

# TECHNICAL REPORT ON THE 2021 MINERAL RESERVES AND MINERAL RESOURCES OF THE TUCANO GOLD MINE, AMAPÁ STATE, BRAZIL

PREPARED BY GREAT PANTHER

MINING LIMITED

Report for NI 43-101

Effective Date – July 31, 2021

Report Date – June 7, 2022



## Qualified Persons:

Carlos H. B. Pires, B.Sc. Hons., FAusIMM (CP)

Fernando A. Cornejo, M.Eng., P.Eng.

Nicholas Winer, B.Sc. Hons., FAusIMM

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## DATE & SIGNATURE PAGE

This NI 43-101 Report on the Tucano Gold Mine Mineral Reserves and Mineral Resource as of July 31, 2021 is submitted to Great Panther Mining Limited and is effective as of July 31, 2021.

### Qualified Persons

### Responsible for

Signed "Carlos H. B. Pires"

Signed By: \_\_\_\_\_

Carlos H. B. Pires, B.Sc. Hons., FAusIMM (CP)

QP for Great Panther Mining Limited

Date: June 07, 2022

Chapters 1, 10, 11, 12, 14.

Signed "Fernando Cornejo"

Signed By: \_\_\_\_\_

Fernando A. Cornejo, M.Eng., P.Eng.

QP for Great Panther Mining Limited

Date: June 07, 2022

Chapters 1, 2, 3, 13, 15, 16, 17, 18, 19, 20, 21, 24, 26.

Signed "Nicholas Winer"

Signed By: \_\_\_\_\_

Nicholas Winer, B.Sc. Hons., FAusIMM

QP for Great Panther Mining Limited

Date: June 07, 2022

Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 20, 24, 25, 26, 27.

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## **CERTIFICATE OF QUALIFIED PERSON**

I, Carlos H. B. Pires, B.Sc. Hons., FAusIMM (CP), am the author of this report "Technical Report on the 2021 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapá State, Brazil", (the "Technical Report") dated June 7, 2022 with an effective date of July 31, 2021 (the "Effective Date") prepared for Great Panther Mining Limited, do hereby certify that:

1. I am Master Geologist of the Tucano Gold Mine of Estrada do Taperebá, SN, Pedra, Branca do Amapari - AP, Brasil.
2. I am a graduate of the School of Geology at UNESP - São Paulo State University, Brazil, in 2005 with a Bachelor of Science degree with Honors degree. I completed a post-graduation in 'Geostatistics in Deposit Evaluation' through the Universidad de Chile (Chile - 2010) and in a Citation Program in Applied Geostatistics in 2017 with accreditation by the University of Alberta.
3. I am a practicing geologist registered with the AusIMM - The Australasian Institute of Mining and Metallurgy (Membership No. 320120). I have practiced my profession continuously for more than 14 years since graduation. Relevant experience for the purpose of the Technical Report is:
  - a. More than 14 years of experience in mineral resource evaluation for Gold and Copper, involvement in projects from the exploration to operations phase, MRMR evaluations, peer Reviews and consulting activities. In addition to Great Panther Mining, Serabi Gold, Mineração Caraíba, Yamana Gold, (BrioGold / LeaGold), Snowden and AngloGold Ashanti are some companies that I have worked for. I joined the Tucano Gold Mine in August 2019 as Master Geologist.
  - b. I have worked on the Tucano deposits since 2019 carrying out Mineral Resources Evaluation in all aspects, including: Modelling, Estimation, Database Management, QA/QC evaluation, Reconciliation and Resource Modelling, from Short Term to Long Term.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I am an employee of Tucano Gold Mines, based on-site and have visited the Tucano Gold Mine multiple times.
6. I am responsible for Sections 10, 11 and 14 and co-responsible for Sections 1 and 12 of the Technical Report.
7. I am not independent of the Tucano Gold Mine pursuant to Section 1.5 of the Instrument by virtue of my employment.
8. I have been involved with the property that is the subject of the Technical Report as a Master Geologist since August 2019.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.

