of relationship and attachment they hold for their lands.

OZ Minerals acknowledges the Kokatha People's connection to 'country', the contribution of the Kokatha People to their region and the enduring importance to the Kokatha People of values, cultural authority, cultural norms and customary laws.

OZ Minerals places great value on our relationship with the Kokatha People. OZ Minerals and the Kokatha Aboriginal Corporation seek to work in partnership, as equals, to further develop the Partnering Agreement *Nganampa palyanku kanyintjaku 'Keeping the future good for all of us'*. This collaborative agreement encapsulates, recognises and values the ongoing contribution of both partners, and will inform the relationship between the Kokatha People and OZ Minerals throughout and beyond the development of the Carrapateena Project.



### Pernatty and Oakden Hills Station Owners

The Far North region of South Australia has a long and rich history of pastoralism. The proposed Carrapateena Project is located on Pernatty Station and the proposed supporting infrastructure is located within Oakden Hills Station. OZ Minerals recognises the importance of the land to its owners and their operations and acknowledges their cooperation in developing the Project. An ongoing relationship between pastoral owners and OZ Minerals will continue to be fostered. This will ensure development of mutual benefits for both parties as a result of the co-existence of pastoral enterprises and mining operations throughout the course of the mine life.

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## DISCLAIMER

The Carrapateena Project is still in a state of development, therefore the information in this document and conclusions presented should be viewed in this light.

OZ Minerals and its Advisors have used reasonable endeavours to ensure this document is based on information that was current as of the date of the document. Statements contained in this document represent the reasonable judgments of OZ Minerals based on the information available at the time of preparation.

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## 1 INTRODUCTION

### 1.1 Purpose and scope

This document provides an update on the key areas of the Carrapateena Project that have progressed to a Feasibility Study (FS) level of definition. This study has advanced the Project beyond the Carrapateena Pre-Feasibility Study (PFS) as released in November 2016. Work to further refine other aspects of the project to Feasibility Study level continues, the outcomes of which are not expected to be material. This document is not intended to be used to secure external project funding.

The Project scope outlined in this document relates only to the mining inventory defined. While consideration has been given to the remainder of mineralisation in the Carrapateena envelope and satellite mineralised bodies, such as Fremantle Doctor and Khamsin, which may present future opportunities to unlock value in the Gawler Craton region for OZ Minerals, they are not specifically addressed in this study.

#### **Separation of Concentrate Treatment Plant Project**

The Concentrate Treatment Plant (CTP) is now being managed as a separate project, independent of the Carrapateena Project timeline.

The CTP continues to offer opportunities to be a strategic differentiator for OZ Minerals with the capacity to upgrade concentrates to 50-60% copper with negligible impurities, making them an attractive feedstock for customers throughout the world.

While OZ Minerals does not consider that the CTP is required for the Carrapateena Project, it potentially offers future upside for both the Carrapateena Project and Prominent Hill Mine given the global trend of decreasing concentrate grades and increasing impurities in the copper concentrate market. Therefore the CTP scope has been expanded to include Prominent Hill Mine concentrate.

Test work supports the viability of the CTP process with the focus of current studies now turning to development and optimisation of the various technical options.

The marketing of the Carrapateena Project concentrate in the absence of the CTP is outlined in Section 8: Marketing and Sales Strategy.

### 1.2 Overview

OZ Minerals ongoing work has built on the previously completed PFS and continues to increase confidence in the Project's economics, constructability and operability. This update confirms OZ Minerals' opinion of the robust nature of the Project, with strong financial metrics, a relatively low threat profile and opportunities for future optimisation. Staged execution is planned to commence in Q3 2017 to enable commissioning and first ore to be processed in Q4 2019.

Key attributes of the Project are: estimated as follows:

- A 4.25 million tonnes per annum (Mtpa) sub-level cave mining operation with a 20 year mine life and average copper equivalent grade of 2.31% in ore milled.
- A conventional copper concentration processing plant producing an estimated average of 66,000 tonnes of copper and 80,000 ounces of gold per annum for the first three years of full production.
- An estimated average Life of Mine (LOM) annual production of 65,000 tonnes of copper and 67,000 ounces of gold.
- A sought after high grade copper-gold concentrate product shipped to customers throughout Asia and Europe.
- Life of Mine (LOM) All-in Sustaining costs (AISC) of US 99c/lb.
- LOM C1 cash costs of US 62c/lb Cu.
- A pre production capital of approximately A\$916 million through to commissioning in Q4 2019.
- At consensus pricing (unlevered, post-tax, 9.5% real discount rate)
  - NPV of \$910 million; IRR circa 20% (including deferred vendor payment of US\$50 million) and \$A66 million contingency, but excluding sunk capitalised costs of \$A63 million
  - LOM Assumptions: copper US\$2.92/lb; gold US\$1,306/oz; USD/AUD 0.75.
- Average annual net cash flow of \$A265 million.
- Commissioning in Q4 2019.
- Estimated project payback by 2024, five years after commencing production.
- Preserved optionality to expand annual throughput and mine life.

The Carrapateena Key Project Elements are summarised in Table 1.1.

A proportion of the production target and forecast financial information derived from a production target set out in this Feasibility Study Update is based on inferred resources (approximately 6%). There is a low level of geological confidence associated with inferred resources and there is no certainty that further exploration work will result in the determination of indicated resources or that the production target itself will be realized.

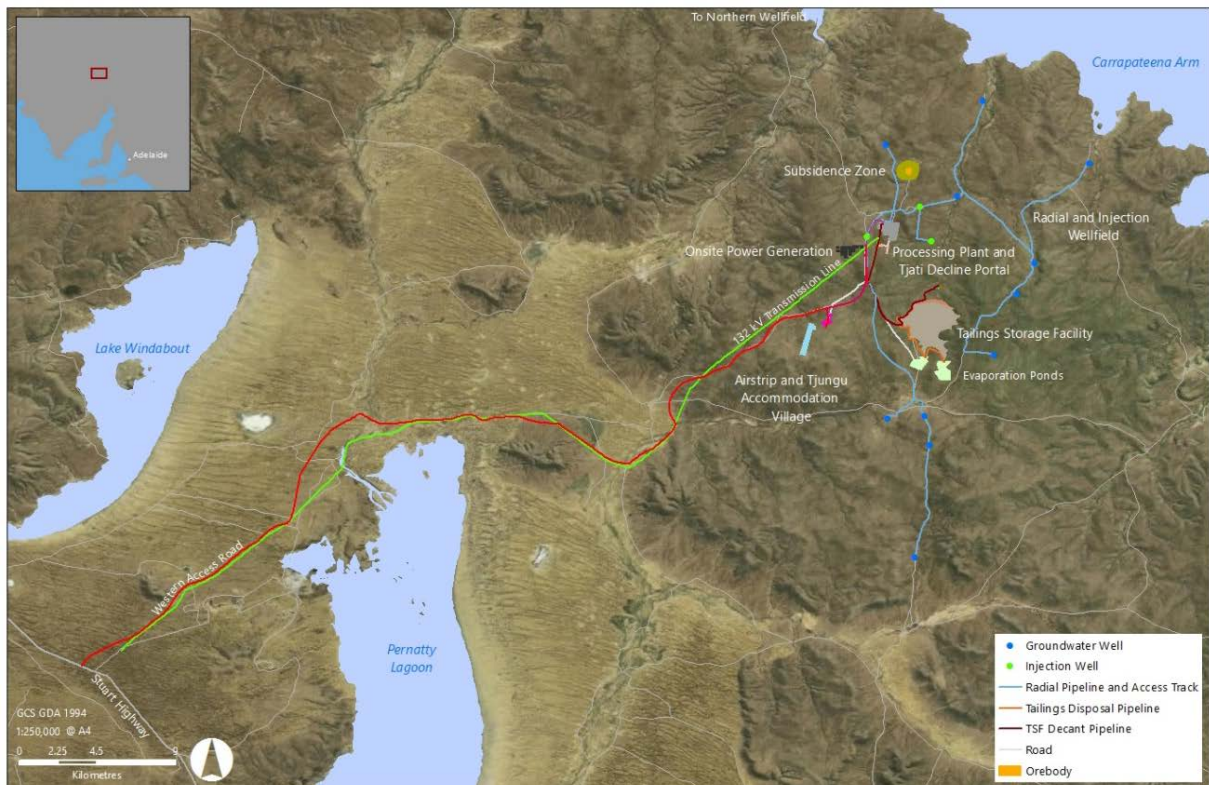
**Table 1.1: Carrapateena Key Project Elements – Base Case**

Area	Feature
<b>Mining</b>	
Primary mining method	Sub-level cave
Production rate / life	4.25 Mtpa (ROM Ore) / 20 years
Main access	Decline (ramp)
Secondary Access	Conveyor Decline (ramp)
<b>Mine Infrastructure</b>	
Primary crushing	Underground
Ore handling	Incline conveying
<b>Processing</b>	
Product	Copper and gold in concentrate
Production rate	Average of ~65,000 tonnes copper and ~67,000 ounces gold per year LOM
Comminution	SAG Mill, Ball Mill and Pebble Crushing
Flotation	Rougher flotation followed by three-stage cleaning
<b>Tailings</b>	
Tailings disposal method	Valley fill thickened tailings storage facility
Tailings storage facility (TSF)	Stage 1: wall height 20 m; capacity 8.9 million m <sup>3</sup> ; four years' operation
<b>Waste Handling</b>	
Putrescible, Recyclable, Hydrocarbon and Other Waste Handling	Segregation of waste onsite. Inert waste disposed in on-site landfill facility. All other waste disposed through licensed off-site facilities
<b>Key Infrastructure</b>	
Power	132 kV, 55 MW High Voltage connection to SA grid
Water	Average operations demand of 11.5 ML/d sourced from a combination of wellfields
Access Road	Unsealed access road 52.5 km to Stuart Highway
Village	550 person
Airstrip	1400 m long x 30 m wide with an apron capacity to support two aircraft (Dash-8 Q300 turboprop aircraft)
<b>Logistics</b>	
Concentrate transport	Road transport from site to Port Adelaide for shipment to customers in Asia and Europe.

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### 1.3 Project Background

Located in South Australia on the eastern margin of the Gawler Craton, approximately 160 km north of Port Augusta (see Figure 1.2), OZ Minerals considers that the Carrapateena Project is a significant global copper resource and the largest undeveloped copper project in Australia.



**Figure 1.1: Carrapateena Project Location**

In 2011, OZ Minerals acquired the Carrapateena Project for US\$250 million plus contingent payments of US\$50 million payable on the first commercial production of copper, uranium, gold or silver, and US\$25 million payable on first commercial production of rare earths, iron or any other commodity.

Since the acquisition, OZ Minerals has focused on updating the Mineral Resource and progressing the Project to FS stage. In mid-2014, OZ Minerals completed a Block Cave PFS that it considers demonstrated a viable mining option for development of the mine using a block cave mining method.

In October 2015, OZ Minerals initiated a Scoping Study to optimise mining of the orebody based on a new resource focused on higher grade. The study concluded that a 4 Mtpa sub-level cave (SLC) mine development with decline access and conveyor ore haulage is the preferred development case.

In 2016, the construction of the advanced exploration decline (named the Tjati Decline) commenced and OZ Minerals worked with the Kokatha Aboriginal Corporation to develop a partnering agreement.

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The OZ Minerals Board approved the outcomes of the PFS for the new Carrapateena Project option in November 2016<sup>1</sup> and the Project progressed to an FS and engineering detailed design phase. Key PFS outcomes included a change in the mining method to an SLC operation at 4 Mtpa.

On 9 December 2016, OZ Minerals obtained the current Mineral Resource Estimate for Carrapateena<sup>2</sup>, thereby further developing its confidence in the higher-grade Project option.

In April 2017, a project execution review was undertaken, resulting in a revised approach for the delivery of the Project based on an Early Contractor Involvement (ECI) contracting strategy.

The ECI process has a defined construction methodology that supports a measured, carefully staged execution plan that seeks to maximise off-site activities, reduce interface risk and minimise camp size requirements. This strategy is designed to deliver significant benefits in relation to costs, quality, schedule and safety.

In addition, a review of the SLC mining methodology was proposed, focusing on optimising ore extraction while minimising underground development requirements. This includes the change from a single decline access with multiple vent rises into a dual decline access to assist conveyor transport of ore to surface, which is intended to deliver enhanced productivity and safety outcomes.

In April 2017, the OZ Minerals Board approved further funding for continued decline construction, further mine design optimisation to bring it to FS level, and acceleration of all other non-mining Carrapateena work packages via the ECI model.

Approval and land access processes have continued to progress. In April 2017 the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) referral was assessed to be a controlled action, triggering a bilateral assessment process with the *Mining Act 1971* (SA) declared the assessment pathway.

In May 2017, a Mining Lease Application (MLA) and supporting Proposal was submitted to the Government of South Australia. Approval of the Mining Lease Proposal is anticipated in Q1 2018.

In addition to the State and Commonwealth Governments approving the MLA, OZ Minerals will require a Program for Environment Protection and Rehabilitation (PEPR), including completion of any secondary permitting requirements, to enable site works to commence.

At the end of July 2017, the Native Title Mining Agreement (NTMA) was signed by the Kokatha People.

The capitalised costs of the Project since 1 July 2016 are A\$63 million.

The development timeline for the Project is shown in Figure 1.3. The proposed site layout is shown in Figure 1.4.

<sup>1</sup> ASX Release Carrapateena Pre-Feasibility Study Executive Summary. Release date 7 November 2016.

[www.ozminerals.com/uploads/media/161107\\_Carrapateena\\_Pre-Feasibility\\_Study\\_Executive\\_Summary.pdf](http://www.ozminerals.com/uploads/media/161107_Carrapateena_Pre-Feasibility_Study_Executive_Summary.pdf)

<sup>2</sup> ASX Release Carrapateena Mineral Resource Estimate Robustness Confirmed, Release date 9 December 2016.

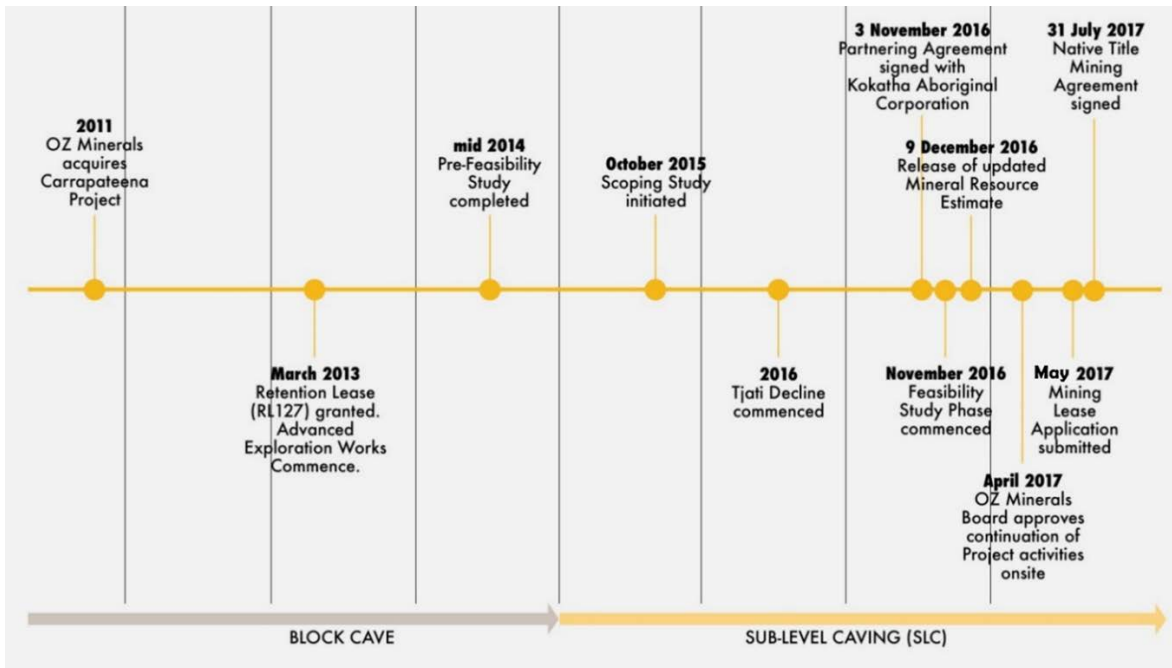


Figure 1.2: Carrapateena Development Timeline

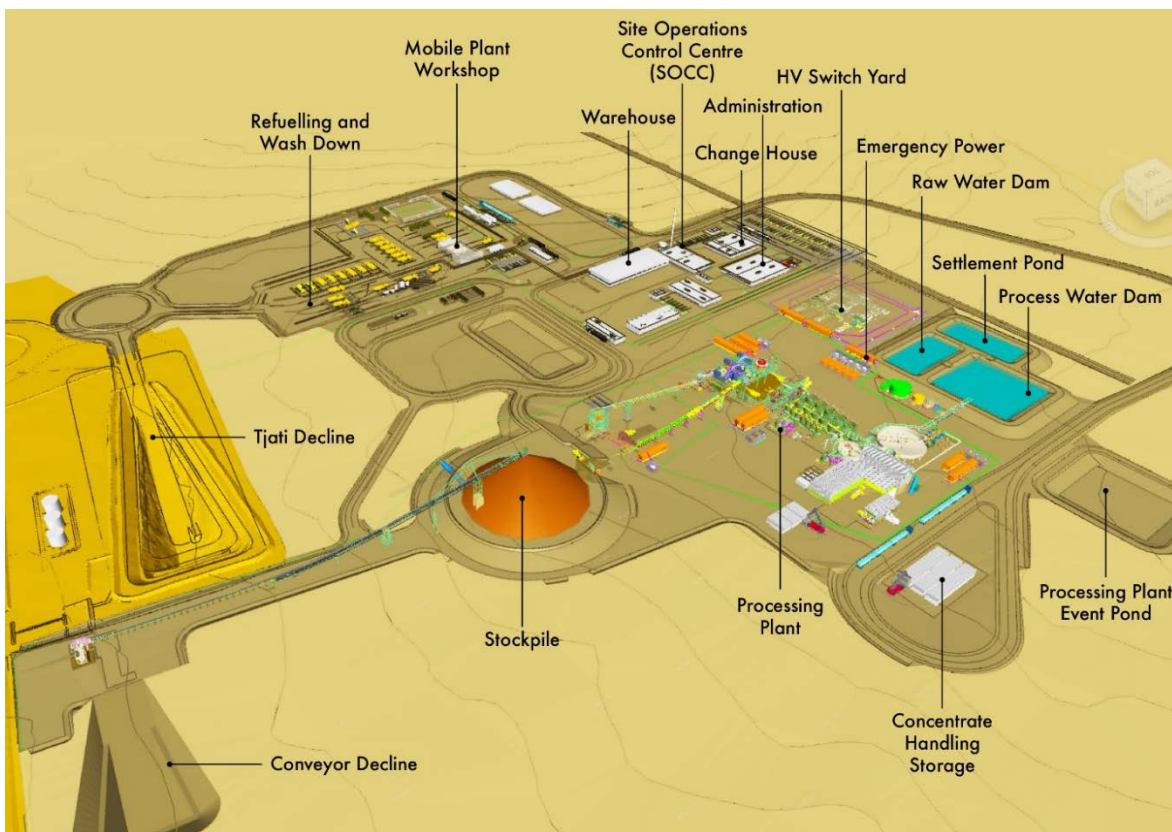


Figure 1.3: Proposed Carrapateena Site Layout

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## 1.4 Study Objectives

### FS Process

- Work collaboratively with major construction partners to develop robust package scopes, reducing the construction schedule risk and lock in pricing to drive capital discipline and enhance delivery certainty.
- Confirm the scope of individual packages and pursue opportunities for technical and commercial optimisation through value engineering activities in collaboration with contractors.
- Validate assumptions made in the PFS, specifically in relation to geotechnical conditions, water supply and cultural heritage associated with anticipated early works through further site investigations.
- Optimise the schedule for delivery, including consideration of early works, and detail secondary approval requirements.

### Mine Design Optimisation

- Improve knowledge of orebody geology, mineralisation, underground stresses and geotechnical conditions to increase caveability confidence.
- Optimise the mining inventory cut-off grade and annual throughput rate for metal and impurities.
- Improve mine design to match modern SLC approach and minimise underground development metres.
- Develop dual declines and build second boxcut as part of updated mine access strategy.
- Ensure underground and surface infrastructure allows for future expansion optionality.
- Develop operating philosophy and operational readiness plans.
- Refine capital and operating cost model and include market benchmark data.

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## 1.5 Study Outcomes

### 1.5.1 Major Work Packages

OZ Minerals adopted an ECI strategy to further accelerate construction readiness, reduce Project delivery risk and drive cost and schedule certainty.

This approach has enabled OZ Minerals to proactively manage risk, particularly in relation to minimising contract interfaces, maintaining capital discipline and leveraging the specialist capability of contractors to optimise construction methodology.

Specific contractors were identified based on the following key criteria:

- History of successful ECI participation.
- Track record and willingness to engage with and prioritise local suppliers and traditional owners.
- Track record of engaging with local suppliers.
- Willingness to work with OZ Minerals to meet budget and schedule requirements.
- Demonstrated financial capacity and delivery experience.

As a result, the 40 PFS work packages were consolidated into nine packages, plus owner's costs and contingency. These new packages are matched to proven delivery partners. The final work packages and the respective delivery company are presented in Table 1.2.

Key outcomes of the FS process include:

- 50% of pre-production capital secured in lump sum contracts near finalisation with construction partners like Ausenco-Downer JV and NRW.
- Optimisation of the process plant design allowing the removal of the CTP from the Project, but retaining the ability to sell all concentrate produced to our existing international customers.
- Improvements to the operation and energy consumption of the processing plant.
- Optimisation of underground infrastructure.
- A 30% reduction in the size of the accommodation village through resequencing the construction schedule.
- Construction of an airstrip, reducing traffic movements, improving safety and reducing travel time for contractors and employees.
- Resequencing of on-site construction works with methodology maximising off-site construction and reducing parallel construction activities.
- A staged construction plan that sees government-approved early works proceed prior to receipt of the main Mining Lease (currently undergoing assessment).

**Table 1.2: Project packages of work**

Package	Scope	Contractor	Delivery Strategy	% of Total Project Estimate Cost
1	Process Plant Non-Process Infrastructure (NPI) Underground Materials Handling Underground materials handling ventilation, pumping and power Bulk earthworks Batch Plant Water and Temp Services Communications and Telemetry	Ausenco Downer Joint Venture	Lump Sum	42.8
2	Western Access Road Airstrip TSF Quarry	NRW	Class 3 Estimate Lump Sum Class 3 Estimate Class 3 Estimate	12.1
3	Accommodation Village	TBC	Lump Sum	3.6
4	Wide Area Network	Telstra	Lump Sum	0.8
5	Regional Power	ElectraNet	BOOM	0.8
6	Ancillary Services and Cleaning	TBC	Rates	0.3
7	Geotechnical investigations (construction)	TBC	Provisional sum	0.3
8	Decline / Mine Development	TBC	Schedule of rates	18.6
9	Spares and Fleet	TBC	TBC	0.7
10	Owners Costs	-	First principles estimate	12.7
11	Contingency	-		7.3

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### 1.5.2 Verification of Key PFS Assumptions

Key assumptions made during the PFS that were flagged for verification during the FS process included geotechnical assumptions for construction, availability of water, approvals timeframes, and availability of operational power.

#### Geotechnical Investigations for Construction Materials

Geotechnical investigations were conducted on the subsidence quarry zone and along the proposed Western Access Road alignment to identify potential borrow pit locations. These studies determined that none of the locations contained material of suitable quality for road construction. An alternative off-site quarry has been secured to meet this requirement and now forms part of the base case at an additional cost to that assumed in the PFS (see Section 5.6).

#### Water

OZ Minerals considers that sufficient water has been identified for construction, sourced primarily from the on-site Radial Wellfield for the development of the airstrip, camp, process plant and TSF. Construction water for the Western Access Road will be sourced from the Radial Wellfield and two separate wells, one located approximately midway along the Western Access Road and one near the Stuart Highway.

Optimising water quality and centralisation of water sources remains an objective of the future works program. As such, further drilling of exploration wells in the Northern Wellfield are assumed in the base case to identify the source and prove up the necessary yields (see Section 5.5).

#### Power

OZ Minerals has signed a Transmission Connection Agreement (TCA) Part B (regulated portion) with ElectraNet for the supply of 55 MW for the Carrapateena Project. Development approval for the Mount Gunson substation is underway. This has mitigated a material threat from the PFS.

Part C (unregulated portion) of the TCA with ElectraNet requires a build, own, operate and maintain (BOOM) contract, with a 13 month construction period for the transmission line following the approval of the MLA.

#### Approvals

In April 2017, OZ Minerals was informed that the Environment Protection and Biodiversity Conservation Act (EPBC) referral was determined to be a controlled action. This triggered the requirement for a bilateral assessment of the Project by both the State and Commonwealth Governments. In May 2017, the Carrapateena MLA and Proposal was submitted. Following a five week public consultation process, one public submission was received along with a number of government submissions. OZ Minerals anticipates that its responses to the submissions will be lodged in September. Approval of the MLA and associated PEPR is scheduled for Q1 2018.

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In July 2017, OZ Minerals formally accepted the conditions for the Airstrip and Tjungu Accommodation Village Miscellaneous Purposes Licence. The PEPR is expected to be approved in September 2017, in time to allow early works to commence on this enabling infrastructure (see Section 6.1).

### 1.5.3 Mine Plan Update

Following operational and technical review by the OZ Minerals and Mining Plus mining study team (including SLC technical experts), an update to the mine plan has occurred.

Key outcomes from this update include:

- Increased Ore Reserve
- Increased total contained metal mined
- Decreased early copper metal flow informed by data collected in 2016 drilling program
- Improved cost model quality and transparency
- Decreased total lateral development required
- Improved caveability logic and confidence
- Improved SLC operational logic and mining layout.

Detailed updates include:

- Optimised SLC cutoff grade to maximise the IRR and NPV of the Project
- Improved main decline location and SLC infrastructure, such as ore passes and services corridor
- Optimised primary ventilation layout and connection with SLC work areas
- Improved SLC production level layout and practical operational philosophy
- Greater detail on pre-production and operational readiness requirements
- Updated cost model and benchmarks against comparable Australian SLC operations.

While optimisation of the material handling system layout to match the updated mine design has begun, this work is yet to be completed. The design assumed in the base case includes a 4.25 Mtpa conveyor system to Crusher 1 located near the top of the SLC and will see further detailed design work over the coming months. It is not anticipated that the further development of the detailed design will materially impact the cost model.

OZ Minerals considers the Project is now in a position to commence detailed design and procure long-lead items.

## 2 RESOURCE AND RESERVE

The FS mine design and Reserve update has increased the Probable Ore Reserve from 70 Mt as stated in the PFS to 79 Mt, with an associated increase in copper mined of 100 kt.<sup>3</sup> The ore inventory in the LOM mine plan is 84 Mt which includes the 79 Mt.

This Feasibility Study Update contains a production target and forecast financial information derived from a production target relating to the Carrapateena Project. The estimated mineral resources and ore reserves underpinning those production targets and forecast financial information has been prepared by competent persons in accordance with the requirements of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (2012 Edition) prepared by JORC (**JORC Code**).

### 2.1 Geology and Mineralisation

The Carrapateena Project is located within the highly prospective Olympic Dam copper-gold (Cu-Au) Province. This is a metallogenic belt along the eastern margin of the Gawler Craton in South Australia, which hosts the Prominent Hill Mine, Olympic Dam mine and the Moonta-Wallaroo historic mining district. The Craton comprises variably deformed and metamorphosed sedimentary, volcanic and plutonic rock, spread from the late Archean to Mesoproterozoic, and it has been subdivided into a series of domains – the Carrapateena deposit being part of the Olympic Domain. The age of the iron oxide copper gold (IOCG) mineralisation in the Gawler Craton is uncertain, though it is interpreted in the literature to be associated with Mesoproterozoic magmatism of the Hiltaba Suite and the Gawler Range Volcanics.

The Carrapateena copper-gold mineral deposit is hosted in a brecciated granite complex, with both bornite and chalcopyrite copper mineralisation present – the bornite being a distinct higher grade zone of mineralisation. The top of the SLC Resource lies approximately 470 m below the ground surface, as illustrated in Figure 2.1.

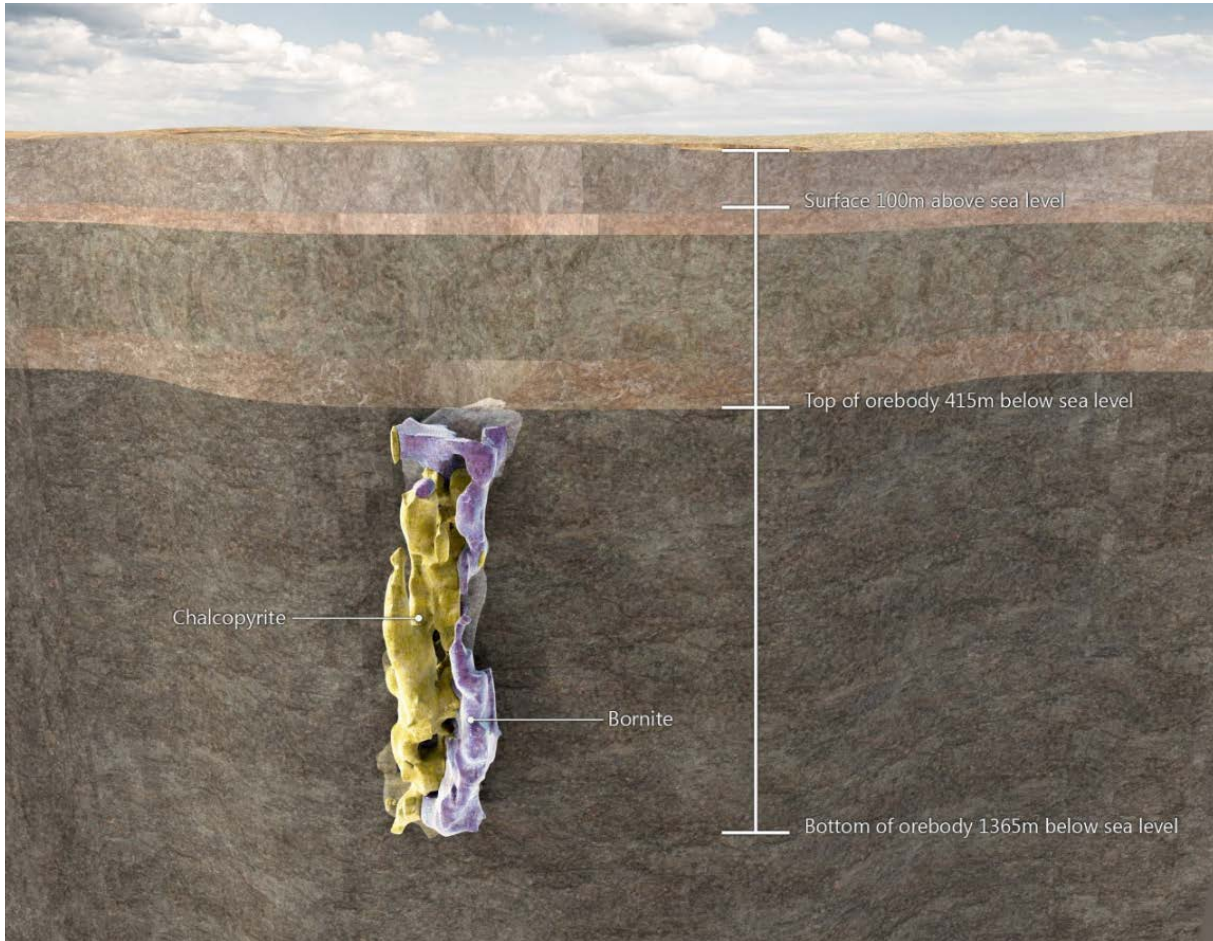
The vast majority of copper and gold mineralisation within the deposit is hosted by hematite-dominated breccias with moderate mineralisation occurring within hematite-altered granite breccias (Eastern Cu domain). Sulphides are the primary copper-bearing minerals in the Carrapateena Breccia Complex. Copper and gold mineralisation is structurally and chemically controlled, with subsequent alteration destroying mineralising structures. The most abundant sulphides are chalcopyrite, pyrite and bornite, and these constitute the majority of sulphides at Carrapateena. The less common sulphides are chalcocite, digenite and covellite, and in smaller amounts sphalerite and galena.

Gold mineralisation at the Carrapateena orebody is almost exclusively hosted by hematite-altered breccias. Gold grains are usually very small (10 µm), and when seen in polished section, are often

<sup>3</sup> Refer to the ASX release titled Carrapateena Project Mineral Resource Restatement and Ore Reserve Statement released on the ASX on 24 August 2017 and available at [www.ozminerals.com](http://www.ozminerals.com).

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intimately associated with copper sulphides. Gold grains are commonly a combination of gold and minor silver (electrum).



**Figure 2.1: Carrapateena Resource (SLC Project)**

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## 2.2 Mineral Resource Estimate

The Mineral Resource Estimate, as released on 9 December 2016 (see Table 2.1), represented a significant upgrade of resource classification with 46% of the Resource classified as Measured compared to the previously Restated 2015 Mineral Resource Estimate referenced in the PFS. The 2016 Mineral Resource Estimate also saw a decrease in uranium as compared to the 2015 Mineral Resource Estimate as a result of a changed cut-off grade shell. This 2016 Mineral Resource Estimate has been used as the basis to the Reserve that supports this FS.

**Table 2.1: Summary of 2016 Mineral Resource Estimate for Carrapateena Deposit**

Classification	Tonnes (Mt)	Cu (%)	Au (g/t)	Ag (g/t)	Cu (kt)	Au (koz)	Ag (Moz)
Measured	61	1.4	0.6	6.3	880	1,180	12.4
Indicated	65	1.6	0.6	7.0	1,030	1,300	14.7
Inferred	8	0.8	0.4	3.5	60	90	0.9
<b>Total</b>	<b>134</b>	<b>1.5</b>	<b>0.6</b>	<b>6.5</b>	<b>1,970</b>	<b>2,570</b>	<b>27.9</b>

Notes:

- 1 Refer to the report titled Carrapateena Project Mineral Resource Restatement and Ore Reserve Statement released on the ASX on 24 August 2017 and available at [www.ozminerals.com](http://www.ozminerals.com). OZ Minerals confirms that it is not aware of any new information or data that materially affects the information included in the 24 August 2017 report, and all material assumptions and technical parameters underpinning the estimates of Mineral Resources in the 24 August 2017 report continue to apply and have not materially changed.
- 2 The Mineral Resources reported above are inclusive of the Ore Reserves reported in this release.

## 2.3 Ore Reserve

The Ore Reserve Estimate for the Project (see Table 2.2) is based on the results of a June 2017 Mine Design Update and will supersede the Reserve announced in 2016.<sup>4</sup>

**Table 2.2: Carrapateena Ore Reserve Estimate July 2017\***

Classification	Tonnes (Mt)	Cu (%)	Au (g/t)	Ag (g/t)	Cu (kt)	Au (koz)	Ag (Moz)
Proved	0	0.0	0.0	0.0	0	0	0
Probable	79	1.8	0.7	8.5	1,400	1,800	22
<b>Total</b>	<b>79</b>	<b>1.8</b>	<b>0.7</b>	<b>8.5</b>	<b>1,400</b>	<b>1,800</b>	<b>22</b>

\* The information in this report that relates to Ore Reserves is based on and fairly represents information and supporting documentation compiled by Murray Smith B.Eng.(Mining), a Competent Person who is a Member and Chartered Professional of the Australasian Institute of Mining and Metallurgy (AusIMM Membership No. 111064).

Murray Smith is a full time employee of Mining Plus Pty Ltd, and prior to this study had no dealings with OZ Minerals Limited. Murray Smith is not a shareholder of OZ Minerals Limited, and is considered to be independent of OZ Minerals Limited.

<sup>4</sup> Refer to the report titled Carrapateena Project Mineral Resource Restatement and Ore Reserve Statement released on the ASX on 24 August 2017 and available at [www.ozminerals.com](http://www.ozminerals.com).

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The previous Ore Reserve Estimate for the Project (see Table 2.3) was based on the results of the 2016 PFS and announced in October 2016.

**Table 2.3: Previous Carrapateena Project Ore Reserve 2016**

Classification	Tonnes (Mt)	Cu (%)	Au (g/t)	Ag (g/t)	Cu (kt)	Au (koz)	Ag (Moz)
Proved	0	0.0	0.0	0.0	0	0	0
Probable	70	1.8	0.7	8.4	1,300	1,700	19
<b>Total</b>	<b>70</b>	<b>1.8</b>	<b>0.7</b>	<b>8.4</b>	<b>1,300</b>	<b>1,700</b>	<b>19</b>

## 2.4 Life of Mine Plan

The LOM Plan for the Carrapateena Project is made up of 94% Probable Ore Reserves with an additional 6% from Inferred Mineral Resources. This composition is associated with Inferred material that needs to be taken with the SLC due to the nature of the mining method. There is additional measured, inferred and indicated material outside of the SLC footprint.

The modifying factors used in the estimation of the Ore Reserve were also applied to the Inferred Mineral Resource in the LOM Plan. No resource conversion factors were applied to the Inferred Mineral Resource used in the LOM Plan.

## 2.5 Mineralised Grade Shells

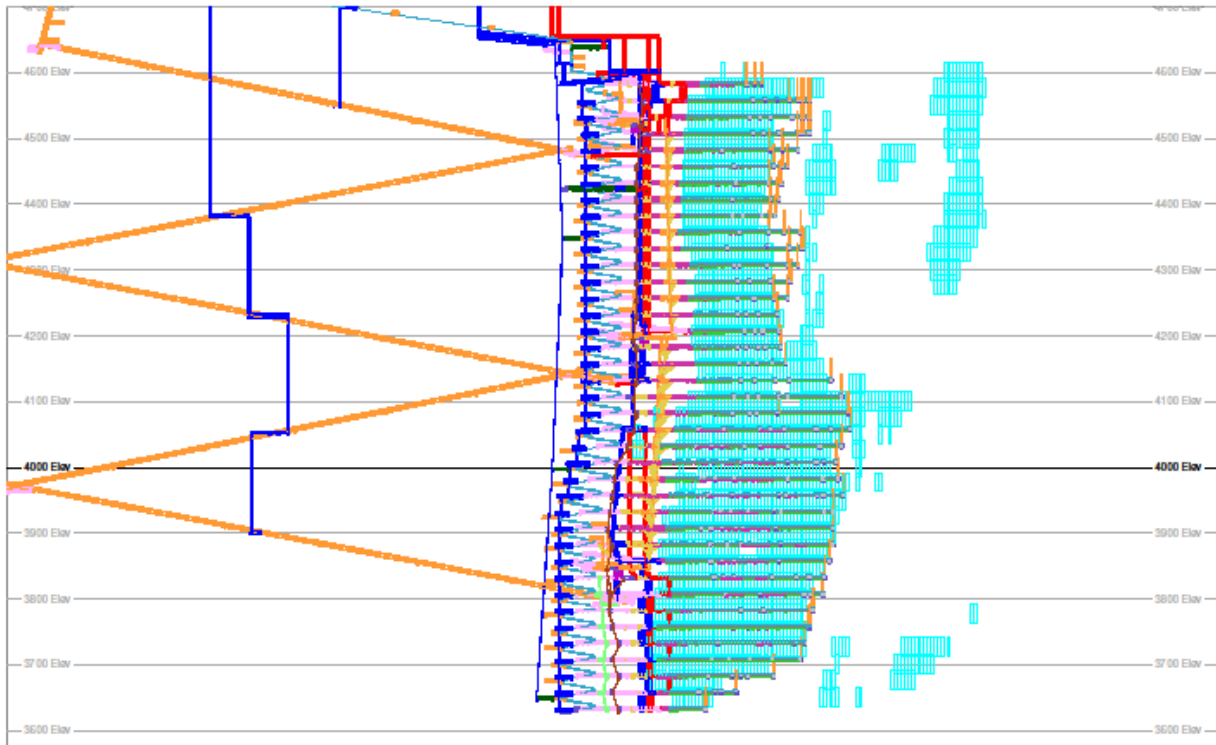
A Movable Shape Optimiser (MSO) review (see Figure 2.2 to Figure 2.6) has been completed for the Carrapateena orebody as part of the optimisation of the LOM Plan. These figures show a cross-section of the orebody at various cut-off grades, and the continuity of the higher-grade zones. The cut-off grade used in this update is outlined in Section 3.2.2.

This MSO work has identified higher grade satellite bodies in the Carrapateena mineralised footprint. While none of these satellite bodies have been included in the base case, the opportunity to supplement the SLC operation exists and will be progressed separately following further study work.

