# Tulu Kapi Gold Mine – Summary of Updates to DFS

# **Purpose of This Document**

The Tulu Kapi 2015 Definitive Feasibility Study ("2015 DFS") evaluated a conventional open-pit mining operation with a 1.2 Mtpa carbon-in-leach ("CIL") processing plant and the full study is available <u>here</u>.

Following the positive 2015 DFS and the engagement of Lycopodium Minerals Pty Ltd ("Lycopodium") as the engineering, procurement and construction contractor for the construction of the processing plant, Lycopodium completed in 2016 a Front-End Engineering Design Study ("FEED Study") for the design and construction of an integrated 1.5 Mtpa ore processing facility for Tulu Kapi.

Lycopodium then prepared the 2017 DFS Update which incorporated due diligence and refinements since the 2015 DFS and the full report is available for <u>here</u>.

KEFI has continued to engage with the key stakeholders in Tulu Kapi to optimise project development plans. Whilst Mineral Resources, Ore Reserves and the mine plan remain essentially unchanged, the planned processing plant was expanded to a nameplate of 1.9-2.1 Mtpa, in order to expand early cash flows by reducing stockpiles. Cost estimates were updated by suppliers during Q3-2022 and further improvements have been made to the project development plans.

The purpose of this document is to provide a summary of the work undertaken since the 2015 DFS on developing an open-pit mining operation at Tulu Kapi with a CIL processing plant. This development scenario forms Tulu Kapi's 2023 Banking Case which provides the basis for banks to provide project debt and has been reviewed and approved by the lenders' Independent Technical Expert. The economic analysis presented is a "Base Case" from the lenders' viewpoint which assumes processing ore from current open-pit Ore Reserves only, the processing plant throughput does not exceed nameplate design capacity and that the Development Loans remain in place until their maturity, i.e. no refinancing once open-pit production has settled down.

The intention is to also develop the underground mine below the open pit, collect silver credits, optimise process plant throughput and to refinance the finance package once open-pit production has settled down – that "Business Plan" scenario is modelled and presented separately.

In summary, the focus herein is to present a conservative foundation as analysed and approved by Independent Technical Adviser for the Secured Lenders or for any additional economic analyses. This document includes the following:

- (1) a summary of the status of the Tulu Kapi technical and evaluation studies;
- (2) a narrative of the key elements of the project description; and
- (3) an introduction to the independent review work completed.

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# 1 Evolution of the TKGM Project

# 1.1 Project Location & Ownership

The Tulu Kapi project is located in western Ethiopia, approximately 360 km due west of the capital Addis Ababa.



Figure 1-1 Project Location Map

Planned project level funding arrangements are summarised in the chart overleaf:

# Syndicate Structure of Partners, Regional Investors Banks and Contractors



Mine & Plan

Contractors

PWM and Lvco



The expected beneficial interest of KEFI in TKGM is c.70%. The permutations for achieving this are being optimised between the syndicate members.

The beneficial interest percentages provided on this slide are indicative only as they shall only be finalised upon funding of the projects being completed and as to whether share issues are made at the parent, interposed holding company or operating subsidiary. The percentages on the slide represent the current expectation of KEFI management.

Banks

**TDB and AFC** 

KEFI's wholly owned subsidiary KEFI (Ethiopia) ("KE") and the Government of Ethiopia formed Tulu Kapi Gold Mines Share Company ("TKGM") in 2017 as the Project company for developing Tulu Kapi. The exploration projects outside the Tulu Kapi Mining License area are not part of TKGM and remain within KE.

In May 2017, the Government of Ethiopia formally committed to a US\$20 million equity investment in TKGM.

In February 2018, the Ethiopian Ministry of Mines, Petroleum and Natural Gas formally transferred the Mining Licence from KE to TKGM in accordance with the legislation and our agreement.

The Government and KEFI have agreed changes to their shareholder agreement and the TKGM foundation documents to admit additional Project equity investors into TKGM.

The Government of Ethiopia has already commenced construction of the offsite infrastructure (electricity and roads) required for Tulu Kapi that it is funding.

# 1.2 Summary of Current Project Description

The Project comprises a proposed open pit mine, waste rock storage facilities, CIL gold recovery plant, tailings storage facility and enabling infrastructure.

The current Project Base Case (2023 Banking Case) is projected to have a 7.5-year operating life with a production rate of between 2.125 million tonnes (Mt) and 1.875 Mt per year of ore, depending on the ore type. The mine plan in 2023 Banking Case assumes a total of 15.4 Mt will be processed over the life-of-mine (LOM) containing approximately 1 million ounces (Moz) of gold. The total LOM waste rock mined will be about 115 Mt giving an overall waste to ore ratio of 7.4. The Project is projected to produce on average approximately 135,000 oz of gold per year over 7.5 years.

	2015 DFS	2017 DFS Update	2023 Banking Case
Life of Mine (LOM)	13 years	10 years	8 years
Mining strategy	Owner mining	Contract mining	Contract mining
Waste: ore ratio	7.4:1.0	7.4:1.0	7.4:1.0
Processing rate warranted	1.2Mtpa	1.5-1.7Mtpa	1.9-2.1Mtpa
Total ore processed	15.4Mt	15.4Mt	15.4Mt
Average head grade	2.1g/t gold	2.1g/t gold	2.1g/t gold
Gold recoveries	91.5%	93.3%	93.7%
Annual steady-state gold production	95,000 ounces	115,000 ounces	135,000 ounces
Total LOM gold production	961,000 ounces	980,000 ounces	984,000 ounces
Gold price	\$1,250/oz	\$1,300/oz	\$1,550/oz
All-in Sustaining Costs ("AISC")	\$724/oz	\$801/oz	\$1,040/oz
All-in Costs (incl. initial capex)		\$937/oz	\$1,336/oz
Average net operating cash flow	\$50M p.a.	\$60M p.a.	\$91M p.a.

Table 1-1 Evolution of Definitive Case for Project Financing the Open Pit Only

#### Notes:

- Based on DFS financial model for Tulu Kapi open pit updated for refinements in consultation with lenders, contractors and input pricing updates generally. The separate Owners' Analysis is not presented herein and builds on this base case to model the impact of silver recovery, introducing initial underground production, optimising plant throughput and debt.
- AISC include all operating costs, maintenance capital and royalties.
- Royalties increase with the gold price and therefore so does AISC.
- Life of Mine ("LOM") is the time to mine the planned open pit only.
- Gold production and net operating cash flow are for the first seven to eight years of gold production.

Section 2 below provides a more detailed project description by discipline.

# 1.3 Evolution of Project Base Case

The first definitive feasibility study for the project was commissioned in 2012 following a prefeasibility study in 2011 by the project's then owner Nyota Minerals.

KEFI Minerals plc took over the project in 2014 and after some drilling and related QA/QC and other investigation work, expanded the mineral resource from 1.1 Moz to 1.6 Moz, revised the mine plan and commissioned SENET of South Africa to produce a new feasibility study in 2015 entitled "Tulu Kapi Gold Project, Definitive Feasibility Study". It was completed in June 2015 SENET DFS, 2015) and was based on a nominal 1.2 Mt/y processing rate scenario.

Since 2015, KEFI has introduced a number of initiatives to improve the technical and economic robustness of the Project, resulting in an update to the feasibility study by Lycopodium dated May 2017 (Lyco 2017) which was based on a 1.5 Mt/y processing rate and included a number of plant design updates compared to the 2015 DFS.

In January 2018, following optimisation studies and contract tendering, Lycopodium prepared a revised study (Lyco 2018), which incorporated a 25% increase in the nominal plant throughput rate compared to the May 2017 study. This did not affect the mine planning but reduced stockpile build up.

In April 2020, Lycopodium updated the capital and operating cost estimates based a review of the FEED taking into account minor layout changes resulting from the decision to lower the level of the plant site following the findings of geotechnical investigations reported by Knight Piésold in February 2020. Knight Piésold also updated the TSF Design Report in April 2020 and revised their water balance report in February 2020. The water balance indicated a risk of shortfall in dry years especially in the early years of the project. Preliminary engineering was undertaken on a water abstraction pumping and pipeline facility from a permanent river (Birbir River) to the North of the project area.

Earthworks quantities were updated for the plant and facilities sites and the TSF and water dams for inclusion in the updated capital estimate. An estimate of both the capital and operating cost of the water abstraction facility was undertaken as part of the update. Prices were updated on the database of procurement items and construction materials.

# 1.4 Independent Review

As the project was overhauled by KEFI and then optimised with the involvement of the principal project contractors, an independent review process has been undertaken using independent technical experts (ITE) appointed by Endeavour Financial after its consultation of then proposed lenders. The process has ensured that risks are assessed as changes are made and then additional work is commissioned to mitigate identified risks either by designing them out or adding contingency plans to address them.

# 1.4.1 Historical Independent Technical Expert (ITE) Involvement

Historically TKGM's ITEs were Micon International Limited (Micon) and Ramboll Environ (Environ).

 Micon has prepared successive drafts of a Due Diligence Review (DDR) Report which have been updated as the project scope and financing approaches have evolved. Their ambit includes all technical, project management and operational aspects of the TKGM Project with the exception of environmental and social planning, management and permitting. The latest draft was issued in August 2020 (Micon 2020) as a Final Draft. • Environ completed a review and reported it in August 2015. Their report described and reviewed the project's ESIA and social plans (including the Resettlement Action Plan). It also prepared a gap analysis comparing the status of work completed and planned against the Equator Principles and the IFC Performance Standards.

#### 1.4.2 Environmental & Social Review

Ramboll Environ USA have advised that they are no longer available to update their original work. A replacement ITE, SLR Consulting (SLR) has subsequently been engaged to take over the Environ role of auditing and advising on IFC compliance. They have undertaken a documentary review and visited the site in February 2020. (SLR, 2020) SLR now act as an independent advisor to TKGM on Environmental and Social matters.

#### 1.4.3 Current Lenders' Technical Advisor

In 2020 the current lenders, Eastern and Southern African Trade and Development Bank based in Nairobi ("TDB") and Africa Finance Corporation based in Lagos ("AFC"), appointed Behre Dolbear International ("BDI") as their Lenders Technical Adviser ("LTA"). BDI also has "Environmental and Social" capability and has unified the scope to include all those aspects formerly reviewed by Micon and SLR. As LTA, BDI will also provide both preconstruction technical due diligence review and project construction and performance test monitoring services to the Lenders.

#### 1.4.4 Current Technical, Project Management, Environmental and Social Review Status

Studies in the following areas are complete:

- Geology and Mineral Resources
- Mining and Ore Reserves
- Mining Method and Mining Schedule
- Metallurgy and Processing Route
- Organisation Design and Operations Development
- Geotechnical Investigation & Plant Site Foundation Design
- Tailings Storage Facility Design
- Site Water Balance (focus on contingency plans for start-up and early years drought contingency plans)
- 2020 and 2022 Operating Cost Update
- 2020 and 2022 Capital Cost Estimate Update (note that the Capital Cost Estimate will be updated prior to execution of the Senior Debt Facility Agreement)
- Periodic updates to agreements with key contractors, project schedule and financial model
- Infrastructure Design
- ESIA 2020 Update
- Resettlement Action Plan

# 2 Project Description

# 2.1 Location Description

The Tulu Kapi Gold Project is located in Western Ethiopia, in the Western Wellega Zone of the Oromia Region approximately 360 km due west of the capital, Addis Ababa.



Figure 2-1 Project Location Map

The Project is accessible by road from Addis Ababa, a distance of 520 km. The journey by road from Addis Ababa to Tulu Kapi takes approximately 10 hours.

The Project area is nine kilometres south of the village of Keley. Regional population centres within easy road travel distance of the licence areas include Ayra, a small town about 20 km to the west, Gimbi, an important market town about 32 km to the east northeast, and Nekemte, a larger regional centre about 110 km to the east.