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10. At the Effective Date of the Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and sealed "*Carlos H. B. Pires*"

---

Carlos H. B. Pires, B.Sc. Hons., FAusIMM (CP)

DATED this 7th day of June, 2022

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## **CERTIFICATE OF QUALIFIED PERSON**

I, Fernando A. Cornejo, M.Eng., P.Eng., am the author of this report "Technical Report on the 2021 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapá State, Brazil", (the "Technical Report") dated June 7, 2022 with an effective date of July 31, 2021 (the "Effective Date") prepared for Great Panther Mining Limited, do hereby certify that:

1. I am Chief Operating Officer of Great Panther Mining Limited, of 1330-200 Granville St., Vancouver, Canada, V6C 1S4.
2. I graduated with a Bachelor Degree in Chemical Engineering, from Universidad Nacional de San Agustín, Arequipa, Peru in 2001 and a Masters Degree in Chemical Engineering from Ecole Polytechnique de Montreal, Canada in 2005.
3. I am registered as a Professional Engineer in the Province of Ontario (Reg.# 100170042). I have practiced my profession since 2001 in a range of operational, technical, and mineral processing consulting roles in Canada, Brazil, Mexico, and Peru. My relevant experience for the purpose of the Technical Report is nineteen years' experience in operational and processing consulting roles in four continents, with a strong focus in Brazil and Mexico over the last eight years.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I visited the Tucano Gold Mine multiple times with my last personal inspection occurring from March 28 to March 31, 2022.
6. I am responsible for Sections 13, 15, 16, 17, 18, 19 and 21 and co-responsible for Sections 1, 2, 3, 20, 25 and 26 of the Technical Report.
7. I am not independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had been involved with the property that is the subject of the Technical Report since July 2019.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the Effective Date of the Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and sealed "*Fernando Cornejo*"

---

Fernando A. Cornejo, M.Eng., P.Eng.

DATED this 7th day of June, 2022

---

## **CERTIFICATE OF QUALIFIED PERSON**

I, Nicholas Winer, B.Sc. Hons., FAusIMM, am the author of this report "Technical Report on the 2021 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapá State, Brazil", (the "Technical Report") dated June 7, 2022 with an effective date of July 31, 2021 (the "Effective Date") prepared for Great Panther Mining Limited, do hereby certify that:

1. I am Vice President of Exploration of Great Panther Mining Limited, of 1330-200 Granville St., Vancouver, Canada, V6C 1S4.

2. I graduated with a Bachelor of Honours Degree in Geophysics and Geology, from Macquarie University, Sydney, Australia in 1986.

3. I am a practicing geologist registered as a Fellow with the AusIMM - The Australasian Institute of Mining and Metallurgy (Membership No. 334232). I have practiced my profession continuously for 38 years since my graduation. My relevant experience for the purpose of the Technical Report is:

- (a) More than 17 years of experience in regional and near mine exploration, including definition of geologic resource models for Archean, Proterozoic and Tertiary aged Gold and Copper / Gold deposits as employee of BHP Minerals (BHP), 7 years with AngloGold Ashanti (AGA) on Archean and Proterozoic Gold and Mesozoic Copper / Gold Deposits and 6 years with Horizonte Minerals for Archean and Proterozoic Gold deposits and Lateritic Nickel deposits.
- (b) Since 1996, I have held senior positions with international companies including, Country Exploration Manager with BHP, Exploration Manager Brazil, VP Exploration Colombia and VP Exploration South America for AGA, and COO for Horizonte Minerals. Since June 2020 I have been Vice President Exploration for Great Panther Mining.
- (c) My first involvement with the Tucano deposits was in 1996 prior to its discovery when in the capacity of Brazil Exploration Manager, BHP negotiated a JV over the regional tenement package covering the majority of a 90km stretch of the Vila Nova Belt in which the Tucano Deposit is centred. BHP carried out extensive regional geophysical and regional geochemical programs until mid-1998.
- (d) In 1999 as Exploration Manager for AGA Brazil, the focus was on the resource definition and PFS studies on the Tucano Gold Mine. (AGA's Amapari Project).
- (e) From 2001 to 2017, I was a partner in Mineracao Vale dos Reis who held title to tenements in the region that were the subject of a Joint Venture with Mineracao Serra da Canga. (controlled by the Tucano Mine). Mineracao Vale dos Reis was sold to the Tucano Mine in 2017.
- (f) Between April and May 2020, I provided consulting services to Great Panther Mining focused on the Tucano Exploration potential and in May was nominated Vice President Exploration. During Covid19 restrictions my focus has been centred on the regional and near mine exploration potential and continued improvements to technical protocols for exploration and resource modelling.