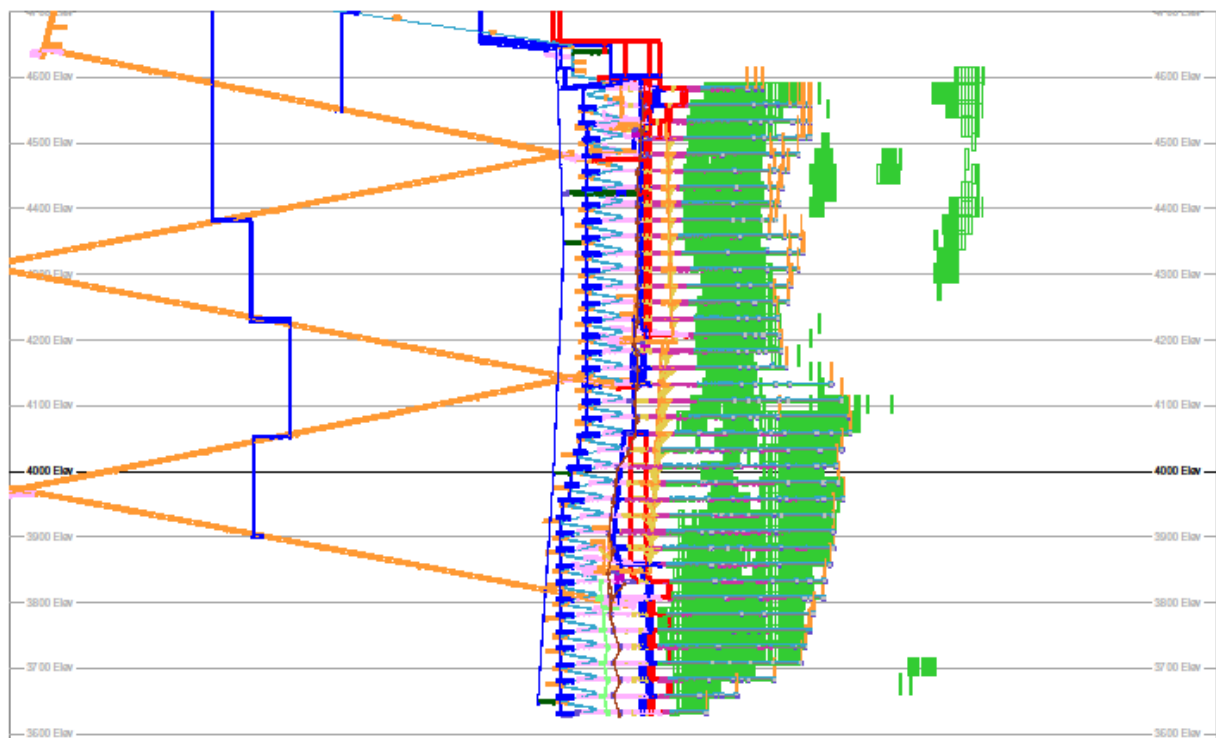
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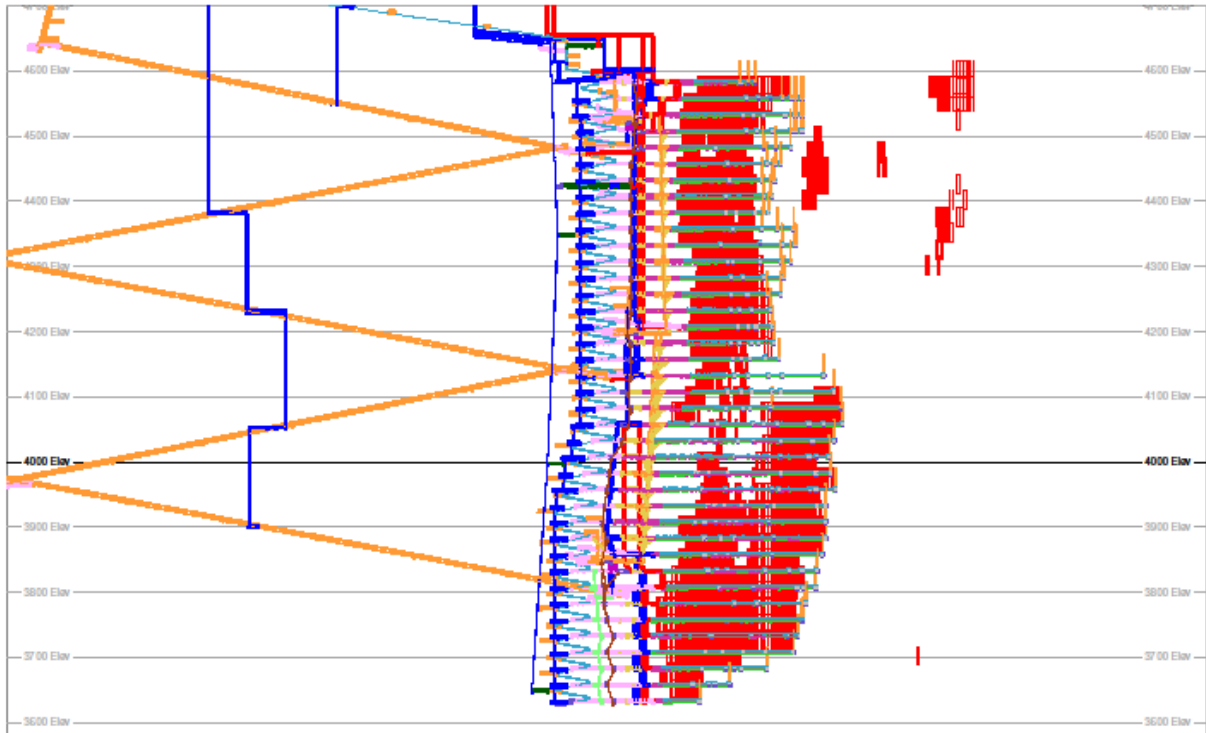


**Figure 2.2: \$62.5/t Minable Shape Optimiser Shapes**

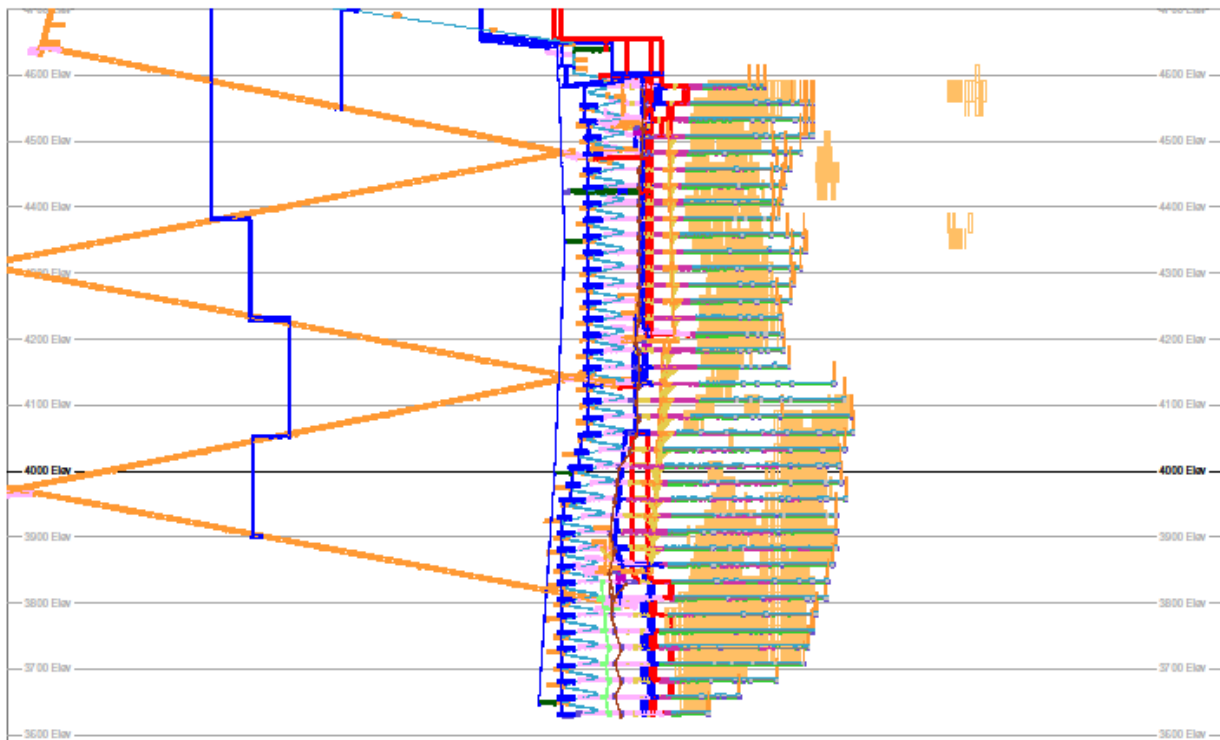


**Figure 2.3: \$75/t Minable Shape Optimiser Shapes**

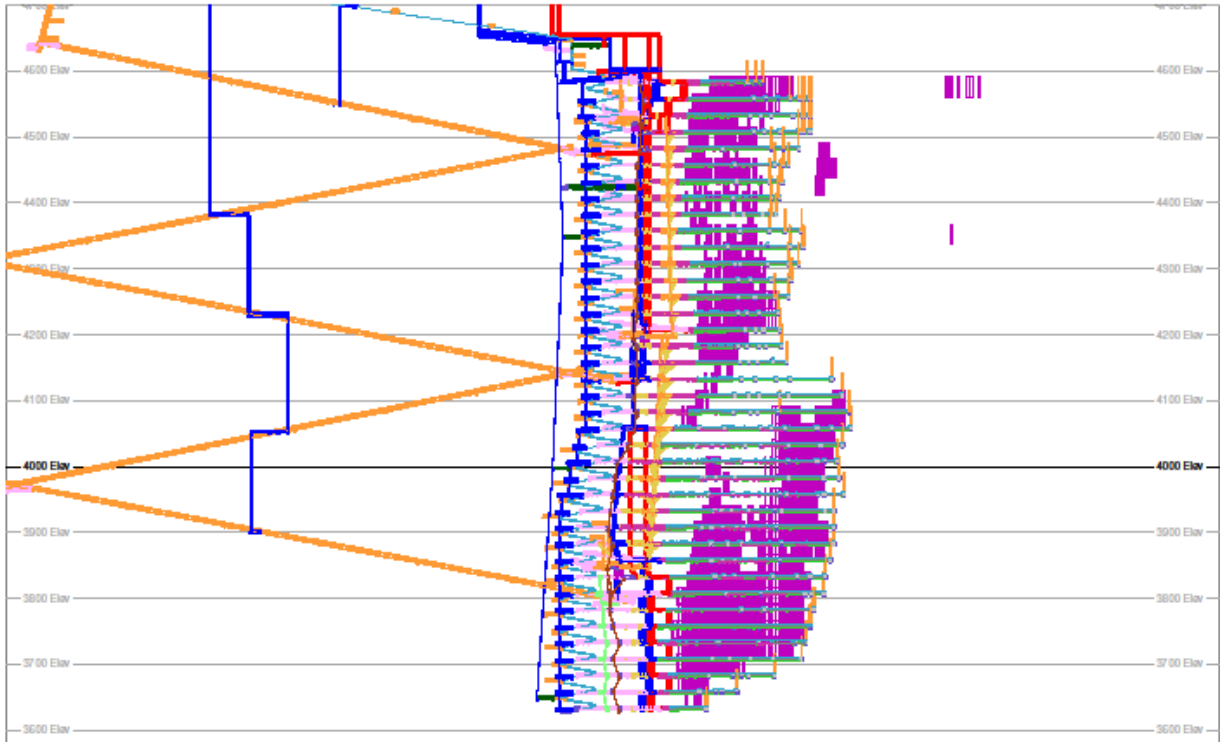
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**Figure 2.4: \$87.5/t Minable Shape Optimiser Shapes**



**Figure 2.5: \$100/t Minable Shape Optimiser Shapes**

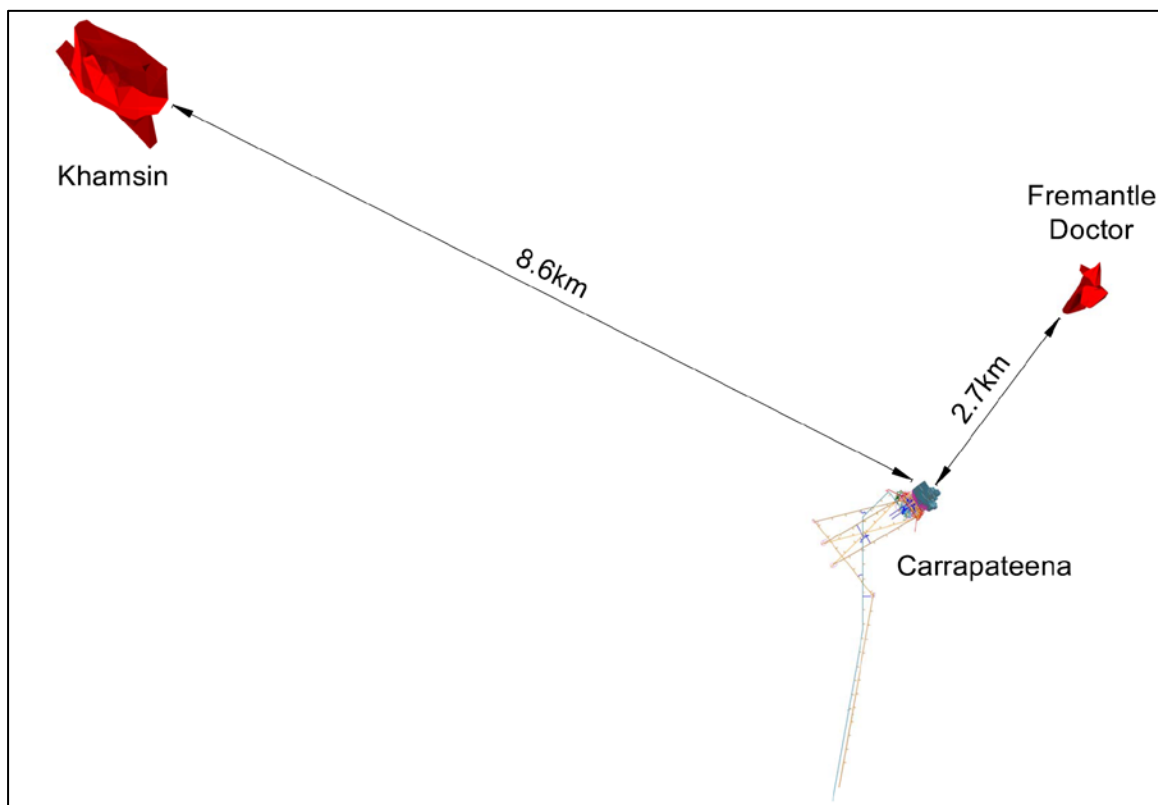


**Figure 2.6: \$112.5/t Minable Shape Optimiser Shapes**

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## 2.6 Regional Mineralisation

Previously identified mineralisation in the immediate vicinity of the Project may allow for the opportunity to grow Carrapateena as a longer-life mining jurisdiction with higher annual throughput. Within the Carrapateena region there are a number of known mineralised bodies that will be included in future resource studies and exploration drilling programs, as described below (see **Figure 2.7**).



**Figure 2.7: Known Regional Mineralisation and Proximity to Carrapateena**

### Fremantle Doctor

Fremantle Doctor is located only 2.7 km to the north east of the Carrapateena deposit. It lies within the boundary of the current Retention Lease and MLA.

To date, only 16 drill holes have been drilled into Fremantle Doctor, so there is insufficient data to support firm planning assumptions. However, it is likely that due to its depth from surface, ore, if defined, would likely be accessed from underground and fed into the existing Carrapateena materials handling system via a 2.7 km incline. Depending on the grade of the deposit, this could either be a high-grade sub-level open stope operation or lower-grade SLC. No resource has been produced for this deposit. This opportunity has been excluded from this FS base case.

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### **Khamsin**

Khamsin is the largest of the inferred deposits in the area. Given its proximity to the Project, its development could leverage Carrapateena infrastructure.

The Khamsin target would require a separate approval process from the Government of South Australia and the Kokatha People. However, it demonstrated to OZ Minerals the potential of the region with mineralisation to expand the Carrapateena area, thereby extending the life of the operation beyond the current Project LOM. This opportunity has been excluded from this FS base case.

### **Carrapateena Satellite Orebody**

A Scoping Study has been completed on one of the larger higher-grade Carrapateena satellite orebodies, which suggests it could support a sub-level open stope operation with an estimated total inventory of approximately 2 Mt based on the 2016 Resource. Mining of the satellite orebody could utilise the existing mobile equipment and materials handling system, and would provide additional tonnes to the Carrapateena operation. The open stopes could also be utilised for underground waste storage over the LOM.

Timing for development of this satellite orebody would likely suit years 3 to 5 of the SLC operation, after establishment of the SLC but soon enough to enable the existing mobile fleet to be used at minimal additional cost.

The scope of works for the satellite orebody has been contemplated in the scope of the proposed future Mining Lease for Carrapateena. There is provision for developing the satellite orebody within the scope of the MLA for Carrapateena. Economic benefit and cost for the satellite orebody has not been included in the FS base case, other than provision for resource drilling. The satellite orebody presents a potential near-term upside to the Carrapateena base case.

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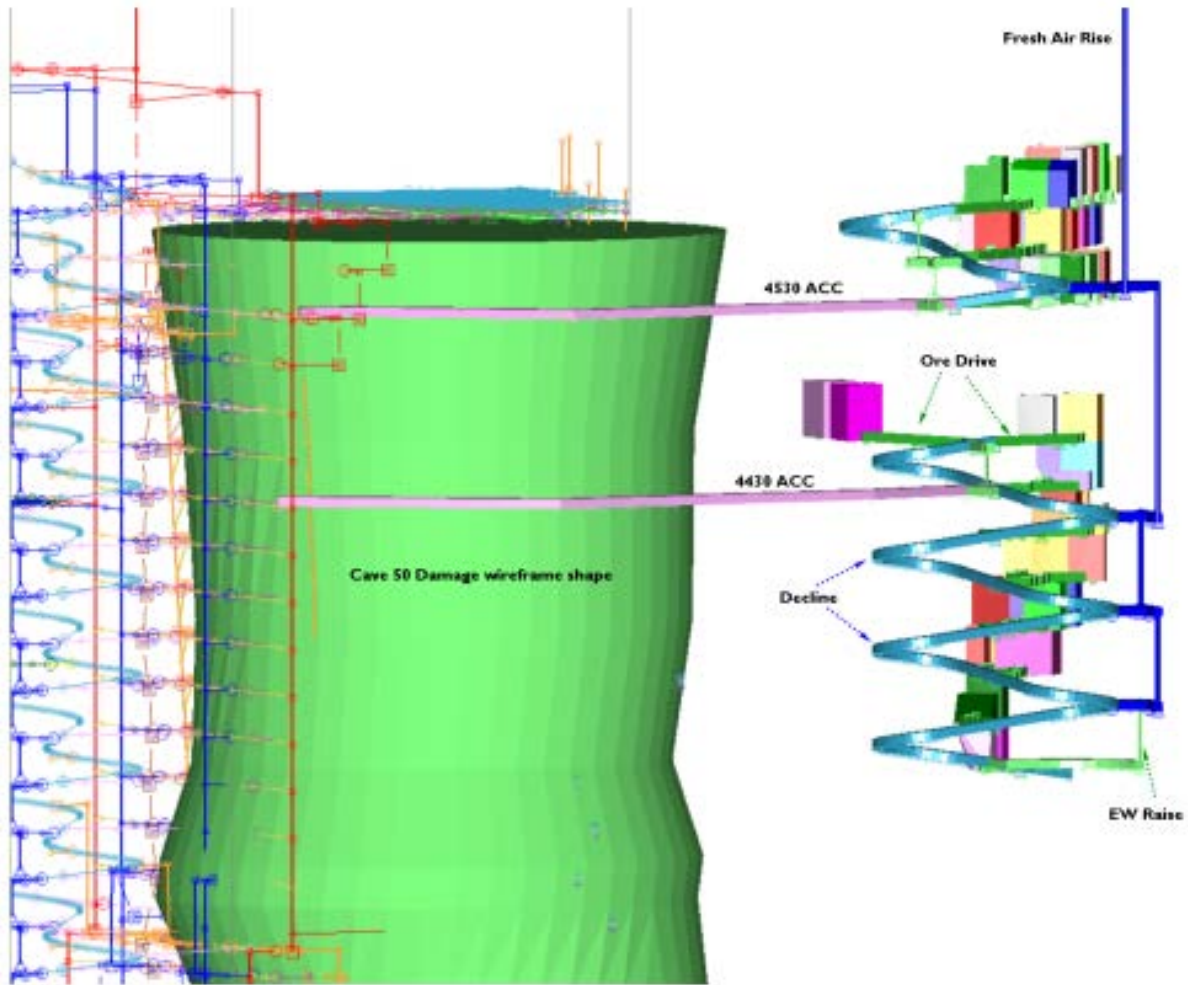


Figure 2.8: Carrapateena Satellite Orebody Design – Isometric View

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### 3 MINING METHOD

#### 3.1 Geotechnical Background

Geotechnical data was gathered in drilling campaigns undertaken by Teck Australia Pty Ltd (Teck) and more recently by OZ Minerals. Teck recovered 54,700 m of core from a drilling campaign dominated by vertical holes, and point load tested basement rocks from five drill holes. The OZ Minerals program recovered 49,500 m of diamond core from inclined holes and cored a limited number of holes through the overburden.

Specimens from all domains, including overburden, were sent for the full suite of materials testing, including triaxial testing, joint shear strength and acoustic emission stress testing. OZ Minerals drilled three water bores above the orebody, in order to test aquifers in the overburden. OZ Minerals also had 19 lines of seismic survey shot over the top of the orebody in order to better define the various horizons and major structures traversing the mine area.

The work described above was used to define the geological and geotechnical environment in which the mine is to be built. Of note is the 280 m thick Woomera Shale, which is fissile, rapidly breaks down to fines and contains clay. The mineralisation itself has only two interpreted faults near it, is massive – showing broadly spaced joints, has intact rock strength ranging from about 120 to 150 MPa and the block model of Rock Mass Rating (RMR) (Bieniawski) shows typical values ranging from 70 to 80. This is equivalent to a Mining Rock Mass Rating (MRMR) (Laubscher) of 63 to 72.

##### 3.1.1 Caveability Assessment

Two industry standard methodologies were used for assessing the caveability of the cover sequence at Carrapateena. The Laubscher methodology indicates the cave should propagate through the overlying sequence. The Flores and Karzulovic benchmark indicates some uncertainty in propagation of the cave to surface. However, for comparison, other SLC caves such as Ridgeway and Telfer have caved greater distances than this benchmark indicates.

Notwithstanding that model and benchmark data suggests the overburden will cave, a number of options to support caving within the Carrapateena SLC have been considered as part of the mining study. Methods considered include:

- Designing a suitable footprint on the upper levels to increase the design hydraulic radius to a value suitable for caving to occur.
- Establishing a higher undercut on the top SLC production level that could help create a larger unstable void at the top of the cave and support cave initiation.
- Pre-conditioning using high pressure water from surface to target desired stratigraphy within the orebody.

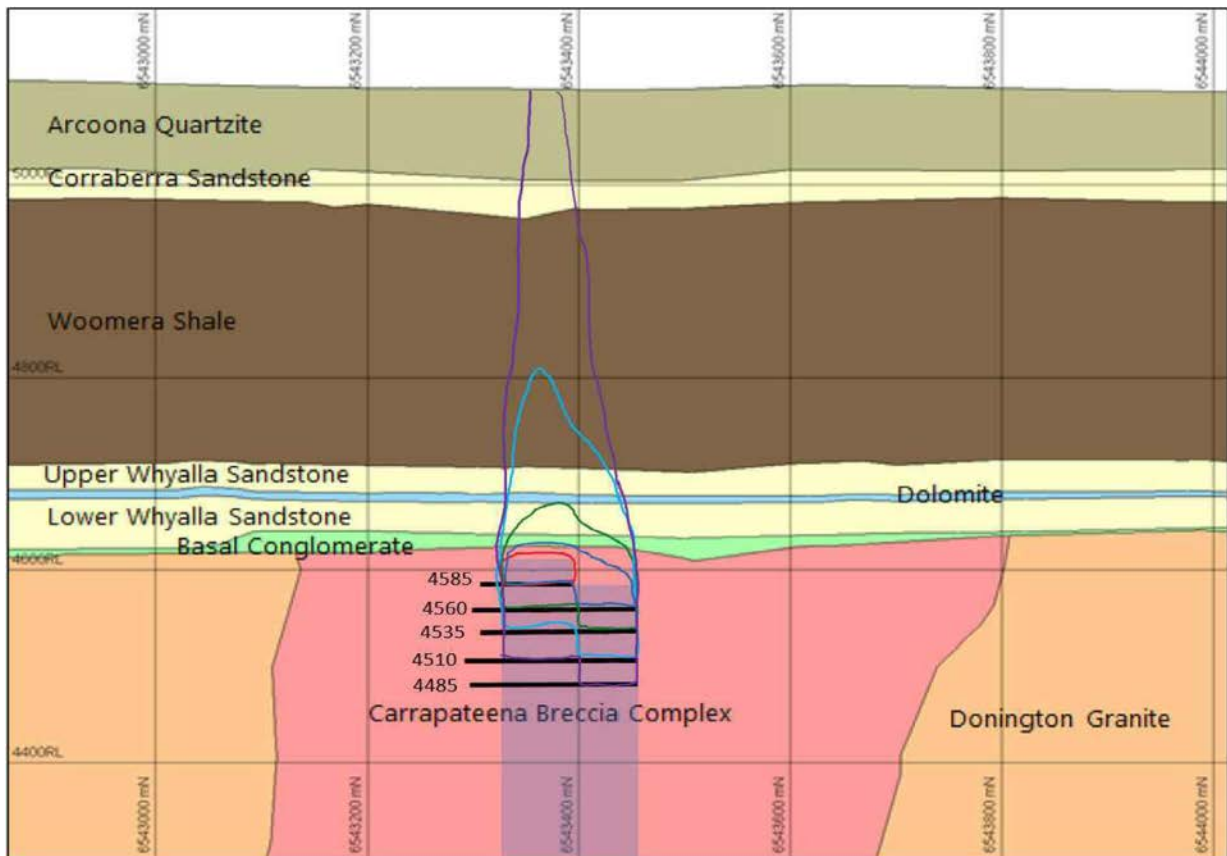
- Long hole (+50 m) uphole blasting above the first SLC production level to fracture material immediately above the cave zone – by extending some sub-vertical production holes, dedicated sets of blast upholes, or a combination of both.
- Mining of drill and blast horizon above the SLC footprint to fracture the rock mass above in areas not easily accessed by hydrofracture or uphole blasting.
- Post-conditioning by hydraulic fracturing from surface as a recovery method post a cave stall event.

Numerical modelling during the FS has shown that pre-conditioning the Arcoona Quartzite is not required, despite the PFS concluding that the Arcoona Quartzite would require pre-conditioning. Additionally, numerical modelling by Beck Engineering identified the Whyalla Formation below the Woomera Shale as a unit that will require pre-conditioning.

As a result of these findings, the need to minimise air gaps and to allow a rapid ramp-up, the FS mine design has focused on optimising the SLC footprint size and hydraulic radius to more reliably enhance caving to surface. Additionally, pre-conditioning through the hydraulic fracturing of key stratigraphy is also included as part of this FS base case. This will be done from surface utilising existing or new diamond drill holes. Pre-conditioning using water is one of the main available techniques available to support cave propagation and has been demonstrated to be a cost-effective means of cave enhancement, inducement and seismicity management. This preconditioning water will report within the mining zone and to the underground mine. This same process has been successfully used at caving operations such as Cadia East and North Parkes.

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**Figure 3.1: Indicative Cave Back Propagation to first surface expression.**

Monitoring cave propagation will be done via a seismic system, monitoring holes, extensometers and a cave marker program, and is outlined in the Carrapateena Cave Monitoring Plan. Cave draw will be closely regulated during propagation as to not 'overdraw' and create a hazardous air gap. Once the cave has reached surface, the risk of an air gap between the caved material and the material yet to cave is significantly reduced.

### 3.1.2 Geotechnical Test Work

Additional geotechnical test work has been carried out in Q2 2017, with further testing required during project execution. The additional test work will support future caveability assessment, update the underground stress and geotechnical model and determine ground support requirements within the cave for the start of production.

Additional surface diamond drilling completed in June and July 2017 for geotechnical purposes provided extra samples in the lithologies where data was previously lacking or had a low statistical confidence. The tests on these samples included the following, and should improve the data confidence throughout all the deficient zones:

- Ultimate Compressive Strength (UCS)
- Ultimate Tensile Strength (UTS)

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- Elastic properties (Young's Modulus and Poisson's Ratio)
- Aggregate and Slake Durability Testing
- Atterburg Limits and Swell Index.

### 3.1.3 Underground Stress

The orientation of SLC production drives at depth is critical for stability and the minimisation of support damage and rehabilitation. The FS base case has realigned the drives to match the direction as defined by Beck Engineering using the Abaqus numerical modelling work, rockmass properties and acoustic emission stress measurement results previously collected by the Western Australian School of Mines.

To more accurately define this stress direction, a number of additional tests are being considered for commencement in H2 2017.

### 3.1.4 Geotechnical Block Model

The current geotechnical block model was updated in March 2017 and includes Rock Quality Designation (RQD), Rock Quality (Q), Rock Mass Rating (RMR) and Geological Strength Index (GSI) and all the parameters used in the calculation of RMR and Q. The model is based on all diamond drilling undertaken up to and including 2016. An update of the geotechnical block model will be completed once laboratory results are received and interpreted, and will be available for use in the next iteration of the mine design, caveability numerical modelling and shale fines migration modelling.

### 3.1.5 Groundwater Modelling

Updates to the PFS groundwater modelling for the underground mine have been carried out based on increased site knowledge from the decline water inflow and improved model assumptions. This has seen a significant decrease in the total water inflow modelled to the underground.

As a result of groundwater inflow modelling, the FS base case has assumed a conservative maximum dewatering requirement of 300 L/sec at the start of production during cave propagation. During Project execution, and prior to finalisation of pump station designs, final calibration and update of the mine scale groundwater model will take place. OZ Minerals expects that the 300 L/sec maximum may decrease.

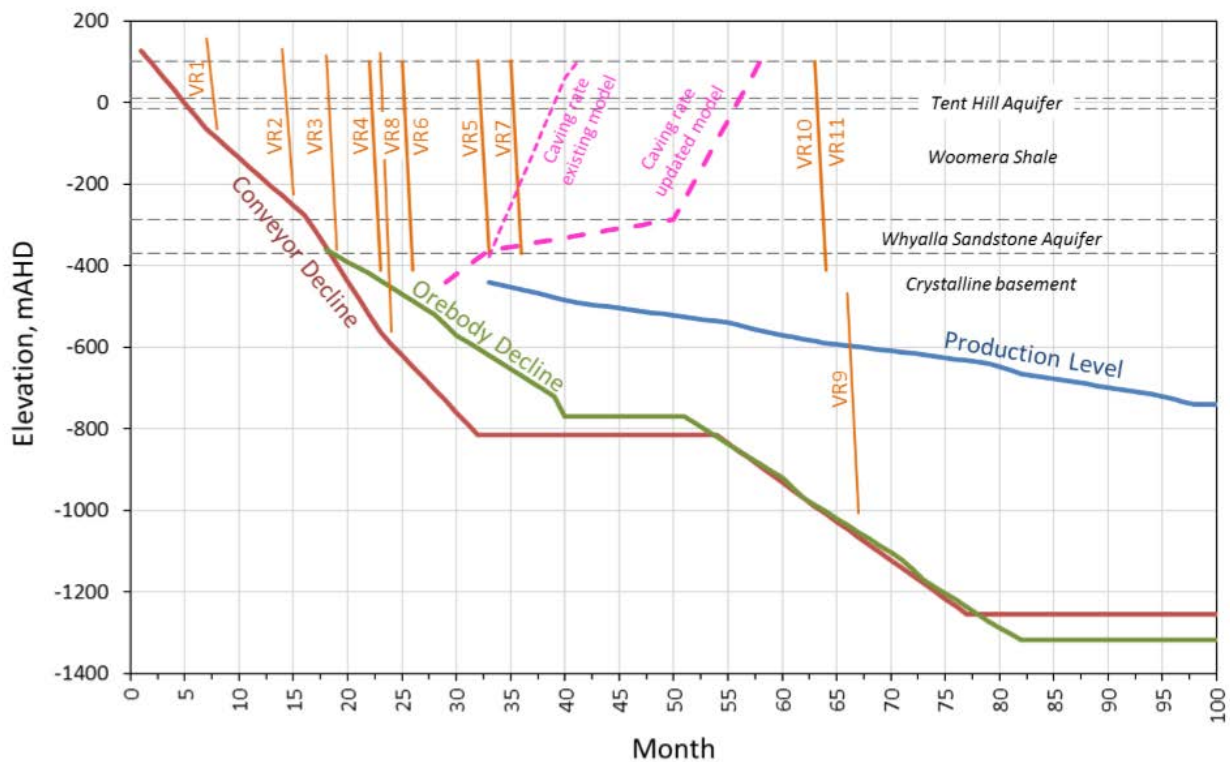
The following improvements to the mine scale groundwater model were made to improve on the original PFS predictions:

- External (to the groundwater model) estimation of potential borewater drainage from the fracture zone to the SLC as the overburden Hydro Stratigraphic Units (HSUs) undergo progressive fragmentation and subsidence. Previous groundwater models were unable to reflect the progression of the cave, giving a misleading 'peak flow' generated from the instantaneous growth of the cave to surface.

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- Transient calibration of the mine-scale groundwater model against the rate of groundwater inflow to the conveyor decline that has been observed in recent months since the decline has intersected and passed through the Tent Hill Aquifer.
- Updating of the mine-scale groundwater model with values of the bulk hydrogeological properties determined as most appropriate, based on the review of hydrogeological properties in Task 1 Cave growth, based on run 5 and 6 of the caveability assessment.

Figure 3.2 is plotted along an x-axis from start of decline development, through to installation of vent rises and mining of the SLC to depth.



**Figure 3.2: Underground Mine Timing and Interaction with Aquifers Based on Elevation**

Additional work is underway to improve the groundwater modelling for the SLC and the interaction of groundwater with surface rain fall events. Modelling work will focus on the probability of rainfall events, such as a 1-in-100-year event, and the subsequent flow of this water into the mine.

This water flow will be via recharge of the groundwater aquifers in the area, as well as flow of rain through the cave subsidence zone and cave material into the operational mine. This work will relate back to site assumptions for rainfall events and regional water modelling.

Management of water within the mine is covered in Section 3.2.13.

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### 3.2 Mine Design

A full redesign of the SLC has been undertaken leveraging the PFS design, the new OZ Minerals Mining Study team and independent SLC technical experts. This update has resulted in reduced anticipated mine infrastructure requirements, an SLC production layout that is intended to support safe productivity and staged automation, and the relocation of all permanent infrastructure out of mineralised material into the host granites. The key mine design updates are listed in Table 3.1.

**Table 3.1: Key Mine Design Updates**

Design Update	Design Improvements
Main Tjati Decline	<ul style="list-style-type: none"> <li>Mine access design changed from a single combined service and conveyor decline to twin decline, one for access and one for materials handling.</li> <li>Tjati Decline and capital level development location has changed from north-east side in the Carrapateena Breccia Complex to the south-west side in the host Granite. This will allow for future changes to cut-off grades.</li> <li>Shortened decline distance to first ore reducing overall development metres, facilitating an earlier production start date.</li> <li>Upper, near ore, Tjati Decline alignment changed to provide access to diamond drilling platforms on the south-west side of the ore zone.</li> </ul>
SLC Level Layout	<ul style="list-style-type: none"> <li>New three-crusher strategy, with the first crusher positioned near the top of the cave eliminating temporary surface crusher.</li> <li>Improved level layouts to improve productivity and reduce traffic interactions along the perimeter drives, with truck haulage-specific layouts for the first three levels and those below Crusher 3.</li> <li>Increased productivity by reducing distance from drawpoints to ore passes.</li> <li>Cave advance azimuth changed by 180 degrees.</li> <li>Added a higher level (4585 level) to support earlier ore access.</li> <li>Power Geotechnical Cellular Automata (PGCA) draw model shut-off grade optimised.</li> <li>Slotting arrangements changed to reduce slot rising and simplify cave initiation on each level.</li> <li>Conveyor transfer development arrangements changed.</li> <li>Designed to enable automation in dedicated 'production zones'.</li> <li>Applied operational learnings from other Australian SLC mines (e.g. Telfer and Ridgeway).</li> </ul>
Primary Ventilation	<ul style="list-style-type: none"> <li>The number of primary ventilation rises through to the surface reduced from 10 to 4.</li> <li>Ventilation design changed to reduce development and improve secondary ventilation.</li> <li>Fresh air 'back bone' to supply clean air direct to working locations.</li> </ul>
Materials Handling System	<ul style="list-style-type: none"> <li>Ventilation decline designed to be used as the conveyor decline once the Mining Lease has been approved.</li> <li>Updated Materials Handling System linked to updated mine design.</li> <li>Improved location and Reduced Level (RL) for efficient SLC production.</li> </ul>

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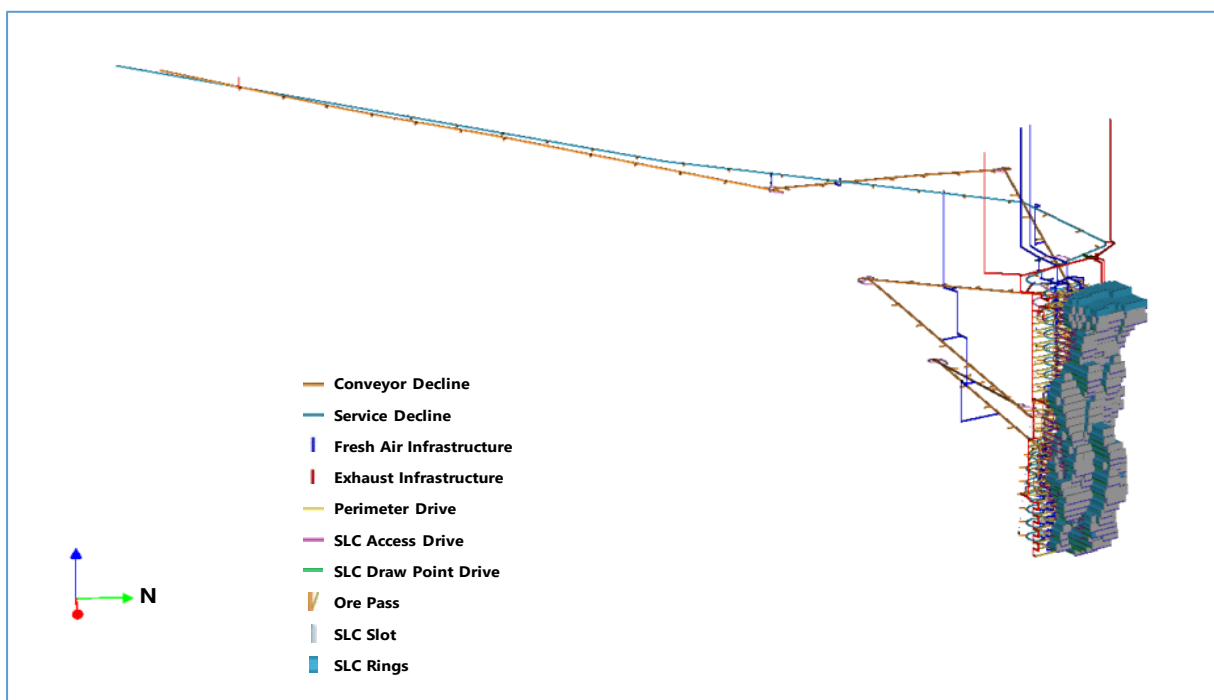
Further work is required to optimise the layout and orientation of the materials handling system prior to project execution. This optimisation will focus on operational suitability of the materials handling system and timing to match SLC production requirements. Final materials handling work is expected to be an optimisation step and not a material change.

### 3.2.1 Mine Design Overview

The proposed SLC mine layout for Carrapateena is shown in Figure 3.3. Access for personnel and equipment is via the Tjati Decline. A separate “conveyor” decline has been designed to run parallel with the Tjati Decline for the first 2 km, and provide primary ventilation during the advanced exploration works period. The Tjati Decline route has been designed with a number of stockpiles that will enable planned future resource definition and diamond drilling programs. Horizontal drilling from underground will be required to improve resource definition.

The conveyor decline comprises a number of straight sections designed to house single conveyors with transfer points located at each end. The conveyor decline is located further from the mineralisation than the Tjati Decline, except for the sections that meet the underground crusher installations.

LOM infrastructure such as the crusher chambers, conveyor decline, orebody decline, and ventilation raises are offset from the orebody and located outside the modelled major deformation zone to reduce the threat of cave initiated damage.

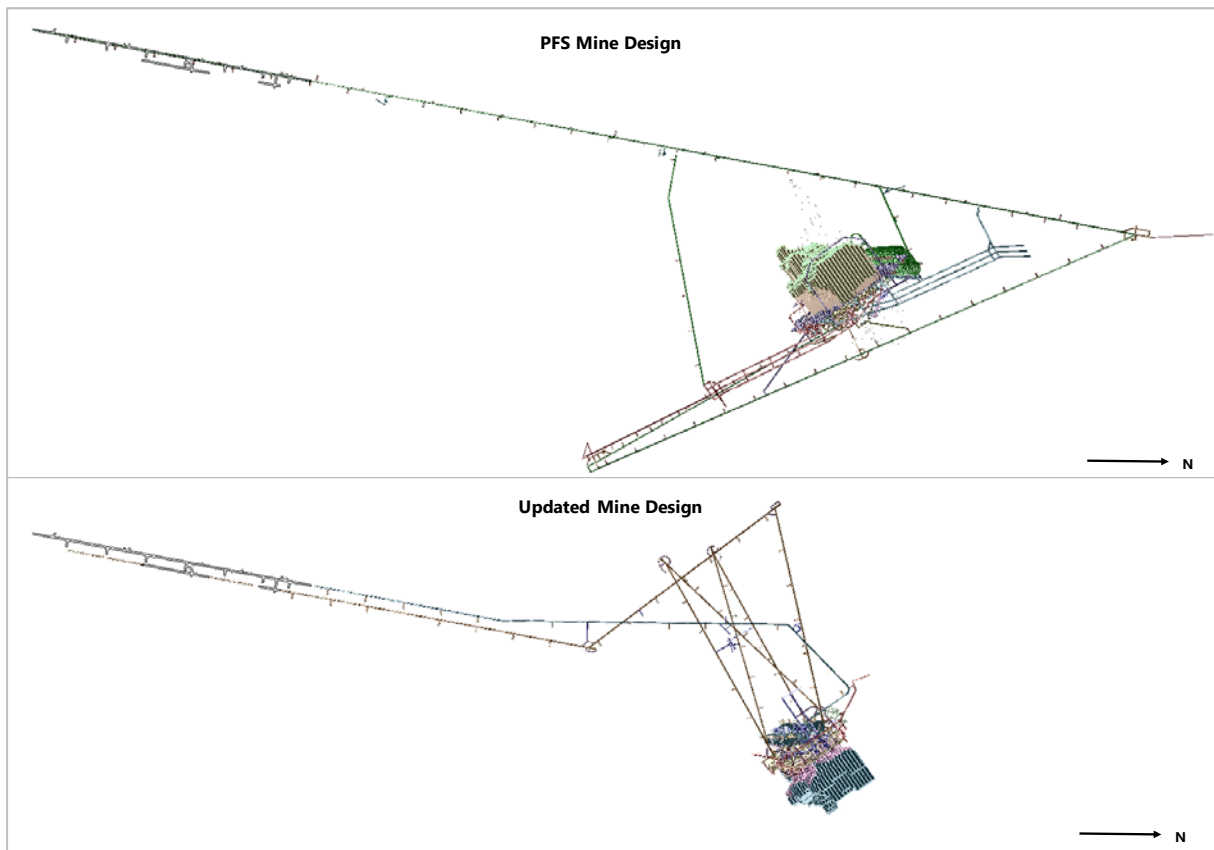


**Figure 3.3: SLC Mine Layout (looking west)**

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The position of the Tjati Decline below 4600 m RL has been moved from the north-east side in the PFS to the south-west side of the orebody. The updated decline route achieves a more direct path to the SLC production area with less development to first ore as compared to the PFS. The Tjati Decline is located within the stress 'shadow' of the cave but has been designed outside the significant damage envelope predicted by geotechnical modelling.

Figure 3.4 compares the plan views of the PFS and the FS mine designs.



**Figure 3.4: PFS Mine Design vs. Updated Mine Design (Plan View)**

The conveyor decline has been designed in long straight sections to allow for conveyor installation. The conveyor system comprises seven sections.

The Tjati Decline and the conveyor decline have a number of ventilation links between them in order to provide a ventilation path through decline development. The ventilation links between the Tjati and conveyor declines have been designed with access drives on each decline, connected by vertical raisebored development.

### 3.2.2 Sub-Level Cave Design

The FS updated SLC design has been improved over the PFS in the following areas:

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- Draw modelling Shut-off Value changed from \$100/t to \$87.5/t initially (four years) and \$92/t for the remainder of the mine life. This work lowered the mine's cut-off grade following shut-off value optimisation described in Section 3.2.3.
- Caving direction changed from a bearing of 55° to a bearing of 235° (clockwise from north). On each level, the cave starts on the north-east side and retreats to the south west (new perimeter drive and decline location), as shown in Figure 3.9.
- Inclusion of 4585 m RL as a small footprint upper '1/2 Level' above the previous SLC shape. The 4585 level became economic due to the location of the decline to the south west of the orebody, shortening waste access requirements, and supported earlier ore access dates.
- Change in multiple level draw strategy and initial cave extraction strategy from 40%, 60% and 90% draw for primary, secondary and tertiary draw respectively to 50%, 70% and 90%. This allows for additional ore tonnes earlier in the mine's production profile (i.e. drawing 50% of the fired tonnes on the top level, up from 40%).
- Level access design updated to improve safety by reducing the number of vehicle interactions, improve productivity by moving ore passes closer to draw points and allow for future automation by designing separate work areas.
- Simplification of cave initiation slotting arrangements, by smoothing out and reducing the number of slot drives per level.

### 3.2.3 Shut-off Value Optimisation

The design of the SLC envelope and draw modelling for the LOM plan was based on shut-off values for the first four years of \$87.5/t and \$92/t for the remainder of the mine life. These shut-off values were determined following iterative expert reviews of the design, cave flow simulation results and high-level economic analysis.

The high-level economic analysis was conducted using recovered SLC ore, including dilution, which was forecast using Power Geotechnical Cellular Automata (PGCA) software. The PGCA software was run using a range of net value per tonne (NVpt) shut-off values to simulate cave flow and ore recovery based on the Mineral Resource block model for different cave extraction strategies.

The outputs from the PGCA runs inputted into a discounted cash flow (DCF) model to estimate the time-based Project value. The cost input parameters for the DCF model were based on work in progress updates to the PFS cost model.

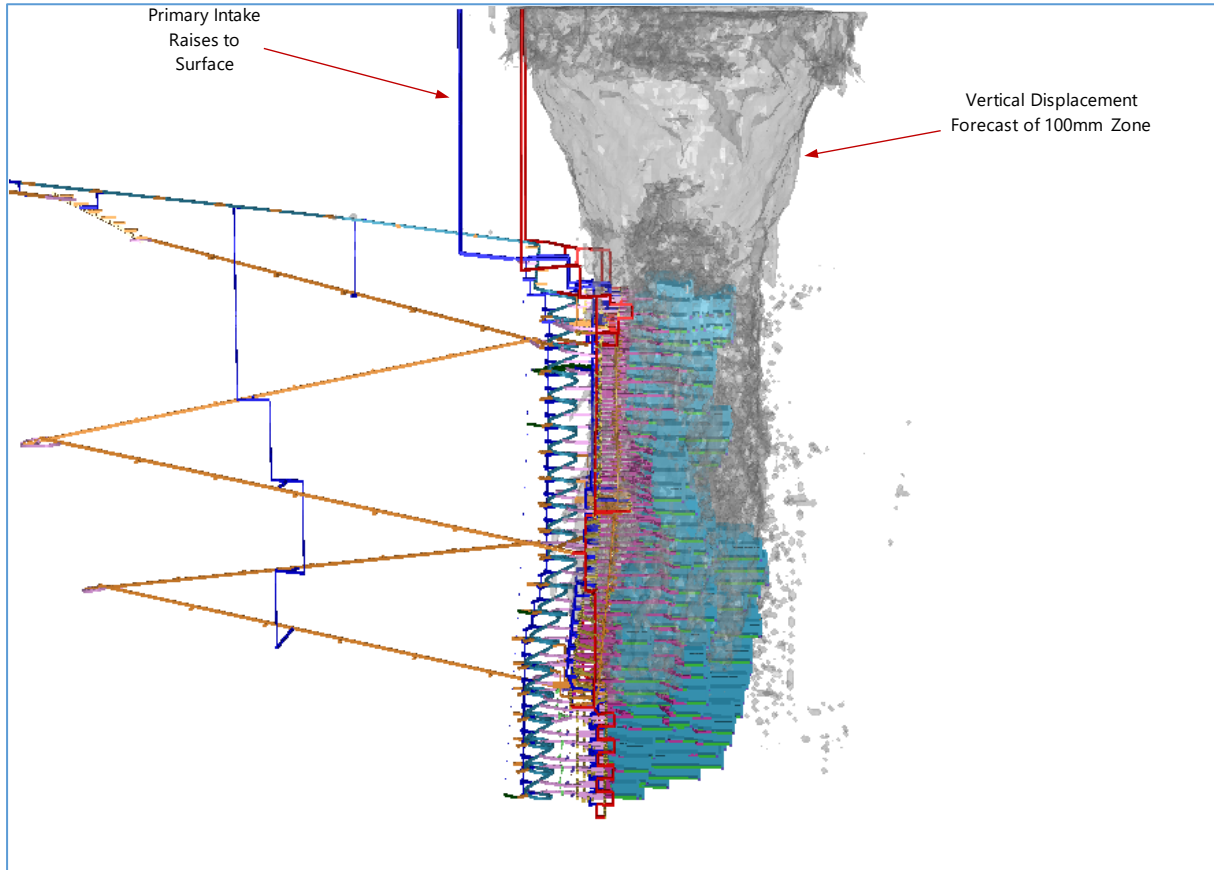
A DCF model was created for each of the PGCA cases with shut-off grades of \$75/t, \$87.5/t, \$100/t and \$112.5/t.

The results of the shut-off grade resulted in a shut-off value of \$88/t to optimise IRR for the first four years, before transitioning to a shut-off value of \$92/t to optimise DCF for the Project.

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### 3.2.4 Development Stand-off Distances and Exclusion Zones

The infrastructure has been located outside the deformation zone of the SLC as shown in Figure 3.5.