Chartered aircraft from Addis Ababa may land at an airstrip at Ayra Guliso, approximately 30 km by road from the project. Road travel from Ayra to the project site takes approximately 2 hours on a mix of gravel and dirt roads. Ethiopian Airlines operate scheduled flights three times a week to Assosa airport, a 4-hour drive from Tulu Kapi. Note that project plans include a secure airstrip at Tulu Kapi.

The project area is characterised by rounded hills and deeply incised valleys at elevations of between 1,550 and 1,770 metres above mean sea level. The Mining Licence Area of 7 km<sup>2</sup> is located on a ridge forming a watershed which drains north and south. The streams in the area are perennial but decrease to very low flow rates in the dry season. Groundwater in the project area is found in two aquifers. The upper unconfined aquifer is located in the saprolite, and the lower semi-confined aquifer is located deeper in the fractured bedrock. Groundwater flow is expected to mimic the surface topography and be controlled by surface water divides.

Land use is predominantly agricultural and the ridges are mainly left to grass for cattle. The hill sides are terraced for seasonal cropping of maize, teff, corn, and other staples. The incised valleys are overprinted by a forest ecosystem providing shade for coffee plantations.

Rainfall is seasonal with a pronounced 'monsoon' period between July and September. Daily average high and low temperatures range from 32°C and 13°C in May immediately prior to the start of the rainy season, to 24°C and 14°C in July and August, which are the coldest months. KEFI has been able to continue uninterrupted exploration throughout the year, including reduced activity during the wet season, and there is no reason why a commercial scale mining and processing operation cannot be conducted throughout the year.

# 2.2 Geology & Mineral Resource

## 2.2.1 Setting and Mineralisation

The region lies within the Arabian-Nubian Shield (AN Shield) which consists of Archaean gneiss and is best described as a granitegreenstone terrain. Additional weakly metamorphosed volcano-sedimentary successions of late Proterozoic age occur within the terrain. The area has been extensively folded, faulted and intruded by Pan-African aged granites and lesser mafic to ultramafic intrusions and hosts a number of gold occurrences/deposits.

The Tulu Kapi area is underlain by a volcano-sedimentary sequence rocks ranging in age from Precambrian to Tertiary age. Gold mineralization is associated with a coarse grained Upper Proterozoic syenite intrusion. The southern and eastern limits of the Tulu Kapi deposit are defined by a northeast-southwest-trending shear zone (Bedele shear zone), which ranges in thickness from 20 m to 60 m and dips to the northwest. The hanging-wall of the shear zone is formed by syenite, which hosts mineralization; diorite forms the footwall contact. Gold mineralization occurs in a series of southeast-dipping zones of quartz-veined, albite alteration that is centred on a north-northeast-trending shear.

The main mineralisation stage at Tulu Kapi is composed of an assemblage of hydrothermal minerals that are present in highly variable abundances and include quartz, albite, carbonate, biotite, muscovite, epidote, sulphide and gold. The mineralisation commonly occurs in veins, crackle zones and minor breccia zones. The typical Tulu Kapi gold mineralisation within the pit is associated with sulphide-bearing albite alteration and quartz veins (replacement and fracture fillings). Albite occurs as overgrowths on original syenite feldspar and also as newly formed crystals in veins and cavities. It is uncertain whether the albite associated with the mineralisation is the same stage as the pervasive albitisation of the syenite. However, since the albitised syenite is cut by quartz veins that pre-date the mineralisation, it is suspected that the pervasive albitisation is an earlier event. A minor generation of late-stage pyrite veins is weakly developed. The veins are typically less than 10 microns wide and have been observed to crosscut muscovite veins. No gold has been observed in association with these veins.

Figure 2-2 Quartz and pyrite in albitised syenite overprinted by a shear fabric GKP 11



Figure 2-3 Albitised syenite cut by several vein stages including cream-coloured deformed quartz, grey quartz, pyrite and late carbonate. Core Specimen. TKBH-009



Figure 2-4 Albitised syenite cut by a vein with quartz, carbonate and pyrite. Core Specimen TK-010.



The sulphide minerals identified include pyrite, sphalerite, bornite, chalcopyrite, galena and arsenopyrite. In addition, tetrahedritetennantite has been tentatively identified. Pyrite is by far the most abundant sulphide and occurs as coarse to fine grained infill and as alteration spots in syenite. Aggregates of small crystals are common and typically these also contain crystals of silicate and carbonate minerals to form a sieve-like texture. Lack of considerable arsenic, antimony and tellurium minerals suggest that the majority of gold could found as a free gold. Figure 2-5 Coarse gold occurring within cracks in pyrite, within pyrite and within the silicate matrix. Sample B4076, reflected light (Pollard, 2007)



Petrographic and metallurgical test works also show that gold is predominantly non-refractory.

## 2.2.2 Exploration

The Tulu Kapi gold deposit has been explored over a protracted period since the late 1930's, albeit with several breaks. Exploration has accelerated over the last 10 years when most of the exploration data was generated. The current database used in the 2015 mineral resource estimate contains 298 diamond core holes totalling 72,033 m, plus a further 342 RC holes for 45,611 m.

The mineral resource estimate for the 2015 Tulu Kapi DFS was prepared jointly by KEFI and Snowden. Mineral resources for the Tulu Kapi deposit have been reported using a 0.45 g/t Au cut-off grade to define a potential open-pit resource above the 1,400 mRL and a 2.5 g/t Au cut-off grade for a potential underground mineral resource below the 1,400 mRL. The elevation limit and cut-off grades were based on open-pit optimisation studies carried out as part of reviews of the previous 2012 Feasibility Study.

The total mineral resources of the Tulu Kapi deposit, as of 4 January, 2015, are shown in the table below. The mineral resource estimates are global estimates which are not constrained by a pit shell. The constraint of the 1400 mRL represents the bottom of the pit optimisation shells generated as part of the 2015 DFS.

#### 2.2.3 Mineral Resource

Several resource estimates have been carried out at Tulu Kapi since 2009 by various consultants with an expanding database including Hellman & Schofield in September 2009, Venmyn in 2010, SRK in 2011 and Wardell Armstrong International ("WAI") in 2012. There has been over 120 km of drilling at Tulu Kapi and over US\$50 million spent on drilling, project due diligence and planning by previous owners.

The 2012 DFS resource estimate was carried out by WAI using a semi-constrained block model in Datamine using the dynamic anisotropy methodology. This was updated post-acquisition by KEFI in March 2014 in the first update as a means of verifying the WAI methodology and resource estimate. It was also used as a starting point for a small exploration infill drill program to confirm significant intercepts predicted by the model and for first-pass mine planning of an optimised pit design, mining method and pit staging.

The KEFI March 2014 estimate incorporated significantly more structural control than all previous estimates in the form of closely spaced strike and dip strings on section and in plan defining continuity of mineralisation. These were based on structural measurements and from observations as known and agreed by the geologists experienced with the deposit. The 2014 estimate also used all available data, including 16,000m drilled by Nyota late in 2012 which missed the cut-off date of their data base

(September 2012) used in the 2012 WAI resource estimate. KME also corrected errors in the Nyota/WAI drill database which (along with the missing 16,000m) had resulted in the underestimation of the Indicated Resource via a lack of downhole survey data being applied to selected drillhole azimuth and dip. The March 2014 estimate was carried out on a 5 x 5 x 1m block model.

The additional data input by KME (under KEFI) in March 2014 allowed for a 69% increase of the Indicated Resource from 1.1Moz to 1.86Moz Au

KEFI further refined the resource estimate using additional structural data based on surface mapping and 82 trenches plus a small programme of additional reverse circulation targeted at infill drilling and maximising structural interpretation. This work was performed between March and June 2014.

The August 2014, resource update of 1.9Moz Au (23.7 Mt at 2.51g/t Au) took into account all drilling and trenching conducted to date along with improved understanding of geological and structural controls and was signed-off by Snowden. The estimate was carried out on a 10 x 10 x 1.5m block model.

In February 2015, KEFI announced the latest JORC compliant independently verified Indicated Resource of 18.8Mt at 2.67g/t Au for 1.62 Moz Au completed to finalise the basis for the 2015 DFS. As part of the 2015 DFS, the updated Indicated Resource was derived from "wireframing" all the mineralised structures and has now been used as a base for further refined pit design, mine scheduling and Ore Reserve estimation.

Total Indicated Resource above 1,400m relative level and in the potential open pit area is 17.7 Mt at 2.49 g/t Au for 1.42 Moz Au (August 2014 estimate was 17.3 Mt at 2.37 g/t Au for 1.31 Moz Au). High grade mineralisation immediately below the planned open pit (in underground potential) is 1.08 Mt at 5.63 g/t Au for 0.20 Moz Au (August 2014 Indicated Resource estimate was 1.07 Mt at 5.88 g/t Au for 0.20 Moz Au).

	Reporting	Cut-off	Tonnes	Au	Ounces
JORC (2012) Resource Category				( 10	<i>,</i> ,
	Elevation	(g/t Au)	(IVIt)	(g/t)	(million)
Indicated			17.7	2.49	1.42
Inferred	Above 1 400 mRL	0.45	1.28	2.05	0.08
Indicated and Inferred			19.0	2.46	1.50
Indicated			1.08	5.63	0.20
Inferred	Below 1 400 mRL	2.50	0.12	6.25	0.02
Indicated and Inferred			1.20	5.69	0.22
Total Indicated			18.8	2.67	1.62
Total Inferred			1.40	2.40	0.10
Total Indicated and Inferred			20.2	2.65	1.72

 Table 2-1 Tulu Kapi Mineral Resources Reported February 2015

Notes:

(1) Mineral resources were declared in a media announcement dated 4<sup>th</sup> February 2015.

(2) The Competent Persons for the for the Resources are Simon Cleghorn, Resource Manager of KEFI, and Lynn Olssen, General Manager Geosciences and Senior Principal Consultant of Snowden Mining Industry Consultants Pty Ltd.

(3) All numbers are reported to three significant figures. Small discrepancies may occur due to rounding.

(4) Mineral resources are reported in compliance with the guidelines of the JORC Code (2012).

In addition to the deeper zones at Tulu Kapi there are proximal targets identified that could add to the current mineral reserves and provide additional plant feed in the future.

# 2.3 Mining

## 2.3.1 Ore Reserve

The 2012 DFS by WAI for Nyota was based on mining a Probable Reserve of 17 Mt at 1.8 g/t for 1Moz from a 1.1Moz Indicated Resource. The applied cut-off grade of 0.4 g/t<sup>1</sup> was derived assuming a gold price of US\$1,500/oz. Mining was to be by conventional open pit drill, blast, load and haul by truck and shovel. Selective mining was not considered.

In the lead up to finalisation of the 2015 DFS (SENET, 2015), KEFI:

- conducted extensive QA/QC on the resources, complemented by 81 trenches, for 1,100 meters sampled exposing ore contacts and 23 reverse circulation drill holes, for 4,100 metres sampled to test the updated resource database.
- wireframed individual ore lodes to enable the mine planning of a selective mining strategy.
- commissioned fragmentation and blast movement prediction modelling by blasting specialists at Itasca.
- completed owner operator mining cost estimates derived from detailed first principles estimates, using site specific data.

The mining study for the 2015 DFS was prepared by Snowden for KEFI and was based on mining a Probable Reserve of 15 Mt at 2.1 g/t for 1M oz from a 1.6M oz Indicated Resource. The applied cut-off grade of 0.5 g/t<sup>2</sup> was derived assuming a gold price of US\$1,250/oz. Given the visual nature of the mineralisation selective mining techniques were contemplated at the ore boundaries to reduce dilution and increase recovery.