4. I have read the definition of "qualified person" set out in National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

- 
5. I have visited the Tucano Gold Mine multiple times with my last personal inspection occurring from March 14 to March 30, 2022.
  6. I am responsible for Sections 4, 5, 6, 7, 8, 9, 24 and 27 and co-responsible for Sections 1, 2, 3, 12, 20, 25 and 26 of the Technical Report.
  7. I am not independent of the Tucano Gold Mine pursuant to Section 1.5 of the Instrument.
  8. I have been involved with the property that is the subject of the Technical Report as Vice President of Exploration, Great Panther since May 2020.
  9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
  10. At the Effective Date of the Technical Report, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and sealed "*Nicholas Winer*"

---

Nicholas Winer, B.Sc. Hons., FAusIMM

DATED this 7th day of June, 2022

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## CONSENT OF QUALIFIED PERSON

Pursuant to Section 8.3 of

National Instrument 43-101 Standards of Disclosure for Mineral Projects

To: British Columbia Securities Commission  
Alberta Securities Commission  
Financial and Consumer Affairs Authority of Saskatchewan  
Manitoba Securities Commission  
Ontario Securities Commission  
Financial and Consumer Services Commission (New Brunswick)  
Nova Scotia Securities Commission  
Office of the Superintendent of Securities Office Newfoundland and Labrador  
Office of the Superintendent of Securities (Prince Edward Island)

I, Carlos H. B. Pires, B.Sc. Hons., FAusIMM (CP), consent to the public filing of the Technical Report, titled "Technical Report on the 2021 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapá State, Brazil", dated June 7, 2022 with an effective date of July 31, 2021 (the "Technical Report") by Great Panther Mining Limited (the "Issuer").

I also consent to the public filing by the Issuer of extracts from, or a summary of the Technical Report, in the news release issued by the Issuer on April 26, 2022 (the "News Release"). I certify that I have read the News Release filed by the Issuer and that it fairly and accurately represents the information in the Technical Report.

Signed on June 7, 2022.

Signed and sealed "*Carlos H. B. Pires*"

---

Carlos H. B. Pires, B.Sc. Hons., FAusIMM (CP)

Qualified Person (QP) for Great Panther Mining Limited

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## CONSENT OF QUALIFIED PERSON

Pursuant to Section 8.3 of

National Instrument 43-101 Standards of Disclosure for Mineral Projects

To: British Columbia Securities Commission  
Alberta Securities Commission  
Financial and Consumer Affairs Authority of Saskatchewan  
Manitoba Securities Commission  
Ontario Securities Commission  
Financial and Consumer Services Commission (New Brunswick)  
Nova Scotia Securities Commission  
Office of the Superintendent of Securities Office Newfoundland and Labrador  
Office of the Superintendent of Securities (Prince Edward Island)

I, Fernando A. Cornejo, M.Eng., P.Eng., consent to the public filing of the Technical Report, titled "Technical Report on the 2021 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapá State, Brazil", dated June 7, 2022 with an effective date of July 31, 2021 (the "Technical Report") by Great Panther Mining Limited (the "Issuer").

I also consent to the public filing by the Issuer of extracts from, or a summary of the Technical Report, in the news release issued by the Issuer on April 26, 2022 (the "News Release"). I certify that I have read the News Release filed by the Issuer and that it fairly and accurately represents the information in the Technical Report.

Signed on June 7, 2022.

Signed and sealed "*Fernando Cornejo*"

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Fernando A. Cornejo, M.Eng., P.Eng.