**Figure 3.5: SLC Development Design Showing the Cave Exclusion Zone, Looking North-West**

### 3.2.5 Decline Development

The Tjati Decline design, following the introduction of a second, independent conveyor decline, is based on the following parameters:

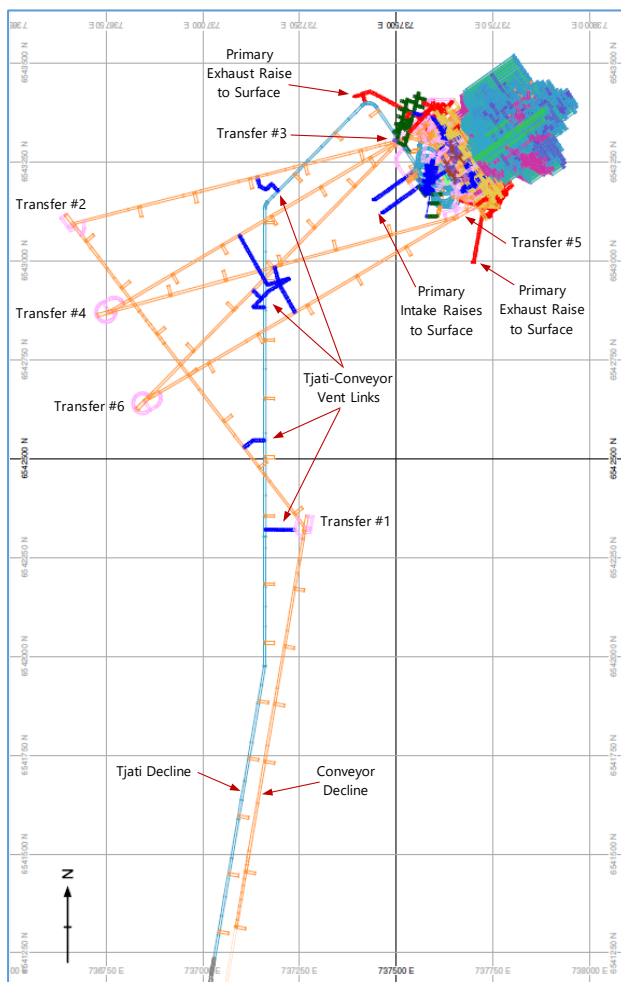
- Stockpile spacing at 200 m
- Minimum radius of curvature of 25 m (centre of drive).

The Tjati Decline provides access to each production level, however prior to the commissioning of Crusher 1, all material handling is assumed to be via truck haulage.

The current Retention Lease approval allows establishment of the Tjati Decline and a parallel ventilation decline. Full mine decline development, including the transition of the ventilation decline to a conveyor decline, and SLC production requires approval of the MLA, expected Q1 2018.



An intake raise will be extended with the Tjati Decline in 25 m vertical increments to provide fresh air to the decline. The decline fresh air intake is based on a 3.0 m diameter raisebore. A plan view of the decline accesses can be seen in Figure 3.6.



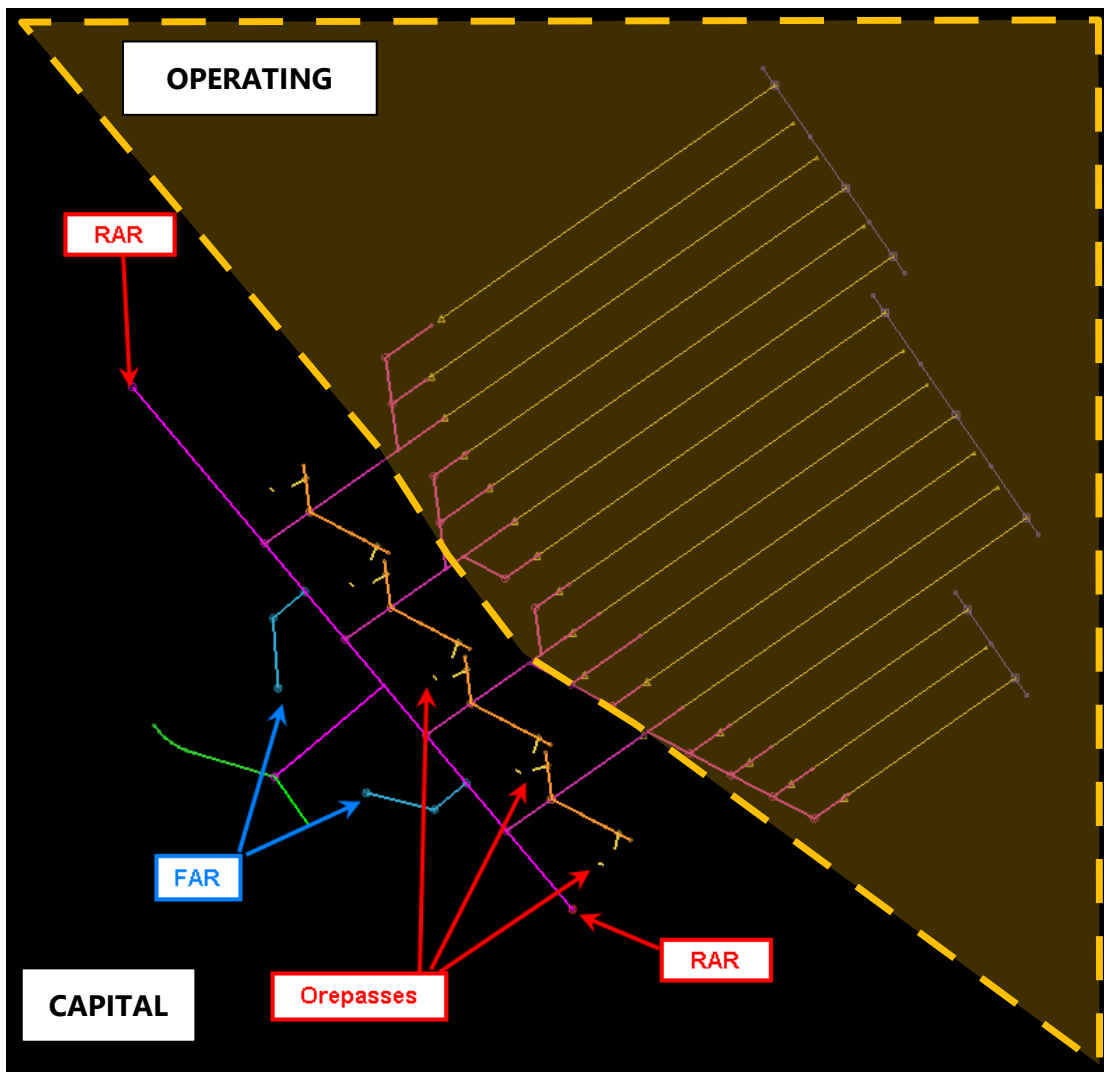
**Figure 3.6: Decline Accesses from Surface, Plan View**

### 3.2.6 Lateral Development

Development up to the wet commissioning of the processing plant in Q4 2019 has been considered Project Capital. Following this, sustaining capital and operating costs have been allocated as per Figure 3.7.

Figure 3.7 shows that sustaining capital includes all development required to establish the backbone of the mine. It also includes declines, perimeter drives, ventilation (Return Air Rise (RAR) and Fresh Air Rise (FAR)) and ore passes, as well as ongoing infrastructure such as future workshops, crusher stations and materials handling. In summary, it includes items with multiple uses or those that will be used over more than one year. Operating costs are limited to development that has a short lifespan or is single use, such as the SLC cross cuts and slot drives.

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**Figure 3.7: Sustaining Capital and Operating Demarcation when in Operational Phase**

The SLC design comprises the following lateral development components:

- Conveyor decline for conveying ore
- Decline adjacent to the orebody for level access – the Tjati Decline
- Total of 39 production levels, spaced at 25 m vertically
- First (or top) production level at 4585 m RL (approximately 485 mbs)
- Last (or bottom) production level at 3635 m RL (approximately 1,425 mbs)
- Crusher 1 located at 4530 m RL
- Crusher 2 located at 4205 m RL
- Crusher 3 located at 3855 m RL
- Main workshop, refuelling bay, wash bay and crib room located at 4430 m RL.

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### 3.2.7 Vertical Development

The SLC design comprises the following vertical development components:

- 2 x Primary exhaust raises (surface expressed and underground)
- 2 x Primary intake raises (surface expressed and underground)
- Ore passes
- Ore pass finger raises
- Crushed ore bins
- Slot rises to initiate caving on each level.

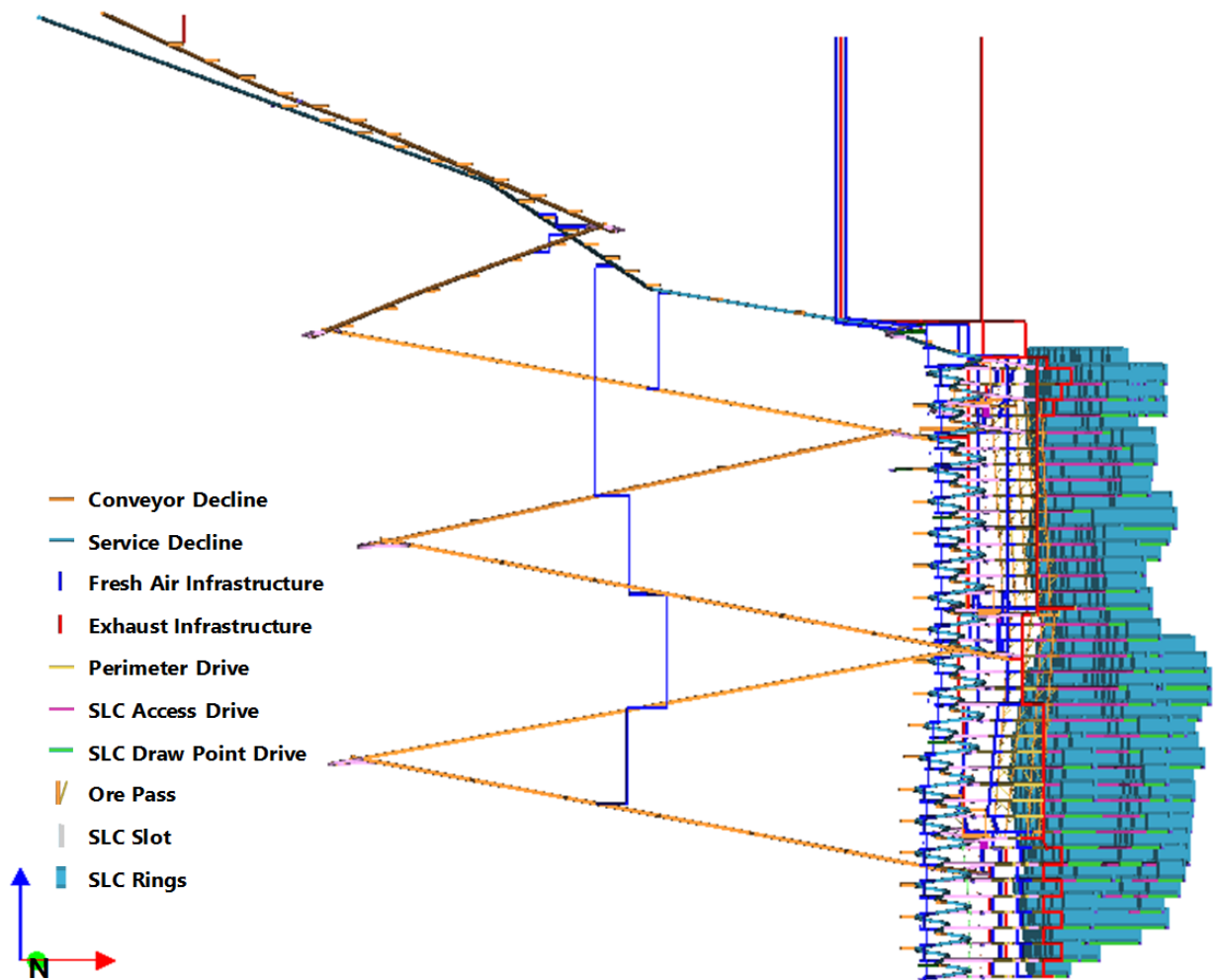
The majority of the raises will be developed using a raisebore at 3.0 m and 5.0 m diameters. Shorter raises between 25 m levels will be developed as longhole raises.

Large diameter (5.0 m) raises developed through the Woomera Shale will require remotely sprayed shotcrete (or fibrecrete) linings to prevent degradation of the rock unit over the mine life.

### 3.2.8 Level Layout

Following operational and technical review by the Mining Study Team and SLC technical experts, the SLC production level layout has been updated. This update has taken into consideration cave flow modelling, the footprint required to improve caveability to surface, operational philosophy and level interactions as well as future automation optionality and the potential to expand footprint at lower cut off grades in the future to increase production rates.

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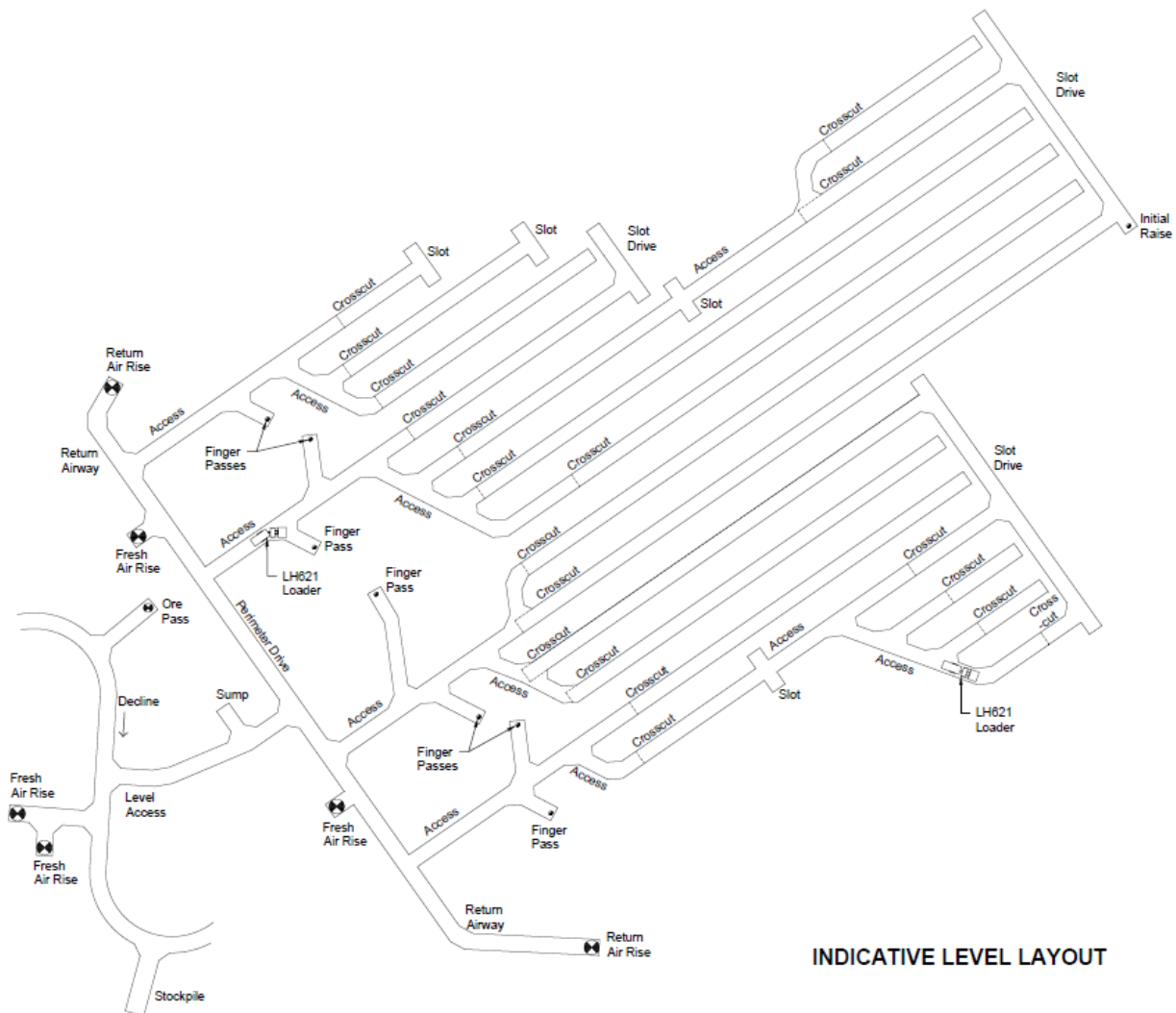
**Figure 3.8: SLC Development Design Showing SLC Levels, Vent Rises and Materials Handling System**

Level access drives will be developed from the Tjati Decline every 25 m vertically. These drives will lead onto the perimeter drives for each level. The level access drives were designed at a nominal gradient of minus 1:50 from the decline to the level sump. From the level sump, all drives were designed at 1:50 up to ensure that the level will drain to the sump.

Perimeter drives were designed with a 5.5 m high by 5.5 m wide development profile to enable truck passage under forced ventilation conditions (with vent bag installed). Truck loading during establishment of the levels will occur at the junctions of the perimeter drives and the SLC access cross cuts, or at the fresh air accesses.

Perimeter drives will be developed to the return air connections to establish a primary airflow along the perimeter drive prior to commencing drawpoint drive development. Sumps, stockpiles, ore pass accesses, and vent connections will be developed concurrently with the perimeter drive, as will the slot drives at the perimeter of the cave footprint. A typical production level layout is shown in Figure 3.9.

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**Figure 3.9: Indicative Level Layout when Four Ore Passes are Required**

### 3.2.9 Diamond Drilling

Diamond drilling is included in the base case to allow definition of the main orebody and develop satellite ore potential. Resource definition drilling near underground infrastructure locations and definition drilling for the initial production levels has been factored into the design and schedule.

A number of the stockpiles in the upper part of the Tjati Decline have been positioned in suitable locations for this diamond drilling to be conducted before the top level development has commenced. This additional information will feed into updated block models for the Carrapateena resource, as well as the development of production geology models for operational use.

Ongoing diamond drilling will be required during the life of the operation to improve the confidence of the resource in the lower portion of the orebody. Additional drilling from underground will also add to definition of the orebody extents, with underground horizontal holes building on the surface vertical hole database.

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### 3.2.10 SLC Production

The SLC production cycle is unchanged from previous work and is summarised in Figure 3.10. Additional work will be required during project execution to further optimise the production cycle and its connection with items such as primary ventilation requirements.

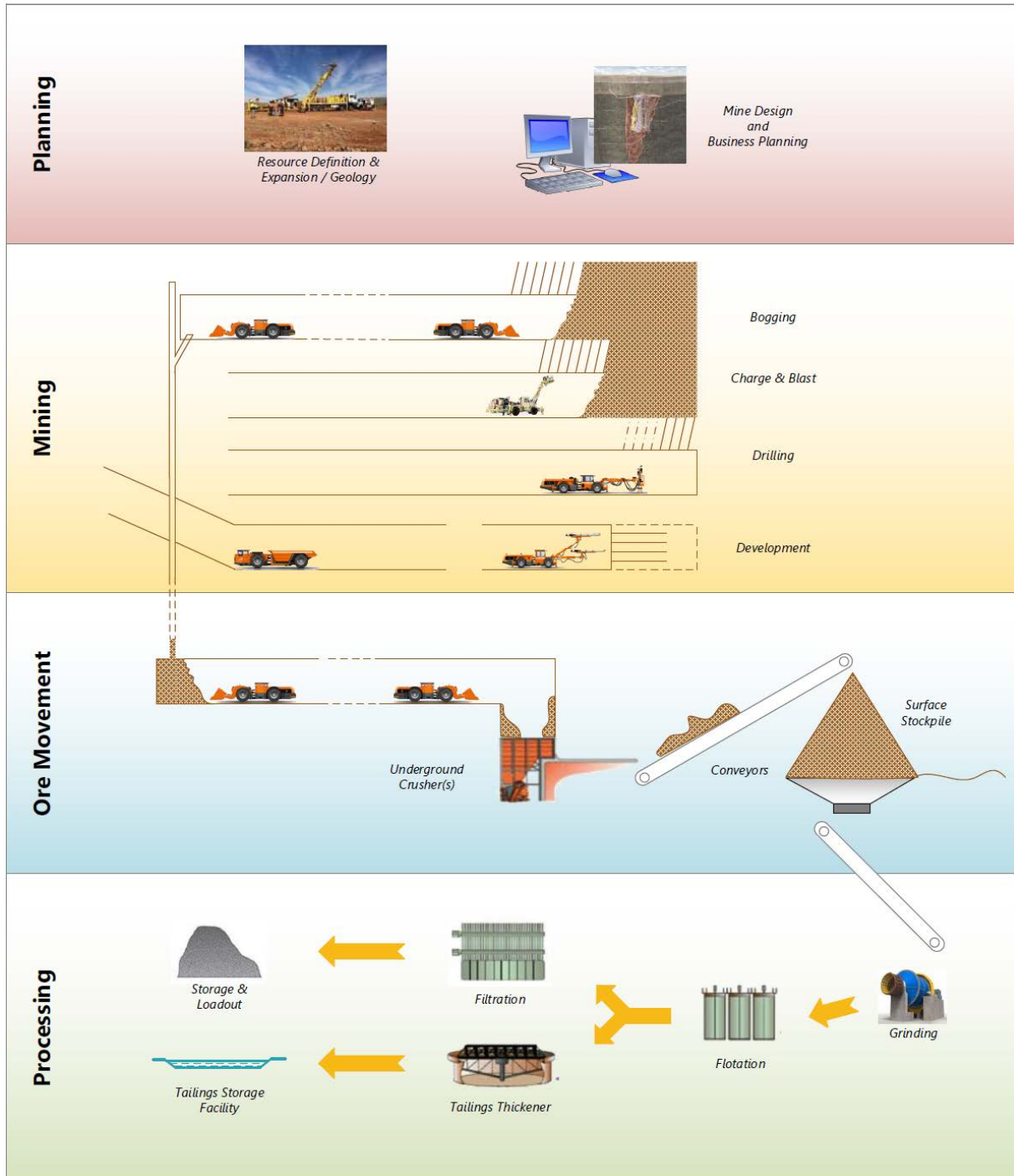


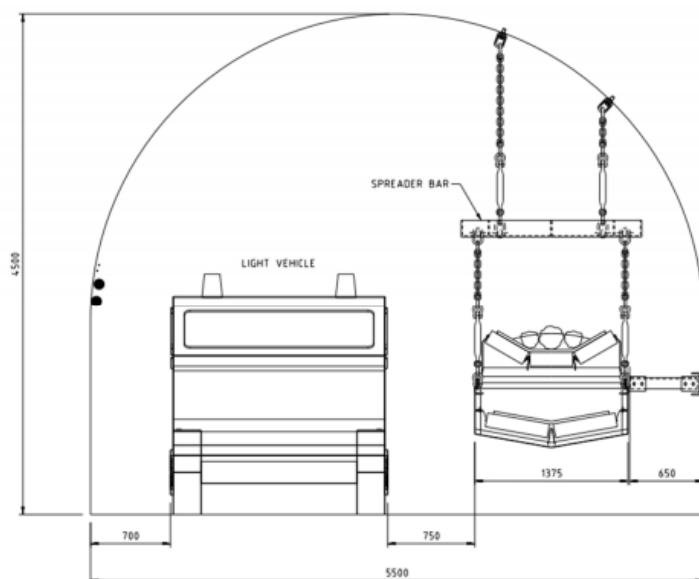
Figure 3.10: Carrapateena Mine Production Materials Flow

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### 3.2.11 Materials Handling

The FS base case assumed the construction of two parallel declines instead of a single dual-use decline as envisaged in the PFS.

The current dual decline arrangement for mine access and materials handling has many advantages as listed in Section 3.2.5. Of those, the main advantage to the materials handling system is the position of the conveyor within the drive profile. In the PFS, the Tjati decline was to be mined at 5.3 m wide x 6.4 m high allowing for the conveyor to be hung from the backs in the first 3.5 km and then transition to being floor mounted once heavy vehicle access was no longer required. However, the risk to personnel of travelling under a loaded belt with respect to falling rocks was not addressed as part of the PFS. The dual decline arrangement allows the conveyor to be in a separate drive to the mine traffic and mounted lower to the ground, significantly reducing rock fall risk and the complexity of conveyor maintenance.



**Figure 3.11: FS Minimum Conveyor Decline Layout Dimensions – 5.5 m W x 4.5 m H**

The updated configuration of the conveyor has also enabled common components over the network length with lift and duty now balanced. This reduced the operating costs of the system while maintaining a similar capital cost.

The current FS base case now includes a third permanent crusher located five levels below the top of the orebody. This additional permanent crusher removes the PFS requirement for a mobile surface crushing unit for ore mined before the commissioning of the then second permanent crusher. Configuration of the new first permanent crushing station allows crushing/conveying of all material types, which reduces haulage costs and haulage constraints for the mine prior to commissioning of the second crusher.

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**Table 3.2: Crusher Throughput**

Name	Crusher Type	Reduced Level	Expected Throughput (Mt)
Crusher 1	Jaw	4520	9.5
Crusher 2	Gyratory	4285	24
Crusher 3	Gyratory	3810	51

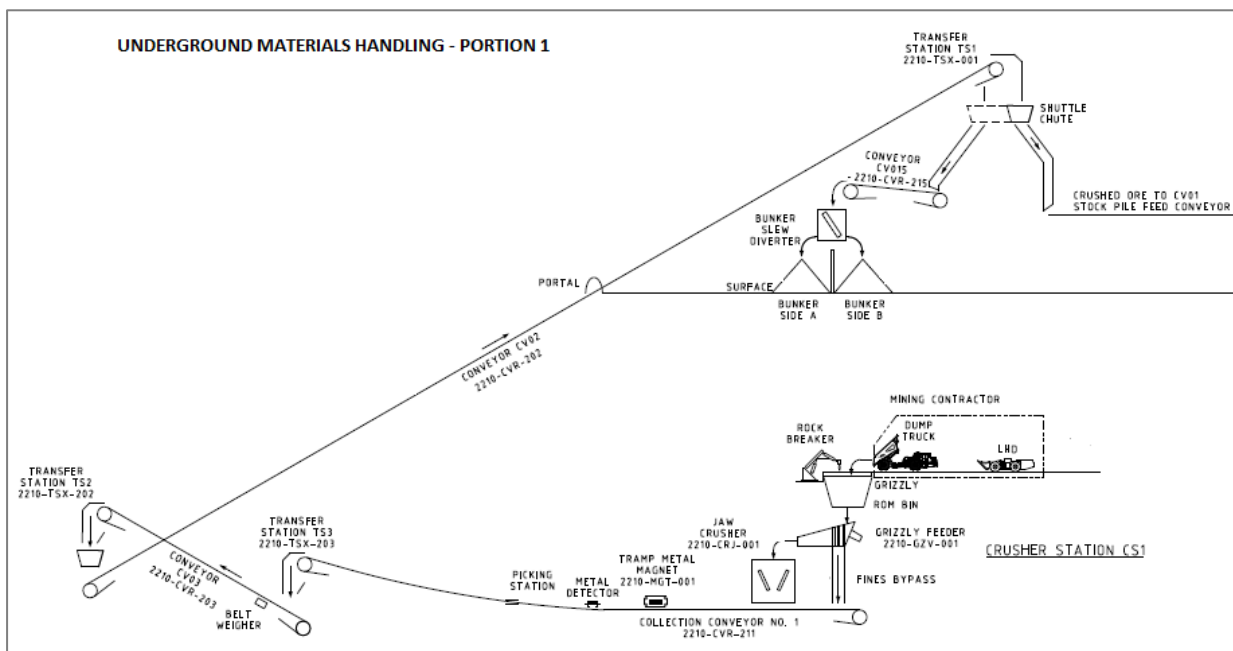
Additional waste rock over conveyor capacity during mine development will be trucked to the surface for use as a construction material, or stockpiled.

Further work is required to finalise the layout of the material handling system. This work is related to the timing and location of the conveyors and crusher stations in relation to the material movement requirements of the mine for production start and ongoing efficient operation.

### 3.2.12 Underground Materials Handling

The underground materials handling system will be delivered in three portions. Portion 1, comprising the system down to the top of the orebody, will be delivered as part of the pre-production capital program. Portions 2 and 3 of the system down to the middle and base of the orebody respectively, will be developed under future sustaining capital.

A simplified process flow diagram for portion 1 is presented in Figure 3.12.



**Figure 3.12: Underground Materials Handling Schematic**

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### 3.2.13 Underground Infrastructure

#### Dewatering

Dewatering requirements for the start of production have been designed on a maximum 300 L/sec as outlined in Section 3.1.5. The groundwater model is being optimised and may impact final pump station design in the order of addition or removal of one pump per pump station.

The primary pumping design will principally align with the PFS Report with four pump stations at a vertical spacing of approximately 400 m, with an approximate pump head in the order of 450 m in a daisy chain fashion.

Mine water management will include the use of area and level sumps within the mine and use of operational pump stations reporting to the mine's primary pump stations. The SLC production levels will utilise a series of level sumps and drain holes to collect and manage water from the lowest suitable point.

Prior to entering the primary pump station, mine water will be treated with screens or trommels to remove trash, as well as the use of staging sumps to remove sediments and clean water discharge. An oily water separator is to be included within the system to manage discharge to surface dams and site water management.

It has been indicated the water is saline with a TDS of 70,000 to 80,000 ppm, mostly sodium chlorides, and a pH of 6 to 8. This will require the use of specialised materials (like duplex stainless steel) for the pumps, valve and other control elements. In addition, piping will need to be either lined or coated.

The mine infrastructure execution design and construction is included in the FS process in Package 1, with primary pumping down to Crusher 1 and the start of production activities.

An updated and calibrated groundwater model developed for the FS will be used to design the mine dewatering system. It will be designed to pump both steady state inflows (mine operating water and groundwater inflows), and any transient inflows as a result of rainfall into the surface cave footprint.

#### Water Supply

Water supply requirements for the underground operation have been modelled on the peak mining requirements, such as mobile equipment and dust suppression, as well as water requirements for underground infrastructure such as the material handling system.

Raw water supply for use within the underground infrastructure and mining operational areas will be supplied from surface using a combination of primary water lines from surface with pressure reducing valves, tanks or dams.

During construction and early production, it is planned for potable water to be transported underground in pods to crib rooms and ablution facilities. LOM potable water supply will be fed from surface and

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used primarily within the crib room and ablution facilities, as well as for fire suppression systems on the material handling system and within the permanent underground magazine once established.

### **Electrical and Communications**

The mine's electrical requirements will be provided by the installation of an 11 kV ring main, which will utilise the main or conveyor declines as well as a services hole to surface. This will establish power to the infrastructure and mining operational areas underground. Substations will be installed as required for permanent infrastructure and progressively moved for mining operations as it continues to depth.

Communications within the mine will include a fibre optics backbone for communication to and control of underground infrastructure and future technology requirements, including automation. This fibre optic circuit will be established as a ring main to ensure continuity of communication. Within working areas, a leaky feeder system will be installed to support the use of digital radio within the mine. During project execution and early production, a basic fibre optics system that allows for expandability will be installed, as outlined in Section 3.5.5.

### **Compressed Air**

Compressed air will be included for the workshops where a stand-alone High Pressure Unit will be provided for general workshop tools and inflating tyres. Compressed air for use on mobile equipment, such as shotcrete spraying rigs, will be supplied with air compressors feeding a pressurised airline leading into operational areas. The need for this pressurised airline in future will be reviewed in line with improvements in the ability of mobile equipment to be standalone. It is noted that Refuge chambers also require a supply of low pressure fresh clean air. Compressed air was excluded in the PFS.

### **Underground Workshops**

The FS base case assumes a single major workshop situated below the No. 2 Crusher installation as did the PFS. Light vehicles and trucks will be serviced and maintained in the surface workshops. Major overhauls of underground equipment, such as 2,000 hour services, will also be performed in the surface workshops.

#### **3.2.14 Mine Ventilation**

##### **Primary Ventilation**

The FS base case design includes primary exhaust fans on the surface return air with secondary fans to draw from a fresh air backbone and provide uncontaminated clean air to working areas. Positively pressuring the SLC production levels will help minimise the contamination of radon entering the SLC levels. This approach is used at Telfer mine in Western Australia to manage heat and dust.

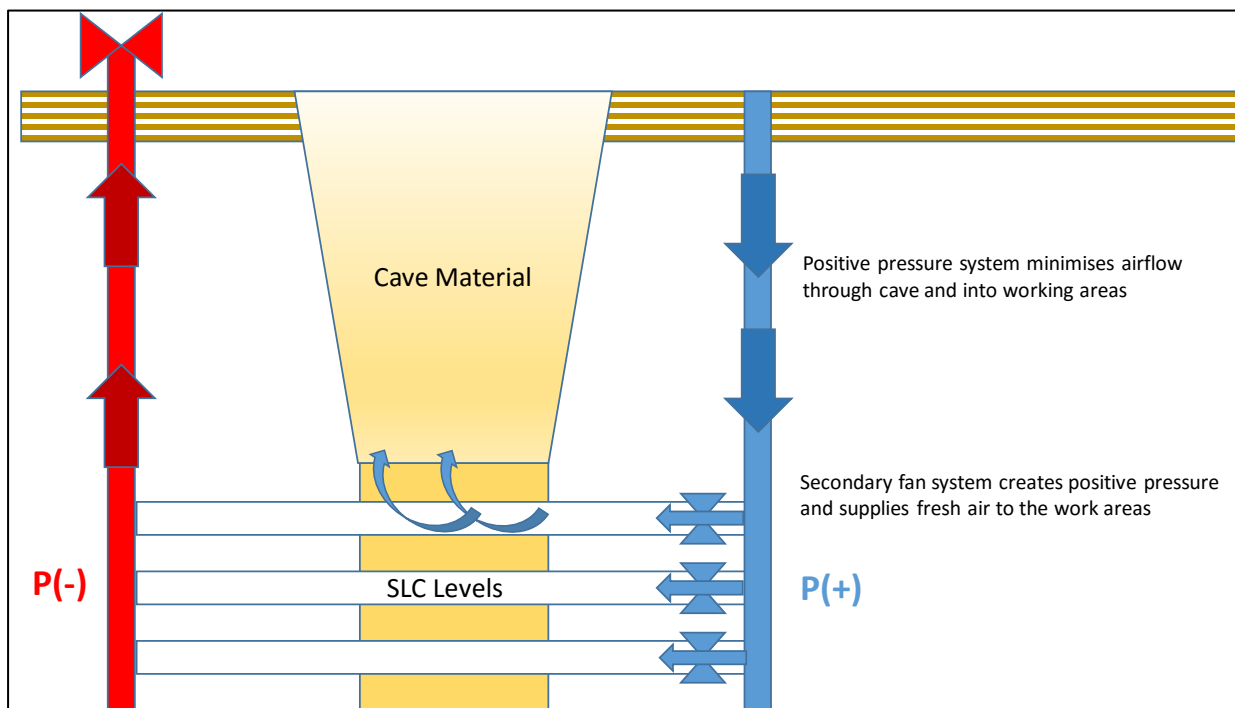
BBE Group reviewed the PFS design and agreed that with the data available, the modified plan was appropriate. Radon testing of core is being carried out to assist in calculating the overall ventilation requirements of the mine, which in turn can be used to calculate total required fan duty. Current

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feedback on radon test work suggests radon emission is in line with or lower than current study assumptions and unlikely to have a material impact on ventilation design.

A cooling plant capable of delivering 21 MW(R) of cooling power is still planned for when production is below a depth of 930 m (approximately 2026) due to the heating effect associated with adiabatic compression. A review of the refrigeration plant design will be completed before construction.

A staged primary ventilation plan will be developed as part of the ongoing mining study refinement to align primary ventilation infrastructure needs with construction and operational activities, while minimising upfront capital expenditure. The modified primary ventilation system, which will be finalised during the mining study, is shown in Figure 3.13.



**Figure 3.13: Cross-Section through the Modified Mine Ventilation System**

Primary underground ventilation for the PFS was a down-cast positive pressure system. Down-cast ventilation 'pushes' air underground, forcing the air underground to move out of the mine through the exhaust raises. This system hypothetically provides a greater level of control on the radon levels in the mine, but has disadvantages such as adding heat to the primary air flow. The change in ventilation design from the PFS is believed to be more effective.

### Secondary Ventilation

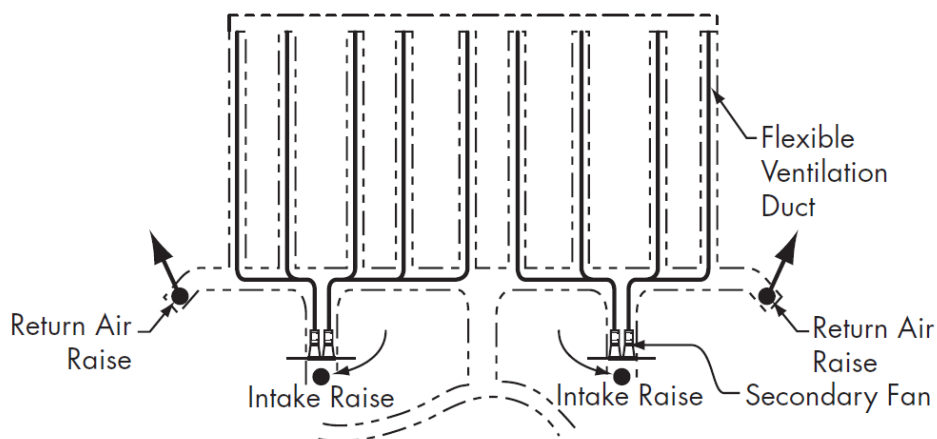
Secondary ventilation within the SLC production levels will be established as shown in Figure 3.14. This setup shows secondary fans installed in a wall of the fresh air backbone, and drawing clean air to the working locations in the cave footprint. Secondary ventilation quantities for SLC levels has been

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calculated based on equipment requirements as well as a minimum amount to prevent the build-up of radon contamination.

This system results in fresh air being supplied to working locations where people are most likely to be outside of cabs. The secondary air is then returned to the return airways located at either end of the SLC footprint having only been used once in an active working location.

A ventilation on demand system will be investigated during the project execution phase to assist with control of secondary ventilation to active headings, and also control of primary ventilation on active work levels.



**Figure 3.14: Simplified Level Ventilation Layout for a Modified Push/Pull**

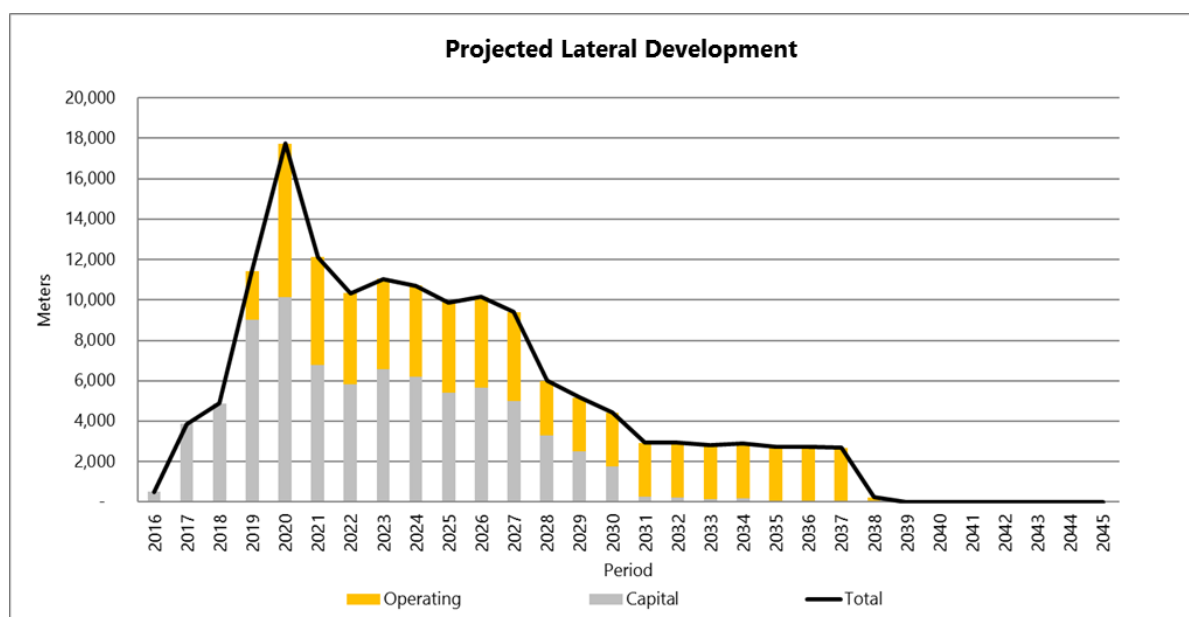
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### 3.3 Mine Schedule

The mine plan delivers first production ore in Q4 2019. The plant ramps up to a throughput rate of 4.25 Mtpa over an 18 month period. This ramp up timing will be linked to the propagation of the cave to surface.

The LOM plan aims to have between two to four production levels active at any one time, depending on the size of the level footprint and SLC draw rates. This approach aims to have a new level starting production as an old level is finishing. The mine will also plan to have one to two levels in development ahead of the production front, to assist with continuity of ore supply, and will maintain a focus on the main decline being ahead of level requirements.

The horizontal development required to achieve full production is shown in Figure 3.16. Changes in mine development requirements between a 4.0 Mtpa case and 4.25 Mtpa case are relatively minor over LOM.



Note: projected lateral development figures are estimates only and subject to the risks outlined in the Key Risks section (see Section 11) and assumptions outlined in this document. Forward looking statements are not a guarantee of future performance and involve known and unknown risks, uncertainties and other factors, many of which are outside the control of OZ Minerals.

**Figure 3.15: Projected Lateral Development**

### 3.4 Pre-Production Activities

Pre-production activities is the umbrella term for Project items that must be in place to ensure production can safely and efficiently start when the SLC production area is accessed.

The majority of the technical and operational pre-production activities are study, review and planning based and can be commenced immediately, whereas most of the geotechnical and geological works require ground disturbing activity such as pre-conditioning and ventilation installation, and will require Mining Lease approval to be in place.

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A combined metallurgical and geotechnical confirmation drilling program is intended to commence onsite from Q3 2017. This will provide the FS and Operations Teams with additional more detailed information on stress direction, the suitability of existing vertical geological drill holes for use in the preconditioning program and the effectiveness of the chosen preconditioning method through a small scale testing regime. These activities are not expected to materially change the design. Commencing Q4 2017 radon emission testing, a staged magazine plan, standard drawings for mine designs and surface geotechnical drilling and testing will be undertaken to verify current designs.

### 3.5 Mine Operations

The following section provides an overview of several documents completed during the recent Mining Study update. This work included development of:

- Draft Production Management Plan
- Draft Cave Monitoring Plan
- Owner operator transition plan
- Staged Underground Automation Strategy
- Pre-charging scoping document.

Additional detailed work will be required during Project execution on items to support safe and efficient mining operations. These include areas such as:

- Implementation of the new OZ Minerals Performance Standards
- Underground Traffic Management Plan
- Ventilation Management Plan
- Water Management Plans.

#### 3.5.1 Proposed Operational Philosophy

The development and subsequent production from Carrapateena considered both the use of a mining services contractor and self-performance. This base case assumes a mining services contract be utilised through the more variable development phase after which operatorship will transition to a steady state owner's team.

Self-perform or 'owner-operator' models provide the flexibility and control that is desired by mine owners, but can hide the actual cost of latent capacity or inefficient management. Often an owner-operator approach best lends itself to a steady-state mine that is past the peaks and troughs in personnel, equipment and capital requirements.

A contractor model provides flexibility and scalability in the initial stages of a mine's life, and the ability to leverage the contractor's culture, skills and experience. The ability to leverage the contractor's balance sheet during periods of peak capital expenditure may also be attractive. What may appear to be a fixed price for a scope of work also appears attractive when building new mining projects.

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### 3.5.2 Production Management Plan

A Draft Production Management Plan (PMP) has been written to establish the operating guidelines and parameters for SLC mining operations. The PMP covers the planning and operating aspects of level and crosscut development, production drilling and blasting, and draw point extraction. Consideration has been given to the initial cave propagation and steady state caving.

The draft document is a starting point for the mine, and will remain a live document that will improve over time as the understanding of Carrapateena-specific cave flow increases, production strategy changes or as new technologies become available.

### 3.5.3 Cave Monitoring Plan

As the mining method chosen for the Carrapateena orebody is SLC, unlike other mining methods, it is not possible to directly view what is happening within the cave. Therefore, flow models are used to estimate the cave performance. Flow models have been built for other SLC operations have been successfully used to provide SLC performance estimates. While this may be a reasonable starting point, the cave performance is strongly influenced by local characteristics, and these generic flow models will be monitored and calibrated.

The purpose of the Cave Monitoring Plan is to define cave monitoring policies and procedures for specific reasons to establish trigger points for management action, especially in relation to major hazard management. A key component of the Cave Monitoring Plan will be a series of Trigger Action Response Plans (TARP) to enable the operational team to have planned responses to possible cave or geotechnical events.

The Cave Monitoring Plan has appraised a variety of monitoring methods and recommends specific methods that would be suitable for monitoring specified issues. As with the Production Management Plan, the Cave Monitoring Plan will be a live document and will be updated as the SLC progresses through the Project phases and into ongoing operations.

### 3.5.4 Contractor to Owner Operator Transition Strategy

A transition to owner operator could be undertaken 'early' (from the commencement of production) or 'late' (after the production ramp-up). The base case for the Project is to defer transition until after the mine is sustainably achieving nameplate production. This deferred approach allows OZ Minerals to focus on achieving consistency and repeatability of production performance before transitioning to owner operator, and utilises the underground contractor skills and expertise to bed in safe and efficient mining operations.

### 3.5.5 Mine Automation

The OZ Minerals strategy is to be early adopters of automation and technology. The business case for Automation is measurable improvement in safety, productivity and efficiency.

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The operation will look to build on an innovative culture when implementing technology and automation. Bringing people on the automation journey and embedding an agile culture will be as important as installing the technology itself.

This FS base case has focused on the system capability, equipment selection, operational and implementation aspects, and concluded that mining automation is feasible and practical, with other mines having successfully implemented a range of systems. These past implementations are instructive in terms of potential system implementation and overall approach.

Automation in itself will not be the (sole) focus, but rather the value-add that can be obtained by prudent and timely application of automation technologies to a well set up and effectively managed underground mining operation. This will see the mine be an early adopter of technology and automation where it adds value to the operation as opposed to installing maximum upfront functionality.

In an SLC mining context, automation refers to semi-autonomous equipment such as LHDs that are capable of navigating between loading and unloading locations, and unloading without direct intervention by a remote operator. Long-hole drills are also amenable to automation. Autonomous trucking is not considered to be in scope given the planned conveyor for permanent materials handling.

Automation of monitoring of mine services and infrastructure such as the materials handling system, primary ventilation and primary pumping, will be included during the Project phase. Control of primary infrastructure, and the control and monitoring of secondary infrastructure, such as secondary fans, operational dewatering and ventilation on demand, will be progressed during operational ramp-up. The base case assumes minimal spend on mine automation during pre-production capital, and allowance made for addition of technology during operations in sustaining capital with timing linked to the staged automation approach.