Classification	Cut-off Grade (g/t	Ore	Au Grade	Au Metal	Waste	Stripping Ratio (W:O)
	Au)	(Mt)	(g/t)	(Moz)	(Mt)	
Probable – High Grade	0.90	12.0	2.52	0.98		
Probable – Low Grade	0.50-0.90	3.3	0.73	0.08		
Total		15.4	2.12	1.05	114.2	7.4

Table 2-2 Ore Reserves by Classification based on February 2015 MRE

This Ore Reserve and mining method are the basis of all subsequent plans developed by KEFI.

# 2.3.2 Mining Method

The operations will be carried out using conventional open pit mining methods, consisting of drilling, blasting, loading, hauling and crushing. The mining activities will be carried out by a mining contractor under the control of the owners technical team.

The quality and quantity of ore delivered to the processing plant and the minimisation of ore dilution and ore loss were the main criteria for the mining method selection. The method used involves a combination of bulk and selective mining approaches. Approximately thirteen percent of the total material movement is categorized as selective ore and waste mining.

- Blasts will be designed by KEFI's technical department and implemented by the mining contractor to achieve the desired fragmentation and digability whilst minimising the disturbance to ore blocks and damage to final pit walls.
- Following bench establishment, mining will continue to limits predetermined by the technical department. Ore, including
  both high grade and low grade ore, and waste, including selective waste and bulk waste, will be identified by the technical
  department. Excavation levels will be controlled by the use of the mining contractor's laser levelling or precision guidance
  system.
- High grade ore, low grade ore and selective waste blocks will be marked out by the technical department on each bench with colour coded markers.
- Under the supervision of KEFI's geologist, the contractor will excavate high grade ore, low grade ore, selective waste and bulk waste as directed by the technical department using appropriate equipment.
- Pit walls will be formed and excavated at angles designated by the technical department. Mining will generally be carried out by excavating high grade ore, low grade ore, selective waste and bulk waste separately. However, concurrent mining may be required from time to time. The contractor will implement methods and practices approved by the owner that will ensure correct identification, excavation and delivery of each material to its design tipping point.

Within the mining cycle there is a specific requirement for excavator cleaning and re-handling of waste material that is necessary to ensure mining selectivity. It is envisaged that mining will progress across the bench from hanging wall to footwall (approximately

<sup>&</sup>lt;sup>1</sup> Cut off used was Saprolite, Fresh and Hard Ore was 0.44 g/t, 0.39 g/t and 0.41 g/t respectively.

<sup>&</sup>lt;sup>2</sup> An elevated cut-off of 0.90 g/t was uses and applied to all domains (i.e. saprolite, fresh and hard ore) to identify high grade

west to east) when possible to avoid collapsing the ore material into the waste, as would occur if mined from the opposite direction. The selective mining process is shown in Figure 2-6 below and contains seven steps:

- 1) Bulk waste removal
- 2) Cleaning waste from the hanging wall contact
- 3) Re-handling of selective waste
- 4) Removal of bulk ore
- 5) Cleaning of selective ore to the footwall contact
- 6) Re-handling of select ore
- 7) Continue mining the waste material.

The cycle utilises more productive top loading of trucks 3 m above the bench where trucks traverse, however the excavator will be on the same level as the trucks when:

- Removing waste immediately adjacent to the ore on the hanging wall contact
- Moving final ore from waste on the footwall contact when the ore is immediately adjacent to the contact
- When bottom loading of trucks that may be necessary when handling the windrows created from the above two activities.
- Tight digging conditions where it is impractical for the trucks to access the lower bench

#### Figure 2-6 Selective Ore Loading Cycle



For wider ore lodes the excavator will be able to resume top loading activities during the excavation process.

#### 2.3.3 Mine Plan

Mining at the Tulu Kapi project is planned to be carried out from one deposit using conventional open pit truck and excavator mining methods by the mining contractor.

KEFI engaged Lycopodium and Mining and Cost Engineering Pty Ltd (MACE) in May 2017 to provide a DFS Update report assessing an increase in the production rate to 1.9-2.1 Mt/y, revise the surface layout to minimize ore stockpiles, optimize the costs which resulted in the Base Case mining schedule (SOG21).

The pit optimisation and design work performed by Snowden in the 2015 DFS were not changed and the Ore Reserves for the Base Case remain the same.

The Base Case DFS mine schedule (SOG21) results in a high-grade stockpile to no more than 1.1 Mt, reduced from 1.7 Mt. The low-grade stockpile reduced from 3.3 Mt to 2.2 Mt and will be processed towards the end of the mine life.

The design of the run-of-mine (ROM) ore stockpile pad is divided into manageable staged developments to ensure enough time to generate sufficient waste rock for construction whilst ensuring adequate stockpile capacity. A low-grade stockpile will be established at the back of the ROM pad. The low-grade stockpile will store the material with a grade between 0.5 g/t and 0.9 g/t Au that will be processed at the end of mining, and will reach a maximum capacity of 2.2 Mt.

The mining benches will be 7.5 m high and will be excavated in 2.5 m lifts or flitches.

In order to minimise losses and dilution, it is expected that there will be some re-handling of waste material adjacent to the gold veins prior the selective digging of the ore using a backhoe excavator. A smaller 150 t class backhoe excavator will be used for cleaning the hanging wall and footwall and the digging of ore, and a larger 300 t backhoe excavator will be utilised to mine the bulk material, mainly waste. For ore lodes greater than 2 m wide the excavator will be able to use a bottom loading method, otherwise top loading will be required. Selective mining will be the most crucial aspect of the mining cycle; hence, this is a key area to manage and it will require thorough supervision during operations to prevent unplanned mining losses and dilution.

During the life of the mine, ore will be hauled from the east access of the main pit to the ROM stockpile while waste will initially be hauled as ROM construction material which will continue to be extended and form part of the North waste dump. As the North waste dump reaches capacity, or as shorter haul routes dictate, the South waste dump will be used. The Western waste dump included as contingency and will only be used where the other waste dumps are unavailable.

Two excavators will be required during the pre-production period and further machines will be required as the total material mined increases. The main mining equipment will be Caterpillar 6030 and 6015 backhoe excavators with Caterpillar 777D 90 t rigid haul trucks. Similar sized alternatives fleets may be used as agreed with the mining contractor.

The three mine waste dumps will be located adjacent to the Main pit, with a small dump to the northeast behind the ROM pad and North dump will be used for stockpiling waste rock from the Stage 4 north pit. The dumps were designed by Golder Associates (Golder) with capacities of approximately 24 Mt, 87 Mt and 5 Mt, respectively. The dumps were designed to maximise land use in the valleys, with the footprint of each waste dump limited to a single catchment area to facilitate water management. An underdrainage system will collect water percolating through the dump and direct it to sedimentation ponds located downstream of the dump footprint.



Figure 2-7 Mine Layout

#### 2.3.4 Contractors

KEFI has concluded four tenders for the mining contract which started with 10 candidates and resulted in the nomination of PW Mining ("PWM") as the preferred Contractor for Mine Establishment and Operation. PWM has over 20 years African-mining experience and extensive experience in the mining techniques adopted for Tulu Kapi.

The supply of explosives to the hole will be under a separate contract and KEFI has nominated AEL, another experienced African explosives contractor, as its preferred contractor.

#### 2.3.5 Mine Schedule

The 2015 DFS adopted a schedule which included:

- Total material moved over LOM was 130 million tonnes comprising 114 million tonnes of waste and 15.4 million tonnes of ore resulting in an average strip ratio is 7.5:1.
- Peak mining volumes occurred in Years 3 to 6 with 18.5Mtpa, declining thereafter. Peak ore mining occurred in Year 2 with approximately 2.6 million tonnes and declining thereafter.
- The processing plant capacity was planned at 1.2Mtpa and lower grade ore was planned to be stockpiled and treated at the end of the mine life.

KEFI and its consultants have since optimised the 2015 DFS mine schedule as a result of planned increases in processing plant capacity. PWM contract proposal is on the basis of these revised schedules. Total waste and ore moved over LOM are broadly similar to the 2015 DFS given the pit excavation remains largely unchanged; however, the main difference is that the peak mining rate is elevated to achieve the higher plant through put rate and allowing the mining of higher-grade ore to be scheduled earlier. These changes result in significantly smaller stockpiles.

During the project optimisation phase after completion of the 2015 DFS there were two iterations of the mine schedule:

- 1.5 1.7 Mtpa plant capacity reported in the 2017 DFS Update
- 1.9 2.1 Mtpa KEFI Plan ("SOG21") Current Schedule used in financial models (see Table 3-6).

# 2.3.6 Mine Planning Next Steps

KEFI plans the following mining related activities to be carried out during the two year operational readiness and construction phase prior to plant commissioning:

- Further refine project execution and risk review with key stakeholders (e.g. PWM, AEL and Lycopodium)
- Finalise binding schedule and pricing for contract agreement with PWM to allow procurement of long lead mobile plant to be initiated and recruitment and training programs to be implemented.
- Infill RC drilling program on closely spaced grid, where required, to improve knowledge on close spaced grade variability
  and lode definition. This program aims to achieve high confidence grade control definition of up to the first 12 months of
  production.
- Develop grade control models for detailed mine planning covering pre-production phase and up to the first 12 months operational phase.
- Develop operational-level detailed short term and medium term mine plans using updated modelling from the reschedule the mine on refined wireframes.
- Implementation and commissioning of fleet management and precision guidance systems.

#### 2.3.7 Basis of Current Mining Budget

Based on the KEFI Mine Schedule ("SOG21"), the final Mine Budget (used for Financial Modelling in Project Economics Section below) was prepared on the following basis:

- Incorporates selective mining of the resource using the methods developed and described in the 2015 DFS.
- Achieves mill target tonnages with improved grades.
- Maintains a surplus stockpile buffer for life of mine.
- Maintains vertical bench advance rates to within practical limits.
- Allows for increase grade control definition of mineralised lodes.
  - Adopts a pre-production mining phase of 3 months (1 qtr.) which achieves the following:
    - Ability to create and maintain healthy and sustainable stockpile inventories to ensure availability of plant feed.
    - Create opening stockpile inventories that provides approximately one quarter of scheduled plant throughput. This will increase as mining and processing achieve steady state, to inventories of around 4 to 5 quarters of plant feed.
    - Avoid unnecessary capital expenditure from excessive pre-production stockpile inventories.
    - Minimise risk of premature mobilisation and fixed cost exposure to PWM in the event of delays to plant commissioning.
- An in-fill drilling program is proposed prior to the commencement of mining operations. This is intended to improve confidence in lode delineation and grade estimation for detailed short term planning and medium term planning, and potentially upgrade portions of the reserve from "Probable" to "Proved"<sup>3</sup>.

#### 2.3.8 Mining Cost Estimate

Key points of note in relation to the mining cost estimate:

- Mining cost estimates are based on feasibility level mine plans.
- The basis of estimate includes:
  - Budget level (±10%) costs from PWM for the following:
    - Site preparation for pit and surface landforms
    - RC and blast hole drilling
    - Blast hole loading and blasting
    - Load and haul ore and waste
    - Crusher loading
  - o Budget level costs for explosives and down-the-hole delivery from AEL.
  - Nominal provisions for daywork is included.
  - KEFI mining team labour costs are based on HR consultant findings.
  - Fuel costs quoted by in-country suppliers.
- Current cost estimates are considered to be at a budgetary level of detail

<sup>&</sup>lt;sup>3</sup> Subject to grade control drill results and a subsequent increase in confidence in Mineral Resource classification

During operational readiness, and following finalised operational-level schedules and pricing as part of the binding
agreements with PWM and AEL and development of short and medium term mine plans, the accuracy of the mining cost
estimate will seek to achieve ± 5%

# 2.4 Metallurgical Testing

There have been two major programs of metallurgical testwork using samples from the Tulu Kapi deposit. The first phase was completed in 2011 for a prefeasibility study and the second phase undertaken to support the original 2012 DFS, collated by SENET, with the metallurgical flowsheet and process design criteria further developed for the updated SENET 2015 DFS. No additional testwork work has been completed since then.