Qualified Person (QP) for Great Panther Mining Limited

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## CONSENT OF QUALIFIED PERSON

Pursuant to Section 8.3 of

National Instrument 43-101 Standards of Disclosure for Mineral Projects

To: British Columbia Securities Commission  
Alberta Securities Commission  
Financial and Consumer Affairs Authority of Saskatchewan  
Manitoba Securities Commission  
Ontario Securities Commission  
Financial and Consumer Services Commission (New Brunswick)  
Nova Scotia Securities Commission  
Office of the Superintendent of Securities Office Newfoundland and Labrador  
Office of the Superintendent of Securities (Prince Edward Island)

I, Nicholas Winer, B.Sc. Hons., FAusIMM, consent to the public filing of the Technical Report, titled "Technical Report on the 2021 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapá State, Brazil", dated June 7, 2022 with an effective date of July 31, 2021 (the "Technical Report") by Great Panther Mining Limited (the "Issuer").

I also consent to the public filing by the Issuer of extracts from, or a summary of the Technical Report, in the news release issued by the Issuer on April 26, 2022 (the "News Release"). I certify that I have read the News Release filed by the Issuer and that it fairly and accurately represents the information in the Technical Report.

Signed on June 7, 2022.

Signed and sealed "*Nicholas Winer*"

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Nicholas Winer, B.Sc. Hons., FAusIMM

Qualified Person (QP) for Great Panther Mining Limited

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## **1. SUMMARY**

### **1.1 INTRODUCTION**

The Tucano gold mine is an established, operating mine that produced 328,632 oz gold since Great Panther acquired it in 2019. The mine is an open pit operation with multiple pits along a 7-kilometre strike length. The ore is processed at a central hybrid CIL plant with ore feed being a blend that averages 30% oxide and 70% fresh rock. Studies are currently underway to implement an underground operation beneath the Urucum North (“URN”) pit on the northern end of the mine sequence.

### **1.2 TERMS OF REFERENCE**

The Report was prepared to support the disclosure in Great Panther’s news release dated April 26, 2022, entitled “Great Panther Announces Updated Mineral Reserve and Mineral Resource Estimates for the Tucano Gold Mine”.

Units used in the Report are metric units unless otherwise noted. Monetary units are in United States dollars (US\$) unless otherwise stated. The currency in Brazil is the Real (R\$).

Mineral Resources and Mineral Reserves are reported in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves (May 2014) (the 2014 CIM Definition Standards). Mineral Resources and Mineral Reserves were estimated in accordance with the 2019 CIM Estimation of Mineral Resources & Mineral Reserves Best Practice Guidelines (November 2019) (the 2019 Best Practice Guidelines).

The following serve as the qualified persons for specific report chapters outlined in Chapter 2 which collectively form this Technical Report as defined in National Instrument 43-101 - Standards of Disclosure for Mineral Projects (NI 43-101) and in compliance with Form 43-101F1:

- Mr Nicholas Winer, FAusIMM, Vice President Exploration, Great Panther Mining
- Mr Carlos Henrique Barbosa Pires, FAusIMM (CP), Master Geologist specialized in Mineral Resource estimation, Mina Tucano Ltda.
- Mr Fernando Cornejo, M. Eng., P. Eng., Chief Operation Officer, Great Panther Mining

### **1.3 PROJECT SETTING**

The Tucano Gold Mine in Amapá State, Brazil (the Tucano Operations or the Project) is located in Amapá State, Brazil, at latitude 0.85°N and longitude 52.90°W, approximately 200 km northwest of Macapá, the state capital. Road access from Macapá to the Project is via a 100 km long sealed road from Macapá to Porto Grande, then 75 km by unsealed road to Pedra Branca do Amapari, and finally 17 km of unsealed road to the mine site.

The Tucano Operations are serviced by a 1,100 m airstrip located approximately 800 m from the main entrance gate to the mine. Charter flights from Macapá to Tucano take approximately 50 minutes. A helipad was constructed near the CIL plant and is used to transport product and for emergency transport of personnel.

The Project area has an equatorial climate. The wet season occurs from January to June; however, rainfall events in the drier months are still frequent. With appropriate planning, mining and exploration activities can be conducted year-round.

The nearest accessible communities to Tucano are the towns of Pedra Branca do Amapari (17,625 population) and Serra do Navio (5,577 population) which are 17 km from Tucano and approximately 175 km and 200 km from Macapá, respectively.

The majority of the workforce are transported by bus from Serra do Navio, Pedra Branca, and other small surrounding communities. Professional staff commute weekly from Macapá or other cities in Brazil on a fly-in-fly-out basis. Personnel, bulk materials, fuel, and other supplies are brought to site by road from Macapá.