The base case assumes a fully owned, robust, generic and independent (i.e. open source) communication network backbone be installed in the mine. This will allow OZ Minerals to maximise optionality and enable a staged approach to add new value-add functionality.

A staged approach to enabling automation functionality is planned. This staged plan is linked to technology installed during the pre-production phase of Carrapateena, as well as the automation of key mining functions during appropriate production and operational phases within the SLC. For example, the operation will plan for the first ore transfer level to Crusher 2 to be designed and setup for automation of loaders, and for semi-automated long-hole drills from the beginning of production.

During the construction stage, the primary focus of the pre-production activities will be towards installation of the optic fibre backbone and supporting infrastructure, a proven scalable mine control system, and rudimentary data management and visualisation systems.

Collection of equipment, cave and location performance data, such as availability, utilisation, delays and productivity, will enable analysis and improvement through operational excellence processes. Collection of data in the mine will progress from manual to semi-automated to fully automated and increase the

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quantity of information stored over time. As seen within other caving operations, collection of information from the beginning of operations will allow the site to analyse 'big data' and answer questions that haven't been thought of yet.

Future mine automation projects will occur after Project construction and as such consideration will be given to including mine automation capabilities and deliverables into the scope of the future mining services contractor.

### **3.5.6 Mining Improvement Opportunities via Pre-charging**

Pre-charging appears to be technically feasible and supported by a high-level business case of improved charge up operator safety and overall mine efficiency. Pre-charging has been used successfully at Ernest Henry in Queensland and Ridgeway in New South Wales. As such pre-charging has been included in the mine's operational philosophy base case.

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## 4 METALLURGY AND PROCESSING

### 4.1 Overview

Based on the FS, the oretypes that will be treated through the process plant at Carrapateena are very similar to those successfully treated at Prominent Hill. The Iron-Oxide-Copper-Gold mineralogy at Carrapateena is relatively simple, consisting of up to 90% hematite, with minor silicates plus sulphides. This leads to an industry standard flowsheet almost identical to Prominent Hill, recoveries of greater than 90% copper and clean sulphide concentrates. The mix of bornite and chalcopyrite copper mineralogy, with low pyrite, results in above industry average copper concentrate grades<sup>5</sup>. Confirmatory test work undertaken since completion of the Prefeasibility Study has demonstrated improved uranium rejection with optimised regrind size and a likely improvement when scaling up batch tests to a full scale Jameson cell which has greater froth washing capacity. The additional test work has also supported the consistent and predictable down grade of uranium from feed to concentrate for all ore types. This improved level of confidence in uranium rejection and predictability has led OZ Minerals to the conclusion that the CTP is not necessary to produce a concentrate that is expected to be highly sought after by customers for the life of the project.

Significant value engineering works have been undertaken to optimise the process plant design with a specific focus on driving capital and operational cost efficiency while meeting required process design criteria and industry accepted design margins, and not sterilising future expansion capacity. Key areas of optimisation, including plant layout, power demand, processing technology, equipment selection, modularisation and maintenance.

Key features of the process plant considered in the capital cost estimate are detailed in Table 4.1.

**Table 4.1: Key Features of Process Plant**

Area	Feature
Product	Copper and gold in concentrate
Production rate	4.25 Mtpa ROM ore. Average of ~65,000 tonnes copper and ~67,000 ounces gold per year LOM
Comminution	SAG mill, ball mill and pebble crushing
Flotation	Rougher flotation, concentrate regrind, Jameson cell cleaner followed by three-stage mechanical cleaners

While the 'nameplate' capacity of the Process Plant is nominally 4.0 Mtpa, the Project base case of 4.25 Mtpa has been defined through optimisation based on historical recorded industry performance with comparable SLC operations resulting in a 6% throughput increase from year 3+ (i.e. post ramp-up) with

<sup>5</sup> Wood Mackenzie global average concentrate grades

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minimal increase in capital cost under a subsequent minor capital works program.. For reference, the Prominent Hill Mine, which has materially the same flowsheet design, operates at 25% above nameplate.

The key enablers to achieve a 4.25 Mtpa throughput rate are:

- Optimisation of process operations can occur during the 18-24 month ramp-up period prior to targeting 4.25 Mtpa in subsequent years.
- Installation of appropriate control systems to allow greater adaptability to variability in feed throughput rates.
- Comminution design is based on 85<sup>th</sup> percentile ore properties. On an annual average basis it is anticipated that the grinding circuit can achieve grind size on > 4 Mtpa.
- Optimisation of maintenance strategy over ramp-up period.
- Ore fragmentation to assist in increasing SAG mill throughput. Attrition of ore in ore passes expected in Year 4+ and provide similar benefit to SAG throughput. The reference case is Ridgeway mine.
- A combination of UG stockpiles (ore passes), surface coarse ore stockpiling and filter feed buffer tank will allow buffer capacity and subsequent management and optimisation of throughput.

#### 4.2 Metallurgical Test Work

An extensive metallurgical test work program has been undertaken on the Carrapateena deposit comprising three major test work campaigns:

- 2007-2012 campaign including preliminary comminution, flotation and leach test work undertaken by Teck Cominco and AMMTEC.
- 2012-2014 campaign including comminution and flotation test work and development of geo-metallurgical model undertaken by OZ Minerals.
- 2016 campaign including confirmatory comminution, flotation and variability testing undertaken by OZ Minerals.

The test work undertaken is summarised in Table 4.2.

**Table 4.2: Test Work Undertaken**

Comminution test work	Flotation test work	Other
<ul style="list-style-type: none"> <li>• JK Drop Weight tests</li> <li>• JK SMC tests</li> <li>• Bond abrasion index</li> <li>• Bond Rod Mill grindability</li> <li>• Bond Ball Mill grindability</li> <li>• ISAmill signature test</li> </ul>	<ul style="list-style-type: none"> <li>• Primary grind size optimisation</li> <li>• Re-grind size optimisation</li> <li>• Variability testing</li> <li>• Impact of dilution</li> <li>• Locked Cycle Tests</li> <li>• Jameson simulation flotation tests</li> <li>• Impact of hyper saline water</li> </ul>	<ul style="list-style-type: none"> <li>• TUNRA material testing</li> <li>• Concentrate properties (TML, BD, SG)</li> <li>• Thickening and rheology test work</li> <li>• Filtration test work</li> <li>• Leach response</li> <li>• Gravity recoverable gold )</li> <li>• Minergraphic assessment</li> </ul>

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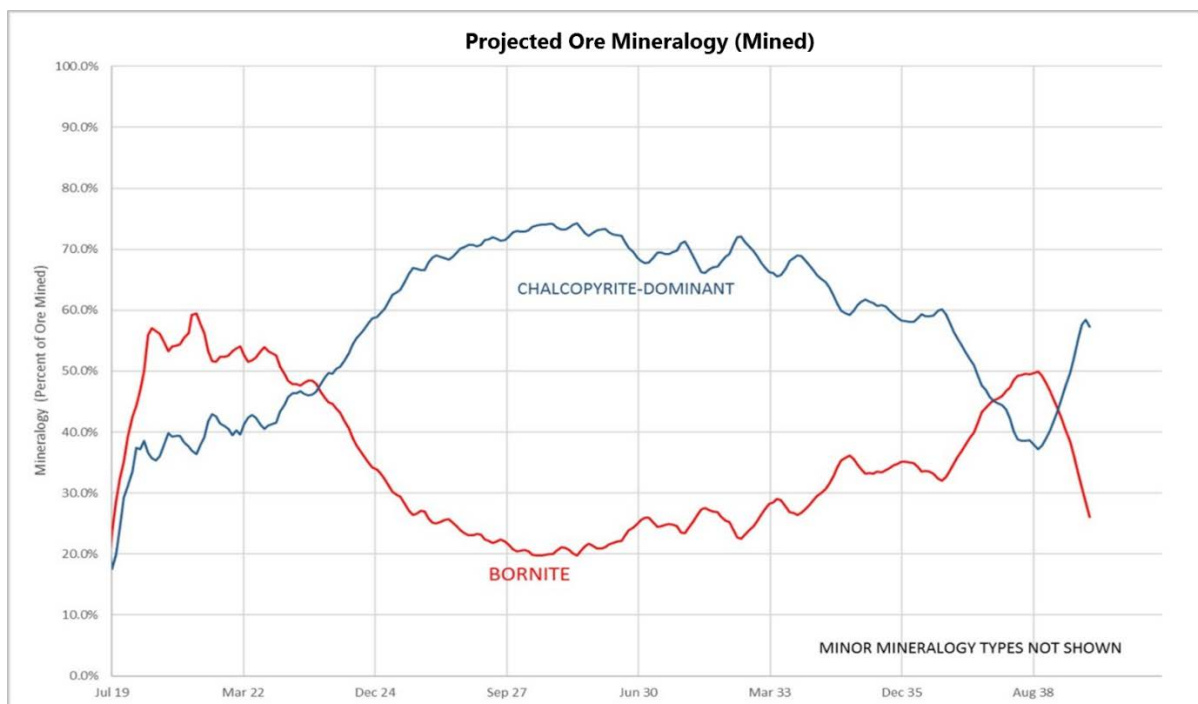
	<ul style="list-style-type: none"> <li>• Impact of mild steel grinding media</li> <li>• Impact of aged ore</li> <li>• Mono vs dual regrind</li> <li>• pH modification</li> </ul>	
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In addition to the individual tests above, a number of bulk flotation tests were completed as part of a parallel CTP project that supports the Carrapateena process design.

### 4.3 Process Plant Ore Supply

The minerals processing plant is designed to treat of crushed ore to produce a copper-gold flotation concentrate. Ore is primary crushed underground to a product size P<sub>80</sub> of 106 mm. The Project FS base case assumes a start-up 4 Mtpa throughput rate increasing to 4.25 Mtpa after ramp-up.

The metallurgical classes of the ore mined over the life of the Project are shown in Figure 4.1. The mineralogy is predominantly chalcopyrite and bornite, with minor amounts of chalcopyrite-pyrite and dilution materials. It is anticipated that the proportion of chalcopyrite-dominant ore will reach a maximum of approximately 87% in 2027. Minor changes in the percentages and timing of the metallurgical classes when compared to the 2016 PFS are the result of revisions to the mine development and production sequence.



Note: projected ore mineralogy (mined) figures are estimates only and subject to the risks outlined in the Key Risks section (see Section 11), and assumptions described in this document. Forward looking statements are not a guarantee of future performance and involve known and unknown risks, uncertainties and other factors, many of which are outside the control of OZ Minerals.

**Figure 4.1: Project Ore Mineralogy (Mined) (moving average)**

#### 4.4 Process Plant

Through the FS process, significant value engineering works were undertaken to optimise the process plant design with a specific focus on driving capital and operational cost efficiency while meeting required process design criteria and industry accepted design margins.

This work was underpinned by extensive engagement between the design, construction and mining operations teams and other key stakeholders to ensure construction methodologies and operational and maintenance requirements were better integrated into design considerations.

This collaborative approach has resulted in enhanced scope definition which now includes many design elements that were previously identified as future provisions in the PFS phase for no net increase in capital cost. Key areas of optimisation, including plant layout, power demand, processing technology, modularisation and maintenance, are summarised in

Table 4.3 and outlined in further detail in the sections below.

**Table 4.3: FS Enhancements to Process Plant**

Optimisation	Description
Process plant layout	Value engineering during FS focused on optimisation opportunities including: <ul style="list-style-type: none"> <li>• Maximising gravity flow in the process steam</li> <li>• Separation of pedestrians from vehicle traffic</li> <li>• Safe traffic flow through revised road and turning layout</li> <li>• Consideration of human factors to improve worker accessibility and movement throughout plant site</li> <li>• Co-location of like buildings</li> <li>• Location of major equipment to minimise working at heights and improve access and maintainability</li> </ul>
Power demand	Value engineering during FS focused on opportunities to standardise equipment and reduce power demand by 20% through optimising motor and drive combinations.
Process Equipment	Mill sizes, flotation cell configuration and regrind technology were optimised during the FS phase to further enhance processing efficiencies.
Process Technology	Key technologies for enhanced data collection to optimise operations and maintenance, support automation of the processing circuit and establish a platform for potential remote operations in the future have been incorporated into the scope.
Modularisation	Specific consideration has been given to options for modularisation to optimise processing plant construction and reduce on-site labour requirements.
Maintenance	Specific consideration has been given to maintenance of the facilities with particular emphasis on improved access, safety and maintenance efficiency.

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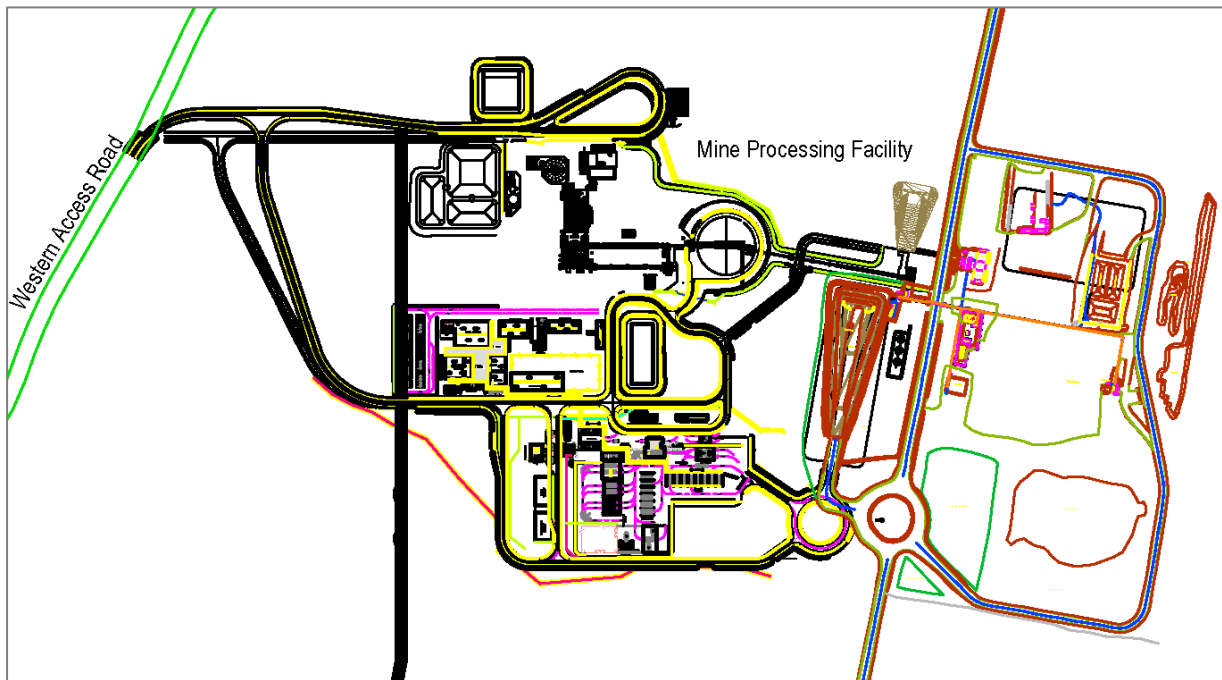
#### 4.4.1 Optimised Plant Layout

The introduction of the second decline for the plant feed conveyor as part of the revised underground mining strategy required a shift in the location of the process plant and supporting infrastructure to provide clear access to the dual declines. This, along with the merging of colocated work packages into single FS scopes, presented an opportunity to undertake a major reconfiguration of the plant layout to optimise functionality and safety throughout the site.

The optimised plant layout is presented in Figure 4.2. Key benefits resulting in the revised design include:

- Safer and more efficient vehicle traffic flow with roadway and turning configurations specifically designed for left-hand drive mining fleet
- Safer and more efficient pedestrian traffic flow throughout the plant with thoroughfares and access points on common levels between facilities
- Enhanced workforce productivity and safety with buildings consolidated into a common area with significantly reduced pedestrians and vehicles interaction
- Minimised interaction between stockpile and decline operations with clear separation between these two areas
- Improved maintainability with specific consideration of safe maintenance and crane access requirements
- Improved processing and power efficiencies through consolidation of processing units to maximise the use of gravity flow for wet process streams
- Enhanced definition around power requirements with switchyard definition added to the site to firm up the incoming 132 kV powerline alignment.
- Site layout with capacity to support future expansion above nameplate within existing footprint.

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**Figure 4.2: Optimised Process Plant Configuration**

#### 4.4.2 Power

During the FS focus has been placed on minimising site power demand to deliver operational cost efficiencies. This has also had the impact of reducing potential impact on the region's network. Key design changes have included:

- Reduced mill power requirement from 21 MW down to 16.5 MW by optimising individual mill and drive combinations.
- Simplified power distribution using a common 11 kV distribution system which is consistent with more commonly available switch gear and improves site safety.
- Variable Speed Drives included on mills and all major drives throughout the plant to stabilise power draw requirements thereby reducing potential impacts on the region's power supply network.
- High Intensity Grinding (HIG) technology applied to the regrind mill (previously ISAmill technology) resulting in 1.5 MW of power saving.
- Equipment selection better matched to process requirements by eliminating excessive and compounding design margin resulting in power efficiencies through reduced motor sizes across the plant.
- In addition to mill sizes, flotation cell configuration and the regrind circuit were optimized during the FS phase to further enhance processing efficiencies

#### 4.4.3 Process Technology

In line with OZ Mineral's modern mining philosophy, options to incorporate advanced technologies such as enhanced data collection to optimise operations and maintenance, support automation of the

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processing circuit, establish a platform for potential remote operations, and in the future preventative maintenance and predictive analysis into the processing plant were actively pursued throughout the FS. Key technologies in the base case scope include:

- VisioRock™ (or equivalent) to be installed on the SAG mill feed conveyor and integrated into the Process Control System (PCS) to provide SAG mill feed size distribution information
- Manta Cube for advanced grinding circuit control
- Floatstar Level Stabiliser and Flow Optimiser (or equivalent) for feed forward level control to improve flotation process stabilisation
- Multivariable control on concentrate hoppers
- FrothSense™ (or equivalent) on all flotation cells and integrated into the PCS for froth monitoring
- Closed Circuit Television Cameras placed around the process plant with Pan, Tilt and Zoom capability to view critical process interactions
- Automatic on-line leak detection system included on the tailings delivery pipeline.

#### 4.4.4 Maintenance

Specific consideration has been given to maintenance of the facilities with emphasis on improved access, safety and efficiency. Features incorporated into the design include:

- Relocation of difficult to access drives (e.g. stockpile conveyor drives) to ground level, thus eliminating the need for large crane access, stockpile clearance and issues with working at heights.
- Identification of crane pad around the site to enable maintenance to be conducted with minimal disruption to existing operations and providing clear access to both sides of the process plant.
- Location of pumps towards the outer edge of the bunded areas for access for small cranes.
- Reduced drop heights for ore and redesign conveyor chutes to allow material flows in the direction of travel to improving belt life and minimise chute wear.

#### 4.4.5 Modularisation

To optimise processing plant construction and reduce on-site labour requirements, a range of modularisation opportunities have been identified, including:

- Modular switch rooms fully tested off-site and transported as single room
- Bolted thickening tanks and floatation cells
- Conveyor modules assembled with walkways, idler frames, hand railing, light poles, cable ladders and associated services incorporated into modules
- Precast concrete assemblies for flotation cell bases and transformer compounds
- Flat pack pipe rack frames
- Skid mounted equipment assemblies, e.g. pumps, compressors, samplers.

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## 4.5 Process Overview

### 4.5.1 Process Design Criteria

Processing plant design criteria has minimal updates since the PFS study phase with minor changes to figures.

### 4.5.2 Process Flow Sheet

The minerals processing plant will include the following processing stages:

- Conveying, stockpiling and reclaiming of crushed underground ore
- Grinding in an SABC (SAG mill, ball mill and pebble crusher) in closed circuit with cyclones producing a grind size P80 of 75  $\mu\text{m}$
- Recovery in a rougher flotation and regrind circuit
- Concentrate upgrading and removal of uranium with a Jameson cell and three stages of mechanical cleaners
- Thickening and filtering of the concentrate
- Stockpiling of the filtered concentrate in the concentrate storage shed prior to placement in containers for storage and load-out
- Thickening of tailings in a Hi-rate thickener and pumping to the TSF.

A simplified minerals processing process flow diagram is presented in Figure 4.3.

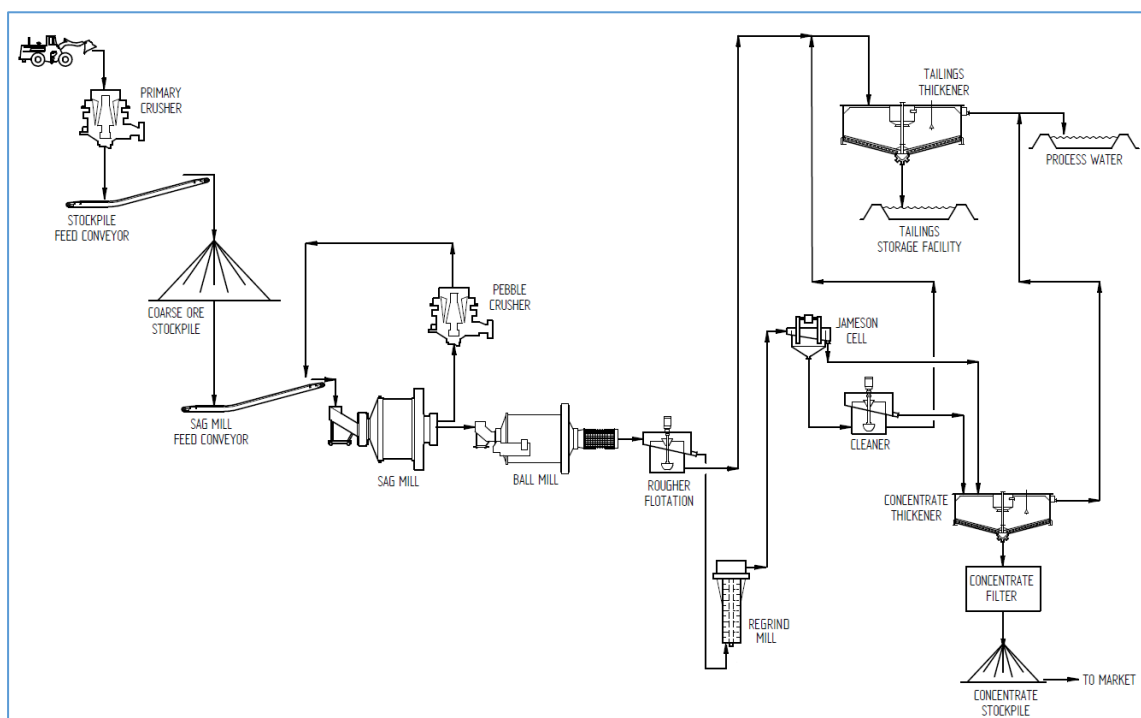


Figure 4.3: Simplified Process Flowsheet

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#### 4.6 Tailings Management

The TSF design has been progressed to FS level. Design parameters are summarised in Table 4.4.

**Table 4.4: Tailings Storage Facility Design Parameters**

Item	Comment/Details	
<b>General</b>		
Total Tailings Volume	55.3 Mm <sup>3</sup>	
Tailings Supply Rate	4.0-4.75 Mtpa	
Solids Concentration	65% w/w	
Tailings Deposition Life	26 years	
<b>Design Summary</b>		
Impoundment Type	Cross valley embankment	
Rate of Rise	2 m/yr, down to 0.5 m/yr	
Beach Slope	0.7%	
Consequence Category	"Significant" (ANCOLD 2012 Guideline)	
Final Beach Surface Area	440 ha	
Catchment Area	1500 ha (including the decant dam)	
<b>Embankment Construction</b>		
Stage 1	20 m high, 1.1 km long, constructed of waste rock	
Stage 2	8 m downstream lift, 1.4 km long, predominantly constructed on waste rock	
Stage 3-5	7, 4 and 3 m upstream lifts, 1.7, 1.9, 2.0 km long, tailings as fill material (with rock armouring)	
<b>Flood containment</b>		
Extreme storm storage allowance	1-in-100 AEP, 72 hour event	
Contingency freeboards	Wave Freeboard	1-in-10 AEP wind event
	Additional Freeboard	0.3 m
<b>Flood discharge</b>		
Spillway capacity during operation	1-in-1000 AEP, critical duration event	
Spillway wave freeboard allowance	1-in-10 AEP wind event	

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### Tailings Disposal

Flotation tailings will be pumped into the 27 m diameter hi-rate thickener. The underflow, with a density of 60% to 65% w/w solids, will be pumped via duty/standby pumps to the tailings hopper, and pumped to the TSF via a duty multi-stage set of tailings pumps. Provision for a future standby set of tailings pumps has been included. The allowances for the consumption rates for consumables remain unchanged from the PFS.

### Tailings Design

The TSF will be constructed in stages as a cross-valley embankment at the head of the Eliza Creek approximately 11 km upstream of Lake Torrens. It is designed to have an ultimate storage capacity of 145 Mt dry tonnes of tailings (or ~36 years at 4.25 Mtpa) with a long-term *in situ* bulk average density of 2.0 t/m<sup>3</sup>. The design capacity is expected to be beyond the requirement of the current Project phase and additional lifts to achieve this will not be undertaken unless required.

The TSF is designed to initially be constructed with sufficient capacity to accommodate over three years' planned production and a design crest width of 6 m and nominal embankment height of 20 m (including 3 m minimum operational freeboard for stage 1). The TSF would then be expanded by way of a series of raises from the initial embankment to arrive at an ultimate crest width of 8 m and nominal embankment height of 46 m (including freeboard of 0.5 m thereafter). The cost of these raises has been included in the FS base case.

The TSF is to be designed, constructed and operated in accordance with the ANCOLD guidelines that take in to consideration siting, initial embankment construction, subsequent raises and rate of rise, water management, erosion control and inspection and maintenance requirements. The proposed design is shown in Figure 4.4.

Materials of construction for the initial embankment would comprise of Non Acid Forming (NAF) mine waste rock and colluvium collected from within the TSF impoundment area. The first TSF embankment raise will be constructed in a downstream direction while subsequent raises will be constructed upstream using compacted tailings and durable rock armour.

Seepage cut-off trenches will be excavated within the embankment footprint down to the quartzite bedrock, with the remaining embankment footprint scarified, moisture conditioned and compacted to achieve a competent foundation for the embankment, subject to approval.

Tailings would enter the TSF by way of sub-aerial spigot discharge points either at the head of the valley reaches, from the upstream crest of the TSF embankment or from the valley sides. This allows the beach slopes to optimally position the supernatant decant pond, providing ease of decant water recovery.

Supernatant water would be removed from the TSF via a gravity outfall pipe, equipped with several decant inlets. Tailings will be spigotted from the perimeter of the TSF so that supernatant water collects near at least one of the decant inlets. Initially the pond would be located adjacent to the initial TSF embankment, with progressive deposition during Year 2 and Year 3, directing the pond away from the

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embankment. Development of the pond in this manner allows the initial TSF embankment to be reduced in size, correspondingly reducing the amount of construction material required.

Each decant structure would consist of a rock filter surrounding a 1.8 m diameter slotted reinforced tower. Water will flow via gravity through the rock filter and tower into a decant riser pipe that is connected to a buried HDPE decant pipeline. Captured water will flow via gravity through this decant pipeline, under the TSF embankment and to a decant staging pond for recovery to the processing plant. As the decant pond moves away from the embankment during the initial years of operation, temporary decant structures would be plugged with concrete and capped to prevent tailings ingress.

Flood management measures include storage capacity within the TSF and Decant Dam impoundments and emergency spillways for both the TSF and Decant Dam. The flood storage capacity at each stage is sufficient to manage the 'extreme storage allowance', i.e. the runoff from a 1-in-100 annual exceedance probability (AEP), 72-hour event, as required by the ANCOLD (2012)<sup>6</sup> Guidelines on Tailings Dams for a 'significant' consequence category. A spillway will be included for each stage of the TSF development, located at the eastern abutment of the embankment. The spillways at the TSF and Decant Dam will provide capacity to discharge a 1-in-1000 AEP, critical duration rainfall event, also required by ANCOLD (2012)<sup>7</sup>.

The location of the TSF in relation to Tjungu Accommodation Village, the processing plant and the mine, is shown in Figure 4.5.

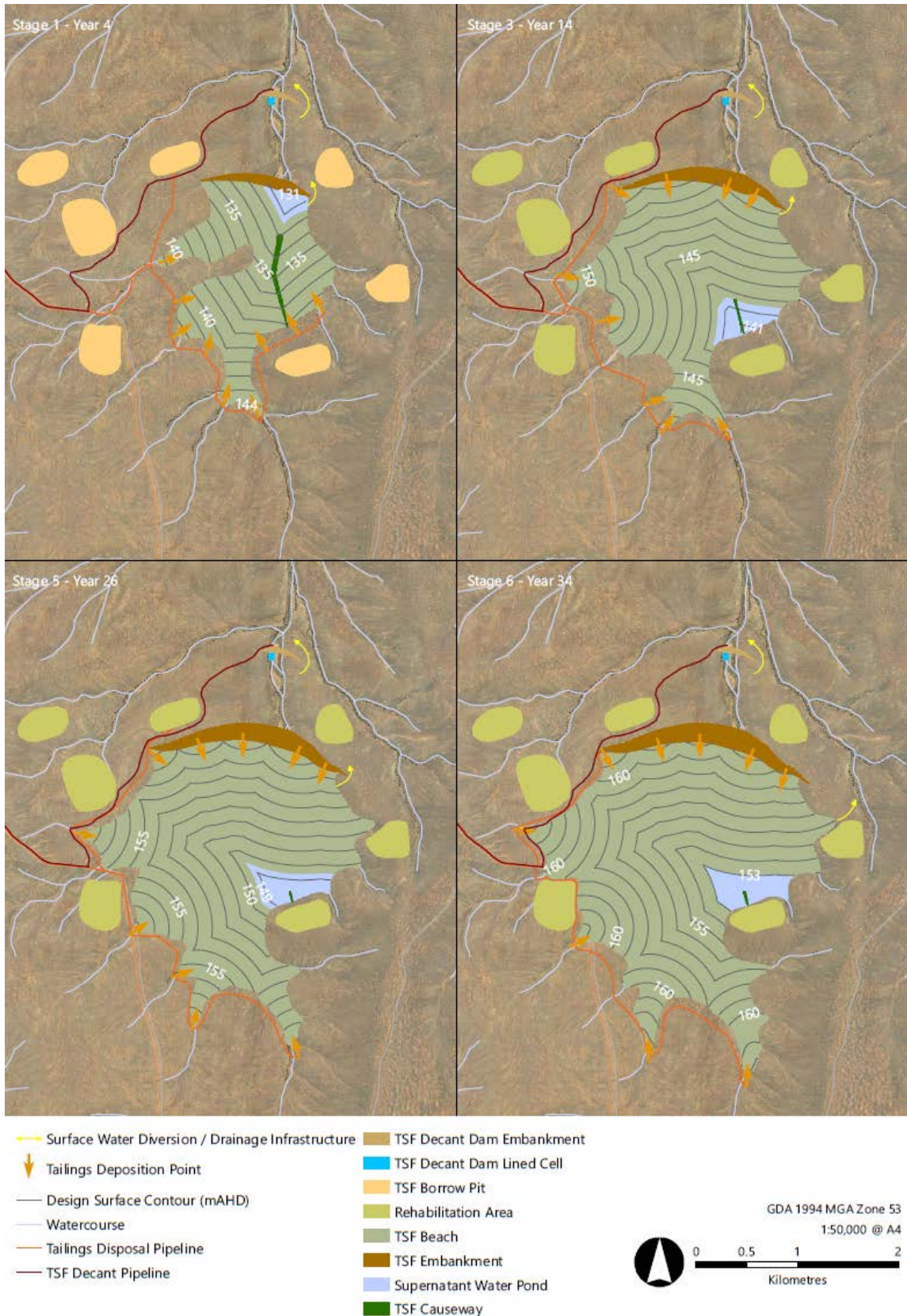
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<sup>6</sup> ANCOLD, 2012. *Guidelines On Tailings Dams*, May 2012.

<sup>7</sup>

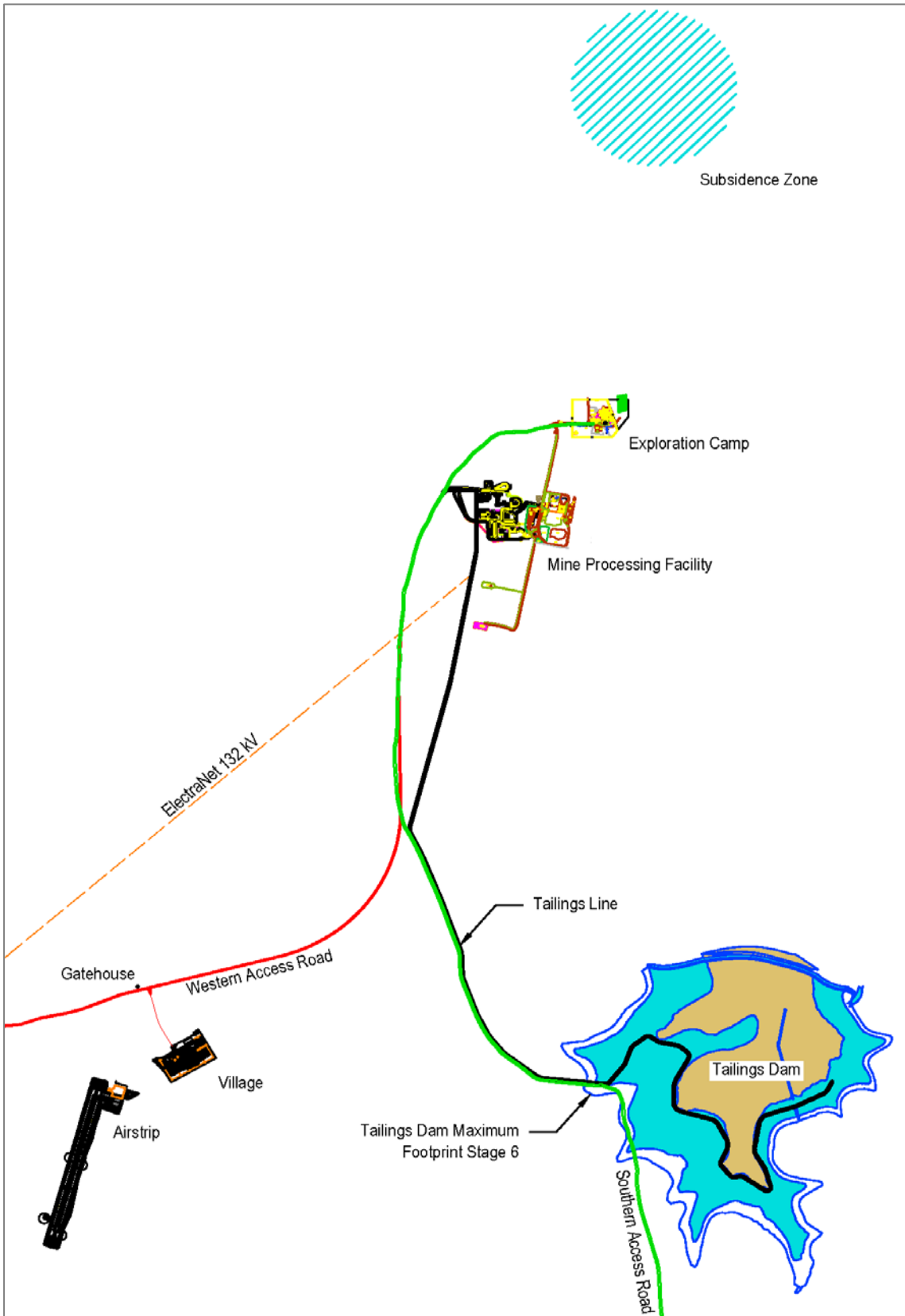
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**Figure 4.4: Proposed Tailings Storage Facility Design**

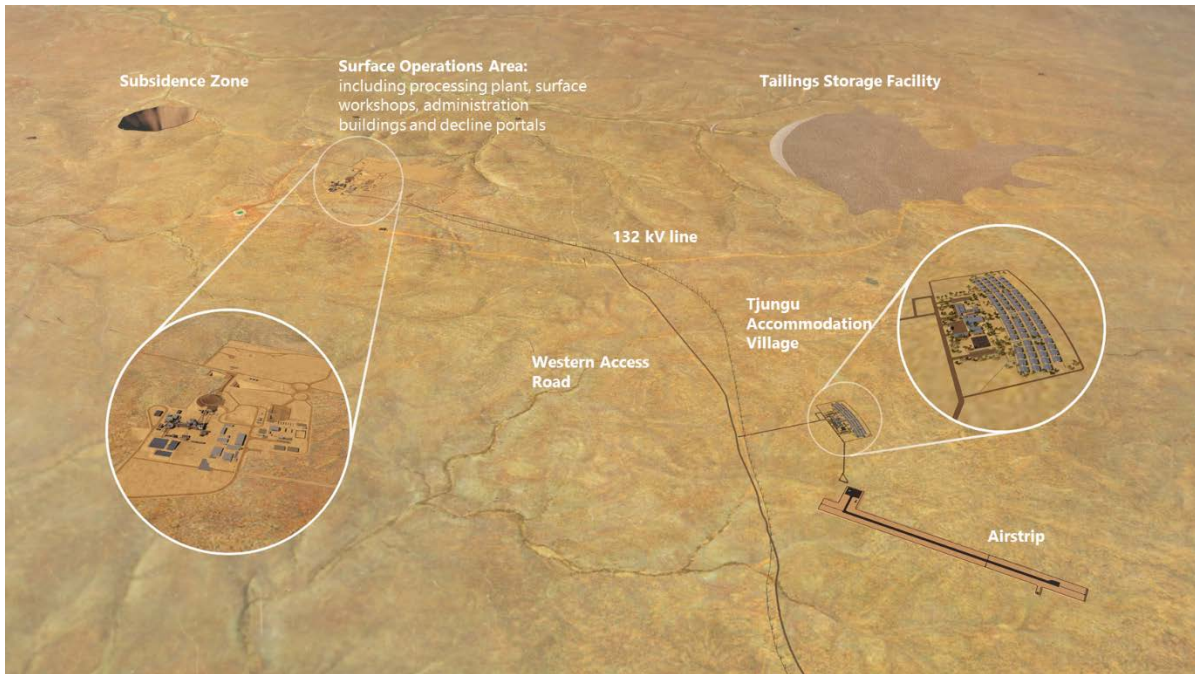
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**Figure 4.5: Location of Tailings Storage Facility**

## 5 PROJECT INFRASTRUCTURE

### 5.1 Overview



**Figure 5.1: Site overview**

The design and scope definition of key project infrastructure packages has been refined to optimise the capital estimate; mitigate major project threats, namely power and water; and to respond to opportunities and threats that have emerged through further investigations and value engineering workshops.

OZ Minerals has entered into a Transmission Connection Agreement (TCA) with ElectraNet for the supply of 55 MW of power.

OZ Minerals is currently negotiating a build, own, operate, maintain (BOOM) contract for the 132 kV non-regulated OHTL from Mount Gunson South substation to Carrapateena. This BOOM contract would provide for a 13 month construction period for the transmission line with an anticipated date for energisation onsite in Q2 2019.

Construction water will be supplied primarily from the onsite Radial Wellfield with installation of the water distribution network scheduled to commence in Q3 2017. Operational water will be supplied from the Radial Wellfield and Northern Wellfield with water drilling exploration ongoing in the Northern Wellfield to prove up the yields.

The design of the Western Access Road has been refined in consultation with the Kokatha people resulting in some areas of the design being optimised in line with cultural heritage considerations, such as the realignment of the road near Yeltacowie Creek which has moved it out of the floodplain.

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Through the FS process, a number of opportunities to reduce onsite peak manning requirements to enhance safety outcomes, reducing the risks associated with the schedule and drive capital cost efficiencies were identified. As a result, the size of the village has been reduced from 825 beds proposed in the PFS to 550 beds in this FS base case.

An airstrip has now been included into the capital cost estimate delivering a significantly safer transport option for workers along with productivity efficiencies with payback period of less than two years.

Following geotechnical investigations which found that onsite borrow materials were not suitable for construction works, an offsite quarry option was pursued.

This solution also provides a potential training and development opportunity for the Kokatha People to gain experience working in a quarry.

Non process infrastructure has been reviewed with a specific focus on traffic flows, personnel movements and accessibility to enhance operability, productivity and maintainability across the site with like facilities grouped together. In addition, the fuel farm facility will be designed and installed by the fuel supplier thereby deferring upfront capital cost, which is paid for through a tariff on fuel supply. This has been incorporated into the base case and is underpinned by a commercial contract currently under negotiation.

In line with OZ Minerals' modern mining philosophy, advanced information and communication technologies have been integrated into the mine design to enable the progressive digitalization of people, equipment and facilities and provide capability for a potential future remote mining operation.

Key features of the Project infrastructure considered in the capital cost estimate are summarised in Table 5.1.

**Table 5.1: Key Features of Project infrastructure**

Area	Feature
Power	132 kV, 55 MW High Voltage connection to SA grid
Water	Up to 11.5 ML/d from on-site wellfield
Access Road	Unsealed access road approximately 50 km to Stuart Highway
Village	550 person high specification, second-hand facility
Airstrip	1344 m long x 30 m wide with an apron capacity to support two aircraft (Dash-8 Q300 turboprop aircraft)
Quarry	Option to operate offsite quarry
NPI	Consumable on-site storage capacity for up to 10 days
Technology and Information Systems	Base build includes core futureproofing components to support future staged expansion, including 10 GB network switches (bandwidth) and a 72 core fibre optic backbone

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## 5.2 Off-Site Infrastructure

### 5.2.1 Western Access Road

The PFS proposed a Western Access Road based on a preliminary design that featured a typical road cross section. During the FS process, hydrological analysis of the catchment was undertaken to further inform design requirements. In addition the road was modelled in a 3D design environment to identify opportunities to minimise earthwork requirements by optimising cut to fill ratios through revised grades and road curvature.

In line with OZ Minerals commitment to creating value for all stakeholders, the road design has been developed in consultation with the Kokatha people. This has resulted in some areas of the design being optimised in line with cultural heritage considerations, such as realigning sections of the road near Yeltacowie Creek which has moved it out of the floodplain.

The PFS proposed the use of local borrow material for the construction of the Western Access Road. Geotechnical investigations of potential borrow pit locations along the road were conducted during the FS process and involved 109 test pits, of which 24 warranted further evaluation.

50% of the evaluated test pits had a California Bearing Ration (CBR) of <5, demonstrating that *in situ* soils along the Western Access Road are of low quality and not suitable or economical for road construction. Due to its low specification, if used, a thick sub-base layer of up to 600 mm would have had been needed to meet the required structural integrity of the road. Furthermore use of local borrow for the 150 mm wearing course (above sub-base) would result in 40% of wearing course needing to be replaced annually.

As a result, the construction methodology for the Western Access Road has been revised and the base case now includes the use of high quality, construction material sourced from an offsite quarry (refer to Section 5.5) thereby significantly reducing the required thickness of sub-base and improving durability of the wearing course.

Value engineering opportunities considered during the FS phase have been incorporated into the scope to drive further capital cost reductions. These include:

- Relaxing hydrological design criteria to 1:5 to allow reduction in thickness of sub-base and number of culvert crossings required along the alignment
- Replacing creek crossing causeways with floodways thus eliminating requirement for numerous 900mm concrete culverts and potentially delivering significant cost savings
- Reducing the design speed to 80 km/hr to increase gradient and tighten curves on the road alignment resulting in reduced earthworks
- Reducing trafficable width of road from 10m to 9.5m providing ~5% reduction in overall cost
- Reducing road base and subbase thickness due to use of high specification offsite quarry material rather than local borrow
- Realigning road alignment at Elizabeth Creek and Yeltacowie Creek in line with Kokatha preferred option.

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Further opportunities will continue to be pursued during the detailed design phase.

### 5.2.2 Accommodation Village

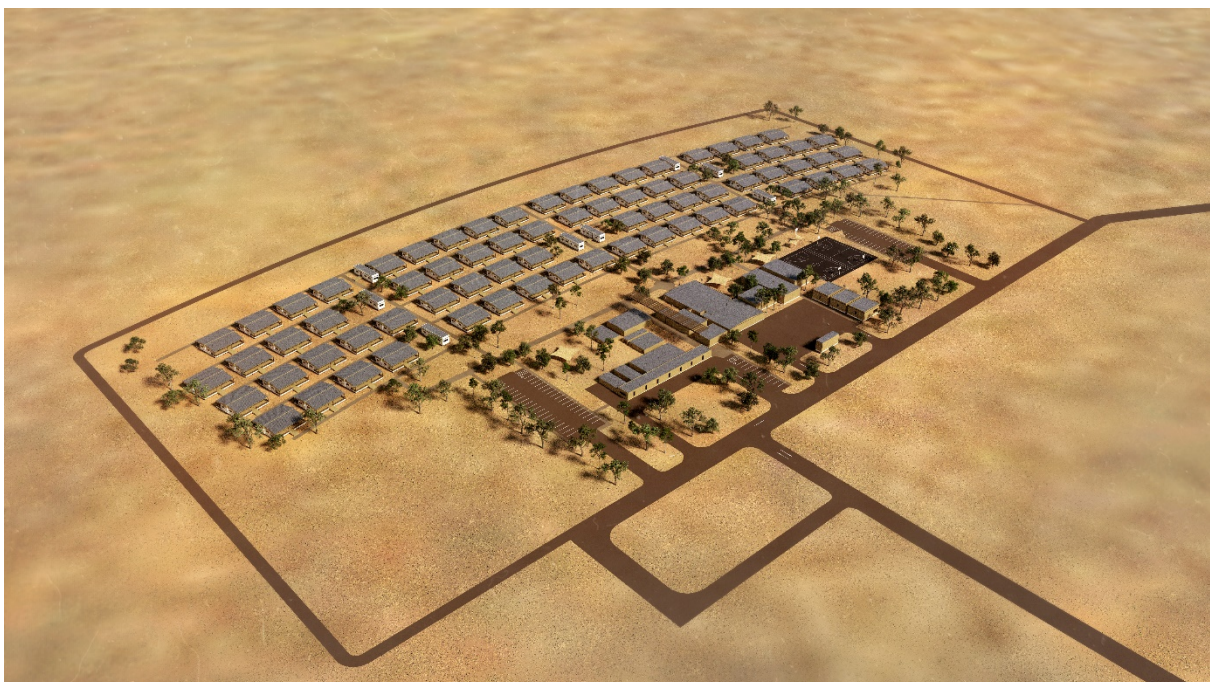
The PFS made provision for the expansion of the exploration camp from 176 to 252 rooms and the construction of a new 825 room Tjungu Village. Through the FS design, a number of opportunities to reduce onsite peak manning requirements to enhance safety outcomes and drive capital cost efficiencies have been realised including:

- Re-sequencing of on-site construction works with a methodology that maximises off-site construction (modularisation) and reduces parallel construction activities
- Alternative off-site quarry location for construction materials enabling workers to be accommodated offsite
- Alternative sequence of the Western Access Road construction enabling workers to be accommodated offsite.