Metallurgical testwork for the PFS and the 2012 DFS on various samples of oxide and fresh Tulu Kapi ore types was carried out by ALS-Ammtech ("Ammtech") and reviewed by Orway Minerals Consultants (see OMC 2012). Testwork in 2012 was carried out to confirm gold recovery efficiencies and to support the process design parameters for a conventional gold recovery plant.

The mineralisation modelled and metallurgical testwork available indicate that conventional CIL extraction can be used, to produce gold as doré. The gold is free milling and all the unit processes included in the design are standard and common to many current gold operations. The testwork program included:

- comminution testwork
- flotation testwork
- cyanidation testwork
- oxygen uptake
- gravity recoverable gold testwork
- thickening testwork
- cyanide detoxification

Variability testwork was conducted on samples from different lithologies and also from different ore zones and was mainly aimed at defining the differences in ore hardness (or grindability) and gold recovery. Samples were taken from 11 geographically diverse oxide ore locations for comminution and extraction testwork, 16 samples from spatially diverse fresh ore sources for extraction testwork and five samples from spatially diverse fresh ore sources for both comminution variability and extraction testwork. There are no deleterious metals identified.

The metallurgical factors and the grade recovery algorithms were developed by SENET and reviewed by Snowden. Metallurgical recoveries were applied to the Snowden optimisation, Snowden production schedule and KEFI's 2015 DFS financial model. For the 2015 DFS overall recovery over LOM was estimated to be 91.5% and LOM recoveries by ore type are listed in the table below.

Table 2-3 Recovery by Ore Type SENET 2015 DFS

Ore type	Recovery	Percent Processed
Oxide Ore	95.9%	6%
Fresh Ore	94.1%	66%
Fresh Hard Ore	89.6%	28%
Average	91.5%	100%

Micon reviewed the metallurgical testwork as part of their review of the 2015 DFS and concluded that the grade-recovery algorithms used in the DFS were conservative. Based on their review they concluded that the gold recovery upside of an additional 2% above the 91.5% used in the DFS would not be unreasonable.

Since completion of the 2015 DFS, KEFI conducted contract tenders for EPCM and then EPC contractors for the processing plant. This process started with 15 bidders from China, Australia and South Africa. All projected schedules, recoveries and costings were supported by the contract quotations by the two leading bidders Sedgman and Lycopodium.

Sedgman and Lycopodium also reviewed the grade recovery algorithms developed by SENET and concluded that the algorithms could be further refined using additional data points. The resulting algorithms result in the following average recoveries over the LOM.

Ore type	Recovery	Percent Processed
Oxide Ore	94.0%	6%
Fresh Ore	92.85%	66%
Fresh Hard Ore	94.12%	28%
Average	93.33%	100%

Table 2-4 Recovery by Ore Type Lycopodium 2017 Update

Following discussions between KEFI and BDI recovery algorithms were further adjusted in 2022 and these are now reflected in the Risk-Adjusted Base Case Financial Model..

The financial model Endeavour V24 (2023) now uses the following formulae for Process Recovery:

Oxide Ore Recovery = 94.07% - (0.012/Head Grade g/t Au) Fresh Ore Recovery = 94.30% - -(0.012/Head Grade g/t Au)

This represents the mean value for cyanidation test results by ore type adjusted for solution losses at the policy target of 0.010 mg/litre.

Table 2-5 Recovery by Ore Type 2022 Update<sup>4</sup>

Ore type	Recovery	Percent Processed
Oxide Ore	93.30%	6%
Fresh Ore	93.70%	66%
Fresh Hard Ore	93.83%	28%
Average	93.72%	100%

# 2.5 Grind Recovery Study

Following discussions with several of the short listed engineering contractors, not only did it became apparent that an increase in processing plant capacity from 1.2 Mtpa to 1.5 Mtpa could be achieved with negligible increases in capital costs and without requiring any changes to the mine plan, but capital and operating cost reductions could also be achieved by increasing grind size from the previously chosen P80 = 75  $\mu$ m to 150  $\mu$ m for the fresh ore and 125  $\mu$ m for the oxide ore, with only minor loss in gold recovery.

During the 2012 DFS, 32 samples in all from various locations were subjected to specific testwork to assess variability within the ore body, including both gold recovery and comminution. These samples comprised 11 samples from geographically diverse oxide sources for grindability and extraction testwork, 16 samples from spatially diverse fresh ore sources specifically for extraction testwork, and five samples from spatially diverse fresh ore sources for both comminution variability and extraction testwork.

- Oxide ore recoveries at P<sub>80</sub> = 150 µm ranged between 90.5% and 98.0% for gold and 65.1% and 97.2% for silver.
- Soft fresh ore recoveries at  $P_{80}$  = 150 µm ranged between 88.1% and 97.0% for gold and 38.4% and 85.5% for silver.
- Hard fresh ore recoveries at  $P_{80}$  = 150 µm ranged between 75.6% and 97.3% for gold and 44.3% and 88.3% for silver.

Leaching testwork based on a  $P_{80}$  = 75 µm grind size was also performed. The difference in solid tails gold assay between the two different grind sizes indicates that only a small improvement in recovery can be expected in the majority of the cases by a finer grind.

The metallurgical results indicate gold recovery is relatively insensitive to grind size and any gold recovery benefits derived from finer grinding are not economically supported due to increases in capital (grinding mill size / power) and operating costs of the optimised circuit design.

No slurry handling difficulties are anticipated at the relatively coarse grind P<sub>80</sub> of 150 µm and many process plants operate at this grind size.

Based on the testwork and input from engineering companies to capitalise on the opportunity to decrease initial capital cost, the optimum grind size for the FEED was established as being  $P_{80}$  = 150 µm.

# 2.6 Processing Route

ROM ore will be transported from the pit to the ROM pad using dump trucks and will be dumped to stockpiles. The ROM ore will be dumped onto the static grizzly on top of the tipping bin using Front End Wheel Loader (FEL) or direct tipped when appropriate. The grizzly mounted above the ROM bin, will scalp off the oversize material which can be broken down to the right size using a rock breaker. During production, the crushing plant will be treating feed ore from a maximum lump size of 600 mm to a product size of 80% passing 150 mm suitable for SAG milling.

Ore will be reclaimed from the ROM bin using a variable speed apron feeder and will be discharged into the primary jaw crusher. Product from the jaw crusher will be transferred to a surge bin, which will either feed the emergency or "dead" stockpile or transferred to the mill feed conveyor. To maintain operation of the downstream processing plant during periods of stockpiling, ore will be transferred to the mill feed conveyor from the stockpile by FEL.

Crushed ore will then be conveyed from the mill feed stockpile to the grinding circuit, which will use a single stage SAG mill operating in closed circuit with hydrocyclones. The milling circuit will handle 303 tph of a blend of oxide and softer fresh ore during the first few years of the LOM and thereafter 266 tph of a blend of soft and harder fresh ore. Freshly crushed ROM ore will be mixed with cyclone underflow (circulating load) and feed water in the SAG mill head chute to achieve the required % solids feed concentration for optimum milling efficiency.

# 2.7 Processing Plant Design Evolution

In the 2015 DFS, SENET designed a 1.2Mtpa processing plant based on utilising proven CIL process technology for the treatment of oxide, softer fresh and hard fresh ore as per the 2012 DFS. The processing plant was designed to consist of:

- Primary Crushing
- Grinding (SAG and Ball Milling in closed circuit)
- CIL
- Acid Wash
- Elution
- Electrowinning & Smelting
- Carbon Regeneration
- Cyanide Detoxification
- Tailings Disposal
- Reagent Storage (Lime, Cyanide, Caustic, Detox Reagents)
- Water Services & Air Services

Since the SENET (2015) DFS and the involvement of Sedgman and Lycopodium, refinements to the process design have been incorporated in the flowsheet to allow for:

- Processing of 1.5-1.7 million tonnes per annum, depending on hardness of feed;
- Replacement of the two stage grinding circuit consisting of a SAG mill and ball with a single stage grinding circuit using a larger SAG mill;
- Other minor circuit rationalisations were available for the purpose of capital reduction.

These modifications, particularly around the crushing, handling and grinding area, resulted in a simplified site layout with a reduced footprint. This will yield a saving in the earthworks costs, given the variable topography around the plant site, (see Lyco 2017 and Lyco 2018).

Following further refinements to the mining schedule in the second half of 2017, plant capacity has been revised and the processing rate has been increased to 1.9-2.1 Mtpa, depending on hardness of the ore. Circuit flowsheet remains unchanged. Sufficient Engineering has been completed to enable revision of capital and operating expenditure estimates.



Figure 2-8 Simplified Process Flow (Source: Lycopodium 2017 DFS Update)

# 2.8 Site Infrastructure

The Tulu Kapi Project site is a green-field remote site which currently has only basic facilities to support exploration activities. The main infrastructure required for the development of the project will be the following:

- Access roads to the Mine Lease Area. (see Offsite Infrastructure section)
- Site roads within the Mine Lease Area.
- Airstrip to be included within the secured area.
- Power supply and distribution (see Offsite Infrastructure section)
- Operational buildings and Maintenance Facilities.
- Explosives plant and magazine
- Water systems.
- Waste management.
- Workforce accommodation.
- Communications and IT Infrastructure.
- Security Infrastructure.

#### The next three pages show:

Figure 2-9 Overall Site Layout Figure 2-10 Plant Site Layout Figure 2-11 Treatment Plant Layout



Summary of Updates to Tulu Kapi DFS





Summary of Updates to Tulu Kapi DFS

#### 2.8.1 Tailings

The current TSF Design Report was prepared by Knight Piésold (Rivonia) in 2020 (Knight Piésold, 2020 [a]).

Three historical TSF Design reports have influenced the Design Report prepared by Knight Piésold:

- (1) Definitive Feasibility Design of Tailings Storage Facility, (Epoch Resources, Nov 2012)
- (2) Updated Definitive Feasibility Design of Tailings Storage Facility, (Epoch Resources, June 2015)
- (3) Tailings Storage Facility and Water Management System Lycopodium Report Summary, (Knight Piésold (Perth), April 2017)

The site for the TSF was selected following a basic site options assessment study, wherein five sites were considered.

The facility embankment will comprise a zoned earth-fill structure, comprising differing structural zones and internal drainage systems and it will be constructed incrementally, over the life of the facility in approximately seven stages.

Tailings will be pumped from the plant and discharged from spigots along the TSF embankment, the downstream face of the WDs and the eastern side of the TSF, creating a tailings beach with the main supernatant pond located in the southwest part of the facility close to the process plant. A decant barge located within the main supernatant pond will return water to the plant.

#### 2.8.2 TSF Water Management

The TSF water management strategy adopted was based on, determining the minimum catchment size that would allow the TSF to remain water negative for different tailings areas, and diverting the remaining water flows in such a way that the water would be available for use in the plant. For a throughput of approximately 2 Mt/y, modelling indicated that the facility was water negative for average climatic conditions for the full catchment. However, water dams and diversion channels were included to separate good quality water from process quality water and to maintain water negative conditions for extreme wet events.

#### 2.8.3 Plant Water Supply

Water will be harvested from the TSF and its upstream catchments and other catchments on the site. Early demand and dry year emergency water supply will be pumped abstraction from the River Birbir, via a buried 8.8 km pipeline

Figure 2-12 Proposed TSF Infrastructure Layout



# 2.8.4 Site Security Infrastructure Design

Physical security infrastructure proposed for the TKGM Mine Lease Area (MLA) was designed following in-depth analysis of the current national, and MLA risk profile, taking into consideration the recommendations from the August 2021 Constellis Security Risk Assessment. A fit for purpose and risk-based methodology was followed during the assessment of the planned site safety and security systems.