#### Exploration camp

The re-sequencing of construction activities allows use of the existing exploration camp to house workers for the construction of the new Tjungu Village and adjacent airport. On commissioning of the Tjungu Village, the base case assumes that the exploration camp will be decommissioned with all site personnel moving to the new Tjungu Village.

#### Tjungu Village



**Figure 5.2: Indicative Tjungu Accommodation Village layout**

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Reflecting the updated peak manning requirements at Carrapateena, the planned capacity of the Tjungu Village has reduced from 825 rooms to 550 rooms.

Further value engineering activities during the FS phase resulted in scope modification that has delivered additional capital cost savings, including:

- Repositioning the Tjungu Village to better reflect the natural terrain to minimise earthworks cut and fill requirements and reduce the access road by 500 m
- Elimination of 9 km sewage pipework and supporting pump infrastructure previously required to transport waste water from the NPI plant to the Tjungu Village now being treated at the NPI
- Elimination of 9 km process water pipework and supporting pump infrastructure to feed the reverse osmosis plant at the Tjungu Village which is now being fed directly from the Radial Wellfield.

The PFS assumed the use of second-hand accommodation units from the Prominent Hill Mine. As part of the PFS phase the units were assessed as requiring major repairs and refurbishment to bring them up to an acceptable condition. Furthermore, due to the age of the units (>10 years), it is likely they would sustain significant structural damage in the transport from the Prominent Hill Mine to the Carrapateena Project. For these reasons, the assumption of using surplus Prominent Hill Mine units was deemed not feasible and as such the assumed PFS pricing was voided.

As part of the FS phase, high specification, fit-for-purpose accommodation modules and associated facilities have been sourced, which can be delivered to site to meet the early works schedule requirements.

The estimate unit price per room is \$61,000 per room, providing a highly competitive solution compared to industry benchmarks.

The village has been inspected by the project team and a representative from a specialist camp and remote infrastructure consultancy that has been engaged by the project team. The facilities have been confirmed to be in good condition and built to a high-specification.

Some modifications to the proposed PFS village have been incorporated into the current estimate to improve its overall functionality. This includes improved access for delivery of supplies, consolidated village layout to reduce pedestrian travel distances to central facilities and separation of sleeping areas from common areas.

### 5.2.3 Airstrip

Worker transport options to the Carrapateena site were re-examined during the FS phase resulting in a recommendation to include an airstrip at site within the Package 2 work scope. The inclusion of an airstrip early in the Project works will deliver improved safety outcomes for workers travelling to/from site, reduce road traffic particularly during construction and enhance safety, and produce significant workforce productivity gains during construction and for the LOM.

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During construction, there will be significant heavy vehicle construction traffic, initially on the Southern Access Road and later on the Western Access Road.

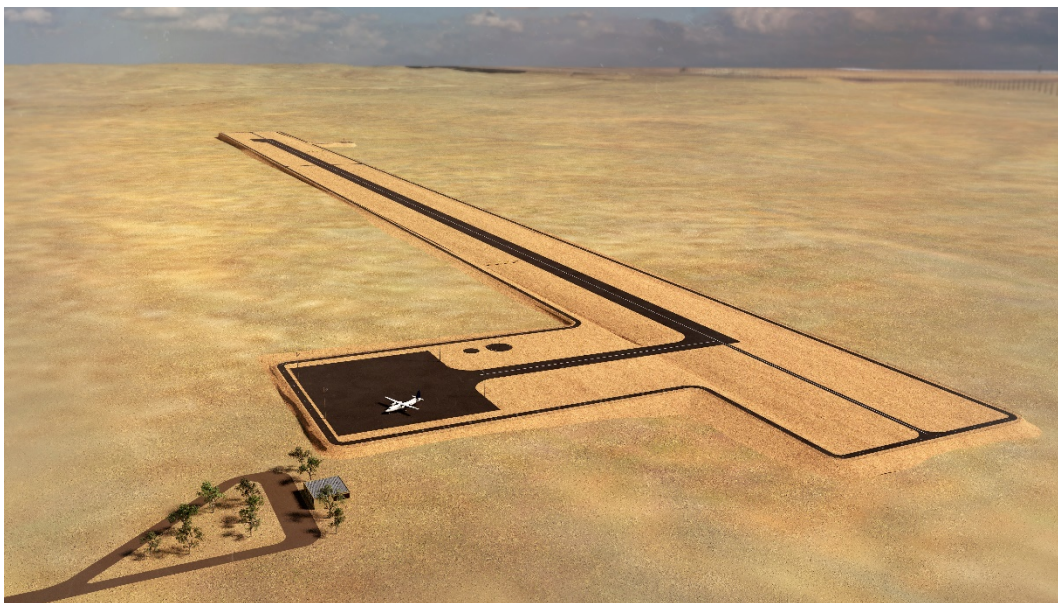
The use of a Fly-in/Fly-out (FIFO) option as early as possible in the construction phase will reduce up to 1,600 personnel movements per month on the access road, thereby reducing traffic interaction. It should be noted however that to ensure support for the Upper Spencer Gulf region, bussing services will be provided out of Port Augusta.

Transporting the workforce to site via FIFO rather than Bus-in/Bus-out (BIBO) delivers significant productivity gains in terms of productive hours worked onsite rather than spent travelling. The Lump Sum price offers included in the base case estimate assume a FIFO workforce with an airstrip operational by May 2018.

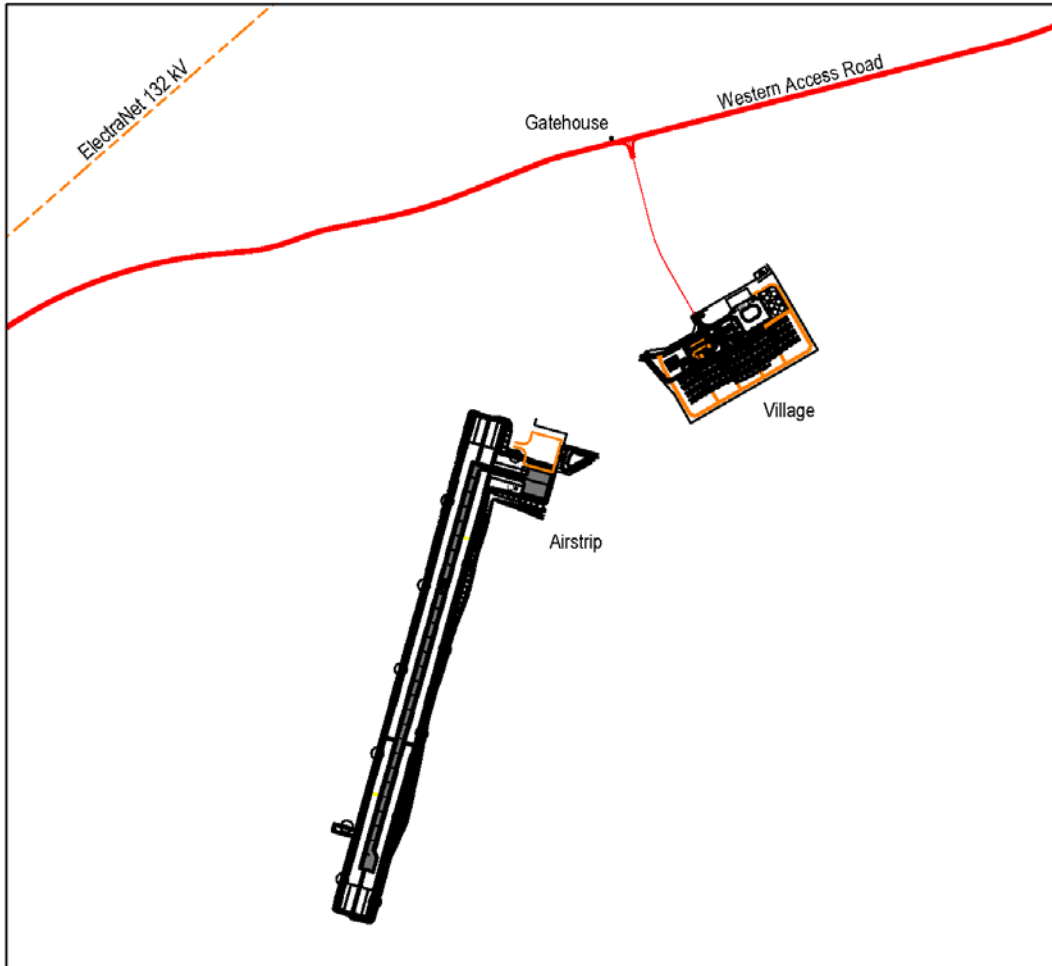
The proposed airstrip is based on a Dash-8 Q300 turboprop aircraft capable of transporting 50 personnel in each movement. The sealed airstrip is 1400 m long x 30 m wide with an apron capacity to support two aircraft and equipped with runway lighting and a navigation beacon to enable night flights as required.

Personnel ticketing and logistics management will be conducted as part of the village operations, which is less than 500 m from the airstrip, with minimal facilities provided at the airstrip itself.

The airstrip layout is shown in Figure 5.3 .



**Figure 5.3: Indicative airstrip schematic**



**Figure 5.4: Airstrip Location Relative to the Village**

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### 5.3 Non-Process Infrastructure (NPI)

NPI has been further defined through the FS phase.

### 5.4 Power

The operational power supply for the Project is via a 132 kV overhead transmission line (OHTL) from the existing South Australian electricity network to the Carrapateena Process Plant via a newly-constructed substation known as Mount Gunson South.

OZ Minerals has entered into a Transmission Connection Agreement (TCA) with ElectraNet for a 55 MW power allocation for a 20 year period.

OZ Minerals is currently negotiating a build, own, operate, maintain (BOOM) contract for the 132 kV non-regulated OHTL from Mount Gunson South substation to Carrapateena. This BOOM contract is expected to provide for a 13 month construction period for the transmission line with an anticipated date for energisation onsite is Q2 2019.

The OHTL alignment will be located within the Western Access Road corridor currently under assessment by the South Australian Government.

#### 5.4.1 Site Power Distribution and Emergency Power

Power will be distributed throughout the surface areas of the site via an 11 kV distribution system, originating at the Site Main 132/11 kV substation.

Emergency back up generation of 2.4 MW capacity via 4 x 600 kVA diesel generators will be provided for the village and 4.95 MW capacity from 3 x 1675 kVA Diesel generators for the processing plant.

### 5.5 Water Supply

#### 5.5.1 Water Exploration

In the April FS Update, it was confirmed that there was a water supply capacity of up to 8.4 ML/day across a range of different locations and salinities. This did not take into consideration an optimised capital works program for infrastructure both downhole and at surface to allow for distributions.

Currently, the value engineered borefield design, which has removed a number of the lower flowing wells, has the site positioned with ~9.7 ML/day across the site and Northern Wellfield with a salinity in the order of 90,000 mg/L (see Table 5.4). Flotation test work during the PFS stage of the project confirmed that metallurgy is not impacted at these salinity levels.

In Q2 2017, a program of works was undertaken to complete long-range pump testing (72 hour tests) at wells identified in the 2016 and earlier drilling campaigns. As a result of this program, an increase of ~10% in the daily yield was obtained and a greater confidence in these wells.

An exploration program is scheduled in the Northern Wellfield to:

- Complete long-range tests on known production sites (target ~10% improvement in yield)

- Complete a drilling program to target wells between 0.5 ML/day and 1 ML/day production capacity to increase the Northern Supply Capacity from the current 2.4 ML/day up to ~7 ML/day to achieve the current forecast 11.5 ML/day requirements and reduce the reliance on higher salinity wells.

Works in Q3 2017 will focused on exploration/pilot wells in the Northern Wellfield, installation of observation wells, drilling out the current known production wells and installation of a monitoring network for the Project.

Regulatory approvals for the Northern Wellfield Supply are expected to take approximately 12 months from the completion of the Northern Exploration works.

### **5.5.2 Water Supply and Demand**

Sufficient water has been identified for the construction works required at Carrapateena. The staging of construction and installation of this supply is outlined in Section 5.5.3.

As per the PFS, operational water will be supplied by the Northern and Radial Wellfields (see Table 5.3).

The PFS anticipated operational water demand of approximately 8 ML/day. Water balance modelling as of June 2017 forecasts average operational water demand of approximately 11.5 ML/day.

The most significant driver for water demand is the process plant with a demand of around 10 ML/d with other ancillary activities such as potable requirements, concrete production, dust suppression and mining demands making up the balance. Further work to optimise water usage is underway.

The sources of water to meet construction and operational demand are summarised in Table 5.3 and Table 5.4

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**Table 5.2: Water Source and Demand for Construction Works and Operations**

Facility	Demand ML/day	Source of Supply
<b>Construction Water</b>		
Western Access Road	2.0 ML	Western Access Road Well and Radial Wellfield
Airstrip	1.0 ML	Radial Wellfield
Village	1.0 ML	Radial Wellfield
Tailing Storage Facility (TSF)	1.5 ML	Radial Wellfield
Bulk Earthworks (Process Plant)	1.5 ML	Radial Wellfield
Stuart Highway Intersection	0.25 ML	Western Access Road Well
Underground	0.35 ML	Pit Well (above orebody)
Construction Average Daily Demand/Supply	Approx. 3-4 ML*	Western Access Road Well and Radial Wellfield
<b>Operational Water</b>		
Village	0.5 ML	Radial Wellfield
Process Plant	10 ML	Northern and Radial Wellfield
Mine (dust suppression and other)	1ML	Northern and Radial Wellfield

\* Under the proposed Early Works Program (see Section 7.3.1), construction of the airstrip and village is scheduled to commence prior to the TSF, process plant and Western Access Road, resulting in a staged water demand with maximum average daily demand of around 4 ML.

**Table 5.3: Wellfield Yield Targets for Operational Water Supply\***

Description Supply	Years 1 to 5 (Including Construction)**	Year 5 Onwards Operations
Radial Wellfield Installed	7.3 ML/day at ~83,000 mg/L TDS**	6.0 ML/day at ~93,000 mg/L TDS
Plus Northern Wellfield Identified	9.7 ML/day at ~92,000 mg/L TDS	8.4 ML/day at ~92,000 mg/L TDS
Additional Northern Exploration Target	Balance to be identified through exploration	
<b>Wellfields Total Demand (ML/d)</b>	<b>11.5</b>	<b>11.5</b>

\* Higher order salinities assume that the higher salinity water is used from the hypersaline wells

\*\* 5.5 ML/d at ~ 30,000 mg/L TDS is available for construction.

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### 5.5.3 Water Distribution

The water distribution network for Carrapateena will be developed in three stages, under the Package 1 scope of works.

#### Stage 1

Three Radial Wellfield wells will initially be developed with a pipeline terminating near the junction to the Western Access Road. Water sourced from these wells will be used for the construction of the Tjungu Village, airstrip and once approved the Western Access Road. This pipeline will be extended to a further two wells following approval of the mining lease to increase the supply.

Construction water for the Western Access Road will also be sourced from two wells, one located approximately midway along the Western Access Road and an existing well near the Stuart Highway. Once the development of the Western Access Road reaches the midway point, the construction will place no further demand on the Radial Wellfield. Investigations remain ongoing into potable water supply from alternate sources for Stuart Highway intersection works.

Construction of this first stage of the water distribution network is scheduled to commence in Q3 2017.

#### Stage 2

The second stage of the water distribution network involves extending the pipeline from the Western Access Road junction to initially terminate at a construction water pond located at the process plant. This allows construction water for the process plant to be sourced from the radial wells with a final local well being connected in to augment supply. Following the construction of the process plant and the TSF, the pipe will be rerouted to the raw water pond as permanent infrastructure. Construction of this second stage is scheduled to commence Q1 2018.

#### Stage 3

In stage three, the Northern Wellfield will be developed for use with the Radial Wellfield to supply operational water for the LOM. Stage 3 construction is scheduled to commence in Q3 2018.

## 5.6 Quarry

OZ Minerals is currently finalising an agreement to operate a currently mothballed offsite quarry. This quarry has approximately 2 Mt of material.

The quality of material available at the quarry together with the commercially competitive offers from contractors to operate the quarry and transport material to site, makes this a superior option compared to the site based quarry sources identified in the PFS.

Due to the location of the quarry, personnel required to operate the quarry and the construction workforce for the Western Access Road can be accommodated offsite, thereby reducing on-site manning

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requirements. This solution also provides a potential training and development opportunity for the Kokatha People.

The quarry is currently licensed under a mining and rehabilitation program to produce between 20,000 - 50,000 tpa of quarry material. This production range is indicative and could be expanded to approximately 65,000 tpa for a limited period. There are no restrictions on stockpiling materials at the quarry. The current licence provides for the extraction of the remaining resource of 1.0 – 1.2 Mt of quarry material and negotiations will provide all necessary operating approvals to OZ Minerals while retaining obligations associated with rehabilitation and closure of the quarry.

The proposed Early Works Program requires approximately 70,000 t of quarry material for the construction of the village and airstrip. Mobilising quarry operations as early as possible in the construction schedule will enable the production of up to 65,000 tpa of quarry material under the existing mining and rehabilitation program, which can support required activities while regulatory approvals or notifications to expand production are sought if required.

## 5.7 Technology and Information Systems

Technology and information systems will provide robust foundational elements, to enable current and future capability requirements of the Carrapateena Project.

Standard control systems with integrated site operations, digital voice radio and CCTV coverage will support the operational philosophy to enable future automation and remote control of the plant and process. A single control room will be established onsite to accommodate and drive collaboration along the mine/processing value chain. Key communications components include a high-speed and reliable Telstra fibre connection to site, 4G cellular coverage and site-wide redundant fibre network.

Proven and established technology and information systems will be used to provide solutions over the LOM. Wherever possible, systems will be hosted offsite using OZ Minerals' current cloud technologies. Enterprise systems (including SAP, Office 365) will be extended to ensure standardised core business processes and business-wide collaboration. This will enable effective use of data for control, monitoring and visibility of operations from day 1, supporting real-time data-driven decision making and predictive analytics into the future.

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## 6 ENVIRONMENT, REGULATORY APPROVALS AND STAKEHOLDERS

### 6.1 Environmental and Regulatory Approvals Overview

The Carrapateena Project is owned 100% by OZ Minerals Limited through its wholly-owned subsidiaries. The applicable legal jurisdiction is that of South Australia. Mining operations in South Australia are conducted in accordance with the requirements of the *Mining Act 1971 (SA)* (Mining Act). The Government of South Australia's Department of the Premier and Cabinet (DPC) administers the Mining Act. OZ Minerals has developed positive relationships with South Australian regulators as a result of the Prominent Hill Mine operation and believe this will continue through the Carrapateena Project.

The legal framework, including tenure, land access and royalties related to the Carrapateena Project, is based on the regulatory process under the Mining Act. Of note, subject to a declaration of the Treasurer following an application lodged with the Director of Mines, a discounted royalty rate of 2% of revenue will be applicable for the first five years of production. Other relevant South Australian and Commonwealth legislation is applicable and will be complied with in relation to the Carrapateena Project.

The primary regulators for the Carrapateena Project are the DPC who regulate mining activities in the state through the Mining Act and the Australian Government's Department of the Environment and Energy (DoEE) who administer the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). Additionally, OZ Minerals works closely with the Government of South Australia's Environmental Protection Authority (SAEPA) and the Government of South Australia's Department for Water, Environment and Natural Resources (DEWNR) as two key stakeholders in the primary approvals for the Carrapateena Project.

In parallel to the engineering studies, OZ Minerals has been working through its regulatory approvals and land access plan to ensure the appropriate regulatory approvals and land access are in place prior to the commencement of site activities.

Activities onsite are occurring under the conditions of Retention Lease 127, which allows OZ Minerals to continue to refine the mining method and propose operating conditions for the future proposed mining activity.

To support the works onsite, OZ Minerals applied for approval under the Mining Act for a Miscellaneous Purposes Licence (MPL) for the development of an airstrip and the Tjungu Village.

In July 2017, OZ Minerals was granted MPL149 for the airstrip and the Tjungu Village. A Program for Environmental Protection and Rehabilitation (PEPR) is scheduled for submission to the DPC in August 2017. Approval is anticipated to be received mid September 2017 in conjunction with required Department of Health licences, allowing early construction works on the airstrip and Tjungu Village to commence.

### 6.1.1 EPBC Referral

In March 2017, OZ Minerals made a submission to the DoEE due to the triggering of the requirements of the EPBC Act. The Project was 'referred' for two reasons, the trigger of the nuclear action definition as a result of disposal of naturally-occurring radioactive material in the Tailings Storage Facility, and the identification of a number of listed threatened species that have been observed onsite or may occur within the Project area.

In April 2017, following the compulsory 20-day statutory consultation period, OZ Minerals was informed that the Project was a "controlled action" and the Project would be assessed under the assessment bilateral established through an administrative arrangement with the State and Commonwealth governments to reduce duplication and streamline environmental assessments.

### 6.1.2 Mining Lease Application

In May 2017, OZ Minerals submitted the environmental impact assessment for the Carrapateena Project in the form of the Mining Lease Proposal and Application and the Miscellaneous Purposes Licences Management Plan and Applications as required under the Mining Act and to comply with the requirements of the EPBC Act. Following a validity check by both the State and Federal government, the Project commenced a formal five week statutory consultation period which closed on 19 July 2017. This consultation period allowed members of the public, parties with direct contact to the Project and government agencies to comment on the submission.

OZ Minerals is anticipating the offer of the Mining Lease to occur in Q1 2018. With Retention Lease 127 due for expiry on 13 March 2018, an application for the extension of the Retention Lease will be submitted in September 2017 for consideration by DPC. However, given the progress already made on the Mining Lease, the timing of the Retention Lease renewal is not expected to present a threat to the Project.

Once formal offer and subsequent acceptance of the Mining Lease has occurred, which only takes place following approval from both the State and Commonwealth governments, OZ Minerals will be required to submit a PEPR for approval and completed secondary permitting requirements to enable site works to commence. The current FS base case assumes approval of the PEPR in March 2018. OZ Minerals intends to continue to work with the State Government to identify opportunities to parallel components and expedite this approval.

The only activity that remains subject to the application of any documentation for assessment is the Northern Water supply for the operations' long-term supply requirements, which is expected to commence following further northern drilling works in Q3 2017.

### 6.1.3 Secondary Approvals

In parallel to the Project assessment and subsequent PEPR drafting, a number of secondary approvals are required under other state and federal legislative requirements, including but not limited to a

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number of additional MPLs, Extractive Minerals Leases (EMLs), and a range of other legislation including the *Environmental Protection Act 1993* (SA), the *Radiation Protection and Control Act 1982* (SA) and the Significant Environmental Benefit offset requirements of the *Native Vegetation Act 1991* (SA). This will support construction and ultimately operations.

#### **6.1.4 Closure Planning**

When considering the activities undertaken for mining, OZ Minerals has focused efforts to ensure closure planning includes, where possible, progressive rehabilitation separate to longer-term closure strategies. The overarching goal of the closure strategy is to identify and evaluate an integrated asset closure solution that creates a safe, stable, resilient and achievable closure outcome acceptable to key stakeholders. The strategy seeks to deliver post-closure conditions that would support the pre-mining land uses and landscape functions.

The OZ Minerals Performance Standards include requirements for rehabilitation and closure planning. The Project will maintain a fit for purpose "Mine Closure Plan" that will include:

- Rehabilitation and closure objectives and criteria.
- Methods used for rehabilitation and closure of various aspects of the assets.
- As-built surveys for structures.
- Asset liquidation.
- Actual versus estimated costs.

The closure management process includes an annual workshop with relevant operational personnel to review the closure methodology and assumptions, the status of progressive rehabilitation activities and changes to operations (past and/or budgeted) that may have relevance to closure.

Assessments by suitably qualified and experienced experts prior to relinquishment of the tenement have been proposed to demonstrate that the proposed outcomes and conditions can be achieved.

#### **6.1.5 Closure Cost**

Closure considerations have been included in a cost model based on benchmarking undertaken on 30 mines across Australia. Mine closure and rehabilitation were analysed to develop a relationship between the total costs of closure against the area of disturbance. Based on these calculations, closure costs have been estimated to be between \$33 million and \$87.8 million. The most likely cost would be around \$43 million, which is assumed in the FS base case and will be formally addressed through the approvals process.

A large amount of the closure projections will be driven by the assumptions taken forwards in the development of the final landform for the TSF.

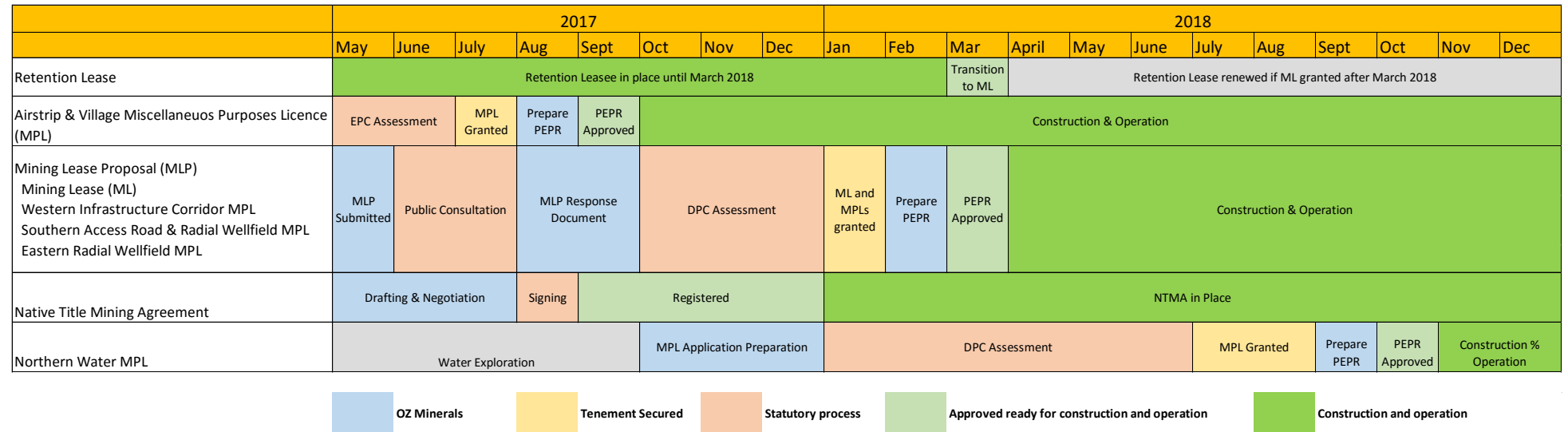
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## 6.2 Approvals Schedule

The anticipated Approvals Schedule is shown in Table 6.1.

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**Table 6.1: Carrapateena Anticipated Project Approvals Schedule**



**Table 6.2: Summary of Approval Status**

Item	Status	Scope
Retention Lease	Retention Lease in place until March 2018	Current exploration activities can continue in accordance with Retention Lease PEPR
Airstrip and Village MPL	MPL granted. PEPR submitted to DPC expecting approval in September 2017	Covers new village, airstrip, ancillary infrastructure and access road
Mining Lease and Associated Management Plans	Mining Lease and MPL Application and Management Plan submitted	Covers mining operations and supporting infrastructure within the proposed tenements as outlined in the Mining Lease Proposal
Native Title Mining Agreement	Successful community meeting held to vote on the NTMA	Future mining activities within the Mining Lease and associated tenements
Northern Water MPL	Not submitted. Awaiting results of water exploration before boundary, application and management plan can be developed	Water supply to support operations

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### 6.3 Stakeholder Consultation

OZ Minerals used stakeholder feedback as a critical input into the development of the Mining Lease Proposal. The feedback received informed a range of key decision points, from development of the Mining Lease Proposal through to Project value creation; planning, employment and procurement.

In-depth engagement was undertaken with the Government of South Australia, through ongoing technical discussions. Stakeholders from a range of State Government departments provided feedback and raised questions on a diverse range of topics. OZ Minerals has provided information during ongoing Project meetings and updates with agencies, and has held technical meetings to discuss Project components and regulatory requirements.

OZ Minerals undertook a formal Stakeholder Feedback Survey in local and regional communities in September and October 2016, and in May 2017 prior to submission of the Mining Lease Proposal, OZ Minerals completed community meetings in Port Augusta, Port Pirie, Whyalla, Roxby Downs, Andamooka and Woomera.

The feedback from these sessions was overwhelmingly supportive with a common theme across all meetings of job opportunities, business opportunities and the need to build sustainable outcomes for communities.

OZ Minerals will continue to engage with key community groups and stakeholders who may potentially be affected by Project activities and is committed to working with all stakeholders to determine post-mining land uses.

#### 6.3.1 Ongoing Stakeholder Engagement

OZ Minerals is committed to creating value in the communities in which it works and developing the Project in a manner that reflects what is important to stakeholders. It is important to OZ Minerals that engagement is maintained with stakeholders who may have raised specific concerns and/or have a specific interest in potential outcomes. This forms a part of the ongoing management capability and how engagement is approached across the Project lifecycle.

The approach to ongoing engagement will be underpinned by the OZ Minerals Social Performance Standards and must comply with the measurement criteria that will be identified through the development of the PEPR as part of the secondary permitting process.

OZ Minerals' engagement will be monitored, measured and reported on as part of its publically available sustainability reporting process. This includes audit of activities and reporting by an independent third party.

OZ Minerals' commitment to creating value for stakeholders is evident through the investment of significant resources to ongoing engagement, including two full-time engagement staff members, who have a regular and ongoing presence in local and regional communities. This is coupled with regular visits to the region by senior and executive members of the OZ Minerals team.

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#### 6.4 Aboriginal Heritage

Management of impacts from the Project on Aboriginal heritage remains an operational commitment for OZ Minerals. OZ Minerals is committed to a high standard of community engagement and social performance by its employees and contractors. OZ Minerals works to a series of social performance standards that ensure the Project continues to understand community views and management of Aboriginal heritage.

OZ Minerals places great value on their relationship with the Kokatha People. OZ Minerals and Kokatha Aboriginal Corporation seek to work in partnership to further develop the Partnering Agreement Nganampa palyanku kanyintjaku 'Keeping the future good for all of us'. This collaborative agreement encapsulates, recognises and values the ongoing contribution of both partners, and will inform the relationship between Kokatha and OZ Minerals throughout and beyond the development of the Project. To ensure the continued effectiveness of the Partnering Agreement, a Partnering Management Committee (PMC) group has been set up to help guide the Project.

By working in partnership with the Kokatha Aboriginal Corporation heritage team and the lessees of Pernatty Station, the OZ Minerals Land Access and Community team were able to optimise the alignment of the Access Road and power line infrastructure, reducing the length of the road from 55 km to 52 km, demonstrating a clear cost saving for OZ Minerals both in Capex and Opex, while maintaining the cultural, environmental and agricultural values of the Project Area.

OZ Minerals aims for no disturbance to Aboriginal sites, objects or remains of significance, and Aboriginal heritage clearances have been undertaken in accordance with the agreed protocol between OZ Minerals and the Kokatha People. Data collected by a mutually agreed anthropologist has been compiled for ownership by both parties. The presence of any artefacts or mythological landscapes within the area have been handled by the Kokatha People's Aboriginal heritage survey team in accordance with the procedures for Aboriginal heritage management agreed under the NTMA.

OZ Minerals is committed to compliance with the *Aboriginal Heritage Act 1988* (SA), The Project will continue to maintain a Cultural Heritage Management Plan to manage the impacts of the Project on Aboriginal heritage through the development of a cultural heritage management system including cultural awareness training, communication and cultural respect, and measures to be undertaken in the event an Aboriginal heritage site is discovered.

#### 6.5 Native Title Mining Agreement

In South Australia, native title is managed under an alternative to the 'right to negotiate scheme' in the *Native Title Act 1993* (Cth) being under Part 9B of the Mining Act. Under Part 9B of the Mining Act, a registered NTMA is required before a Mining Lease can be granted.

The NTMA and Certificate of Compliance with the Kokatha Aboriginal Corporation was endorsed by a voting majority and signed at the community general meeting at the end of July 2017. The NTMA was

then lodged for registration with the South Australian Mining Registrar. It is expected registration will take approximately one month and is anticipated for late August 2017.

## 6.6 Pastoral Agreements

The activities associated with the Project interact with Pernatty, Oakden Hills, Bosworth, Arcoona and South Gap Pastoral Leases at varying degrees. The Pastoral Leases are predominantly used for sheep grazing, however limited water resources in the area necessitate low stocking rates and some areas are only grazed when surface water is present in dams, creeks and waterholes.

OZ Minerals has worked with the pastoralists during the design development of regional infrastructure alignments and construction and is in the process of negotiating access and compensation agreements where required with pastoral leases and freehold landowners for areas covered by the proposed tenements. These agreements will address:

- Waiver of exemption requirements as required under section 9AA of the Mining Act. All land access and compensation agreements will consider any future exempt land and waiver requirements, and will ensure that the parties are given adequate agreed notice and compensation.
- Compensation based on a dollar per hectare impact according to infrastructure footprints (including fenced exclusion areas and regional infrastructure MPLs).
- Impact to the status of pastoral organic producers (ensuring no impact).

## 6.7 Third-Party Agreements

The proposed tenements for the Project overlap with other third-party's tenements.

A number of Dual Tenement Agreements as required by section 80 of the Mining Act for overlapping tenements were negotiated during 2017. These outline the manner in which OZ Minerals will engage with the neighbouring exploration ground holders and ensure that Project activities and third party activities can occur without interference to each other.

Further, a number of access deeds and operating protocols, including waivers, will be completed for infrastructure that interacts or connects to existing infrastructure.

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## 7 PROJECT IMPLEMENTATION

### 7.1 Project Management

A comprehensive project management structure has been put in place to ensure the Project can be developed on budget and schedule.

Governance of Project execution has been formally established with charters and delegation authorities in place. These include the use of a Management Committee, Steering Committee and independent Advisory Committee. The Operations General Manager is the customer of the Project and as such is included in all material decision making processes to ensure operability features heavily in decision making.

A management committee comprising two senior executives from our project management partner and OZ Minerals has been put in place to allow for more agile decision making and effective conflict resolution without causing distraction to the Project.

The Carrapateena Management Committee (CMC) has been established to provide governance over the delivery of the Carrapateena Project. More specifically, its purpose is to provide a pathway for agile Project decision making and oversight regarding the relationship between the Principal and PMC through to Project completion.

The Carrapateena Steering Committee is convened to ensure Project information is circulated across all pillars of OZ Minerals and also to provide decision making where the authority level of the CMC is exceeded

A three-member Advisory Committee also acts as an independent review party over the Project and reports directly to the Steering Committee.

### 7.2 Safety Management

The Carrapateena delivery strategy primarily involves multiple vertically integrated packages thus enabling a single contractor to be responsible for a geographically defined construction area. In the instance where more than one contractor is required in a geographical area, such as the TSF construction, the contractor with the primary component of work shall lead.

The safety management strategy for construction works recognises that lead contractors selected for the project bring proven safety management systems and procedures along with a track record of successful application. It seeks to avoid imposing additional layers of compliance requirements by allowing contractors to apply proven methodologies to achieve the required safety outcomes.

Contractors will be required to develop safety management plans specific to their scope of work prior to mobilising to site. These plans will be reviewed and approved by OZ Minerals to ensure they are consistent with the company's Performance Standards, desired culture and social performance objectives.

OZ Minerals will periodically audit contractors against their approved plans to provide assurance that safety is being managed appropriately and the desired safety outcomes are being achieved.

In the event that the Royal Flying Doctor Service is required during early works, an airstrip is available at Pernatty Station that is suitable for a light aircraft.

### 7.3 Project Schedule

#### 7.3.1 Early Works Program Schedule

The base case Early Works Program comprising detailed engineering, long-lead procurement, off-site fabrication and construction of the Tjungu Village and airstrip is scheduled to commence in Q3 2017 prior to the approval of the Mining Lease. This strategy will deliver:

- Improved safety due to reduced on-site works, interfaces and schedule pressure
- Reduced personnel at site and peak camp requirements
- Improved quality control across delivery
- Optimised equipment selection
- Minimised schedule risk and maximised productivity
- Increased schedule flexibility and minimised on-site rectification works
- Achieved sequential engineering, fabrication, installation and commissioning.

The Early Works Program schedule is shown in Table 7.1.

#### 7.3.2 Post Mining Lease Approval Schedule

Following the receipt of the Mining Lease and PEPR Approval, on-site works are planned to commence within the mining lease, starting with bulk earth works for the process plant and NPI.

Construction of the Western Access Road is planned to be undertaken concurrently, starting from the Stuart Highway progressing towards Carrapateena. This road will provide the primary long-term access route to site and includes provision for the Wide Area Network (WAN) within the same alignment. It also provides access for ElectraNet to construct the HV powerline on an adjacent alignment.

The airstrip is expected to be operational in May 2018, allowing for a FIFO workforce. Upon completion of the conveyor decline and Crusher 1 chamber, the underground materials handling installation will commence.

Construction of the TSF is scheduled to commence in Q3 2018 to support partial process plant commissioning and first concentrate in Q4 2019.

Key milestones for the Project are presented in Table 7.1.

**Table 7.1: Schedule of Key Project Milestones**

Activity Name	Date
Phase One – Early Works	
Construction Commences Airstrip and Tjungu Village	Q3 2017
Phase Two	
Mining Lease Approval	Q1 2018
Mining Lease PEPR Approval	Q1 2018
Commencement of on lease construction works	Q2 2018
Airstrip and Tjungu Village Operational	Q2 2018
First Development Ore	Q1 2019
Main Decline Complete to Top of Orebody	Q2 2019
First Production Ore	Q4 2019
First Concentrate	Q4 2019
Process Plant Fully Commissioned	Q4 2019

#### 7.4 Employee and Industrial Relations

A Workplace Relations Management Plan will be developed to ensure our contractors comply with the requirements of the Code for Tendering and Performance of Building Work 2016 (Building Code).

During the construction phase, it is planned that the OZ Minerals site HR Manager will work collaboratively with the various employee relations/industrial relations representatives to ensure alignment with the OZ Minerals principles. However, given the dynamic nature of the construction workforce and the multitude of workplace agreements, specialist support may be engaged to assist in the development and management of these agreements and the associated Project risk.

A Greenfield Agreement for this Project will not be required as the base case assumes we use existing Enterprise Bargaining Agreements that the individual ECI partners already have in place with their employees. This will allow subcontractors to remain distinct regarding their employment arrangements.

#### 7.5 Commissioning

OZ Minerals will develop an overarching site-wide commissioning management plan that integrates all packages to understand timing and interfaces between packages. This plan will form the framework for the contractors' detailed commissioning plans, which will specify the activities required to commission their scopes of work and demonstrate achievement of required performance criteria.

The implementation of the site-wide commissioning management plan will be supported by a completions management system to monitor and report the progress of each package. The system will be designed to provide maximum visibility of commissioning status at any given point of time, providing flexibility to reprioritise works as required to respond to changing circumstances.

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OZ Mineral's commissioning strategy recognises the importance of an integrated commissioning team to achieve seamless transition from construction through to commissioning and into operations. As such, the Operations team has been actively engaged in the design process and will continue to be involved throughout construction and commissioning.

A key focus for the Operations team is operational readiness, which will take into consideration key aspects of commissioning and handover including minimum level of spares, training, licences and equipment preservation, all of which have been included in the base case.

## 7.6 Operational Readiness

To ensure Carrapateena delivers the FS recommendation and builds on the OZ Minerals Value Proposition, operational readiness planning will be a critical focus through the life of the Project. Operational readiness will assist in delivering stakeholder value by:

- Establishing a lean business and delivering results through effective planning and agile deployment
- Ensuring the asset has the core ability to take key operational decisions where it counts
- Establishing accountability for asset-based delivery of safety, volume and cost performance
- Leading value-based relationships with traditional owners, local communities, pastoralists and relevant key stakeholders.

Operational readiness will be underpinned by early identification of high-performing leaders and by developing capability of asset-based people, recognising those with leadership potential.

### 7.6.1 Operational Readiness Plan

The Operational Readiness Plan (ORP) for the Carrapateena Operation describes a framework to assist OZ Minerals and its business partners to establish a safe sustainable mining and processing operation. The current draft is intended as a working document containing the implementation strategy and supporting information, and guidelines for the management system and processes required to enable commencement of operations. For this reason, the ORP will undergo refinement and revision as knowledge and experience is acquired while the mining and processing operations phase of mine development is being established.

### 7.6.2 Operational Readiness Plan Functional Areas

The Operational Readiness Plan describes the process by which the operational teams will prepare for full-time and sustained operation of the mine and processing facility following handover from the Project Team. For this to occur, systems will be in place at that time in the following functional areas:

- Support Functions:
  - Site Management
  - Safety and Health

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- Community and Environment
- Human Resources
- Commercial
- Operational Functions:
  - Technical Services
  - Mining
  - Processing
  - Engineering and Maintenance
  - Logistics.

Each of the functional areas will work through requirements for people and processes specific to their area of operational support and delivery. Examples of these are shown in Table 7.2.

**Table 7.2: Operational Readiness Support and Delivery**

People	Processes	Other
Organisational Structure	Operational Systems and Processes	Regulatory and Community Relations
Recruitment Planning	Asset Management	Minor Equipment, Software and Consumables
Training and Development	Contractor Management	
	Wet Commissioning Plans	
	Planning Process	
	Reporting Process	

Operational readiness planning and delivery will take place during the Project execution phase as a parallel path to Project delivery. The will ensure that necessary people, processes and systems are in place ready for commissioning handover and enable safe and rapid ramp up of operations post project phase. These activities have been scheduled and costed as part of the FS base case.

### 7.6.3 Construction Interface Management

During the Project construction phase of the operation, the ORP will define and implement the Mine Operating System (MOS). The MOS will manage the interface between construction and operations during the Project phase, as well as be a key operational system and process for ongoing operations.

The MOS will outline the necessary site planning and communication requirements and include a structured approach to Annual, Quarterly, Monthly, Weekly and Daily planning and reporting. Through the involvement of all stakeholders in the MOS process, site activities will be coordinated to minimise delays or unplanned interactions that prevent maximum value being realised for all teams on site.

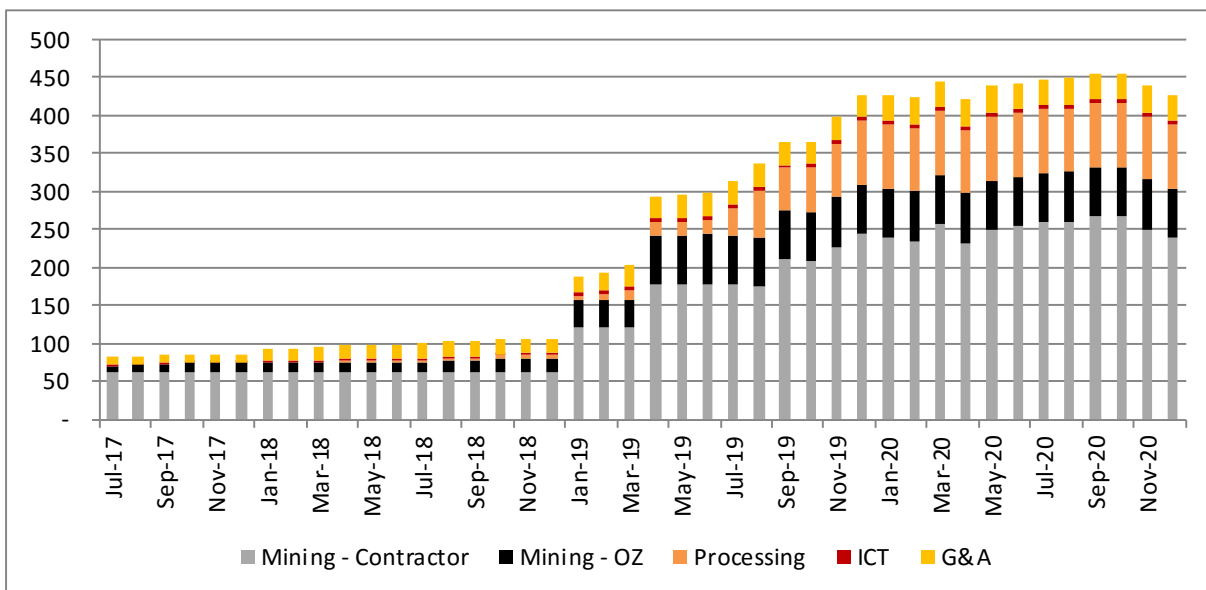
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The coordinated MOS process will minimise the interface risk during the Project phase. The Operations General Manager is accountable for leading the site and the site MOS.

### 7.6.4 Staged Onboarding and Organisational Structures

As part of the FS base case, organisational charts through the various Project and Operational phases have been developed with assumptions made about when each role will be recruited. This will be continually refined through Project execution.

Key operational positions, starting with operational managers, will be recruited at milestones during the Project to progress the delivery of the people, processes and other operational readiness requirements of each specific area.



**Figure 7.1: Carrapateena Resourcing (non-construction)**

During the life of the Carrapateena operation, a staged approach to people and organisational structure will be taken. This staged approach is based on the requirements of the operation at different points in time, the capability of the people and the establishment of systems and processes.

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## 8 MARKETING AND SALES STRATEGY

### 8.1 Summary

The Carrapateena concentrate is expected to be a desirable product for copper smelters due to its high copper grade of 30-40%. OZ Minerals has significant experience in marketing concentrates of varying qualities, including the Prominent Hill Mine concentrate. OZ Minerals has strong relationships with existing and potential customers, and mature mine-to-market access via established logistics routes to domestic export ports.