Infrastructure will include multiple rings with a combination of physical barriers, lighting and surveillance and hardened buildings. This infrastructure will be supported by a guard force and intelligence systems.

# 2.9 Off-site Infrastructure

Under an agreement with the Ministry of Finance and Economic Co-operation of the Federal Democratic Republic of Ethiopia (MOFEC), since renamed Ministry of Finance (MOF):

• all of the external roads, including a new road bridge crossing the Birbir River, will be designed and constructed by the Ethiopian Roads Authority.

 the Ethiopian Electric Power Corporation (EEPCo) will be responsible for the bulk power supply to Tulu Kapi Gold Mine and the extension of the EEPCo power supply grid from its Gimbi 132 kV substation to the Tulu Kapi mine site.

#### 2.9.1 Access Roads

Various studies relating to the upgrade of existing roads to Tulu Kapi for use as the permanent access road have been completed since 2015.

The main physical challenge arising from the upgrade of exiting roads were:

- the steep gradient associated with approaches to bridges across the Bir-bir river and
- the length of the gravel roads to be maintained during the wet seasons.

The final recommendation called for the construction of a new 14 km long access road from the town Keely to Tulu Kapi, complete with a new concrete bridge across the Bir-bir river.

This was found as an cheaper than the main alternative being the upgrading the existing 79 km long Gimbi-Guyi-Oma-Genji-Tulu Kapi road.

The new access road was surveyed and designed by Golder Associates during the 2012 DFS. This design has been revisited and refined a number of times, the latest being by ERA in 2019.

Three existing gravel roads can be used for access during the construction phase until the completion of the permanent access road (see Figure below). The preferred route (Inango - Oma - Genji - Tulu Kapi Road) has now had its old wooden bridge replaced with a new concrete bridge and is ready for use subject to minor works. It will also handle abnormal loads if required with additional minor works.



#### 2.9.2 Power Supply

Grid Power will be used for the Project. The grid power supply will be from Ethiopian Electric Power Corporation's ("EEPCO") substation in Gimbi town, which is 47 km along an agreed route from Gimbi to Keley to Tulu Kapi and will be supplied by a new HT 132kV Overhead Power line.

The maximum demand for the Tulu Kapi plant is estimated to be 15MW considering start-up requirements of the mills with a normal operating demand of approximately 10MW following the plant expansion for Fresh Hard ore. EEPCO have allocated their construction budget for the project and confirmed capacity to supply additional power above 15 MW if there is further need in future.

A standby diesel power plant will also be installed to provide backup power to start up and run the operation as insurance in case of the unexpected failure to deliver by EEPCO.

EEPCO has already completed procurement of all long-lead items and KEFI/TKGM does not expect to have to use the standby power plant. There is 11 months of float on the schedule and EEPCO and, besides, EEPCO will be under pressure to deliver or risk the Government failing to earn its equity.

## 2.10 Logistics

The Base Case assumes that ships loaded with equipment and supplies will deliver the cargo to the port of Djibouti. From Djibouti the containers and heavy bulk loads will be transported to site by road via Addis Ababa. The total length of the route from Djibouti to mine site is 1,471 km, comprising 984 km from Djibouti to Addis Ababa and 487 km from Addis to site. Whilst alternative port and road routes are available, the main and preferred route is as set out.



Figure 2-13 Supply Route Map from Djibouti to Tulu Kapi

Two road surveys were completed by Bolloré Logistics in 2016 and 2019 (Bolloré, 2016 & Bolloré, 2019). The 2016 survey did not fully take abnormal transport into account. The 2019 survey took abnormal transport into account, confirmed alternative route south of Addis Ababa for abnormal items as proposed in the 2016 survey and concluded with a weight restriction of 40 ton per component (excluding truck weight) due to conditions of bridges along the route.

The 2016 survey used the Guliso – Guji road and the 2019 survey Gimbi-Guyi-Oma-Genji road as the access roads to Tulu Kapi Site.

# 2.11 Project Execution

#### 2.11.1 Project Scope

The Project comprises the greenfield development of an open cut mining operation, a processing facility and associated infrastructure to mine and process gold ore deposits.

The scope will be divided as shown in the table below:

Summary of Updates to Tulu Kapi DFS

Ref #	Scope	Engineering by:	Construction Management by:
1	Resettlement	TKGM & Government	TKGM & Government
2	Permitting	Originated by Lycopodium and stamped by Ethiopian Engineering Consultant	TKGM to submit permit via an Ethiopian Engineering Consultant to the local authorities
3	Main Access Roads	ERA	ERA/TKGM
4	Electrical Supply	EEP	EEP/TKGM
5	Mining Mobilisation & Preproduction Mining	TKGM & PWM*	PWM* under TKGM control
6	ROM Pad Crusher Engineered Fill	Knight Piésold RSA	Knight Piésold RSA
7	ROM Waste Rock Fill	MACE	PWM under TKGM control
8	Fuel Storage & Distribution	Total* Ethiopia	Total* under TKGM control
9	Explosives Supply & Distribution	AEL*	AEL* under TKGM Control
10	Laboratory Equipment & Fit Out	ALS*	ALS* under TKGM Control
11	Plant Site Bulk Earthworks	Lycopodium & Knight Piésold RSA	Lycopodium & Knight Piésold RSA
12	Waste Rock Dumps	Knight Piésold RSA & MACE	PWM
13	TSF & Water Dam	Knight Piésold RSA	Knight Piésold RSA & Lycopodium
14	Process Plant	Lycopodium	Lycopodium
15	Accommodation Village	Lycopodium	Lycopodium
16	Birbir River Water Abstraction	Lycopodium	Lycopodium
17	Other Site Infrastructure	Lycopodium	Lycopodium

\* The names mentioned have not been contracted but all have supplied proposals to allow estimate of costs and schedule

More granular detail on the Lycopodium scope and Execution Planning is detailed in:

- Lyco Proposal (2022) Appendix 4 (Scope of Work)
- Lyco PEP (2021) which will be updated once Lycopodium is awarded the contract.

# 2.11.2 Owner's Team

The TKGM Owner's Team will be responsible for execution of the following scopes of work during the project period:

- (1) Project Management
- (2) Community Engagement & Security
- (3) Operations Readiness

Preliminary organisation structures (TKGM ORG, 2023) and Recruitment Schedules (TKGM Recruit, 2023) have been generated. Recruitment has commenced.

#### 2.11.2.1 Project Management Scope

The project management group will be responsible for co-ordination and oversight of all activities to ensure that the mine is commissioned on schedule and within its capital budget.

In order to achieve these objectives the project team and others in the owner's team will report to a steering committee under the chairmanship of Norman Green. Norman has more than 30 years of successful global experience in management of large mining and mineral refining capital projects from concept to completion.

The project team will:

- oversee Lycopodium during both the E&P and CM phases of the project;
- monitor and report the progress of the EEP and ERA projects;
- monitor and control other contractors performing specialist works not in Lycopodium's scope (e.g. Total & AEL);
- ensure that the Bank's Engineer has all the data required to ensure the timely release of funds.

#### 2.11.2.2 Community Engagement & Security

TKGM will need to manage its relationships with the community and various levels of government to ensure that the resettlement process is as smooth as is possible given the circumstances.

Security will be essential to timely completion of the works and will require skilful management. Key experienced members of both the security and Community engagement teams are already in place in the Addis Ababa office.

#### 2.11.2.3 Operations Readiness

Initial estimates for operating cost estimation have been informed by the databases of international mining engineering consultancies like Snowden, Knight Piésold and Lycopodium. As relationships have developed with key contractors and potential suppliers those estimates have been refined by tender data.

As the recruitment and procurement processes advance more of this estimation is being brought in house in the process of preparing cost models for budgeting and control.

Preliminary Operations Readiness Planning has commenced. Detailed operations readiness planning will be commenced as appropriate people are brought on board to inform the process and take ownership of it. The recruitment process is already underway and as the operations team reaches "critical mass" the planning process will gain momentum. It will be completed during the 2 year construction period.

# 2.12 Permitting, Environment and Social Impact

#### 2.12.1 Permitting

The legal structure and procedures for the mining industry in Ethiopia are clearly laid out with administration and legislation through two Ministries and associated regulatory Bureaus for Mining and the Environment.

TKGM has a Mining Licence Agreement/Permit, MOM\LSML\81\2015, dated April 2015, which is valid until 2035, renewable for consecutive 10 year periods if required. Changes or modifications to the Project within the mine lease, like for example, addition of an underground mining extension, are encompassed within the existing Mining Agreement, but would need a new ESIA and Environmental Permit amendment. Only development of further deposits subsequent to off-lease exploration will require new mining licences.

A new Proclamation in March 2020 was issued to improve the bureaucracy of mining legislation and all activities for the mining Project are encompassed in the TKGM Mining Agreement. Formal permits are still required from different Ministries, including Construction Permit (under Construction Law) and the Water Use Permit (from the water authorities and subject to the relevant Water Laws). The 'land occupancy title deed certificates' needed to finalise the resettlement of Project Affected People (PAP) are the responsibility of the Oromo government but are not a prerequisite to application for the Construction Permit. Other requirements, including for safe storage of chemicals and cyanide; Explosives Agreement; and landfill and incineration are included in the ML and do not require specific permits. Licences for bulk storage and transport of fuels will be the responsibility of the supplier; and the lonising Radiation Permit required for laboratory equipment will be part of the contract to supply analytical services.

TKGM has a permitting register which lists all permits required together with action dates, which is kept by the Compliance Officer, appointed in June 2022.

#### 2.12.2 Environmental & Social Management System

KEFI Gold and Copper has various governing policies and strategies at the corporate level including:

- an Audit and Risk committee;
- Anti-bribery and corruption policy;
- Remuneration committee;
- Whistleblowing policy;
- Health and Safety Policy; and
- a Corporate Governance Statement.

Environmental and Social Policies are being developed as are the controlling statements/documents for Tulu Kapi Gold Mine. Roles and responsibilities for environmental management were defined in the ESIA and ESMP with suitable manning levels. The team structures for Community Development, Stakeholder Engagement and for Occupational Health and Safety are in place, with a strong local Social team working at site and recruitment for managerial and supervisor positions underway.

During the period from February 2022, a major organisation restructure was undertaken to move from planning focus to an execution focussed organisation. TKGM appointed a new Managing Director and an Organisational Services Manager in February 2022, with the Community Liaison contractor reporting to them. In April 2022, the former Chief of Staff to Oromia President, was appointed as Country Manager to TKGM, responsible for Government- and Stakeholder Relations. In October 2022, TKGM recruited a new Safety, Security, Health and Environment Manager and April in 2023 appointed a Resettlement and Livelihood Manager. Finally in May 2023 the Local (Ethiopian based) Project Manager took care of construction for both the TKGM Project and required for resettlement. Although TKGM has not yet appointed an Environmental manager for the project, the HSSE manager with the assistance of the Resettlement and Livelihood Manager oversees this position until the role is filled.

These appointments set up the management structure for developing E&S at the Project and initiate the required capacity building for implementation of the Project ESMP and RAP.

There have been successive iterations of environmental and social studies and reporting at Tulu Kapi for over a decade, with initial baseline data collection starting from 2008/9 and continuing to 2020. The 2020 ESIA Report is a comprehensive document, backed up with detailed appended study reports, which covers updated project description, including analysis of alternatives and justified option choices; the legal and procedural context; baseline descriptions; Impact identification and assessment and mitigations to address these; an outline Environmental and Social Management Plan; and finally lists the commitments made in the ESIA.

The ESIA shows that the Project is largely in compliance with the Equator Principles, IFC Performance Standards, IFC EHS Guidelines for Mining and National Ethiopian ESIA requirements.

# 2.12.3 Provenance of the Tulu Kapi Environment and Social Impact Assessment.

In 2012, an Environmental and Social Impact Assessment (ESIA) was conducted by Golder Associates Africa (Pty) Ltd. (Golder) in association with JEMA International Consulting Plc (JEMA) on behalf of Nyota Limited. The ESIA was reviewed and approved by the Ethiopian Ministry of Mines (MoM) with the following stipulations:

- The Ministry required additional information in relation to kinetic geochemical modelling in relation to the potential for Acid Mine Drainage;
- Detailed Environmental Management Plans should be presented; and
- The final Resettlement Action Plan (RAP).

In 2014, following KEFI's acquisition of the project from Nyota, an ESIA Addendum Report (Report No. 1406864-13090-1) was prepared by Golder which addresses the above stipulations of the MoM, as well as updates to baseline data and infrastructure changes which occurred since the submission of Nyota.

In 2015, the entire 2012 ESIA Report was updated by Golder to provide a report for the 2015 DFS and address comments received from the IFC on the 2012 Report along with other updates.

In January 2019 an updated version of the 2015 ESIA Report was produced by Golder, which included the following:

- Updates to the project description and layout; and
- Updates to the wet season terrestrial and aquatic ecology, as well as surface water and groundwater environmental baseline description to reflect the 2018/2019 situation.

The update to the ecological baseline addressed the comment in the 2015 Ramboll Assessment (see 1.4.1 above) recommending an updated ecological baseline study.

In October 2020 a further update of the ESIA Report was produced by Golder '2020 Update of the Environment and Social Impact Assessment for the proposed Tulu Kapi Gold Mine, Ethiopia' (Golder 2020). This update was created in light of comments provided to KEFI by SLR after having reviewed the January 2019 update of the ESIA. This document is the basis of the EPA clearance issued in August 2023 (EPA, 2023).

#### 2.12.4 Standards

The following standards have been adopted in the development of the design of facilities and management systems at Tulu Kapi:

- Applicable local, national and international Environmental and Social laws, regulations and standards;
- The Equator Principles;
- The IFC Performance Standards;
- The IFC General EHS Guidelines;
- The IFC Sector Industry Environmental, Health and Safety Guidelines for Mining; and
- All ILO conventions signed and ratified by the countries, all ILO conventions covering core labour standards1 and all ILO conventions covering the basic terms and conditions of employment.

The IFC EHS Guidelines for Mining invoke the International Cyanide Management Code (ICMC) as good international practice for all mining operations employing sodium cyanide based mineral extraction processes. The ICMC is a voluntary code and certification of the Project to the ICMC is not specifically required.

#### 2.12.5 Resettlement

Significant resettlement and livelihood displacement is required for development of the Project. There are approximately 700 landowners and 360 households within the MLA with 1,500 landholdings and a total population of approximately 1,774 affected people. There are also 2 public roads, a health clinic, 3 churches with associated cemeteries and a further 257 graves scattered around the MLA. The Project has had an ongoing minimisation strategy to reduce the impact of the project footprint by rearranging infrastructure and changing plans so that fewer people are subject to involuntary displacement. This readjustment has avoided disturbance of 103 graves and significantly reduced the number of people requiring resettlement and compensation for lost farmland.

Land tenure in Ethiopia is held by the state and the Government has legal control over any resettlement and is responsible for implementation, with limited input from the proponent. A separate impact assessment may be required for the host land and communities neighbouring the resettlement site. Surveys of immovable assets covering housing, trees, crops and other agricultural- or livelihood structures on the MLA have been regularly updated but require a specified cut-off date for final inventory.

Detailed procedures are in place for the resettlement, which will be initiated by a Government Announcement 'Letter of Expropriation', followed by mandatory kebele level meetings. The Project then has plans for individual negotiations which will include a full description of the process; inventories and compensations and how these have been calculated; details of the replacement land, housing and facilities at the host site; and options for livelihood replacement. These individual discussions will allow for challenges to inventories which can be followed up with property checks if necessary, before 'acceptance sign-off' and certification. Compensation payment must be paid into a restricted Woreda account within 30 days of sign-off, before pay-out to recipient bank accounts.

Resettlement is designed in multiple stages to facilitate staged access to priority areas where significant early works are required.

Livelihood replacement proposals are based on land replacement, cash compensation, training and re-skilling, with two streams of agricultural intensification and diversification; and local economic and business development. However, it has been acknowledged that necessary or imposed transfer from subsistence- and coffee reliant livelihoods to more market economy-based lives, where food security is dependent upon cash purchase rather than self-sufficiency is difficult and can take years.

The Resettlement Action Plan has been reworked and updated in November 2022. The revised RAP (TKGM RAP, 2022)

Final surveying of the resettlement host area can resume as soon as finance is approved, when security for the Woreda officials is assured, and is expected to take around 3 months.

# 3 Project Economics

# 3.1 Introduction

This section describes the initial open pit scenario which will be partially funded by bank project finance. The inputs to this 2023 Banking Case include:

- the estimated project and sustaining capital;
- the project and production schedules which underly the model estimated operating cost required for this scenario.
- Capital and operating costs were last estimated in detail by TKGM and Lycopodium during 2022.
- Capital expenditure will be re-estimated immediately prior to closure of the primary project finance facility agreement.
- Mining costs are planned to be updated in mid-2024. The TKGM team is building detailed cost models to prepare to take over estimation of operating cost for processing and other owner activity which will allow for a disciplined operations readiness planning process.

## 3.1.1 Financial Model

This section covers the TKGM Open Pit Project's forecast economics including the lenders' financial model on which they were based, the lenders' financial model's inputs and assumptions (2023 Banking Case).

The financial model in question was prepared by Endeavour Financial and is represented by the Excel file "20230724 Financing Model v24.xlsm" (Endeavour V24, 2023) which incorporates the most recent inputs at the time of writing.

# 3.2 Project Capital Cost

## 3.2.1 Sources of Input

The capital cost estimates are based on the following documents:

- (1) Lyco Proposal (2022) Scope of Works & Services
- (2) Lyco BOE (2022) Basis of 2022 Capital Estimate.
- (3) Lyco CCE (2022) Detailed print of 2022 Capital Estimate
- (4) TKGM Costs (2023) Excel spreadsheet with details and derivations of the costs used in the Financial Model.
- (5) Mining Budget (2023) Excel Spreadsheet to provide input on Owner and Contractor Mining Cost and schedule to Financial Model.

#### 3.2.2 Initial Capital Cost Estimate

Table 3-1 Initial Capital Estimate<sup>5</sup> in USD thousands (Source: Endeavour V24, 2023)

Initial Project Capital Before Financing Cost	
Mining Contractor	28,935
Working Capital Transfer to Operating	(4,097)
TKGM Mining Costs	8,197
Pre-production Drilling	3,100
Subtotal Mining Capex	36,135
Plant Indirects	32,425
Leasing Vehicles Transfer to Sustaining Capital	(1,616)
EPCM	84,024
Other Processing Plant	47,149
Subotal Processing Plant	161,982
Off-site Infrastructure	20,005
On-site Infrastructure & TSF	15,211
Subtotal Infrastructure	35,216
Relocation & Environment Cost	25,798
Other Owners' Cost	30,223
Initial Payment to Closure Sinking Fund	1,865
Subtotal Owners' Cost	57,886
Capital Cost	291,219

#### 3.2.2.1 Project Capital Estimate Notes

- (1) Only the pre-production activities and mobilisation of the Mining Contractor have been included in Mining Capital
- (2) TKGM's mining costs are approximately two-thirds pre-production establishment and operations and one-third capital equipment.
- (3) The pre-production drilling will perform infill drilling on initial production targets and is expected to generate data to support an update to resources and reserves.
- (4) The "Engineering and Procurement" lump sum is estimated USD 74 million and it is included in the EPCM subtotal in this summary.
- (5) The Off-site Infrastructure scope of work is entirely in the hands of the Ethiopian Government institutions ERA (Roads Authority) and EEP (Electrical Distribution Corporation).
- (6) Knight Piésold will control the Tailings Storage Facility works. Lycopodium will provide supervision over their work.
- (7) The estimate includes USD12.23 million in contingency mostly calculated on the development of the site infrastructure and processing facility and not the fixed price component nor the mining works.

#### 3.2.3 Project Schedule

The project schedule, developed by TKGM and Lycopodium, incorporates a 24 month window for the completion of outstanding engineering, procurement and construction. This window will be preceded by a "reprice" of the contract. It is anticipated that any additional "early works" required to complete fixed and reimbursable scope of works will be undertaken contemporaneously within the "reprice" scope and schedule window. It is also anticipated that the resettlement process will be commenced in the same window.

The final schedule issued after the repricing exercise will be used to update the final financial model but the existing state of estimate is reflected in the table below.

<sup>&</sup>lt;sup>5</sup> Source Endeavour V24 "Sources & Uses Summary" and "TK Input" tabs Summary of Updates to Tulu Kapi DFS

#### 3.2.4 Sustaining Capital Cost

Table 3-2 Sustaining Capital Summary USD thousands<sup>6</sup> (Source: Endeavour V24, 2023)

Sustaining Capital Breakdown	USDK
Livelihood restoration	830
Mining Sustaining Capital	2,550
Plant & Mine Camp Sustaining Capital	1,886
8.1.1 - TSF Water Management - (Water Dam 2)	3,029
8.1.4 - TSF Raises	15,525
TSF Sustaining Capital - Sub-Total	18,554
Total Sustaining Capex	23,820
TSF - Closure	8.610
Other	2,973
Closure Provision	11,583

#### 3.2.4.1 Sustaining Capital Estimate Notes

- (1) The principal sustaining capital costs are continuous raises of the TSF and water storage dams in the first years of operation.
- (2) The TSF raises include 15% contingency
- (3) The installation of the pebble crushing circuit may be required to deal with treating harder ore later in production.
- (4) The Closure Sinking Fund is in the model on the sensitivity tab (rows 110 and row 111) and switched on in the Base Case so it flows through to TK Cashflows. Closure sinking fund payments are annually for first 8 years, with first draw down drawdown in Year 8.

<sup>&</sup>lt;sup>6</sup> Endeavour V24 (2023) [TK Input Tab] Summary of Updates to Tulu Kapi DFS

# 3.3 Production Schedule

The production schedule used in the financial model (Endeavour V24 2023) is based on the current mining schedule known as "SOG 21" (Mining Schedule 2020). That schedule has been prepared to monthly resolution but has been summarised to a quarterly resolution in the financial model. It is proposed that initial production will be modelled to monthly resolution following preparation of detailed mine plans following completion of the pre-production drilling program.