### 8.2 Benchmarking

In terms of product specification, based on drilling and testing to date, the Carrapateena concentrate is expected to possess one of the highest copper grades in the global market. Carrapateena concentrate is expected to be saleable internationally, including to China, Europe, India and Australia.

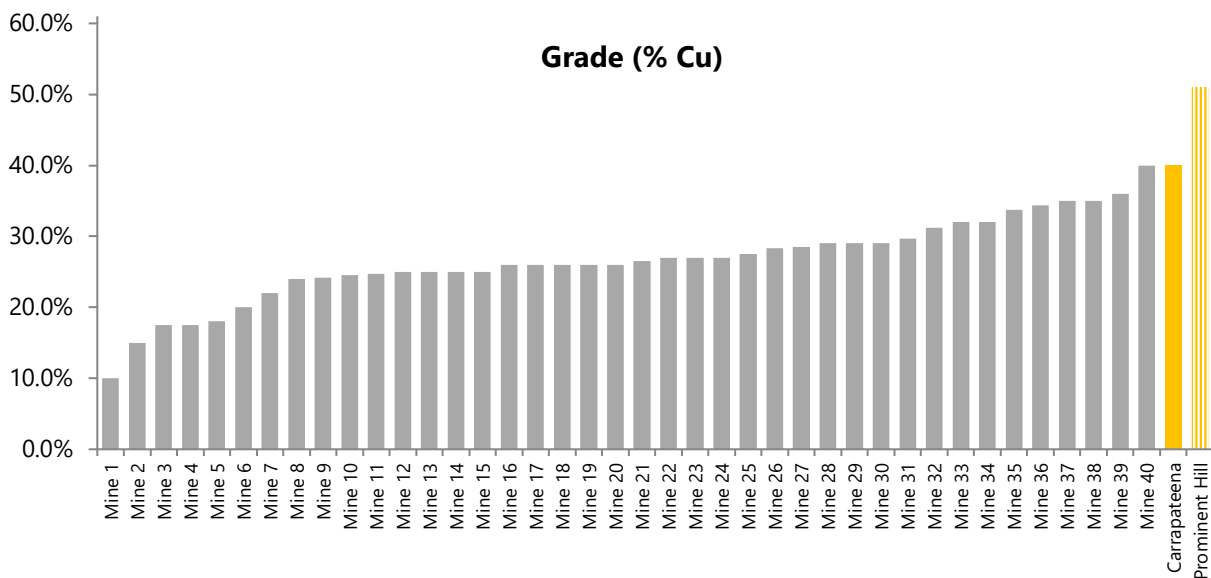


Figure 8.1: Comparison of Global Copper Grades (Source: Wood Mackenzie)

#### 8.2.1 Copper Grade

The copper grade is expected to range between 30-40%. Smelters typically desire a 25–35% copper grade and as such the Carrapateena concentrate would be ideally suited to copper smelters as feed stock. This high copper grade is also desirable as a blend stock for blending facilities.

Copper payables are assumed in the FS base case to be industry standard

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### 8.2.2 Gold and Silver Content

The gold content in the Carrapateena concentrate is expected to be in the range of 10–30 g/t and would be acceptable to most smelters. Gold and silver payable levels and refining charges are expected to be in line with industry standards.

### 8.3 Uranium, Arsenic, Bismuth, Fluorine, Chlorine, Lead and Mercury

Based on test results to date, Carrapateena concentrate is expected to have low levels of all impurity elements. Each copper smelter is configured to manage certain levels of individual impurities. Some smelters are legislated to only accept impurities of a restricted import limit. International impurity import limits vary from country to country, and may change from time to time. To mitigate changes to import regulations, it may be prudent for mines to consider producing a product that is not easily affected by longer-term future regulatory changes.

The common impurities of arsenic, bismuth, fluorine, chlorine, lead and mercury have well established industry penalty scales, none of which are expected to trigger penalties for Carrapateena concentrate. Industry standard penalties for uranium in copper concentrates are less well established. OZ Minerals has significant experience in selling concentrates containing uranium of varying levels. The average uranium level in Carrapateena concentrate is expected to be less than that found in the Prominent Hill Mine concentrates and is expected to be saleable internationally without attracting penalties for the first eight years of production. Following this initial period, only moderate penalties are expected in the international market, but these are estimated to be significantly lower than those incurred for the Prominent Hill Mine concentrate. As a result, CTP is no longer a pre-requisite part of the base case for Carrapateena.

OZ Minerals has developed a diversified sales approach including mine site ore and concentrate blending, custom shipment production and, sales to smelters and blending facilities.

An improved level of confidence in uranium rejection and predictability in concentrate processing has led OZ Minerals to conclude that the CTP is not necessary to produce a high quality, saleable concentrate. However, should the CTP prove to be a viable project, it would potentially allow Carrapateena concentrate to be sold to an increased range of markets at premium commercial terms.

#### 8.3.1 Market for Copper Concentrates

In the short term (to 2018), due to decreased global economic activity, mainly influenced by China, the copper market is expected to be in a surplus. Despite the current surplus market, global demand is still expected to grow faster than forecast mine supply. The supply demand balance is expected to return to deficit within 2-5 years. China continues to be the largest consumer of copper, followed by rest of Asia, North America and Europe. Traditional uses for copper including infrastructure, electronics and power are expected to be complemented by emerging new uses such as electric vehicles and the required copper grid infrastructure. Although the long term copper demand is forecast to outgrow supply, this is still subject to any adverse macroeconomic factors.

The majority of the world's copper concentrate production is processed in copper smelters and refineries throughout the world. These smelters and refineries convert copper concentrate into copper metal and other recoverable saleable metals. A mine concentrate producer will be paid for the recoverable metal. Undesirable elements have to be removed and disposed of during the smelting and refining stages. A mine concentrate producer incurs charges for these deleterious elements. In recent times, smelters have developed operating models to maximise revenue from impurities. Hence the market demand for concentrates has become more complex, with copper grade no longer being the only consideration.

## **8.4 Marketing Plan**

### **8.4.1 Target Customers**

Custom international and domestic smelters, and blending facility operators would be the target market. Potential customers have been kept updated with forecast specifications of Carrapateena concentrates. The concentrate specification has been received positively by potential customers. We expect Carrapateena concentrate will be able to be delivered into the Prominent Hill Mine contracts if required and commercially attractive to do so.

### **8.4.2 Approach**

The current OZ Minerals strategy is to commit the majority of its production under long-term contracts direct with smelters. The balance is sold on the spot market or under contract to Merchants to be placed into smelters or as clean concentrate for their blending facilities. The tonnage allocation to each customer will be assessed on items such as specification, counterparty credit risk, existing relationship (if any), geographical risk and, commercial cost based on contract terms. OZ Minerals seeks to have a diversified customer base in order to mitigate risk in counterparty performance and changes in the market. During Project execution and commissioning, OZ Minerals will strategically assess and refine the commercial opportunities that Carrapateena concentrate presents as a standalone concentrate product or as part of the wider OZ Minerals concentrate book.

## **8.5 Marketing Plan**

### **8.5.1 Technical Test Work**

During Project execution, additional concentrate samples will be made available for marketing test work (sample assay by Customers if requested). To date, test work undertaken has confirmed the smelting characteristics are suitable for a number of smelting technologies.

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### 8.5.2 Concentrate Logistics

The concentrate will be trucked from the mine in hard-lidded containers to Port Adelaide where it is then loaded onto ocean going vessels for export to overseas customers. OZ Minerals has been exporting concentrate through Port Adelaide since 2012.

Port Adelaide has permits to handle, store and load copper concentrate. Port Adelaide currently possesses infrastructure and stevedoring capability that is sufficient to handle the Prominent Hill Mine, Carrapateena Project and other third-party bulk cargoes.

The location of Carrapateena mine allows for alternative port options to be considered if Port Adelaide becomes unavailable in the future.

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## 9 FINANCIAL

### 9.1 Summary

The Carrapateena Project has an updated estimated net present value (NPV) of \$910 million with an updated estimated internal rate of return (IRR) of 19.6%. The Project assumes extraction of first development ore in Q1 2019. The operation is expected to be commissioned in Q4 2019 after the plant has operated continuously for two weeks at a minimum of 75% of nameplate capacity.

The cashflows are based in Australian dollars in real terms.

Following the approval of the PFS, all costs incurred in relation to progressing the Carrapateena Project, including decline development, site infrastructure, studies and general and administration (G&A) costs have been capitalised and amount to \$63 million at 30 June 2017. As these costs have been incurred prior to the investment decision, they have not been included in calculating the base case Project economics. For completeness and transparency, the financial metrics including those costs is provided in Table 9.1.

**Table 9.1: Financial Metrics Including Costs Incurred Prior to Investment Decision**

	PFS	FSU	FSU + Sunk Costs	FSU - Contingency
NPV (\$m)	765	910	860	950
IRR (%)	20.2	19.6	18.5	20.5
Pre-production capital (\$m)	833	916	979	850
Key Assumptions	CTP Q1 2016 Corporate Economic Assumptions Discounting from 1 July 2016	No CTP Q3 2017 Corporate Economic Assumptions Discounting from 1 July 2017	\$63m incurred from 1 July 2016 to 30 June 2017 included in 2017 costs	\$65m excluded from 2019 costs

The estimated pre-production capital of the Project (excluding sunk costs) is \$916 million. An Early Works Program is proposed to be undertaken prior to approval of the Mining Lease and access to site in April 2018, which includes detailed design of the process plant and TSF, long-lead procurement, off-site fabrication and construction of the airstrip and village. The committed expenditure during this period of \$167 million is included in the estimated pre-production capital of \$916 million above

During the construction phase up until commissioning, the costs such as electricity supply, mining of ore, processing costs of testing material etc., which in the normal course of operations would be expensed as incurred, are capitalised as the Project is in development. These costs amount to an estimated \$40 million and are not included in the pre-production capital and would be largely offset by

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the estimated revenue generated from the expected sale of concentrate from pre-commissioning ore of \$30 million. Coinciding with the anticipated delivery of first concentrate from the processing plant in September 2019, capitalisation of operating costs ceases.

As per the sale and purchase agreement with Rudy Gomez, Teck and other parties, an amount of US\$50 million is payable upon commencement of sale of concentrate containing copper or gold from the Carrapateena Project or sale of interest in Carrapateena to third parties. This payment is included in the LOM capital costs in 2020.

Through the ramp up phase of the Project expected from September 2019 to the end of 2020, estimated sustaining capital amounts to \$160 million compared to estimated LOM sustaining capital of \$820 million.

Also noting that the level development ceases from 2033 as from that point onwards, it is expected that there will only be draw down of ore until the end of LOM

The above costs have been classified as sustaining as they are in the nature of costs incurred to maintain the average production rate from the Project and not of a growth nature. All costs incurred in creating an asset, such as equipment or level development, which has a useful life of more than a year is capitalised as sustaining capital or otherwise considered as an operating cost.

Estimated operating costs of the mine amounts to \$50 per tonne of ore milled. This includes the costs of mining, processing, road transport to Port Adelaide and shipping to customers, site G&A, South Australian Government royalty of 2% for new mines for the first five years followed by 5% thereafter.

The revenue estimates for copper, gold and silver is derived from sale of concentrate containing 36% copper, 11 grams per tonne of gold and 150 grams per tonne of silver. The commodity price, metal payabilities, treatment charges and refining costs, penalties and USD:AUD assumptions are based on Q3 2017 corporate economic assumptions, which is the average of analyst estimates.

Working capital is assumed to be self-generated by the Project and as such no separate funding is envisaged.

The income taxes are based on the corporate tax rate of 30% on a standalone basis with no benefit for the Project from group tax losses built into the financial assessment.

It is anticipated that the Project will generate annual average net cashflows after tax of \$240 million between 2021 to 2025 while it generates average LOM net cashflows of \$265 million for each year of operation.

The estimated LOM C1 costs of US 62 cents per pound is within the bottom quartile of the C1 cost curve providing resilience to the Project from market volatility. The estimated LOM AISC of US 99 cents per pound (which includes royalties and sustaining capital cost in addition to the C1 costs) is within the bottom quartile of the AISC cost curve.

## 9.2 Capital Cost

### 9.2.1 Pre-Production Capital Cost

The estimated pre-production capital cost for Carrapateena is \$916 million and represents the estimated cost of developing the Project until it produces first concentrate (expected in September 2019). The breakdown of pre-production capital compared to the PFS is provided in Table 9.2 for reference.

**Table 9.2: Breakdown of estimated Pre-Production Capital Compared to PFS**

Cash flow – Real	FS	PFS	Var
Plant and Equip	442	220	222
Mine development	183	265	(82)
Services/Utilities/Camp	97	165	(68)
Project execution	128	95	33
Contingency	66	85	(19)
<b>Total Pre-Production Capital</b>	<b>916</b>	<b>830</b>	<b>80</b>

Pre-production capital includes the expenditure to build or develop the following:

- Minerals Processing Plant with 4 Mtpa nameplate capacity
- Camp for accommodating 550 persons
- First lift of the TSF with a capacity to accommodate tailings for the first four years of operations
- Wellfields, desalination plant for the camp, other water supply infrastructure
- Communications, WAN, and IT infrastructure
- NPI including mine access road and airstrip
- Underground materials handling systems to convey ore from the first crusher to surface
- Decline development up to, and including, the first crusher chamber
- First crusher, associated infrastructure and its installation
- First ventilation fan and associated infrastructure including installation
- Substation at site to step down from ElectraNet transmission line
- Groundwater exploration
- Spares, surface and underground fleet
- Approval, studies, project management, owner's team
- Contingency.

This detailed package level estimate is presented in Table 9.3 in line with the proposed delivery strategy.

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The capital cost has been derived through the FS process based on commercial offers, first principals estimating and industry benchmarks.

**Table 9.3: Estimated pre-production Capital Cost Summary (A\$m)**

Package	Description	FSU
1	Process Plant Non-Process Infrastructure (NPI) Underground Materials Handling Underground materials handling ventilation, pumping and power Bulk earthworks Batch Plant Water and Temp Services Communications and Telemetry	391.7
2	Airstrip Access Road Quarry TSF	110.7
3	Camp	33.5
4	WAN	7.5
5	Regional Power	7.0
6	Ancillary Services and Cleaning	2.5
7	Geotechnical Investigations	3.0
8	Decline development	170.8
9	Spares, Surface and Underground fleet	6.4
10	Owner's Costs	116.5
11	Contingency	66.6
<b>Total</b>		<b>916.2</b>

The above estimates do not include sunk costs of approximately \$63 million, which have been incurred in progressing the Project from 1 July 2016 to 30 June 2017. The estimates are all excluding GST as it is not a cost to the company, and do not include CPI escalation unless it has been built in by the contractors where the amounts are quoted as a lump sum. A real weighted average cost of capital of 9.5% is used to discount the cashflows, which accounts for not including escalation in the underlying cashflows.

Approximately 50% of the pre-production capital has been negotiated into Lump Sum Contracts near finalisation.

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Contingency accounts for approximately 7% of the Project delivery capital cost and has been developed through a detailed assessment of each contractor, associated package, level of scope definition, pricing comprehensiveness, extent of uncertainty based on assumptions and exclusions and industry benchmarks. The contingency allocation is based on a package-by-package analysis within individual contingencies at package level. These have been consolidated to derive the total pre-production capital cost contingency.

### Variance from PFS Estimate

The key components contributing to the variance from the PFS estimate include sunk costs, contingency, mining and conveyors, scope definition and productivity assumptions for village, western access road and TSF. A breakdown of this variance is presented in Figure 9.1.

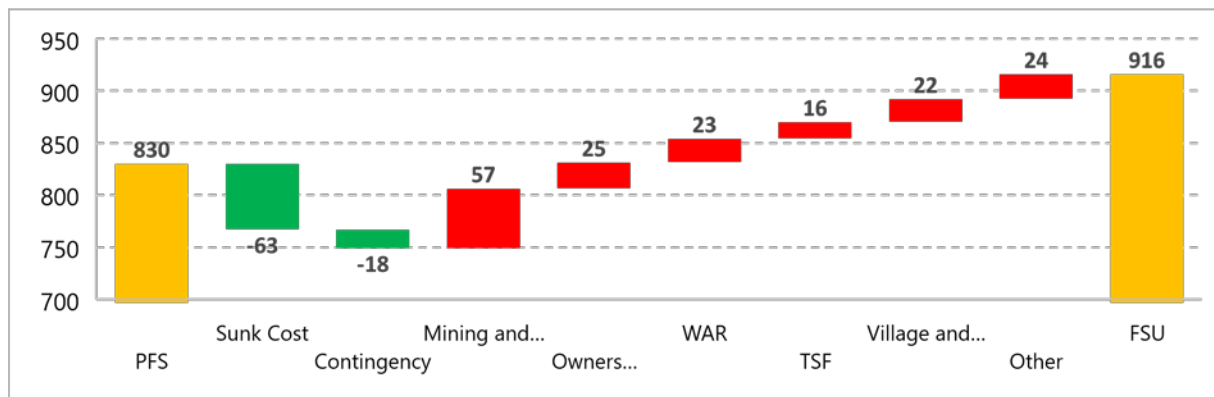
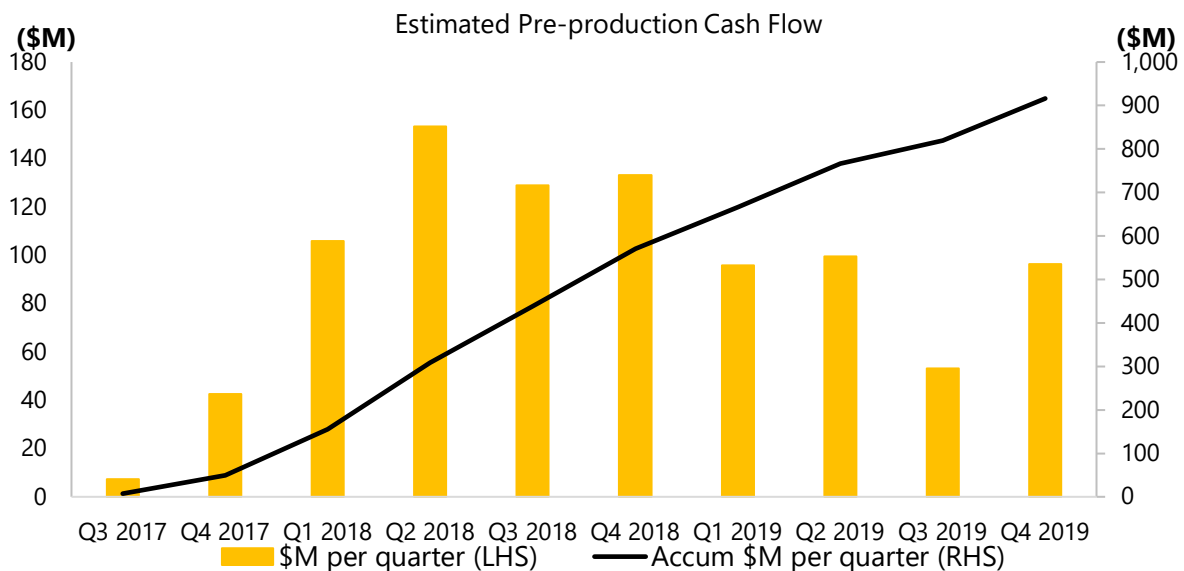


Figure 9.1: Breakdown of Variance from PFS Estimate

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### Estimated Pre-Production Cashflow

Figure 9.2 shows the projected cashflow of the estimated pre-production capital comprising works from Q3 through to Q4 2019.



**Figure 9.2: Projected Cashflow of Estimated Pre-Production Capital**

Note: pre-production cash flow figures are estimates only and subject to the risks outlined in the Key Risks section (see Section 11) and the assumptions set out in this document. Forward looking statements are not a guarantee of future performance and involve known and unknown risks, uncertainties and other factors, many of which are outside the control of OZ Minerals.

### Sustaining Capital

Capital expenditure excluding the deferred purchase consideration discussed above has been considered as sustaining capital expenditure from October 2019 (post commissioning). In the absence of a definition of sustaining, it is a matter of judgement of what constitutes sustaining capital. Generally, sustaining capital is required during the operation phase of the mine to advance mining operations, replace items of plant that have reached their maintainable and useful life, and planned expenditure required to build or modify equipment or infrastructure items necessary to sustain operations at the rated capacity. For the purposes of the Carrapateena Project, the following expenditures incurred from October 2019 have been considered as sustaining capital:

- All costs of capital equipment throughout the LOM
- Development costs relating to the two declines
- Underground mine infrastructure development costs
- Development costs relating to Level development that has a useful life exceeding one year
- Costs of ore passes, drives and vent raises

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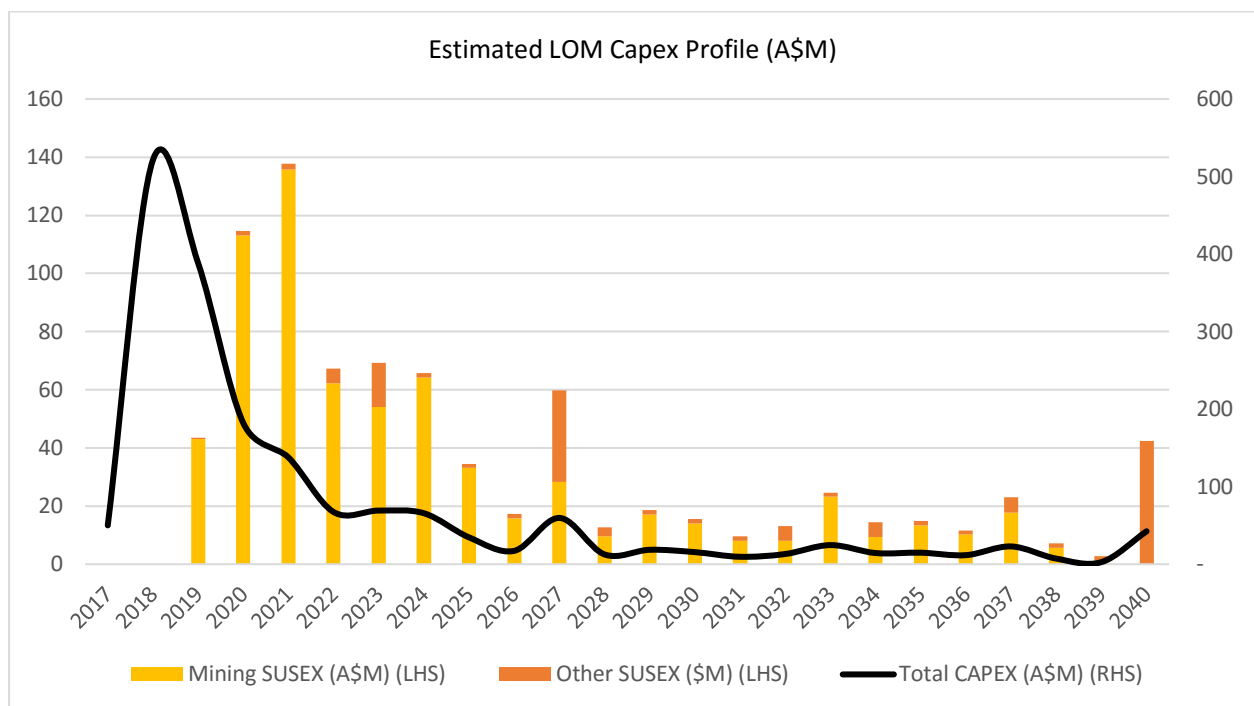
The key judgement is whether the capital is incurred to sustain the 4.25 Mtpa production rate and whether the benefit from that expenditure flows to the Project over more than one year.

The estimated total sustaining capital expenditure over the life of the Project amounts to \$820 million (PFS \$580m) and includes estimated mine rehabilitation and closure costs of \$42.5 million. The increase in sustaining capital between PFS and FS reflects a better level of definition of scope and costs and reclassification between operating costs.

The high levels of estimated sustaining capital expenditure in the early stage of ramp up (first five years average of \$90 million and total in the first five years of \$450 million) compared to average LOM sustaining capital is predominantly attributable to the following:

- Extension of the decline
- Development of multiple operating levels
- Underground infrastructure
- Second crusher
- Extension of materials handling systems from the first crusher to the second crusher
- Other development costs in the nature of capital.

The LOM capital expenditure profile is shown in Figure 9.3 below.



**Figure 9.3: Estimated LOM Capital Expenditure Profile**

Note: LOM capital expenditure profile figures are estimates only and subject to the risks outlined in the Key Risks section (see Section 11) and the assumptions set out in this document. Forward looking statements are not a guarantee of future performance and involve known and unknown risks, uncertainties and other factors, many of which are outside the control of OZ Minerals.

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### 9.3 Operating Cost

Carrapateena is expected to be an operating mine from Q4 October 2019 post commissioning. The operation is expected to be commissioned in Q4 2019 after the plant has operated continuously for two weeks at a minimum of 75% of nameplate capacity. The estimated operating cost amounts to \$50 per tonne LOM (see Table 9.4).

Key exclusions are capital costs, GST, contingency, changes in foreign exchange, depreciation, amortisation and escalation beyond the estimate base date.

The estimate base date is July 2017. The exchange rates used for the estimate are provided in Table 9.7.

**Table 9.4: Estimated Operating Cost Summary**

Category	Description	PFS \$/t	FSU \$/t
Mining and Material Handling	Development, drill and blast, load and haul, mine services, supervision and technical support	20	23
Processing	All processing, laboratory and tailings management	20	17
Logistics	Land and sea freight	7	7
General and Administration	Administration salaries, site supplies and services, site administration, travel and accommodation, insurances, legal and SHEC compliance	4	3
<b>Total</b>		<b>51</b>	<b>50</b>

Operating costs also not included in the table above include the South Australian Government Royalty which is 2% of mine gate value for the first five years and 5% thereafter

#### 9.3.1 Product Logistics costs

Operating costs assumed are based largely on contracts already in place for the Prominent Hill Mine and reference to benchmarks with adjustments made for proximity to logistics infrastructure.

### 9.4 Financial Analysis

Based on the cashflows discussed above, the estimated NPV of the Carrapateena Project is \$910 million at consensus commodity prices and exchange rates using a 9.5% real weighted average cost of capital assuming no debt. The estimated project IRR of 19.6% results in a short payback period of five years from commissioning of the Project.

Excluding the deferred purchase consideration of US\$50 million, the estimated project NPV is \$960 million with an IRR of 20.5%.

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**Table 9.5: Financial Analysis**

Carrapateena FS	Units	PFS	FS
Annual average milling rate	Mtpa	3.8	4.25
Head Grade	%CuEq	2.31%	2.31%
Inventory	Mt	75.7	83.6
First Production	Year	2019	2019
Mine Life	Years	20	20
Pre-production Capital	\$M	(834)	(916)
Capital Expenditure LOM	\$M	(1,484)	(1,803)
Sustaining Capital LOM	\$M	(582)	(820)
Development Capital LOM	\$M	(432)	(687)
Other Capital LOM	\$M	(151)	(133)
Mining OPEX	\$/t	(20.3)	(23.1)
Milling OPEX	\$/t	(19.7)	(16.6)
G&A	\$/t	(4.0)	(3.5)
C1 Cost after by-product credits	US\$/lb	0.82	0.62
AISC	US\$/lb	0.92	0.99
Capital intensity (ex-sustaining capital)	\$/t of Cu	11,800	11,800
Annual Average net cashflow	\$M	241	265
NPV 9.5%	\$M	766	910
IRR	%	20.2	19.6
Payback from completion of development	Years	4	5

The weighted average cost of capital used for evaluating the Project is the OZ Minerals Real WACC of 9.5% and is based on no debt.

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### 9.4.1 Price Sensitivity, Net Cashflows and NPV

#### Price sensitivity

The sensitivity of the financial metrics to changes in the key drivers is provided in Table 9.6.

**Table 9.6: Sensitivity of Financial Metrics to Changes in Key Drivers**

	NPV (A\$M)	IRR
Base case	910	19.60%
±1% Cu	30	0.30%
±1% AUD	32	0.30%
±1% Au	9	0.10%
±1% Cu grade	26	0.20%
±1% Cu recovery	26	0.20%
±1% Au recovery	9	0.10%
±1% Pre production capex	8	0.15%
±1% Mining costs	3	0.02%
±1% Power costs	1	-
±3 month schedule change	51	0.80%

The commodity price, foreign exchange and marketing assumptions that are the basis of the financial valuations carried out during the Feasibility Study Update are shown in Table 9.7. These are based upon a representative range of analyst forecasts issued in July 2017.

**Table 9.7: Commodity Price, Foreign Exchange and Marketing Assumptions**

Scenario/Year	2017	2018	2019	2020	2021	LT
Copper, US\$/lb	2.60	2.63	2.77	2.98	3.02	2.92
Gold, US\$/oz	1,259	1,298	1,308	1,322	1,330	1,306
Silver, US\$/oz	17.9	19.1	19.4	19.7	19.7	20.0
Diesel, A\$/ltr	0.95			0.98		
A\$ / US\$	0.75	0.74	0.74	0.74	0.75	0.75

The Carrapateena Project is NPV neutral or provides a 9.5% return on capital at a copper price of US\$2.12/lb and spot gold and silver prices of US\$1,266/oz and US\$17/oz respectively and assuming a USD:AUD exchange rate of 0.80. At this NPV breakeven price, the Carrapateena Project has an estimated payback of 11 years.

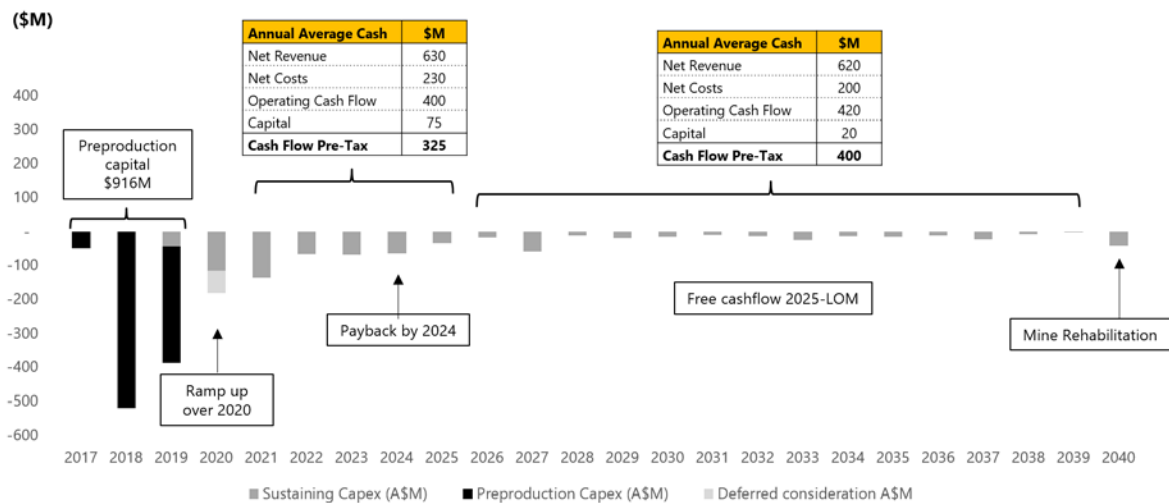
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It is anticipated that the Carrapateena Project will generate high cash flows in the first five years of full production from 2021 to 2025, providing a short project payback. Table 9.8 shows the anticipated average cashflow for the first five years.

### Net Cashflows

**Table 9.8: Average Estimated Cashflow**

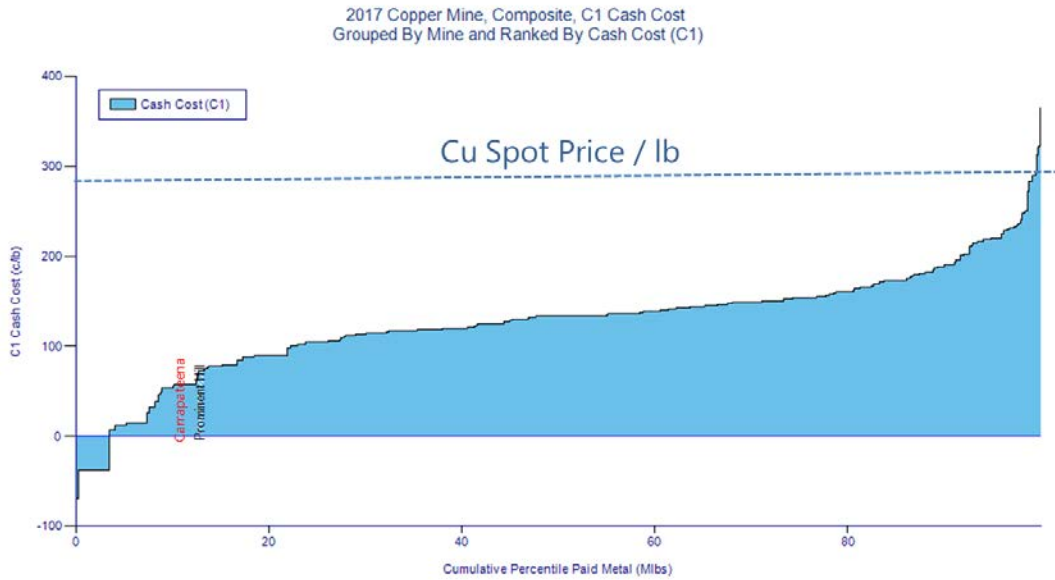
Average Estimated Production	2021 to 2025	2026 to 2039
Copper Production (tonnes)	63,000	67,000
Gold Production (ounces)	79,000	63,000
Average Estimated Cashflow	2021 to 2025 (A\$m)	2026 to 2039 (A\$m)
Net Revenue	630	620
Net Costs	230	200
Operating cash flow	400	420
Total Capital	75	20
Cash Flow Pre-tax	325	400
Tax	85	105
Net Cash flow	240	295



**Figure 9.3: Estimated Life of Mine Cashflow**

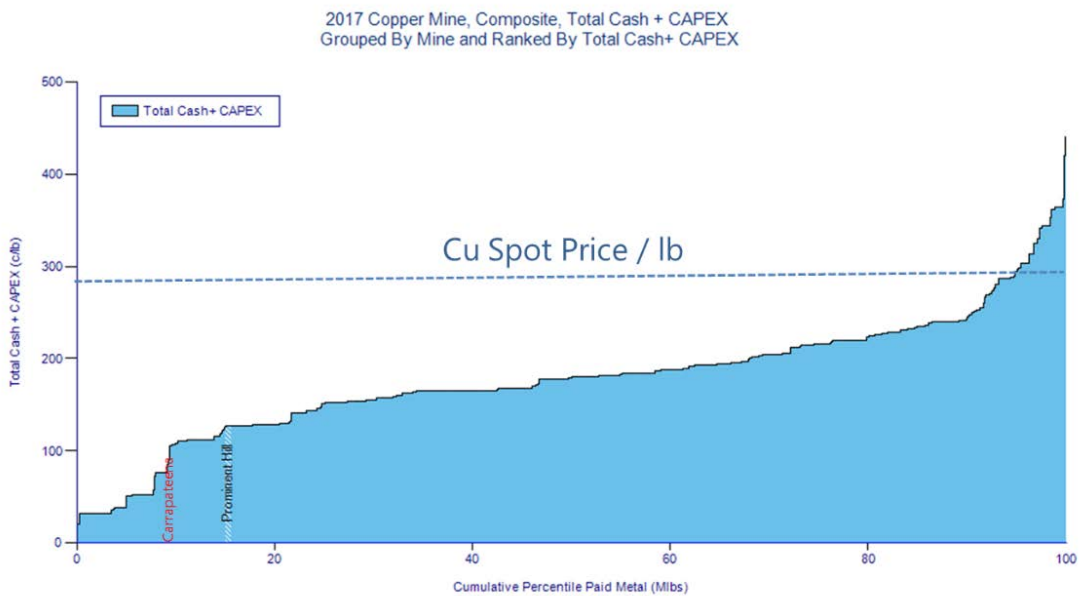
Note: life of mine cash flow figures are estimates only and subject to the risks outlined in the Key Risks section (see Section 11) and the assumptions set out in this document. Forward looking statements are not a guarantee of future performance and involve known and unknown risks, uncertainties and other factors, many of which are outside the control of OZ Minerals.

The AISC for the Project is US99c/lb, which is in the bottom quartile of producers of concentrate globally. This firmly positions the Project to sustain severe commodity price volatility. The LOM C1 cash cost for the Project (as shown in Figure 9.5) is estimated to be US62c/lb, which places the Project in the lowest quartile of producers of copper concentrate globally. The LOM sustaining capital costs amount to US21c/lb and royalties amount to US16c/lb.



Source: Wood Mackenzie Ltd, Dataset: 2017 Q2

**Figure 9.4: Life of Mine C1 Cash Cost for Carrapateena Project**



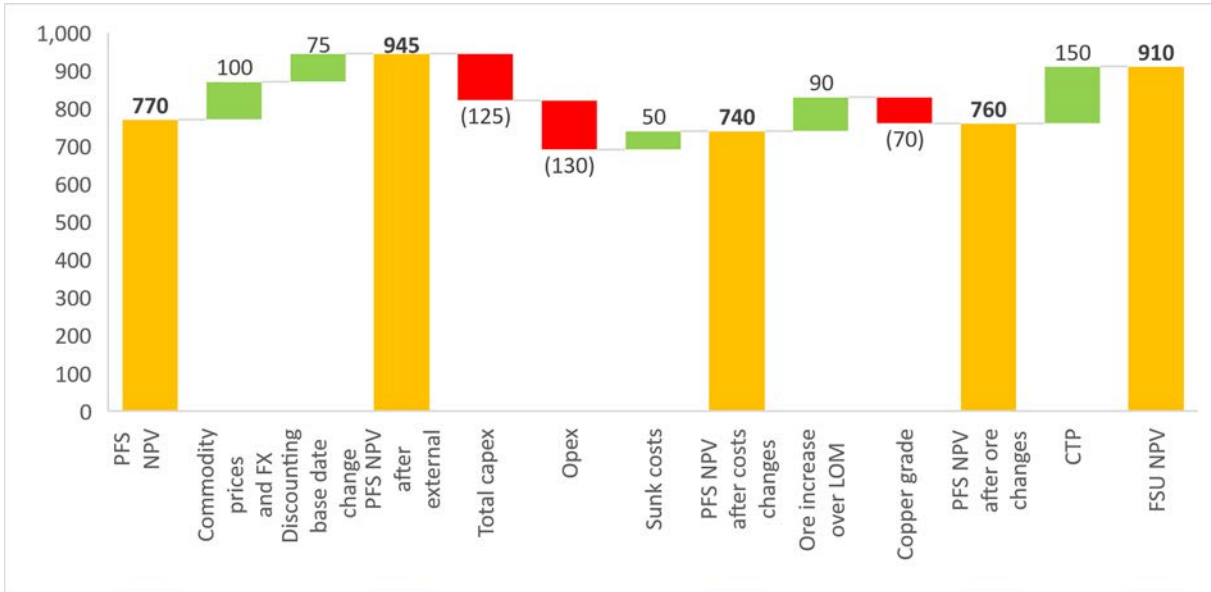
Source: Wood Mackenzie Ltd, Dataset: 2017 Q2

**Figure 9.5: Life of Mine Surrogate for AISC for Carrapateena Project**

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**Net Present Value Analysis**



**Figure 9.6: Contributing Factors and Impact on NPV since PFS**

As part of the FSU, a number of upside and down side scenarios were assessed including optimistic and pessimistic schedules, milling tonnage, capital costs increases and decreases.

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## 9.5 Funding

### 9.5.1 Basis of Cash Funding Analysis

The objective of the funding plan is to provide certainty of Carrapateena Project, with financial risks assumed, and provide OZ Minerals with flexibility to pursue other growth opportunities.

OZ Minerals expects to have the capacity to self-fund the development of the Carrapateena Project based on current projections of the Prominent Hill Mine cash flows and with the cash balance of \$625 million at 30 June 2017

However, to maintain optionality in funding other growth projects work streams are in place to enable the Carrapateena Project to be bankable on a stand-alone basis.

Finance work streams include:

- Construction and contracting strategy
- Reserve life of mine requirements for debt financiers
- Operational readiness
- Offtake and sales marketing and commercial arrangements
- Power and water supply arrangements
- Standalone credit metrics for bankability to be assumed for appropriate debt sizing analysis
- Early engagement with current bank lending panel (underway)
- Standalone Project debt sizing to be within the Company's financing framework of conservative gearing; Debt / EBITDA < 1.5x and Debt / Capital < 25%.

OZ Mineral's initial observations are that the Carrapateena Project is suitable for a conventional standalone debt financing and also can be funded on a corporate basis and within the current financial framework. There is a level of flexibility as to if and when debt financing could be implemented, due to the Company's current high cash balance and projected cash generation from Prominent Hill.

Based on the above, OZ Minerals has reasonable grounds to believe that the funding for the Carrapateena Project will be available when required.

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## 10 RISK MANAGEMENT

### 10.1 Summary

The Project is subject to risk factors that are specific to the Project in addition to, like most other mining and development projects, those of a more general nature.

Any, or a combination, of these risk factors may have a material adverse impact on the Project's operating and financial performance. This section describes some of the potential key threats and opportunities associated with the Project. It does not purport to list every risk that may be associated with the Project in the future, and the occurrence of consequences of some of the risks described in this section are partially or completely outside the control of OZ Minerals.

The assessment is based on the knowledge of the Directors as at the date of this Feasibility Study Update, but there is no guarantee or assurance that the importance of different risks will not change or other risks will not emerge.

The forward-looking information provided in this Feasibility Study Update with respect to, but not limited to, production forecasts, growth forecasts of the Project's resources and reserves, sales, earnings and capital expenditure estimates is based on certain assumptions which are inherently subject to significant uncertainties. The actual results of the Project's operations in future years may therefore differ from its current estimates.

The key risks associated with design and construction delivery have been considered through risk assessment workshops wherein threats were identified and strategies for their elimination or impact reduction designed and implemented. During this process opportunities were also identified and where appropriate have either been included in the design and development of the project or plans and strategies have been developed to progress them further.

The Carrapateena operations team also conducted operations risk workshops wherein critical risks, principal mining hazards and material risks were identified. The Carrapateena risk register is updated on a regular basis. Bow tie risk analysis has been completed on all Principal Mining Hazards and management plans for these risks have been developed. Specifically cave mining risks such as cave stall and cave dilution are operational risks that will continue to be managed by the Carrapateena operations team.

A discussion of certain key risks is set out in section 11.

#### 10.1.1 Opportunities

##### **Contingency not fully expended**

The estimated pre-production capital of \$916 million consists of \$66 million contingency. The rigorous Early Contractor Involvement approach with the robust scope definition, offsite fabrication and defined contractor milestones has the potential that only some or none of contingency will to be drawn down.

##### **Decline advance rate**

As the decline development is on the critical path for the project, any acceleration in decline advance has the potential to bring forward the commissioning of the mine. OZ Minerals is actively managing contract performance and working closely with its partner to continue identifying opportunities to increase the development rate.

As noted in Table 9.6 the NPV of Carrapateena is highly sensitive to a change in commissioning. A three month accelerated schedule has the potential to improve NPV by an estimated \$51 million.

#### **Mineralisation surrounding the Carrapateena sub level cave footprint**

The Carrapateena ore reserve was defined at a cut-off grade of AU\$100/t, although the break even cut-off for sublevel caving is estimated to be AU\$51/t. Mineralisation of grade above break even surrounds the SLC zone and may be able to be mined. Any reduction in the cut off grade has the potential to increase the mining inventory with minimal additional capital expenditure.

The current mine design provides for recovery of only 62% of the known Carrapateena mineralisation.

#### **10.1.2 Discussion of key threats**

##### **Quality of Operational Water**

As the raw water demand increases through the operational phase the average total dissolved solids (TDS), i.e. salinity, of the water may increase to above the design criteria. Metallurgical testwork has shown that there is a small decrease in recoveries when the salinity exceeds 110,000mg/L.

OZ Minerals considers that sufficient water has been identified for construction.

Operational water sources have been identified however they are geographically dispersed. During the FS the operational demand increased from the PFS introducing a small deficit resulting in the need to continue exploration drilling in the North.

This exploration will further reduce the reliance on hypersaline wells, low flow wells at distance from the site, and mine inflows to meet operational demands. As such, drilling of exploration wells in the Northern Wellfield are assumed in the base case to identify the source and prove up the necessary yields (see Section 5.5).

The exploration program is targeting; lower salinity waters improving the operations and maintenance regimes for the processing plant and; secondly the centralisation of wells to a single point thus limiting infrastructure costs, and further identification of lower salinity water to maintain salinity below the 110,000mg/L.

##### **Decline advance rate**

The decline development is on critical path for the project. Any deceleration in decline advance has the potential to delay the commissioning of the mine and construction interface, resulting in additional costs and delay in connection with the Project.

The decline advance rate remains on schedule to reach the top of the orebody in Q2 2019. As the decline development is on the critical path for the project, any deceleration in decline advance has the potential

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to delay the commissioning of the mine. As the decline progresses, cycle time through the Woomera shale continues to be optimised. Management plans are in place to mitigate threats that may result from ground conditions.

As part of the operational readiness planning, the next phase of an underground mining contract is being developed as the existing contract ceases upon reaching the top of the orebody. This is intended to ensure a seamless transition into operations.

#### **Approvals timing/conditions**

The successful development of the Project depends on OZ Minerals being able to obtain all necessary regulatory approvals, including any approvals arising under applicable mining laws, environmental regulations and other laws. There can be no guarantee that all such approvals will be obtained, either at all or on terms or in time to enable OZ Minerals to successfully develop the project.

Approvals are progressing on schedule and are anticipated to be complete in 6 months. In accordance with the South Australian assessment process, OZ Minerals has proposed a set of conditions and environmental outcomes that it believes are in alignment with its understanding of the project and the environmental assessment. These conditions are commensurate with those at Prominent Hill.

Feedback on the Mining Lease Proposal was primarily on the tailings storage facility with regulators seeking to understand the risk to shallow groundwater and closure strategies.

The establishment of a number of working groups continue to track progress, proactively address queries and concerns and ensure that all parties are informed of upcoming stages. A delay of the grant of the Mining Lease or PEPR beyond Q1 2018 could result in delays to onsite construction works and Western Access Road and may put Lump Sum pricing secured during FS phase at risk.