Production Year		-1	1	2	3	4	5	6	7	8	9	Total
Ore Mined	Mt	0.4	3.5	2.6	1.5	2.3	2.0	1.9	1.1	0.0	-	15.4
Waste Mined	Mt	1.6	18.6	19.5	20.5	19.7	18.6	11.6	5.0	0.1	-	115.0
Total Material Mined	Mt	2.0	22.2	22.1	22.0	22.0	20.6	13.4	6.0	0.1	-	130.4
Ore Grade	g/t	1.4	1.9	2.1	2.0	2.2	2.1	2.2	3.2	10.1	-	27.1
Contained Gold	Koz	16.8	212.9	174.2	100.9	166.6	134.4	131.5	107.6	5.3	-	1,050.3
S/P Close	Mt	0.4	1.8	2.3	1.7	2.0	2.1	2.0	1.1	-	-	
S/P Close	g/t	1.4	1.0	0.9	0.7	0.7	0.7	0.7	0.7	-	-	
S/P Close	Koz	16.8	58.5	68.8	39.0	45.0	46.1	44.9	24.6	0.0	0.0	
Ore Processed	Mt	-	2.1	2.1	2.1	2.1	2.0	1.9	2.0	1.1	-	15.4
Head Grade	g/t	-	2.5	2.4	1.9	2.4	2.1	2.1	2.0	0.8	-	16.4
Contained Gold	Koz	-	171.3	163.9	130.7	160.7	133.4	132.7	127.9	29.9	-	1,050.3
Recoveries	%	-	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.3	-	7.8
Gold Recovered	Koz	-	148.3	153.7	122.4	150.7	125.0	124.3	119.8	37.7	2.3	984.4

Table 3-3 Annual Summary Production Schedule<sup>7</sup>

Figure 3-1 Mine Production Schedule Annual Summary<sup>8</sup>



Figure 3-2 Processing Plant Processing Treatment Schedule<sup>9</sup>

<sup>7</sup> Source: Endeavour V24 (2023) ["Annual Summaries & Charts" tab]

<sup>&</sup>lt;sup>8</sup> Source: Endeavour V24 (2023) ["Annual Summaries & Charts" tab]

<sup>&</sup>lt;sup>9</sup> Source: Endeavour V24 (2023) ["Annual Summaries & Charts" tab

Summary of Updates to Tulu Kapi DFS



Open pit mine production is scheduled to be completed during the first half of the seventh production year. Based principally on plant capacity, the mill completes treatment of the ore early in the eighth production year. The mining contractor will provide front end loader stockpile rehandle and crusher feed resources until the end of the plant life. The processing - mine battery limit is the primary crusher which is fed by the mine but the asset is owned by the plant.

The financial model uses the mine production schedule as a hard coded input. The model then schedules processing plant production based on the following constraints:

- One quarter of mine production will be stockpiled on the ROM pad prior to completion of plant commissioning.
- Low grade ore will be stockpiled separately on the ROM pad.
- Plant capacity is calculated by adjusting the nameplate capacity for ore type, mechanical availability and utilisation factors.
- The plant will treat remnant low grade stockpiles at the end of its life.
- Gold metal recovery has been estimated based on ore type and the metallurgical test work program (See 2.4 above)
- Allowance for some gold "lock-up" in circuit has been made in the modelling.<sup>10</sup>

- (1) "TK Input" Sheet Row 373 3koz
- (2) "Sensitivities" Sheet Row 185 9.78 koz

The gold is returned to production at the end of the project life in the following places:

(4) Sensitivities" Sheet Row 187 + 9.78 koz returned from 1 Apr 2033 to 31 Mar 2034

The worst impact is in the December quarter of 2033 which shows an overall Recovery of 136.7%. This is purely as a result of the back calculation of the recovery number which factors in ounces recovered at the back end. (See TK Cashflows Sheet Cells AW67:AZ67).

<sup>&</sup>lt;sup>10</sup> For conservatism the model assumes gold lockup in two places:

The former of these adjustments reflects gold locked-up in circuit, while the latter is a reflection of the BDI suggested throughput reduction during start-up where ounces are lower earlier on but are eventually recovered at the end of the mine life. Note that the Overall Recovery for the first quarter of production is 56.9% despite nominal recoveries of 93.6% and 93.7% on material processed. See Endeavour V24 (2023) ["TK Cashflow" Sheet Cells T55:T69]

<sup>(3)</sup> TK Input" Sheet Row 373 + 3koz returned in 31 Dec 2033.



# 3.4 Operating Cost

#### 3.4.1 Sources of Input

The capital operating cost estimates are based on the following documents:

- (1) Mining Budget (2023) Excel Spreadsheet to provide input on Owner and Contractor Mining Cost and schedule to Financial Model.
- (2) Mining Schedule (2020) Provides the basis for the production schedule used in both the Financial Model, Endeavour V4 (2023) and the Mining Budget (2022)
- (3) Lyco OCE (2022) All non-mining opex estimated using input from TKGM and their own industry databases
- (4) TKGM Costs (2023) Excel spreadsheet with details and derivations of the costs used in the Financial Model.

#### 3.4.2 Mining Operating Cost Estimate

Mining Costs have been estimated on the following basis:

- Contractor pricing schedules (PWM)
- Supplier estimates and proposals (AEL & Total)
- First principles for TKGM staffing and other resources cost
- Costs have been benchmarked for reasonableness and subject to review by mining industry due diligence consultants.
- Fuel Cost estimated @ USD 0.80 litre.

Table 3-4 Mining Costs

Item	Unit	Total	Capital	Operating
Mobilisation, Site Establishment and Demobilisation	USDM	20.90	14.71	6.19
Site Works	USDM	7.45	1.45	6.00
Load and Haul	USDM	218.69	4.21	214.49
Drilling and Blasting	USDM	80.88	2.49	78.39
Pit Dewatering	USDM	9.17	0.54	8.63
Contractor Fixed Costs and Overheads	USDM	60.61	3.97	56.64
Dayworks, Standby and Stand-down	USDM	6.92	1.16	5.76
KEFI owners team	USDM	184.65	8.61	176.04
Total Cost	USDM	589.28	37.13	552.14
Material Moved (Ore & Waste)	tM	130.43	1.96	128.47
Unit Mining Operating Cost	USD t rock			4.30
Unit Mining Operating Cost excl Rehandle	USD t rock			4.12
Operating Cost Associated with Rehandle Period	USDM			(14.90)

Source: Mining Budget (2023) [Mining Budget Tab]

# 3.4.3 Other Operating Cost Estimate

Other operating costs have been estimated and reported in Lyco OCE (2022).

#### Table 3-5 Fixed and Variable Unit Cost Summary

OPERATING COST SUMMARY	Oxide
Plant Throughput	2,125,000 t/y
Grind Size	P80 125 microns
Power unit cost	US\$0.019/kWh
Estimate Period	3Q22
Accuracy	±15%

Shallow Fresh 2,125,000 t/y P80 150 microns Deep Fresh 1,875,000 t/y P80 150 microns

COST CENTRE		Oxide Shallow Fresh				D	eep Fresh		
[ [	US\$/y	US\$/t	% Cost	US\$/y	US\$/t	% Cost	US\$/y	US\$/t	% Cost
Power	1,521,568	0.72	4%	1,718,716	0.81	5%	1,862,750	0.99	5%
Operating Consumables	22,970,607	10.81	54%	18,031,523	8.49	48%	19,056,576	10.16	49%
Maintenance	4,400,829	2.07	10%	4,400,829	2.07	12%	4,452,376	2.37	11%
Process & Maintenance Labour	1,837,782	0.86	4%	1,837,782	0.86	5%	1,837,782	0.98	5%
Total Processing	30,730,786	14.46	73%	25,988,850	12.23	69%	27,209,484	14.51	70%
Administration Labour	5,823,817	2.74	14%	5,823,817	2.74	16%	5,823,817	3.11	15%
General & Administration Costs	5,025,593	2.36	12%	5,025,593	2.36	13%	5,025,593	2.68	13%
Laboratory	685,265	0.32	2%	685,265	0.32	2%	685,265	0.37	2%
Total G&A	11,534,674	5.43	27%	11,534,674	5.43	31%	11,534,674	6.15	30%
TOTAL	42,265,460	19.89	100%	37,523,524	17.66	100%	38,744,159	20.66	100%
Processing Cost, US\$/oz	239.76 187.58 219.50				187.58				
- · ·									

Exclusions:

All Mining Costs

#### FIXED & VARIABLE COSTS

COST CENTRE	Oxide		Sh	Shallow Fresh			Deep Fresh		
	Fixed	Variable	% Fixed	Fixed	Variable	% Fixed	Fixed	Variable	% Fixed
	US\$/y	US\$/t		US\$/y	US\$/t		US\$/y	US\$/t	
Power	1,057,066	0.22	69%	1,057,066	0.31	62%	1,057,066	0.43	57%
Operating Consumables	0	10.81	0%	0	8.49	0%	0	10.16	0%
Maintenance Materials	3,513,124	0.42	80%	3,513,124	0.42	80%	3,564,671	0.47	80%
Process & Maintenance Labour	1,837,782	0.00	100%	1,837,782	0.00	100%	1,837,782	0.00	100%
Administration Labour	5,823,817	0.00	100%	5,823,817	0.00	100%	5,823,817	0.00	100%
General & Administration Costs	5,025,593	0.00	100%	5,025,593	0.00	100%	5,025,593	0.00	100%
Laboratory	685,265	0.00	100%	685,265	0.00	100%	685,265	0.00	100%
TOTAL	17,942,647	11.45	42%	17,942,647	9.21	48%	17,994,194	11.07	46%
Evel ve even									

Exclusions: All Mining Costs

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Source: Lyco OCE (2022) p.5

## 3.4.4 Overall Operating Cost

Mining Costs represent approximately 65% of total operating cost with processing approximately 26% and General Project's mining (65% of total cost), processing (26%), and general and administration (9%) functions. The sources used by BDI for these costs are the Mining Budget and Operating Budget.



Figure 3-4 Annual Operating Costs<sup>11</sup>



<sup>&</sup>lt;sup>11</sup> Source: Endeavour V24 (2023) [Annual Summaries & Charts tab]

Figure 3-5 AISC Cost Curve



The chart above was sourced from BDI's 2023 Update and shows Tulu Kapi's AISC on the industry cost curve from Q2 of 2023. Note that the sensitivities were applied by BDI to provide the range dimensions.

# 3.5 Life of Mine Production

The table below shows Life of Mine production and cost profile for the open pit mine. This is the part of the project that has been analysed for the approval for bank project finance (2023 Banking Case). Further production at higher grades from underground sources will be studied with a view to developing those opportunities early in the Open Pit mine life.

Table 3-6 Annualised Production Statistics and Operating Cost<sup>12</sup>

Production Year		1	2	3	4	5	6	7	8	9	Total
Ore Mined	Mt	3.5	2.6	1.5	2.3	2.0	1.9	1.1	0.0	0.0	15.4
Waste Mined	Mt	18.6	19.5	20.5	19.7	18.6	11.6	5.0	0.1	0.0	115.0
Total Material Mined	Mt	22.2	22.1	22.0	22.0	20.6	13.4	6.0	0.1	0.0	130.4
Ore Grade	g/t	1.9	2.1	2.0	2.2	2.1	2.2	3.2	10.1	-	27.10
Contained Gold	Koz	212.9	174.2	100.9	166.6	134.4	131.5	107.6	5.3	0.0	1,050
Ore Processed	Mt	2.1	2.1	2.1	2.1	2.0	1.9	2.0	1.1	0.0	15.4
Head Grade	g/t	2.5	2.4	1.9	2.4	2.1	2.1	2.0	0.8	-	16.36
Contained Gold	Koz	171.3	163.9	130.7	160.7	133.4	132.7	127.9	29.9	0.0	1,050
Recoveries	%	87%	94%	94%	94%	94%	94%	94%	126%	-	94%
Gold Recovered	Koz	148.3	153.7	122.4	150.7	125.0	124.3	119.8	37.7	2.3	984.4
Revenue	\$m	229.9	238.3	189.7	233.6	193.8	192.7	185.7	58.5	3.6	1,525.9
Offsite Costs	\$m	1.3	1.4	1.1	1.3	1.1	1.1	1.1	0.3	0.0	8.7
Mining Costs	\$m	94.5	87.2	85.6	88.1	86.5	67.2	42.8	15.9	0.0	567.8
Processing Costs	\$m	27.7	28.8	28.9	29.2	30.2	30.1	30.1	17.5	0.5	223.1
G&A	\$m	10.9	11.2	11.2	9.9	9.9	8.8	8.7	4.7	0.0	75.5
Operating Costs	\$m	134.4	128.6	126.9	128.5	127.7	107.2	82.7	38.5	0.6	875.1
Sustaining Capital	\$m	12.8	2.3	2.9	3.9	2.1	2.3	3.4	0.0	0.0	29.8
Closure	\$m	1.9	1.9	1.9	1.9	1.9	1.9	1.9	0.0	0.0	13.1
Plant Residual	\$m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All in Sustaining Costs	\$m	159.5	151.5	145.0	151.1	144.3	125.0	102.0	44.3	1.4	1,024.2
AISC per Oz		1,075.56	985.75	1,184.26	1,002.95	1,154.19	1,005.43	850.94	1,174.49	592.58	1,040.37

<sup>12</sup> Source: Endeavour V24 (2023) [Annual Summaries & Charts tab]

# 4 References

This section lists the documents which underpin the updated DFS summarised in this document and is split into two tables:

- The first table shows the references by subject or discipline providing a short citation of the reference. The short citation may be used elsewhere in this document.
- The second table shows the full citation of each document in alphabetical order of the short citation.