### **10.1.3 General Risks**

#### **Inaccurate cave flow model**

The cave flow model may not be realistic, or may be inaccurate or flawed, leading to increased dilution and/or lower draw rates. Additionally surface material may migrate through orebody at an unknown rate. Any of these matters could result in significantly reduced efficiencies to the project and adversely affect the financial performance of the Project including its NPV.

#### **Cave may stall**

The overburden may not cave as expected or the Orebody may not cave through the expected surface sequence. Alternatively rock behaviours may be different to expectation (competent units are of concern (sandstone and Arcoona Quartzite)). Any of these matters could result in significantly reduced efficiencies to the project and adversely affect the financial performance of the Project including its NPV.

### **Reliance on Prominent Hill**

OZ Minerals intends to rely on cashflow from its Prominent Hill project as a significant source of funding for the Project. In the event that there are any issues with Prominent Hill or any general economic factor which may reduce the cash flow from Prominent Hill, this may adversely affect the funding strategy for the Project.

### **Current and future finance**

The ability to secure any required funding for the project may depend on a number of factors, including commodity prices, interest rates, economic conditions, debt market conditions, share market conditions and country risk issues. Inability to obtain financing or refinancing or other factors could cause delays in developing the Project or increase financing costs and, thus, adversely affect the financial condition and performance of the Project.

### **Environmental laws and government regulations**

Environmental regulation of mining activities at both State and Federal level imposes significant obligations on mining companies. Changes in these laws and regulations may adversely affect the Project, including profitability.

In addition, mining is an industry that has become subject to increasing environmental responsibility and liability. Environmental legislation is evolving in a manner which could require stricter standards and enforcement, increased fines and penalties for non-compliance, more stringent environmental assessments of proposed projects and a heightened degree of responsibility for companies and their officers, directors and employees. There is no assurance that future changes in environment regulation, if any, will not adversely affect the Carrapateena operations.

### **Native title**

Any native title claims or cultural heritage issues arising now or in the future may cause delay or have a material impact on the development of the Project.

### **Water and power management**

OZ Minerals requires water and power for operation of the Project. It is expected the project will have access to adequate water and power supply. However, in the future, no assurance can be given that sufficient water or power will be available or that access to water and power will not be disrupted in the future. Climate changes and changes to water allocations and to government policy may affect the Project's access to water and power necessary for existing and future mining operations.

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**Uranium downgrade not as expected**

There is a risk that during operations the expected downgrade of uranium within the processing circuit is not achieved.

**Resource and reserve estimates**

While the Reserves of the Project are believed to be well established, reserve estimates are necessarily imprecise and involve subjective judgements regarding the presence and grade of mineralization and the ability to economically extract and process the mineralisation. Should OZ Minerals or the Project encounter mineralisation or geological mining conditions at the Project different from those predicted by historical drilling, sampling and similar examinations, mining plans may have to be altered in a way that might adversely affect its operations and reduce its Reserves. Should such reduction occur, material write-downs of the Project and/or increased amortisation charges may be required.

Although the Reserve and Resource estimates for the Project have been carefully prepared by them or, in some instances, have been prepared, reviewed or verified by independent mining experts or experienced mining operators, these amounts are estimates only and no assurance can be given that any particular level of recovery of minerals from the Reserves will in fact be realised or that an identified Resource will ever qualify as a commercially mineable (or viable) deposit that can be economically exploited.

Estimates of Reserves, Resources and production costs can also be affected by such factors as environmental regulations, weather, unforeseen technical difficulties, unusual and unexpected geological formations and work interruptions.

Material changes in Reserves, grades, stripping ratios or recovery rates may affect the economic viability of projects. Reserves and resources should not be interpreted as assurances of mine life or of the profitability of current or future operations.

**Capital Expenditure estimates**

The Project has a substantial capital expenditure program. There is a risk that the capital costs could be greater than expected and if this is the case, it may adversely affect the Project's financial performance and NPV.

**Contingency is insufficient**

The pre-production capital of \$916 million consists of \$66 million contingency. There is a risk that this contingency is insufficient and the pre-production capital will be higher.

**Closure costs**

Close-down and reclamation works to return operating sites to the community can be extensive and costly. Estimated costs are provided for, and updated annually, over the life of each operation but the provisions might prove to be inadequate due to changes in legislation, standards and the emergence of

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new reclamation techniques. In addition, the expected timing of expenditure could change significantly due to changes in the business environment that might vary the life of an operation.

Closure considerations have been included in a cost model based on benchmarking undertaken on 30 mines across Australia. Mine closure and rehabilitation were analysed to develop a relationship between the total costs of closure against the area of disturbance. Based on these calculations, closure costs have been estimated to be between \$33.0 m and \$87.8 m. The most likely cost would be around \$43 m, which is assumed in the FS base case and will be formally addressed through the approvals process. However, these costs could be greater than anticipated.

### **Project development and delays**

Development activities may be affected by factors beyond the control of OZ Minerals, including geological conditions, mineralisation, consistency and predictability of ore grades, commodity prices and the rights of the indigenous people on whose land exploration activities are undertaken. Unexpected geological or mining conditions, equipment or service failures, industrial relations, health and safety concerns and weather conditions may also adversely affect development of a mine. It is not uncommon for new mining operations to experience unexpected problems and delays during development, construction and mine start-up, which can delay the commencement of mineral production. Accordingly, there is no assurance that the Project will commence production in time, if at all.

### **Operating risks**

The mining and processing operations of the Project are (or will continue to be) subject to many risks and hazards, including industrial accidents, mine collapse, cave-ins or other failures relating to mine infrastructure, periodic interruptions due to inclement or hazardous weather conditions, power interruption, critical equipment failure, fires, flooding and unusual or unexpected geological or mining conditions. Such risks could result in damage to applicable mines, personal injury, environmental damage, delays in mining or production, monetary losses and possible legal liability.

### **Supply Chain**

The Project operates within a complex supply chain depending on suppliers of materials, services, equipment, and infrastructure, and on providers of logistics. In particular, the Project has significant new equipment requirements. Supply chain failures, or significantly increased costs within the supply chain, for whatever reason, could have an adverse effect on the Project from a cost and/or timing perspective.

### **Infrastructure and transport**

Ore produced from the Project's mining operations is transported to customers by a combination of road and sea. A number of factors could disrupt these transport services, including weather-related problems, rail or port capacity constraints, key equipment and infrastructure failures and industrial action, impairing OZ Minerals' ability to supply its customers. Efficient and reliable rail transportation is important for OZ Minerals to meet its export sale obligations and earn revenue (and profits) from the

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sale of Ore. Delays or shortfalls in rail transportation, or inability to secure sufficient rail transportation entitlements in the future, could have an adverse effect on the Project.

#### **Variable and open ended port charges**

The charges payable by shippers for their entitlements to use of their respective port terminals could increase or decrease substantially from time to time as a result of events and circumstances beyond a shipper's control resulting in materially higher port charges than anticipated.

#### **Health and Safety**

Health and safety regulation affects the Project. Copper production and mining activities in relation to the Project are hazardous activities. If any injuries or accidents occur in connection with the Project, this could have financial implications for Project including potential development, production delays or stoppages and this may have an adverse effect on the Project's financial performance. In addition to the development area there is a risk of a safety incident with significant heavy vehicle and personnel movement interactions on the access road.

#### **Major operational failure**

The Project's operations involve chemicals and other substances stored under high temperature and pressure, with the potential for fire, explosion or other loss of control of the process, leading to a release of hazardous materials. This could occur by accident or a breach of operating standards, and could result in a significant incident.

OZ Minerals' insurance does not cover every potential loss associated with its operations and adequate coverage at reasonable rates is not always obtainable. In addition, insurance provision may not fully cover its liability or the consequences of any business interruption. Any occurrence not fully covered by insurance could have an adverse effect on the OZ Minerals' business.

#### **Land Access Arrangements**

Approval and land access processes have continued to progress with the objective of ensuring that land access is in place prior to the commencement of site activities. Failure to ensure adequate land access arrangements are in place within the requisite timeframe may adversely affect the Project including OZ Minerals' ability to execute its mine plan.

#### **Industrial Action**

OZ Minerals is conscious of its reliance on skilled and productive employees and contractors to develop the Project and, once operation, maintain its production levels. It has taken deliberate steps to be thorough in selecting individuals with such characteristics to be its employees and has created a collective agreement for its employees. Any industrial action by OZ Minerals' employees or contractors' employees has the potential to disrupt the Project's development and/or production and consequently, may adversely affect the Projects' financial performance.

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### **Reliance on major customers for sales**

OZ Minerals derives revenues from contracts. If these contracts expire and are not renewed, or customers default and other replacement customers are not found, the financial results of the Project may be adversely affected. In addition, to the extent that the contracted volumes cannot be delivered on an agreement a liability may arise.

### **Reliance on third parties**

The use by OZ Minerals of contractors and other third parties for exploration, mining and other activities creates reliance on others for the success of current operations and for the development of exploration projects. Problems caused by third parties may arise with the potential to affect the financial and/or operational performance of the Project.

### **Enforcement of legal rights**

OZ Minerals has and will enter into contracts which are important to the Project. Any failure by counterparties to perform their obligations under those agreements may have a material adverse effect on the Project and there can be no assurance that OZ Minerals would be successful in enforcing any of its contractual rights through legal action.

### **IT failures and cyber security threats**

The Project relies heavily on information technology and process control systems. In common with most large, global companies, OZ Minerals has experienced cyber attacks and is faced with ongoing threats to the confidentiality, integrity and availability of such systems. Whilst no material losses related to cyber security breaches have been discovered, given the increasing sophistication and evolving nature of this threat, we cannot rule out the possibility of them occurring in the future. An extended failure of critical system components, caused by accidental, or malicious actions, including those resulting from a cyber security attack, could result in a significant environmental incident, commercial loss or interruption to operations.

### **Economic risks**

As with any entity whose securities are listed on the ASX, the Project will be influenced by a variety of general business cycles and economic conditions. Changes in business and economic factors, such as interest rates, exchange rates, inflation, changes in national demographics, changes in government fiscal, monetary and regulatory policy in Australia or overseas and changes to accounting or financial reporting standards, can be expected to impact on the Project. Deterioration in general economic conditions may adversely affect the operating and financial performance of the Project.

### **Impact of inflation on costs**

Higher than expected inflation rates generally, or specific to the mining industry in particular, could be expected to increase operating and development costs and potentially reduce the value of the Project.

While, in some cases, such cost increases might be offset by increased selling prices, there is no assurance that this would be possible.

### **Government policy and taxation**

Changes in relevant taxation laws, interest rates, other legal, legislative and administrative regimes, and government policies in Australia may have an adverse effect on the Project and its financial performance and NPV.

### **Competition**

The markets for the commodities to be mined in the Project are intensely competitive. The mineral commodities industry is characterised by technological advancements and the introduction of new production processes using new technologies. OZ Minerals has numerous competitors worldwide.

These competitors may develop technologies and processing methods that are more effective or less costly than those currently used by OZ Minerals. Some of these competitors have substantially more resources and a greater marketing scale than OZ Minerals. Competitive activity in the markets served by OZ Minerals can have a significant impact on the prices realised for its products, and can therefore have a material adverse effect on the results of operations or financial condition of the Project.

### **Wars, terrorism, political, economic and natural disasters**

Events may occur within or outside Australia that could impact upon the world economy, the relevant commodities or the operations of the Project. For example, war, acts of terrorism, civil disturbance, political intervention and natural activities such as earthquakes, floods, fire and poor weather affecting the transport and mining of Ore. OZ Minerals has a limited ability to insure against some of these risks.

### **Commodity price risk**

OZ Minerals or the Project generate revenue from sales of copper and (to a lesser extent) gold. The prices for each commodity are determined predominantly by world markets, which are affected by numerous factors outside the control of OZ Minerals. Historically, such commodity prices have been cyclical and volatile.

Absent offsetting factors, significant and sustained adverse movements in these commodity prices may have a material impact on the ongoing financial performance and financial position of the Project. In addition, OZ Minerals is exposed to commodity price risk arising from embedded derivatives in certain sales contracts containing a provisional price mechanism.

### **Exchange rate risks and hedging**

The assets, earnings and cash flows of the Project is (or will be) influenced by movements in exchange rates, particularly movements in the US dollar.

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OZ Minerals may enter into supply agreements which include obligations to supply copper or other minerals at prices that are either fixed or floating. The fixed price contracts may be denominated in either A\$ or \$US and act as a hedge against future adverse selling price movements, as such reduce the ability to benefit from increases in future selling prices and additionally, if agreements are denominated in A\$, movements in foreign exchange rates.

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## 11 DEFINITIONS AND ABBREVIATIONS

Acronym	Expansion
AEP	Annual exceedance probability
Ag	Silver
AISC	All-in sustaining costs
ANZI	Australia New Zealand Inflatable (stress cell)
AS	Australian Standard
ASX	Australian Securities Exchange
Au	Gold
AUD	Australian Dollars
BIBO	Bus-in/Bus-out
BOOM	Build, Own, Operate and Maintain
BN	Bornite
Capex	Capital expenses
CBR	California Bearing Ration
CC	Comminution Class
HCP	Chalcopyrite
CIF	cost insurance freight
CMC	Carrapateena Management Committee
COS	Coarse Ore Stockpile
CS1/2/3	Crushing Station No.1/2/3
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth
CTP	Concentrate Treatment Plant
Cu	Copper
DCF	discounted cash flow
DMT	Dry metric tonnes
DOA	Delegation of Authority
DoEE	Department of Energy and Environment
DPC	Department of the Premier and Cabinet
DPTI	Department of Planning, Transport and Infrastructure
DSCR	Debt-Service Coverage Ratio
EBITDA	Net income with interest, taxes, depreciation and amortisation
ECI	Early Contractor Involvement
EGL	Effective grinding length
EML	Extractive Minerals Leases

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Acronym	Expansion
EPC	Engineering, Procurement and Construction
ERD	Environment, Resource and Development
ExCo	Executive Committee
FAR	Fresh Air Rise
FC	Flotation Class
FEL	Front End Loader
FIFO	Fly-in/Fly-out
FS	Feasibility Study
GDP	Gross domestic product
GSI	Geological Strength Index
GST	Goods and Services Tax
H1/H2	First half/Second half of the year
HBN	High grade Bornite
HCP	High grade Chalcopyrite
HDPE	High Density Polyethylene
HIG	High Intensity Grinding
HSU	Hydro Stratigraphic Units
HV	High Voltage
HWWT	How We Work Together principles
Hx	Half (year)
IBC	Intermediate Bulk Container
ICN	Industry Capability Network
ICT	Information, Communications and Technology
ID	Identity
IOCG	Iron Ore Copper Gold
IRR	Internal Rate of Return
IT	Information Technology
JORC	Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia
KAC	Kokatha Aboriginal Corporation
LHD	Load Haul Dump
LLCR	Loan Life Coverage Ratio
LME	London Metal Exchange
LOM	Life of Mine
LPG	Liquid Petroleum Gas

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Acronym	Expansion
mbs	Metres below surface
MHS	Materials Handling System
ML/d	Megalitres per day
MLA	Mining Lease Application
MOU	Memorandum of understanding
MPL	Miscellaneous Purposes Licence
MSO	Minable Shape Optimiser
Mtpa	million tonnes per annum
NAF	Non-acid forming
NORM	naturally-occurring radioactive material
NPI	Non-Process Infrastructure
NPV	Net Present Value
NSR	Net Smelter Return
NTMA	Native Title Mining Agreement
NVpt	net value per tonne
OEM	Original Equipment Manufacturer
OHTL	overhead transmission Line
Opex	Operating expenses
ORP	Operational Readiness Plan
OSA	on-stream analyser
PAF	Potentially acid forming
PCS	Process Control System
PEPR	Program for Environment, Protection and Rehabilitation
PFS	Pre-Feasibility Study
PGCA	Power Geotechnical Cellular Automata
PMP	Production Management Plan
ppm	Parts per million
PVC	Polyvinyl chloride
Q	Quality
Qx	Quarter
RAR	Return Air Rise
RL	Reduced Level
RMR	Rock Mass Rating
RO	Reverse osmosis
ROM	Run of Mine
RQD	Rock-quality designation

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Acronym	Expansion
SA	South Australia
SABC	SAG mill, ball mill and pebble crusher
SAG	Semi-autogenous Grinding
SANTS	South Australian Native Title Services
SCT	Strata Control Technology
SHEC	Safety, Health, Environment and Community
SLC	Sub-level cave
TARP	Trigger Action Response Plan
TBC	To be confirmed
TC	Treatment charge
TCA	Transmission Connection Agreement
TDS	Total dissolved solids
TS1/2/3	Transfer Station No.1/2/3
TSF	Tailings Storage Facility
TUoS	Transmission use of system
U	Uranium
UCS	Ultimate Compressive Strength
UG	Underground
US	United States
USD	United States Dollar
UTS	Ultimate Tensile Strength
WAN	Wider Area Network
WBS	Work Breakdown Structure
WMT	Wet metric tonnes



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# Carrapateena Feasibility Study Update

## Presentation

24 AUGUST 2017



A modern  
mining company

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The Carrapateena Project is still in a state of development and the feasibility study is not fully complete, therefore the information in this material and conclusions presented should be viewed in this light.

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All figures are expressed in Australian dollars unless stated otherwise.

This presentation should be read in conjunction with the Carrapateena Feasibility Study Update and the Half-Year Financial Report released today.

# Compliance Statements

## Prominent Hill Resources and Reserves

The information on Prominent Hill Mineral Resources and Ore Reserves in this presentation is extracted from the document entitled "Prominent Hill 2016 Mineral Resource and Ore Reserve Statement and Explanatory Notes" which is annexed to the ASX Release entitled "Prominent Hill mine life extended to 2028" released on 15 November 2016 and available at [www.ozminerals.com/media/asx](http://www.ozminerals.com/media/asx). OZ Minerals confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and, in the case of estimates of Mineral Resources or Ore Reserves, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. OZ Minerals confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

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# Compliance Statements

## Carrapateena Production Targets Cautionary Statement

Production targets for Carrapateena are based on:

Probable Ore Reserves:	94%
Inferred Mineral Resources:	6%

There is a low level of geological confidence associated with Inferred Mineral Resources. There is no certainty that further exploration work and studies will result in the determination of Inferred Mineral Resources or that the production targets will be realised.

The Ore Reserve and Mineral Resource estimates underpinning the production targets were prepared by a Competent Person in accordance with the JORC Code 2012. The material assumptions used in the estimation of the production targets and associated financial information referred to in this presentation can be found in the Carrapateena Feasibility Study Update released on 24 August 2017, the Restated 2016 Carrapateena Mineral Resource Statement as at 18 November 2016 released on 9 December 2016, and the Carrapateena Ore Reserve Statement as at 4 August 2017 released on 24 August 2017.

## Carrapateena Resources and Reserves

The information on the 134 Mt Carrapateena Mineral Resource in this presentation is extracted from the document entitled "Carrapateena Project Mineral Resource Statement and Explanatory Notes as at 18 November 2016" released on 9 December 2016 and available at [www.ozminerals.com/media/asx](http://www.ozminerals.com/media/asx). OZ Minerals confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and, in the case of estimates of Mineral Resources, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. OZ Minerals confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

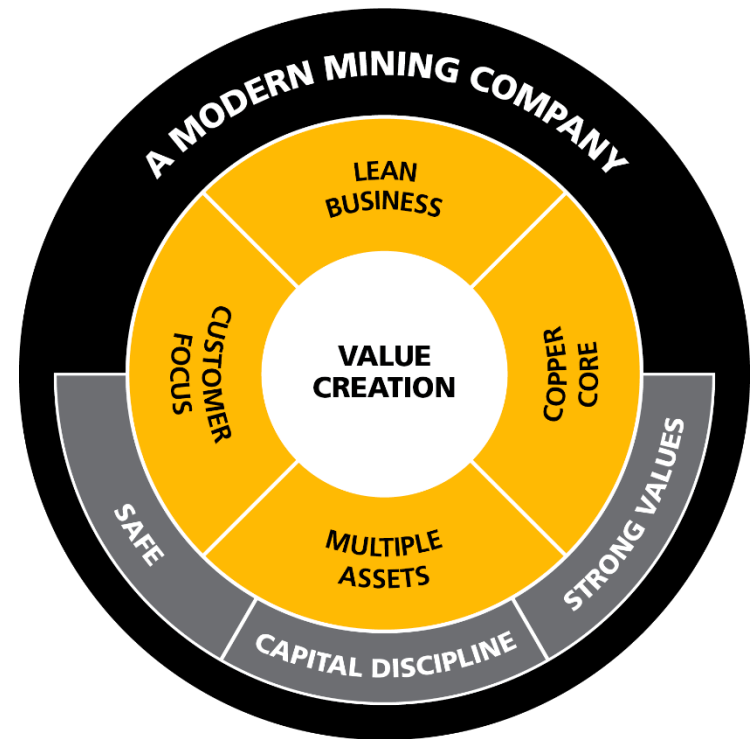
The information on Carrapateena Ore Reserves in this presentation is extracted from the document entitled "Carrapateena Project Ore Reserve Statement and Explanatory Notes as at 4 August 2017" released on 24 August 2017 and available at [www.ozminerals.com/media/asx](http://www.ozminerals.com/media/asx). OZ Minerals confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and, in the case of estimates of Mineral Resources, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. OZ Minerals confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

# 2017 H1 Highlights

## Strong first half performance

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- Operational discipline at Prominent Hill drives continued bottom cost quartile production with AISC of US125c/lb and C1 cost of US90c/lb; on track for all guidance metrics
- Strong balance sheet maintained after growth investment; \$625 million cash balance and no debt allowing for shareholder returns and continued investment into growth pipeline
- Carrapateena development progressing well; project on schedule for first concentrate production in Q4 2019
- West Musgrave energy, water and transport logistics studies completed; Scoping Study completion and decision on whether to move to PFS expected in Q4 2017
- Growth pipeline extends to seven earn-in agreements with well regarded explorers



# Half Year Result

## Improved profitability and robust cash flows

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Significant performance improvement versus comparative period:

- Increase in Revenue of \$48 million to \$446 million
- Increase in Underlying EBITDA of \$39 million to \$217 million
- Increase in Underlying NPAT of \$26 million to \$81 million
- Underlying EPS of 27.0 cents per share

Strong Balance Sheet maintained with a cash balance of \$625 million and no debt

Board declare fully franked interim dividend of six cents per share totalling \$18 million

- Record date 7 September
- Payment date 21 September

Robust cash generation supports investment in Carrapateena, West Musgrave and expanding growth pipeline

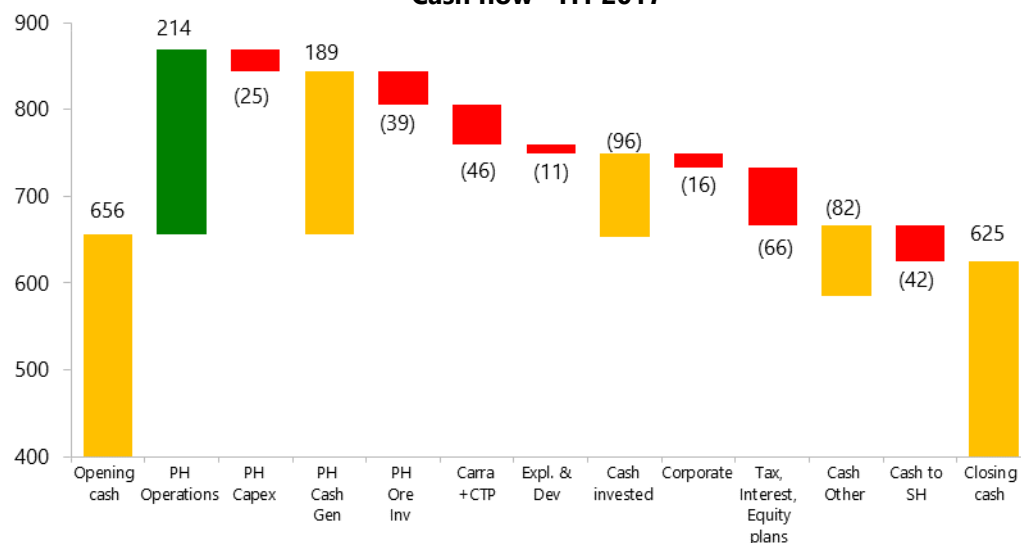
(\$M)

Underlying NPAT H1 2017 vs H1 2016



(\$M)

Cash flow - H1 2017



# OZ Minerals Portfolio

Operations, projects and a growing pipeline of opportunities

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PROMINENT HILL	CARRAPATEENA	WEST MUSGRAVE	GROWTH GAWLER CRATON	GROWTH PIPELINE
<p><b>OP AND UG MINING</b></p> <p><b>STRONG CASH GENERATION</b></p> <p><b>BOTTOM QUARTILE COSTS</b></p> <p><b>ROM STOCK UNWIND 2018-2023</b></p> <p><b>RESOURCE TO RESERVE CONVERSION</b></p> <p><b>LONG LIFE</b></p>	<p><b>LOW RISK JURISDICTION</b></p> <p><b>20 YEAR UG MINE LIFE</b></p> <p><b>BOTTOM QUARTILE COSTS</b></p> <p><b>RAPID PAYBACK</b></p> <p><b>EXPANSION OPTIONALITY</b></p>	<p><b>ESTABLISHED RESOURCE</b></p> <p><b>SCOPING STUDY COMMENCED</b></p> <p><b>OPEN PITTABLE</b></p> <p><b>LOW STRIP RATIO</b></p> <p><b>REGIONAL EXPLORATION OPPORTUNITIES</b></p>	<p><b>KHAMSIN</b></p> <p><b>FREMANTLE DOCTOR</b></p> <p><b>MOUNT WOODS</b></p> <p><b>INTERCEPT HILL</b></p>	<p><b>ELOISE</b></p> <p><b>COOMPANA</b></p> <p><b>ALVITO (PORTUGAL)</b></p> <p><b>OAXACA (MEXICO)</b></p> <p><b>M &amp; A</b></p>



# Carrapateena: delivering on our growth strategy

**VALUE CREATION**  
 NPV<sub>9.5</sub> ~\$910M | IRR ~20% | Payback by 2024 | Average annual cash flow \$265M | Bottom quartile LOM costs - AISC US99c/lb; C1: US62c/lb  
 20 Year mine life from a plant operating at 4.25Mtpa\*

## Lean Business

- Design fit for purpose with expansion optionality
- Dual decline design reflecting agile approach

## Copper Core

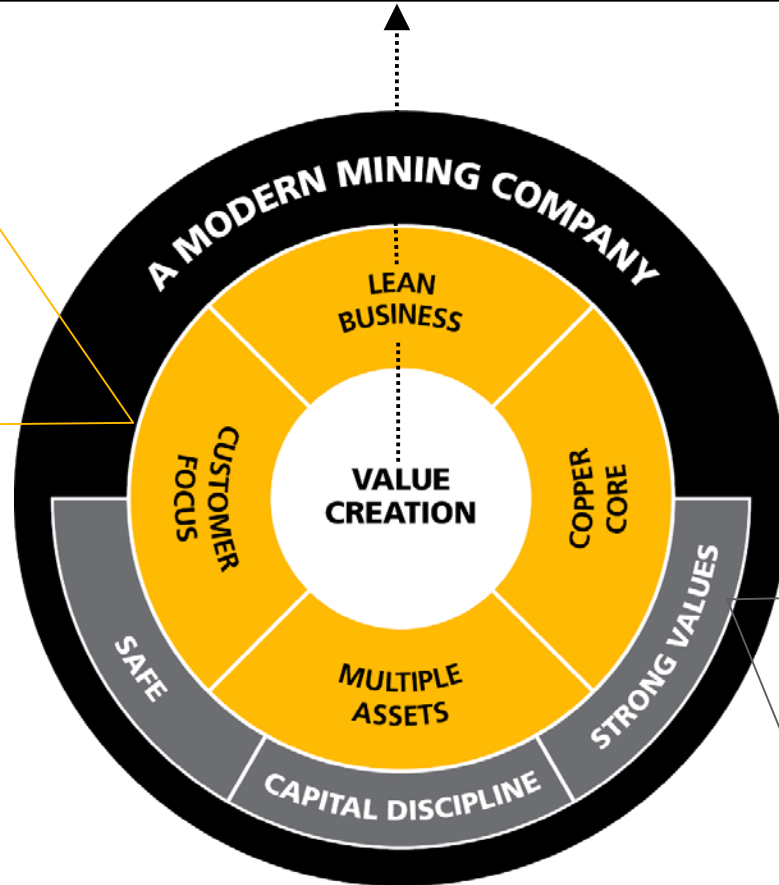
- High grade 30%-40% copper in concentrate
- Average annual production of 65kt Cu and 67koz Au\*
- Ore Reserve estimate: 79Mt @ 1.8%Cu, 0.7g/t Au, 8.5g/t Ag\*\*

## Multiple Assets

- Second cash generating asset
- Expansion optionality retained given known mineralisation and highly prospective region

## Customer Focus

- High quality concentrate saleable under existing international Prominent Hill contracts



## Safe

- Everyone works safely at site and strives for a workplace with no injuries

## Capital Discipline

- Cost certainty has increased with 50% of ~\$916 million pre-production capital in lump sum contracts near finalisation
- Project can be funded from existing cash balance and cash flows with ability to maintain dividend policy

## Strong Values

- ECI partners responsible for delivering local content and traditional owner involvement
- Strong relationships with pastoralists and the Kokatha people

\* These production targets and associated financial information must be read in conjunction with the production targets cautionary statement on slide 4

\*\* Please read in conjunction with the Carrapateena Ore Reserve estimate compliance statements on slide 4

# FS Production Summary

Strong production with bottom quartile costs

- / 20 year mine life from a plant operating at 4.25 Mtpa\*
- / Estimated average annual production of 65,000 tonnes of copper and 67,000 ounces of gold\*
- / Production years 1-3 post ramp up: ~66,000 tonnes of copper and ~80,000 ounces of gold\*
- / Bottom quartile production costs\*:
  - LOM AISC costs US\$0.99/lb copper
  - LOM C1 costs US\$0.62/lb copper
- / Commissioning in Q4 2019
- / High metal recoveries of ~91% for copper and ~73% for gold
- / Expansion optionality retained in annual throughput and resource extensions given highly prospective region
- / Ore Reserve estimate increased by 13% to 79 Mt @ 1.8% Cu, 0.7g/t Au, 8.5g/t Ag\*\*

\* These production targets and associated financial information must be read in conjunction with the production targets cautionary statement on slide 4

\*\* Please read in conjunction with the Carrapateena Ore Reserve estimate compliance statements on slide 4. The increase is from the Carrapateena Ore Reserve Statement as at 20 October 2016 released on 7 November 2016, which had the Ore Reserve estimate at 70Mt

# FS Financial Summary

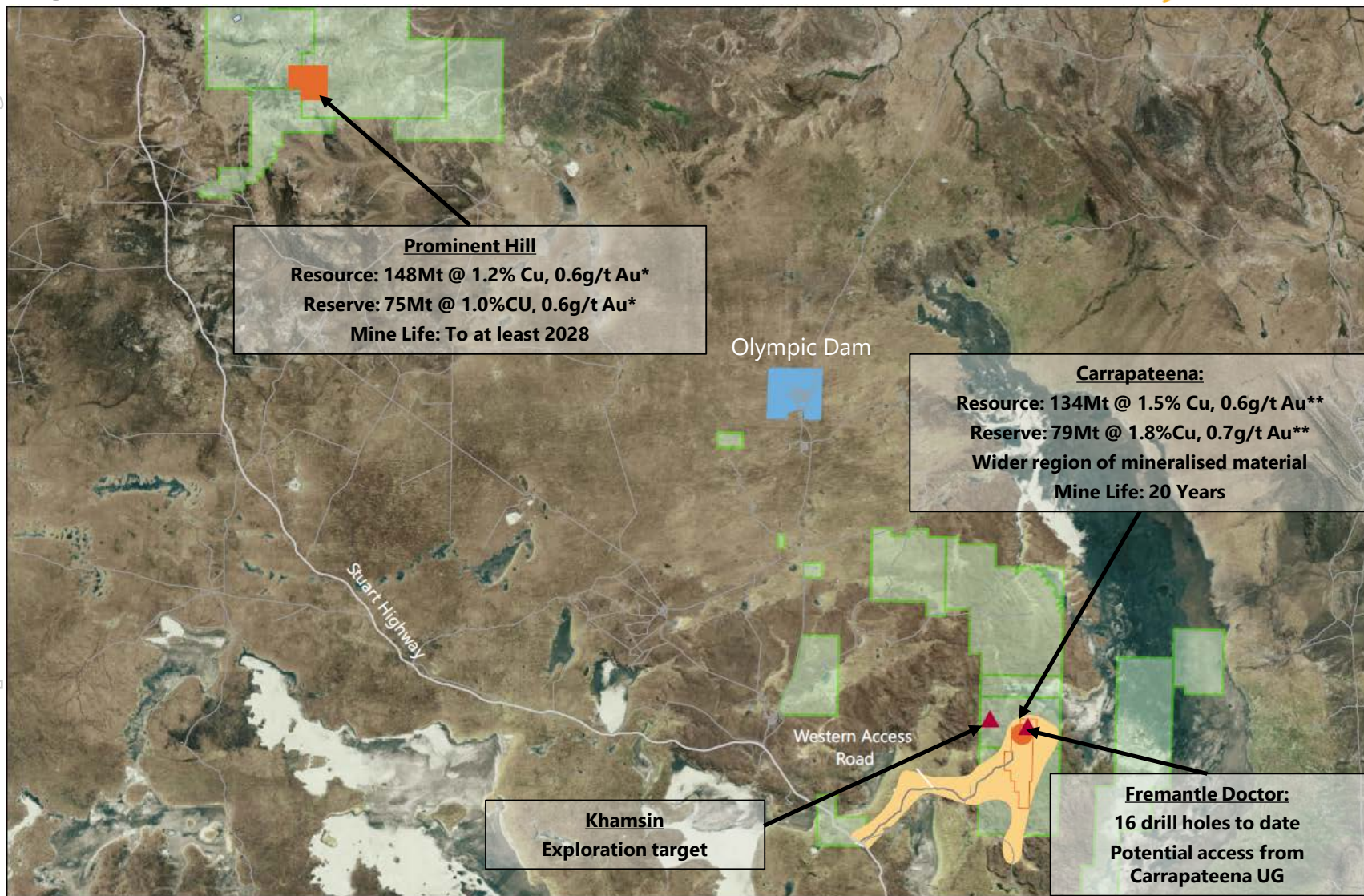
Robust financial metrics confirmed

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- / OZ Minerals' Board has approved development of the Carrapateena project
- / At consensus pricing (unlevered, post-tax real discount rate of 9.5%)
  - NPV<sub>9.5</sub> of ~\$910 million; IRR ~20% (including deferred vendor payment of US\$50 million)
  - Assumptions: LOM copper US\$2.92/lb; LOM gold US\$1,306/oz; USD/AUD – 0.75
- / ~\$916 million pre-production capital cost, including contingency of \$66 million
- / Concentrate Treatment Plant removed from project financials:
  - Additional test work demonstrates consistent and predictable downgrade of impurities from ore to concentrate
  - Increased confidence Carrapateena concentrate will be sought after in international markets
- / ~ \$12.2 billion total revenue over LOM
- / ~ \$4.2 billion projected net pre-tax cash flow including capital expenditure
- / Project payback by 2024, five years after first concentrate production
- / Average annual cash flow after tax of \$265 million (\$240 million from 2021 - 2025)
- / 50% of pre-production capital in lump sum contracts near finalisation
- / Project can be funded from existing cash balance and cash flows with ability to maintain dividend policy

# Regional Mineralisation

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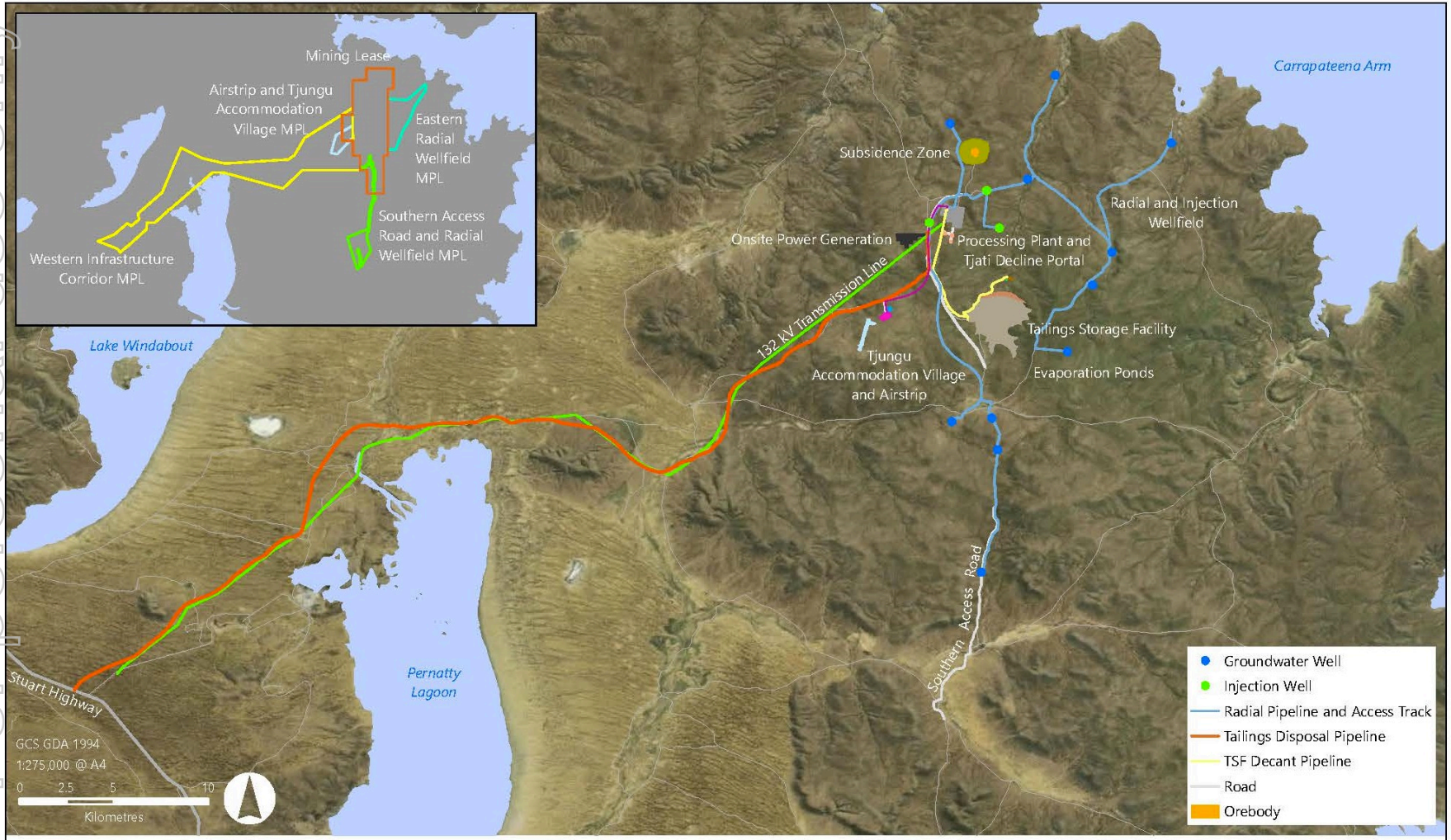
\* Please read in conjunction with the Prominent Hill Mineral Resource and Ore Reserve estimate compliance statements on slide 3

\*\* Please read in conjunction with the Carrapateena Mineral Resource and Ore Reserve estimate compliance statements on slide 4

# Carrapateena Project Location

## Site and regional infrastructure overview

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# Resource and Mining

## Ore Reserve

The FS mine design and Ore Reserve update has increased the Probable Ore Reserve estimate by 13% to 79 Mt, with an associated increase in copper to be mined of 100kt

The Ore Reserve as at 4 August 2017 is underpinned by the Mineral Resource as at 18 November 2016

Mineable inventory increases to ~84 Mt with additional ~5 Mt of Inferred Resource @ 1.8% Cu, 0.7g/t Au

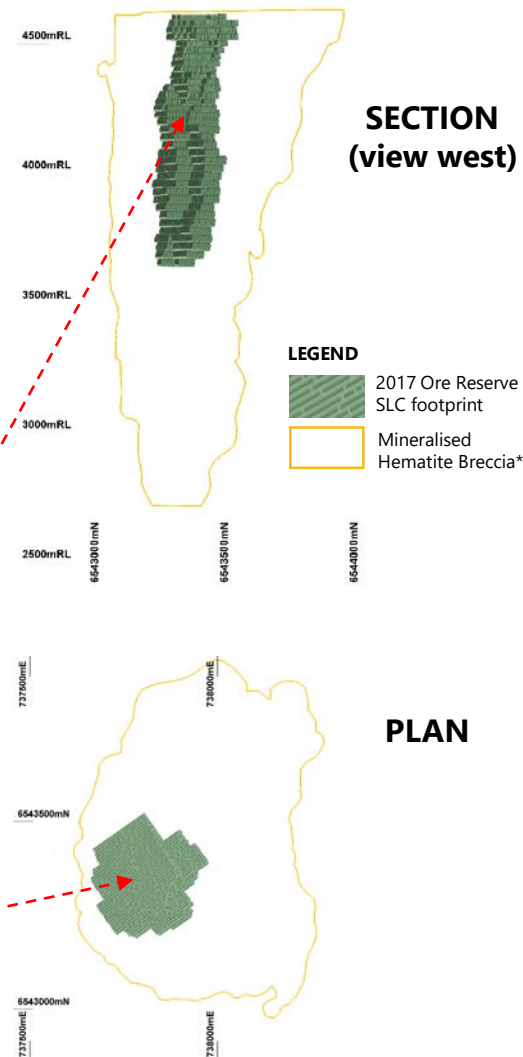
- The LOM Plan for the Carrapateena Project is made up of 94% Probable Ore Reserves with an additional 6% from Inferred Mineral Resources.
- Composition associated with Inferred material that needs to be taken with the SLC due to the nature of the mining method

### Carrapateena Ore Reserve estimate August 2017 (at A\$90/t NSR cut-off)\*

Classification	Tonnes (Mt)	Cu (%)	Au (g/t)	Ag (g/t)	Cu (Kt)	Au (Koz)	Ag (Moz)
Proved	0	0	0	0	0	0	0
Probable	79	1.8	0.7	8.5	1,400	1,800	22
<b>Total</b>	<b>79</b>	<b>1.8</b>	<b>0.7</b>	<b>8.5</b>	<b>1,400</b>	<b>1,800</b>	<b>22</b>

\* Please read in conjunction with the Carrapateena Mineral Resource and Ore Reserve compliance statement on slide 4

These wireframes show the interpreted limits of the hematite breccia.



# Mine and SLC design

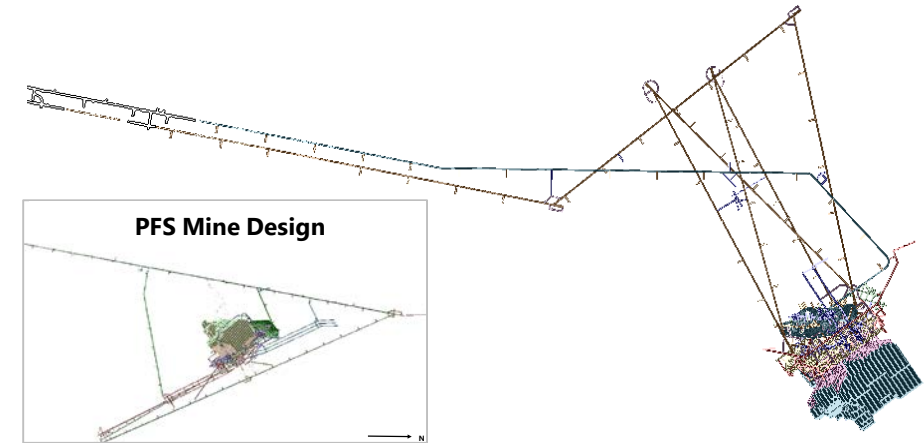
## Dual Decline Design

- / Tjati decline for personnel and equipment access
- / Second decline providing primary ventilation and then materials handling
- / Shortened distance to first ore reducing overall development rates

## SLC Design

- / LOM infrastructure offset from the orebody and located outside the modelled major deformation zone
- / Three permanent UG crushers to enhance productivity; temporary surface crusher removed
- / Level layouts minimise traffic interactions and improve productivity
- / Optimised cave footprint, including the addition of a new level to maximise early ore
- / Multiple level draw strategy and initial cave extraction strategy maximises early ore tonnes in production profile

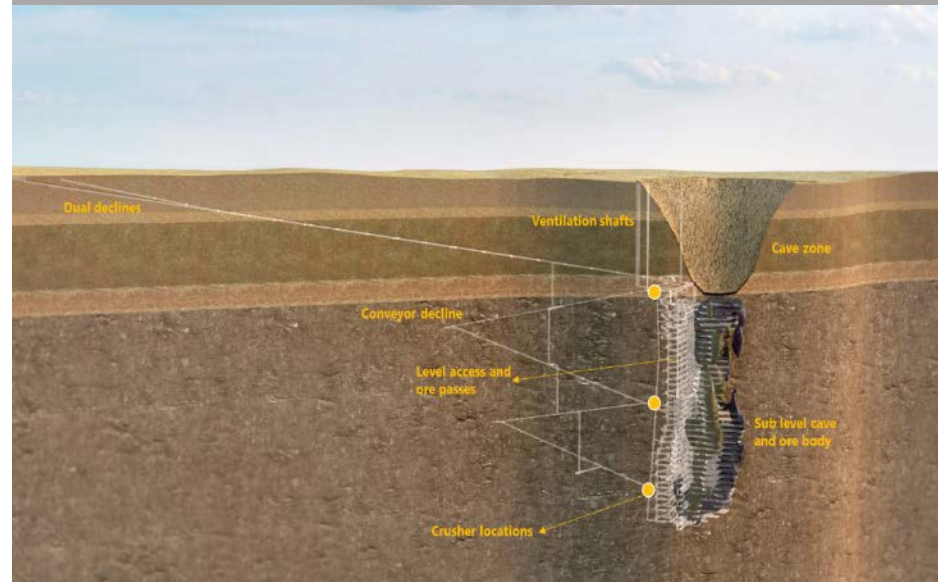
## Mine Design



## PFS Mine Design



## SLC Area and Near Mine Infrastructure



# Caveability

## Comprehensive modelling undertaken

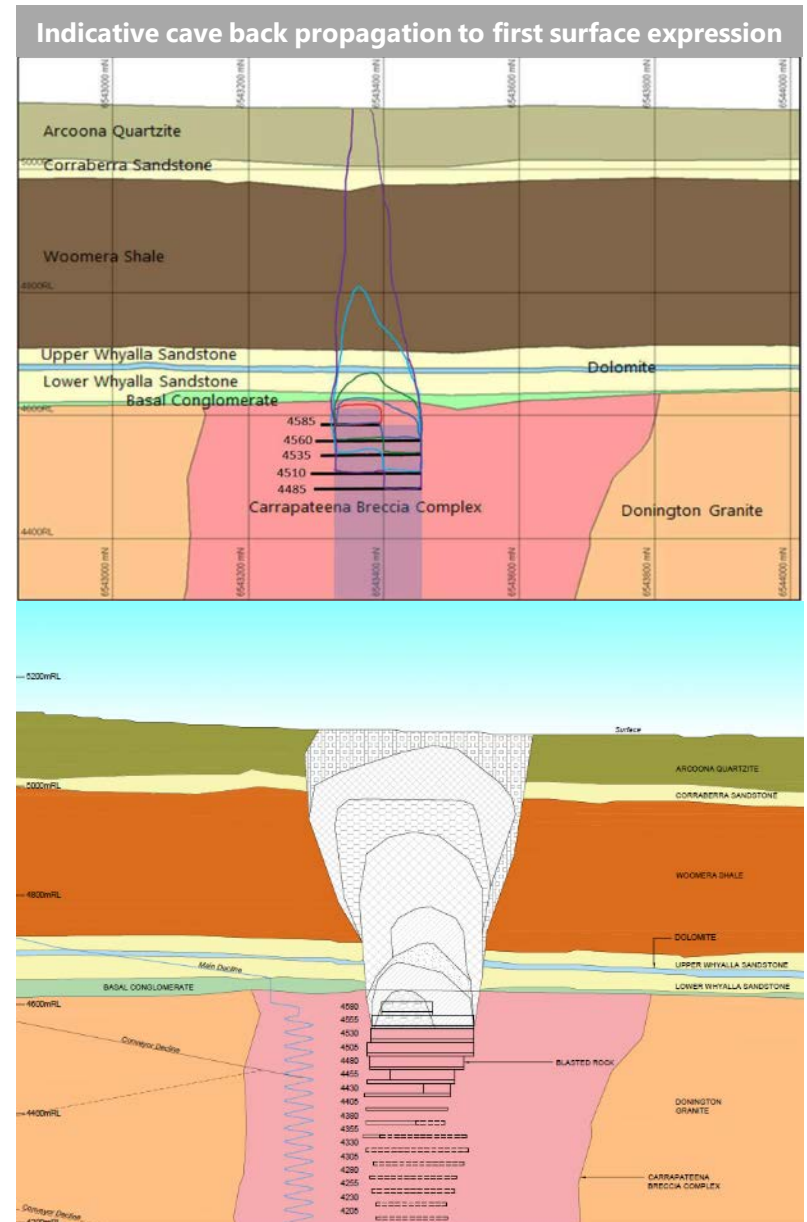
Extensive data gathered and analysed to define geological and geotechnical environment

Two industry methods used to assess caveability – Laubscher and the Flores and Karzlovic

Various options to support caving include:

- Cave model and benchmarking
- Upper level footprint design to increase design hydraulic radius to a value suitable for caving
- Pre-conditioning
- Long hole uphole blasting above first SLC production level
- Mining of drill and blast horizon above SLC footprint to fracture rock mass

Cave propagation monitoring via seismic system, monitoring holes, extensometers and a cave marker program





# Ventilation and Materials Handling

## Ventilation

Telfer style ventilation circuit with surface exhaust fans and fresh air backbone feeding production areas

## Materials Handling

Ventilation decline to be used as the conveyor decline following Mining Lease approval

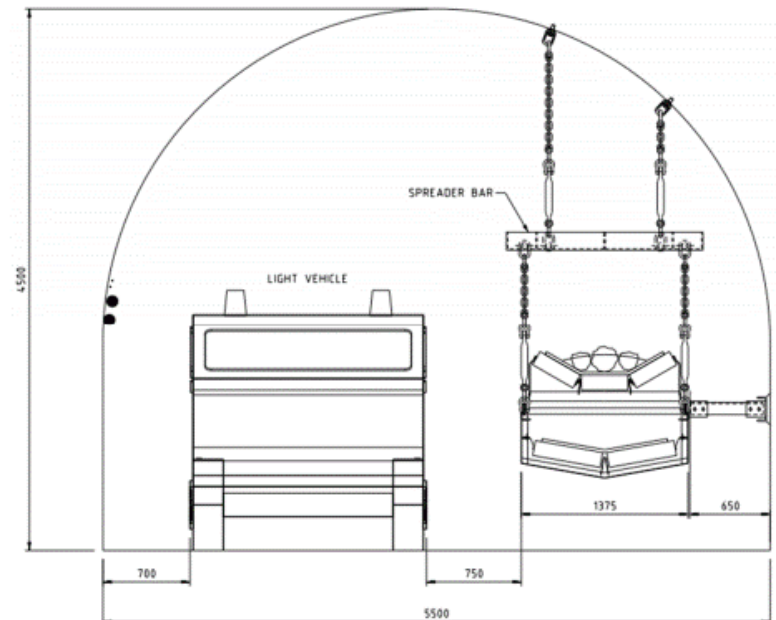
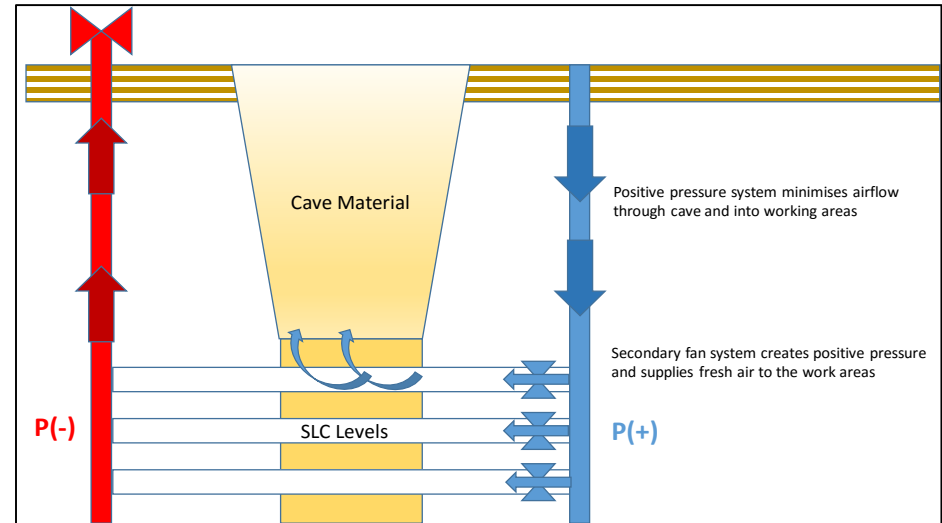
Conveyor location in second decline provides significant safety benefits

- Floor mounted
- Maintenance activities without heavy vehicle interaction
- Personnel not travelling under loaded belt

Third permanent crusher to be located five levels below top of ore body removes need for mobile surface crushing unit

System will be delivered in three stages

- Stage one: system to top of ore body (part of pre-production capital)
- Stage two and three: system down to the middle then bottom of ore body (sustaining capital)



# Processing Plant

## Process flowsheet

Flowsheet similar to Prominent Hill – design incorporates lessons learnt

Conventional grinding, rougher / regrind circuit, three stages of cleaner flotation followed by thickening and filtration

Jameson cell upstream of the cleaner circuit, identical to Prominent Hill

Circuit includes additional recycle crusher on the SAG circuit to address ore hardness at Carrapateena

## Optimisation of plant layout

Reduction in power requirements from 21 MW to 16.5 MW by optimising individual mill and drive combination

Safe vehicle and pedestrian traffic flow

Site layout can support future expansion above nameplate capacity

## Next Steps

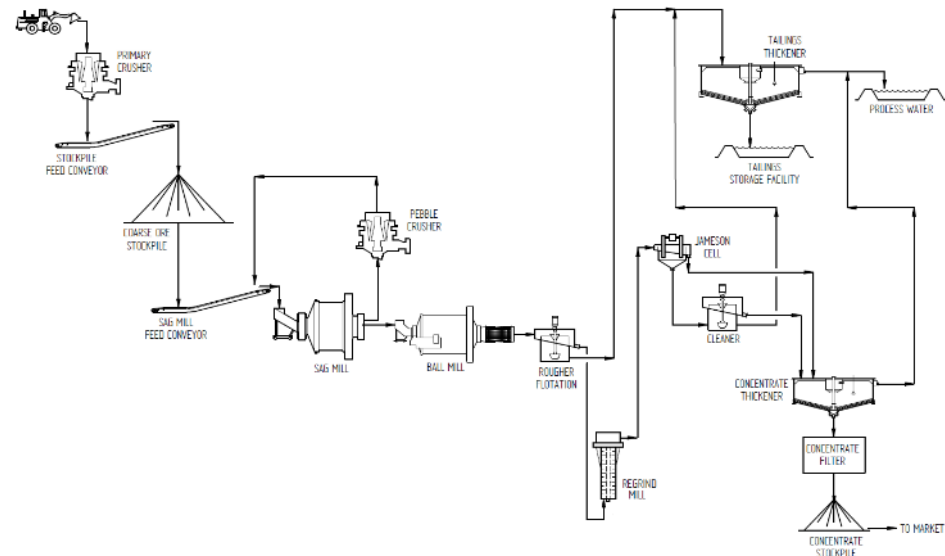
Construction scheduled to start in Q2 2018

Ausenco Downer JV responsible for delivery

Wet commissioning in Q4 2019

18-24 month ramp up period to 4 Mtpa, targeting 4.25 Mtpa from 2021 onwards

## Simplified Processing Plant Flowsheet



## Processing Plant Layout



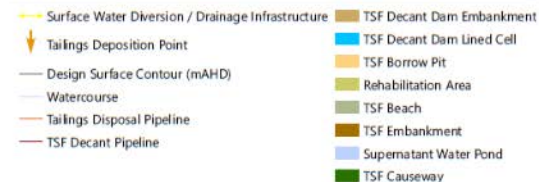
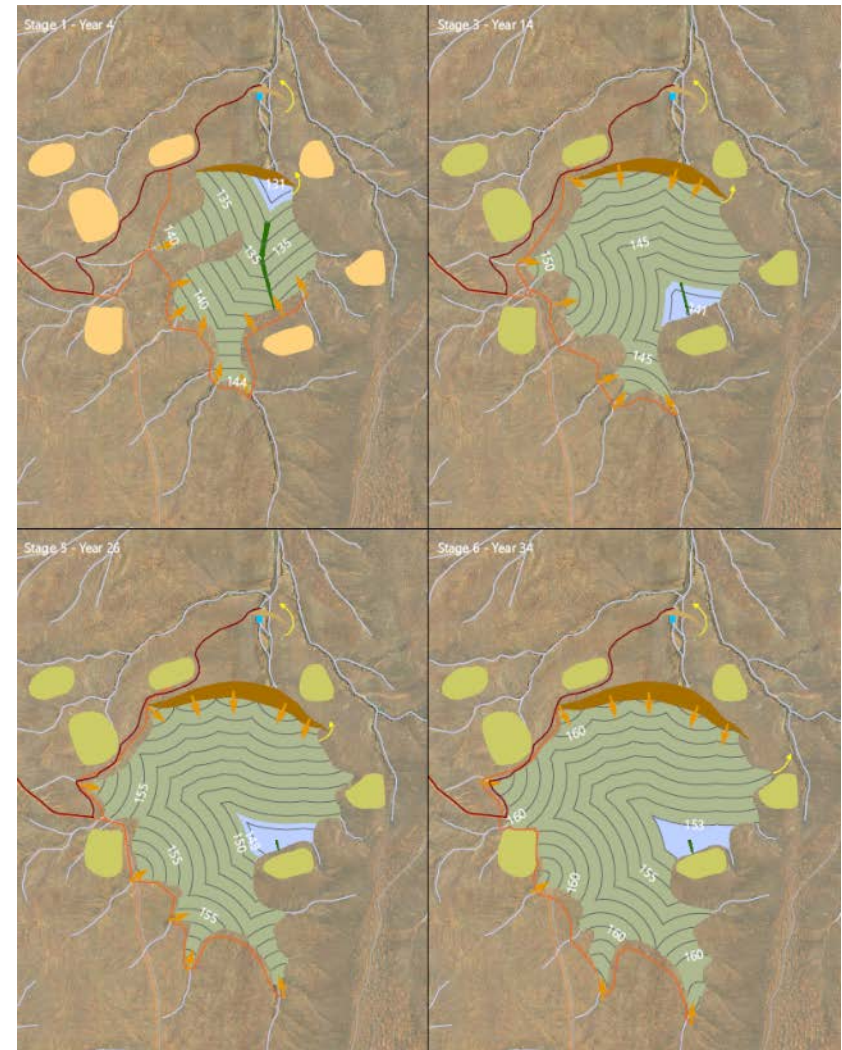
# Tailings Storage Facility

## Design

- Peer reviewed design to ANCOLD standards
- Constructed in stages as a cross-valley embankment
- Gravity decant system in place, excess water will drain to decant dam and when available be reused by process plant
- Translocation of supernatant pond away from embankment progressively moving to south-east area of impoundment
- Hazard assessments completed above ANCOLD design requirements taking into consideration major events

## Next Steps

- Construction scheduled to commence Q3 2018
- NRW responsible for delivery
- Initially constructed to accommodate four years of operation with a design crest width of 6 m and nominal embankment height of 20 m
- Embankment construction via local borrow sources



# Power and Road

Operational power supply via 132 kV overhead transmission line (OHTL) from existing South Australian electricity network at Mount Gunson

Transmission Connection Agreement signed with ElectraNet for up to 55 MW power allocation for 20 year period

OHTL alignment is located within the Western Access Road corridor

## Next Steps

Currently negotiating a build, own, operation and maintain (BOOM) contract for the non-regulated OHTL from South Mount Gunson substation to Carrapateena

Construction scheduled to commence Q2 2018

Scheduled date for energisation onsite Q2 2019

## Western Access Road

52.5 km unsealed road from Stuart Highway to site

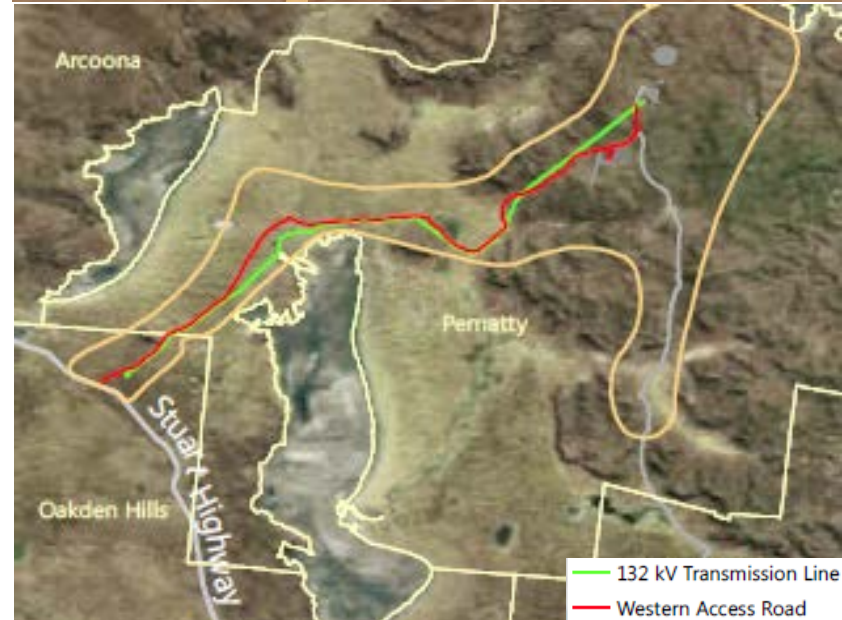
Developed in consultation with Kokatha people

High quality, DPTI specification material sourced from offsite quarry

## Next Steps

Construction to start Q2 2018; expected completion Q4 2018

Western Access Road and Power Infrastructure Alignments



# Water

## Construction Water ~3-4 ML p/day

Sufficient water identified for construction of airstrip, camp, process plant, TSF and Western Access Road

## Operational Water ~11.5 ML/d

Operational water requirements largely defined

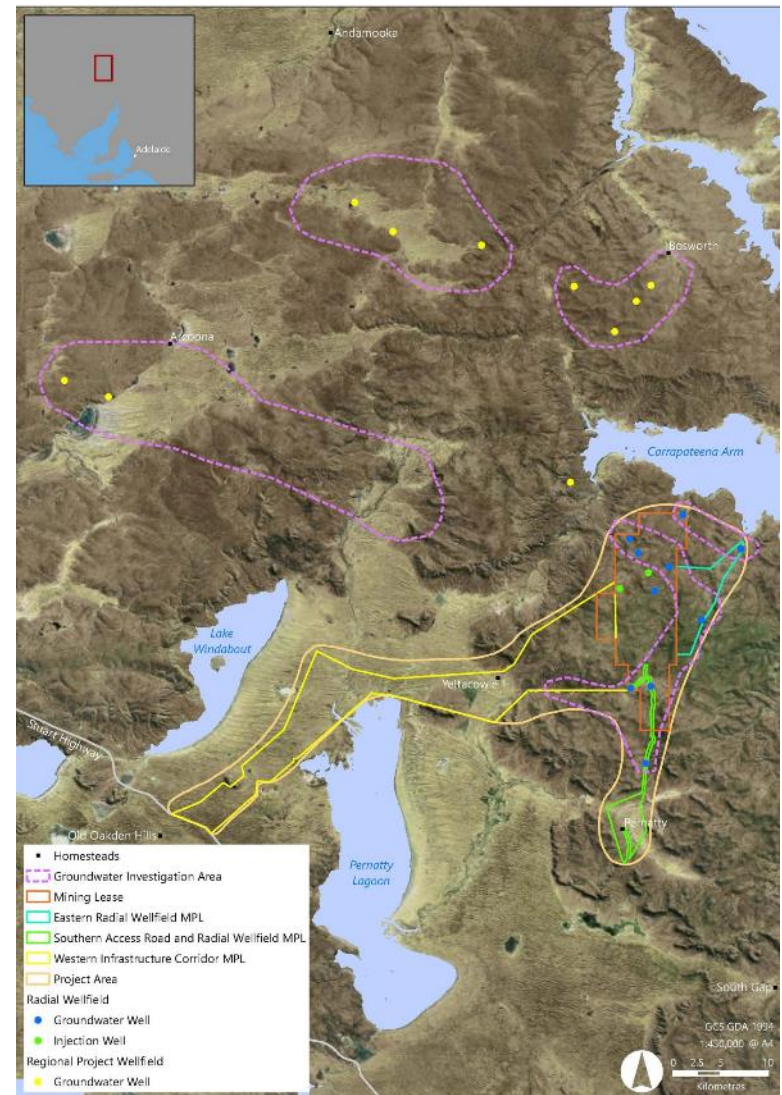
## Next Steps

Further drilling of exploration wells in Northern Wellfields to find centralised wells and limit infrastructure costs

The water distribution network is scheduled to be developed in three stages – as illustrated in figure to the right.

- Stage 1 – Q3 2017
- Stage 2 – Q1 2018
- Stage 3 – Q3 2018

Ausenco-Downer JV responsible for delivery



# Airstrip and Accommodation Village

## Tjungu Village

550 person camp

Onsite peak manning requirements reduced through resequencing of construction works, parallel offsite construction activities

High specification, fit-for-purpose accommodation modules and associated facilities sourced

## Next Steps

Construction scheduled to start Q3 2017

Anticipated completion Q2 2018

In negotiations with contractors

## Airstrip

Included in FS scope to deliver improved safety outcomes for workers travelling to site

Sealed airstrip 1400m L x 30m W

Based on Dash-8 Q300 turboprop aircraft capable of transporting 50 personnel

## Next steps

Construction scheduled to start Q3 2017

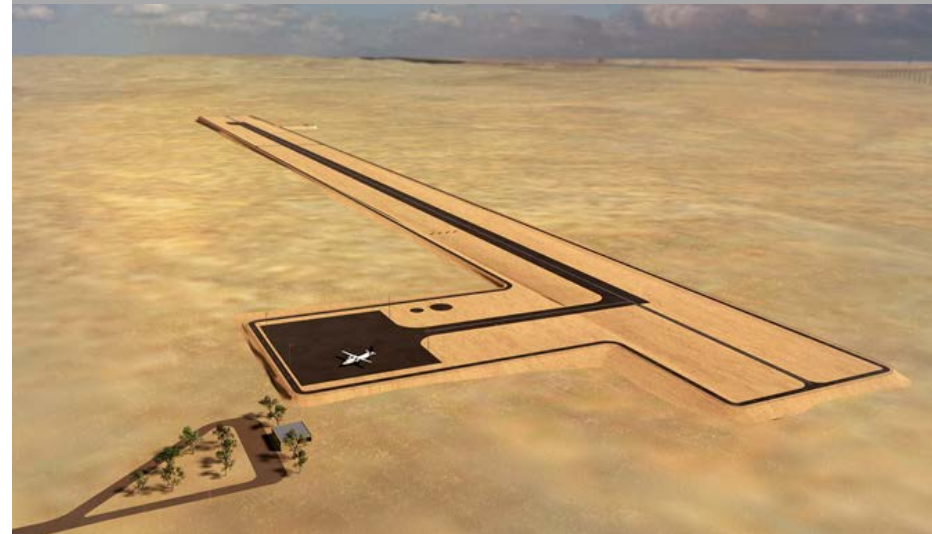
Anticipated completion May 2018

NRW responsible for delivery

### Camp Layout



### Airstrip Design



# Pre-production Capital Cost Summary

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Pre-production capex of ~\$916 million (excludes \$63m incurred from 1 July 2016 to 30 June 2017)

50% of pre-production capital in lump sum contracts near finalisation

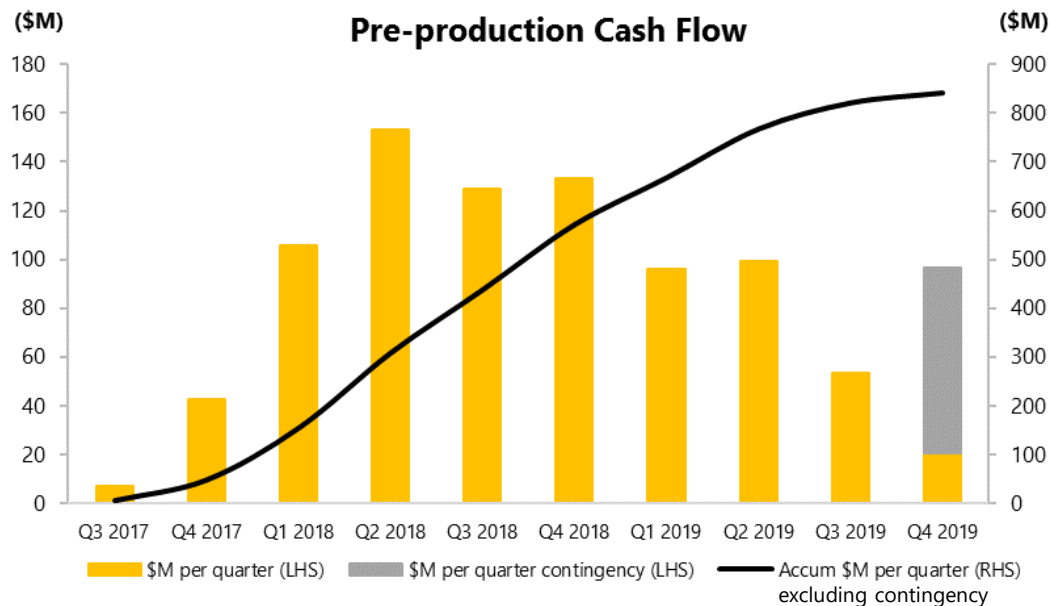
Contingency of \$66m (circa 7% of the capital cost) reduced by \$18m compared to the PFS with ECI approach and locking in costs

Pre-production capex includes costs of plant, airstrip, camp, site infrastructure, decline, first crusher and conveyor systems to the first crusher

Owners costs include costs related to project execution including project management

Ability to fund the development from existing cash balance and future Prominent Hill cashflows

Package	Description	(\$M)
1	Plant, conveyor & other infrastructure (lump sum contract, two phases): Ausenco Downer JV	392
2	Airstrip (lump sum), western access road TSF (class 3 estimate): NRW	111
3-7, 9	Camp (lump sum), regional power (BOOM) and other costs: Electranet, Telstra	60
8	Decline development (schedule of rates) Pybar	171
10	Owner's costs	117
11	Contingency	66
<b>Total</b>		<b>916</b>



# Lowest Quartile AISC

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LOM AISC US\$99c/lb and C1 US62c/lb for copper production

Lowest quartile cost production ensures resilience to adverse commodity price cycles

Operating cost of A\$50 per tonne, sustaining capex of A\$10 per tonne

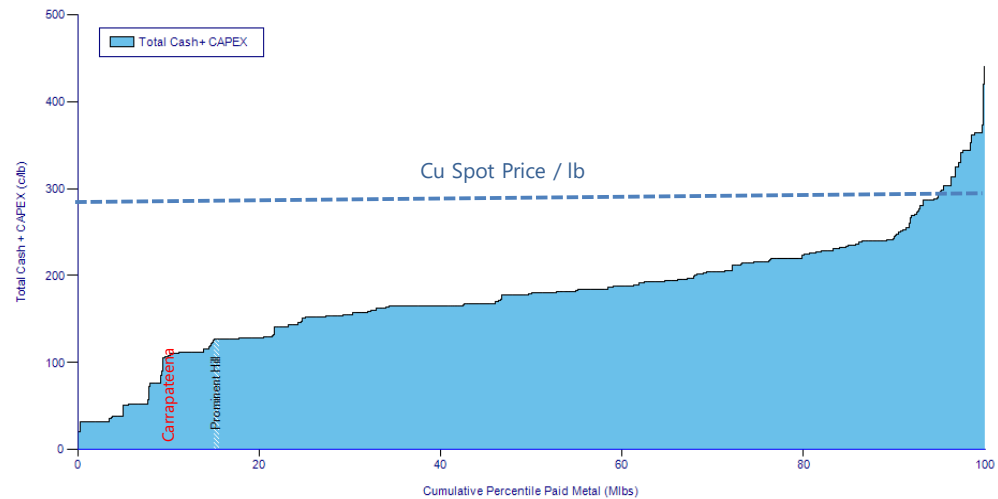
Net by-product credits partially offset by TCRCs contribute A\$6 per tonne

The classification between operating and capital expenditure has been better defined during the FS

Sustaining capex includes the following costs post commissioning:

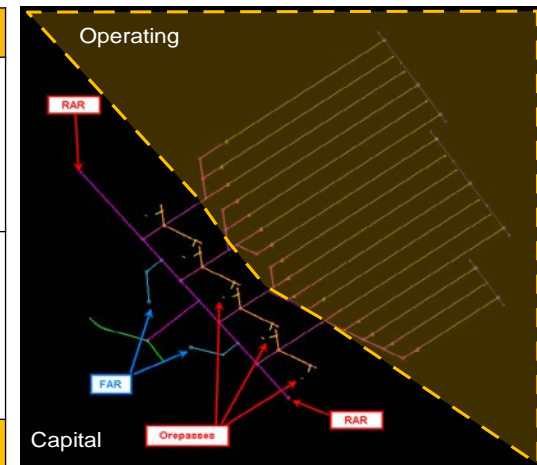
- LOM capital equipment
- Decline development and mine infrastructure
- Level development with useful life exceeding one year
- Ore passes, drives and vent raises

2017 Copper Mine, Composite, Total Cash + CAPEX Grouped By Mine and Ranked By Total Cash+ CAPEX



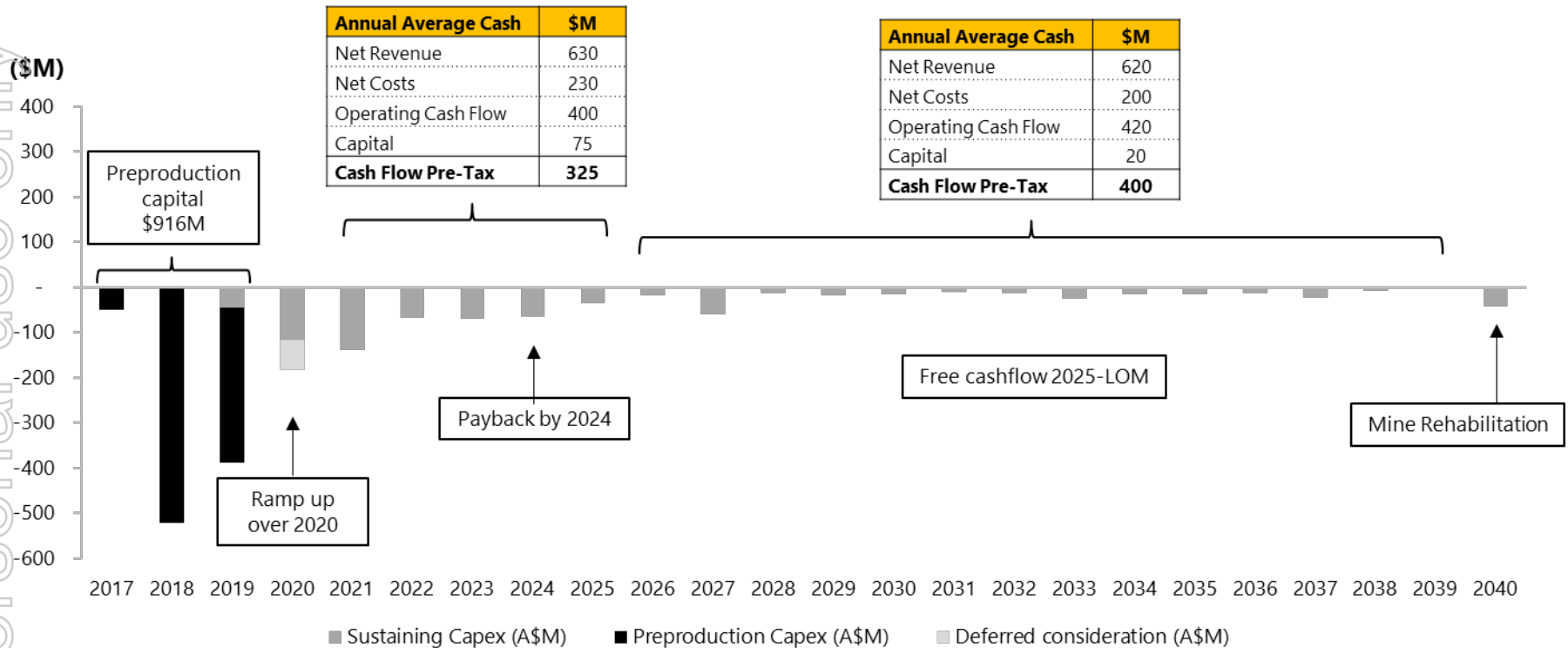
Source: Wood Mackenzie Ltd, Dataset: 2017 Q2

Description	\$/t
<b>Operating cost</b>	
Mining, Processing, Haulage, G&A	50
<b>Sustaining Capex</b>	
Development and other capex from Q4 2019	10
<b>Total</b>	<b>60</b>





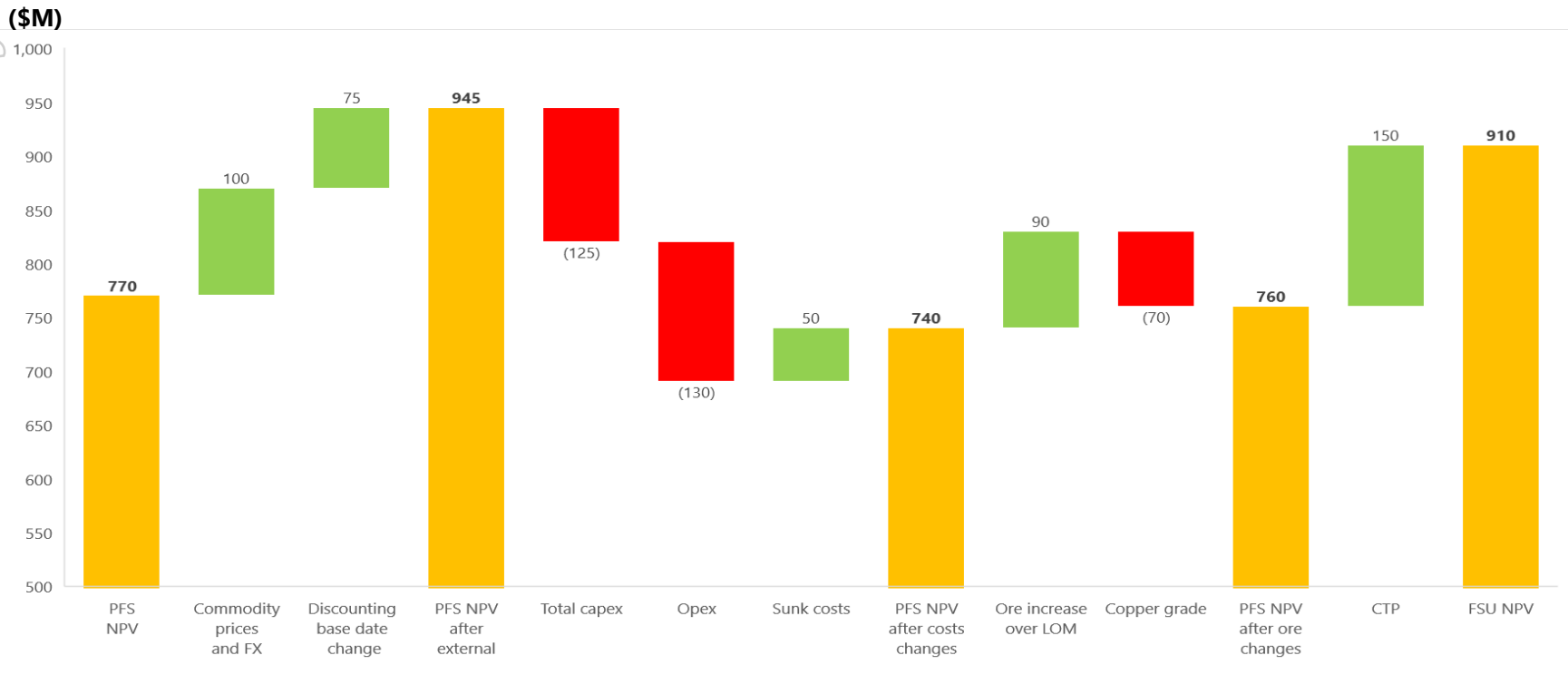
# LOM Cash Flows



- / Ramp up to full production over 18 months
- / Quick payback by 2024 followed by consistent cashflows throughout LOM with options for expansion
- / LOM Net revenue of \$12.2 billion with pre tax net cashflows of \$6.2 billion (\$4.2 billion post tax)
- / Strong consistent operating cashflows over a 20 year mine life with low capex required and high margins
- / Higher sustaining capex during ramp up and first five years of full production
- / Payment of deferred consideration of US\$50m in 2020

# Carrapateena Net Present Value Summary

## NPV Reconciliation to PFS



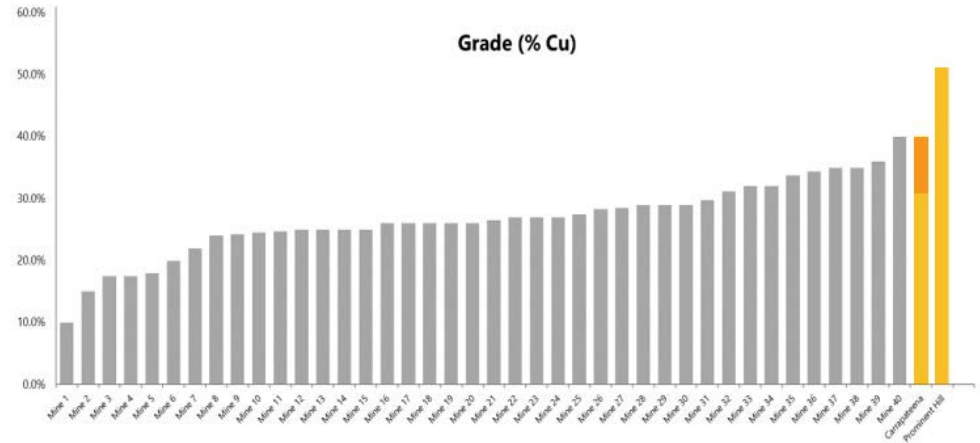
- / Carrapateena NPV of ~\$910m at FS level definition with greater pre-production capital certainty
- / Higher commodity prices provide benefit of \$100m
- / Capex and Opex increases due to better definition of costs and increase in ore inventory
- / Sunk costs since 1 July 2016 to 30 June 2017 excluded from pre production capital
- / Increase in ore inventory partially offset by lower grade
- / CTP no longer required - costs removed from project

# Sales and Marketing

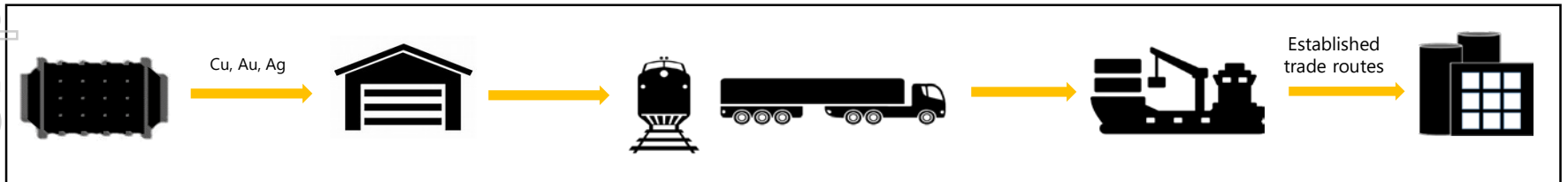
## International demand for high grade concentrate

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- / Copper grade 30-40%
- / Gold and silver by product credits
- / International market terms achievable
- / Established trade routes to smelters in Asia and Europe
- / Strong relationships with Customers
- / Experience in marketing copper concentrates including Prominent Hill
- / General decline in global copper concentrate grades



Source: Wood Mackenzie



# Project Risks and Opportunities

## Risks

### Quality of operational water

- Existing water quality yields sub-optimal recovery, geographic dispersion of wells
- Exploration drilling in Northern Wellfield – centralise wells to a single point and identify lower salinity water

### Decline

- Critical path, delay will impact mine commissioning
- Optimising cycle time through Woomera Shale
- Planning for seamless transition into operations

### Approvals

- On schedule, expected completion in 6 months
- Proposed conditions commensurate with Prominent Hill
- Feedback on MLP primarily on TSF - shallow groundwater risk and closure strategies
- Working groups established to facilitate process

Risks associated with design and construction were considered through risk assessment workshops where elimination or impact reduction have been designed and implemented.

## Opportunities

### Contingency not fully expended

- ~\$916 million pre-production includes \$66 million contingency
- Rigorous ECI approach, robust scope definition, offsite fabrication and defined milestones – potential for minimal / no drawdown

### Decline

- Critical path, acceleration in advance rate = potential to bring forward commissioning
- Actively working with partner to identify opportunities
- Three month accelerated schedule = potential NPV improvement of \$51 million

### Mineralisation

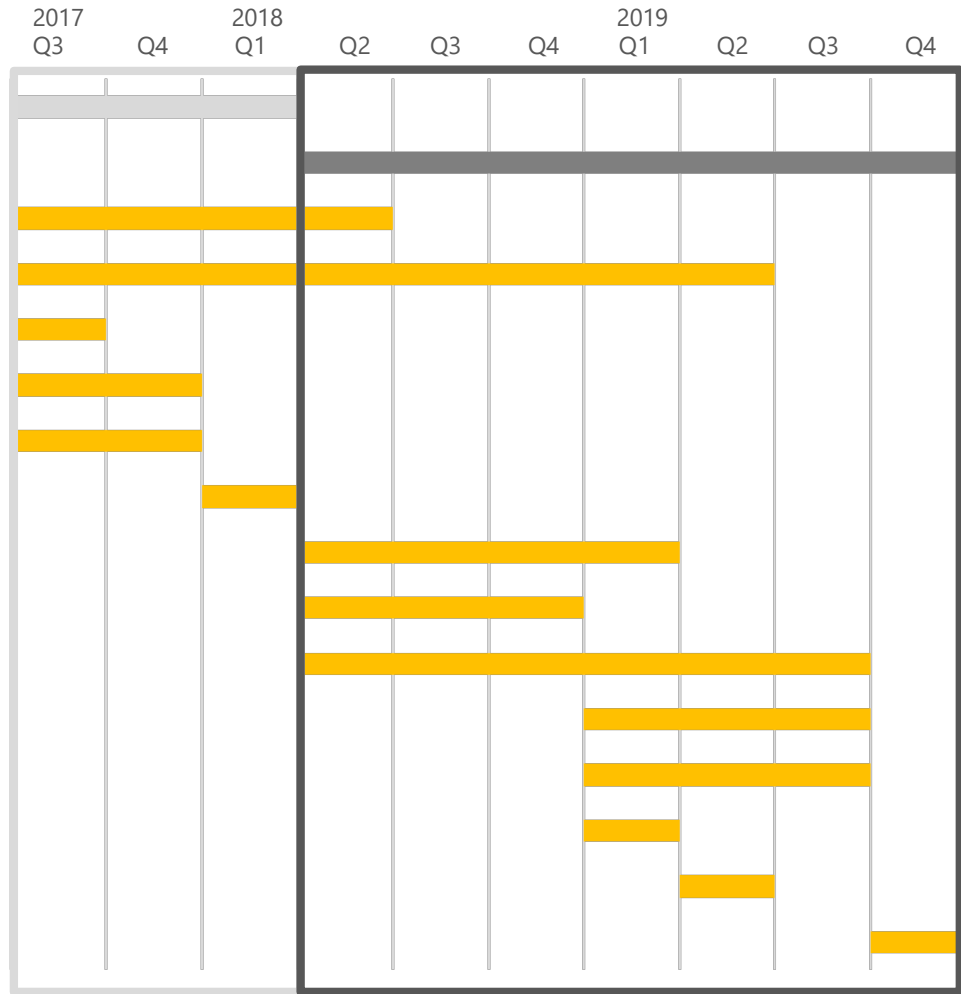
- Ore reserve cut-off grade of A\$90/t, break even cut-off for SLC is A\$51/t
- Mineralisation above break-even surrounds SLC zone
- Accessing only 62% of Carrapateena resource

Opportunities identified have either been included in design and development of project or are planned for further progress.

# Project Schedule

Two phases

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# Carrapateena: delivering on our growth strategy

**VALUE CREATION**  
 NPV<sub>9.5</sub> ~\$910M | IRR ~20% | Payback by 2024 | Average annual cash flow \$265M | Bottom quartile LOM costs - AISC US99c/lb; C1: US62c/lb  
 20 Year mine life from a plant operating at 4.25Mtpa\*

## Lean Business

- Design fit for purpose with expansion optionality
- Dual decline design reflecting agile approach

## Copper Core

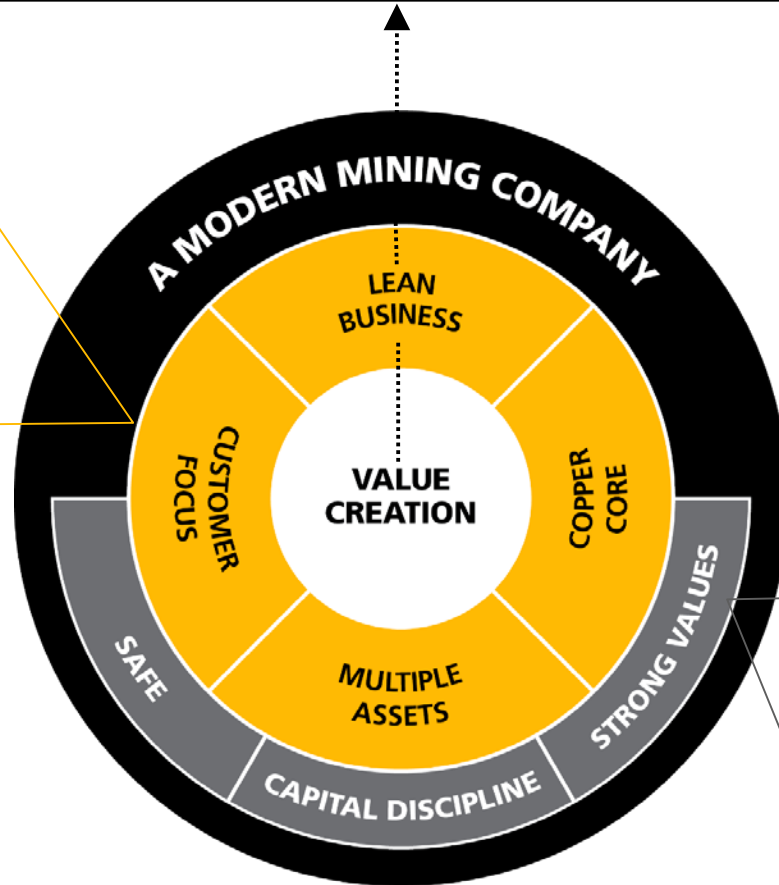
- High grade 30%-40% copper in concentrate
- Average annual production of 65kt Cu and 67koz Au\*
- Ore Reserve estimate: 79Mt @ 1.8%Cu, 0.7g/t Au, 8.5g/t Ag\*\*

## Multiple Assets

- Second cash generating asset
- Expansion optionality retained given known mineralisation and highly prospective region

## Customer Focus

- High quality concentrate saleable under existing international Prominent Hill contracts



## Safe

- Everyone works safely at site and strives for a workplace with no injuries

## Capital Discipline

- Cost certainty has increased with 50% of ~\$916 million pre-production capital in lump sum contracts near finalisation
- Project can be funded from existing cash balance and cash flows with ability to maintain dividend policy

## Strong Values

- ECI partners responsible for delivering local content and traditional owner involvement
- Strong relationships with pastoralists and the Kokatha people