Table 4-1 Documents by Subject

#	Subject	Document Short Citation	Comment
1	Introduction	DFS Update Memo (2024)	
2	Technical Review Report	Micon (2020)	Provides reasonably up to date project description and credible technical and risk review.
		BDI (2023)	Most recent report for the banks by their Technical Adviser
3	Project Description	DFS Update Memo (2024)	Project Narrative updated to 2024
		Senet (2015)	These are both still relevant but this
		Micon (2020)	memorandum is up to date.
4	Geology	Micon (2020)	
		Snowden MRE (2015)	
5	Mineral Resource Estimate	Snowden MRE (2015)	Original Report,
		KME PPT (2018)	PowerPoint explainer
		Micon (2020)	Critical review
6	Ore Reserves & Mining	Snowden Geotech. (2015)	Geotech report for pit design parameters
		Snowden ORE (2014)	Original Mine plan & Reserve Estimate
		Snowden ORE (2015)	Reserve Estimate update based on Feb 2015 Resource update
		Mine PPT (2020)	Mining Presentation to Banks in 2020 showing updated SOG 21 Mining Schedule
		Mining Schedule (2020)	Spreadsheet of Minesched output
		BGS (2020 a)	LOM Grade Control Approach

#	Subject	Document Short Citation	Comment
		BGS (2020 b)	Pre-production Drilling Program
7	Metallurgical Testwork &	OMC (2012)	Met Testwork Report 2011 & 2012
		TKGM (2022)	Process Recovery for Financial Modelling
	Process Plant Design	Lyco (2017)	Lycopodium DFS Update Report 15 Mtpa
		Lyco (2018)	Lycopodium DFS Update Report 2.0 Mtpa
		Lyco PPT (2020)	Lycopodium Presentation to Banks in 2020 on Plant Design & Processing
8	TSF & Water	Knight Piésold (2020 a)	Design Report
		Knight Piésold (2020 b)	Water balance modelling
		Knight Piésold (2020 c)	Water Balance modelling
		AKR (2020 a)	River abstraction memorandum
		Lyco (2020 a)	Birbir Abstraction Arrangement
9	Site Project Infrastructure	Lyco (2020 b)	Layout Layouts
10	Off-site Infrastructure & Logistics	AKR (2023)	Status Update at November 2023
		Bolloré (2016)	Road Survey Djibouti to Tulu Kapi
		Bolloré (2019)	Road Survey Djibouti to Tulu Kapi
11	Environmental and Social Impact Assessment	EPA (2023)	2023 Environmental Clearance Certificate
		Golder (2020)	ESIA Report
		SLR (2020)	Audit Report
		TKGM RAP (2023)	Resettlement Action Plan
12	Project Execution	Intro Memo (2024)	Add some words to intro memo
		Lyco Proposal (2022)	Comprehensive Proposal for EPC/M works 2022 version
		Lyco BOE (2022)	Basis of Estimate for 2022 Capital Estimate

#	Subject	Document Short Citation	Comment
		Lyco CCE (2022)	2022 Capital Estimate Detailed Print
		Lyco PEP ( 2021)	2021 Project Execution Plan (out of date but instructive in terms of approach to Execution Model) Will be updated on award.
13	Operational Readiness	Intro Memo (2024)	Add some words to intro memo
		TKGM ORG (2023)	Cascading organisation structures for Owner's Team
		TKGM Recruit (2023)	Spreadsheet of Recruitment Schedule for Owner's Team
14	Project Economics	Endeavour V24 (2023)	Financing Model V24
		TKGM Costs (2023)	Excel Spread Sheet with details of cost breakdown to provide input for Endeavour Financial in preparing Financial Model
		Mining Budget (2023)	Mining Budget to provide input to Financial Model.
		Lyco OCE (2022)	Provides treatment cost input from Lycopodium databases and operating assumptions.

Table 4-2 Documents by Short Citation in Alphabetical Order

Reference	Citation
AKR (2020 a)	AK Roux, Water Supply to Project: Birbir River Pipeline – Technical Details, Memorandum AK/0023 dated 20 March 2020.
AKR (2023)	AK Roux, Off-Site Infrastructure – Status Report, Memorandum AK/0029 Rev 4 dated 26 October 2023.
BDI (2023)	Behre Dolbear International Ltd., Technical Project Final Due Diligence Report on KEFI Minerals Tulu Kapi Gold Mine, Western Ethiopia Project J22-093 Updated 4 <sup>th</sup> November 2023.
BGS (2020 a)	Blucher Geological Services, "Tulu Kapi Gold Life of Mine Grade Control", 28 August 2020.
BGS (2020 b)	Blucher Geological Services, "Tulu Kapi Gold Pre-production Grade Control Programme and Budget", 25 September 2020.
Bolloré (2019)	Bolloré Logistics, "Road Survey From Djibouti to Tulu Kapi" May 2019
Bolloré (2016)	Bolloré Logistics & Antrak Logistics, "Road Survey: Tulu Kapi Project" 23 September 2016
DFS Update Memo (2024)	TKGM, "Tulu Kapi Gold Mine – Summary of Updates to DFS", April, 2024
EPA (2023)	Federal Democratic Republic of Ethiopia Environmental Protection Authority, Issuance of Environmental Clearance for Gold Mining Project, 14 August 2023.
Endeavour V24 (2023)	Endeavour Financial, <<20230724 Financing Model v24 -USD 1550 Au.xlsm>>13 September 2023.
Golder (2020)	Golder Associates Africa (Pty) Ltd., 2020 Update of the Environment and Social Impact Assessment for the proposed Tulu Kapi Gold Mine, Ethiopia, October 2020.
KME PPT (2018)	KEFI Minerals Resource Department, Tulu Kapi Resource Estimates and Geological Interpretation, 12 February 2018.
Knight Piésold (2020 a)	Knight Piésold Ltd, Preliminary Design Report for The Tulu Kapi Tailings Storage Facility and Water Storage Dams Revision B, Project Number RI402- 00012/10, [excl. appendices], Rivonia, May 2020.
Knight Piésold (2020 b)	Knight Piésold Ltd, Tulu Kapi Gold Project – Site Water Balance Update – Dry Climatic Conditions Assessment, Project Number PE18-00268, Perth, 21 March 2018.
Knight Piésold (2020 c)	Knight Piésold Ltd, Tulu Kapi Gold Project – Commissioning Water Balance Model, PE20-00182, Perth, 17 February 2020.
Lyco (2020 a)	Lycopodium Minerals Pty. Ltd., Water Supply – Bir Bir River Abstraction Tower Pumping Arrangement Plan and Elevations Rev. A, DRG No. 330-GD-001, 17 March, 2020.

Reference	Citation
Lyco (2020 b)	Lycopodium Minerals Pty. Ltd., Plant Site Layout Plan Water Supply – Bir Bir River Abstraction Tower Pumping Arrangement Plan and Elevations Rev. A, DRG No. 110-GD-003, 14 Feb 2020.
Lyco (2018)	Lycopodium Minerals Pty. Ltd., Tulu Kapi Gold Project 25% Plant Upgrade, 2008-000-GEREP-0001 Rev B 16 January, 2018.
Lyco (2017)	Lycopodium Minerals Pty. Ltd., Tulu Kapi Gold Project Study Update, 1953- 000-GEREP-0001 Rev C 23 May, 2017.
Lyco BOE (2022)	Lycopodium Minerals Canada Ltd, "Tulu Kapi Gold Project Capex Basis of Estimate (5169-GEST-001), October, 2022.
Lyco CCE (2022)	Lycopodium Minerals Canada Ltd, "Tulu Kapi Gold Project Capital Cost Estimate Rev 1, 2022.
Lyco OCE (2022)	Lycopodium Minerals Canada Ltd, "Tulu Kapi Gold Operating Cost Estimate (5169-FEST-001), August 2022.
Lyco PEP (2021)	Lycopodium Minerals Pty. Ltd., Tulu Kapi Gold Project, Project Execution Plan, 2121GPLN-0001 Rev D, 25 June, 2021.
Lyco PPT (2020)	Lycopodium Minerals Pty. Ltd & TKGM., Plant Design & Processing, PowerPoint presentation, 29 November 2020
Lyco Proposal (2022)	Lycopodium Minerals Canada Ltd, "Tulu Kapi Gold Project Engineering, Supply & Labour Hire (ESLH) Proposal (LMCL-00582), 19 August, 2022.
Micon (2020)	Micon International Limited, Mineral Industry Consultants, Due Diligence Review of the Tulu Kapi Gold Project, 10 August, 2020.
Mine PPT (2020)	TKGM, TKGM Mining, PowerPoint presentation, 30 November 2020.
Mining Budget (2023)	< <mining (pw230311="" budget="" draft="" reva.xlsx="" sog21="" –="">&gt; spreadsheet prepared by G. Davidson.</mining>
Mining Schedule (2020)	<<2020_05_25 TK_minesched_SOG21 Rev01.xlsx>> spreadsheet output of scheduling program prepared by Steve O'Grady for MACE.
OMC (2012)	Orway Mineral Consultants (WA) Pty. Ltd., Tulu Kapi Gold Project, Metallurgical Testwork Programme, Nyota Minerals Ethiopia Limited, Report No. 8865 Rev 0, Perth, June 2012.
Senet DFS (2015)	SENET Pty Ltd South Africa. <i>Tulu Kapi Gold Project, Definitive Feasibility Study,</i> July 2015
SLR (2020)	SLR Consulting (Africa) (Pty) Ltd., Update of Environmental and Social Review of Tulu Kapi Gold Mine, November 2020.
Snowden MRE (2015)	Snowden Mining Industry Consultants, KEFI Minerals Ethiopia Tulu Kapi (Project No. AU4448) Resource Report, 11 August, 2015.

Reference	Citation
Snowden Geotech. (2015)	Snowden Mining Industry Consultants, KEFI Minerals Tulu Kapi (Project No. AU4541) Feasibility Study Geotechnical Assessment, 3 June, 2015.
Snowden ORE. (2014)	Snowden Mining Industry Consultants, KEFI Minerals Plc. Tulu Kapi (Project No. AU4471) Ore Reserve Estimate, October, 2014.
Snowden ORE (2015)	Snowden Mining Industry Consultants, Tulu Kapi Ore Reserve Estimate, Letter Report, 22 April, 2015.
TKGM Costs (2023)	<<20220828 Financial Model Cost Breakdown Lyco 5169 Ver D4.1 (TB) – PM adjusted.xlsx>> 25 July 2023
TKGM ORG (2023)	TKGM, "Draft Organisational Structure vs 02", 21 September, 2023< <tkgm 21-09-23.pdf="" structures="" vs02="">&gt;</tkgm>
TKGM RAP (2022)	TKGM, Resettlement Action Plan, TKGM_CO_PLN_028 Rev 12022, 2 November 2022.
TKGM Recruit (2023)	TKGM, "Recruitment Schedule", 20 September, 2023< <tkgm 21-09-23.pdf="" structures="" vs02="">&gt;</tkgm>