The topography within the operations area ranges from 90–320 meters above sea level (“masl”), consisting of river valleys and low hills. The process plant is at an elevation of about 143 masl. Vegetation in the region is dominated by native forest. There are settlement areas for subsistence agriculture established along or close to the main Porto Grande – Serra do Navio access. Along the access and within the settlement areas there has been significant clearing of the forest.

## **1.4 MINERAL TENURE, SURFACE RIGHTS, ROYALTIES AND AGREEMENTS**

The Project is owned by Great Panther through its wholly-owned Brazilian subsidiaries; Mina Tucano Ltda, Tucano Resources Mineração Ltda, Mineração Serra da Canga Ltda and Mineração Vale dos Reis Ltda

The Project consists of 39 mineral tenures, totalling 197,283 ha. The tenures are controlled 100% by Great Panther, through its Brazilian subsidiaries, except for the cases of a mining lease agreement with DEV Mineração S.A. covering the Duckhead deposit and 49% participation through Marina Norte Empreendimentos de Mineração S.A. on a non-contiguous, 3260 hectare exploration license application. The active Tucano mine operations are within mining concession 851.676/1992, wholly owned by Great Panther through Mina Tucano Ltda. The reserves in URE and Duckhead are, respectively, in the mining concession application 850.865/1987 and covered by a mining lease agreement in the name of Mina Tucano Ltda. (858.079/2014) excised from a mining concession for iron ore, held by DEV Mineração S.A. (“DEV”). The lease is registered in the Mines Department (ANM) and governed by a private contract between Mina Tucano Ltda. and DEV.

Great Panther holds all surface rights required to support the life-of-mine (LOM) plan. Where exploration activities are conducted in areas where some form of third party surface right exists, Great Panther may secure access through a combination of rights-of-way, leases and disturbance compensation agreements. The majority of Great Panther exploration tenure covers uninhabited tracts of land that belong to the State.

Royalties are payable to:

- The federal government under a Compensation royalty for the Exploitation of Mineral Resources; which is 1.5% for gold.
- The State of Amapá, governed by a royalty for the Control, Monitoring, and Supervision of Research Activities, Mining, Exploration and Exploitation of Mineral Resources. This is based on the grams of gold produced multiplied by an index. The current index is BR\$ 3.8204 multiplied by a factor of 0.4. Great Panther negotiated a reduced factor of 0.25 from 2020.
- The municipalities of Pedra Branca do Amapari and Serra do Navio, under an agreement for community development under which Tucano contributes up to a 1% royalty over the gross proceeds from gold sales.
- Certain former tenure holders who were partners in Mineracao Vale dos Reis, which is a commodities royalty that is levied at 0.75% of commodity sales revenue, less transport and insurance expenses. The royalty is payable on 13 exploration mineral areas, should production be initiated within their limits.

## 1.5 GEOLOGY AND MINERALIZATION

The Tucano deposits are examples of structurally controlled orogenic, Proterozoic gold deposits. They are hosted by iron formations and flanking calc-silicate units in a greenstone sequence with a large number of pre/syn and post mineralization intrusions.

The Tucano Operations are hosted within the Vila Nova Greenstone sequence, part of the Maroni-Itacaiunas mobile belt of the Guyana Craton.

The principal deposits at Tucano form a 7 kilometre long lithologic-structural corridor referred to as the mine sequence. From north to south the deposits are Urucum (North ("URN"), Central North, ("URCN"), Central South, ("URCS") and South, ("URS"), Tapereba (TAP C and TAP AB). Duckhead and Urucum East ("URE") are associated with fold hinges within the mine sequence, off the main north-south structure.

The mineralization zone is generally decametric (~50 to +100 m) in width being made up of a series of 1 – 8 m wide, steeply dipping, sub-parallel, economically mineralized lenses, hosted in iron-rich formations, particularly magnetite iron formations, banded iron-formation (BIF) and iron-rich carbonate formations. Quartz veining is rarely present, and veins are defined by the continuity of grades within zones of strong sulphide and /or carbonate alteration, generally within or near the contact of iron formations and the calc-silicate unit. Pyrrhotite is the main sulphide in the northern and central parts of the trend while pyrite dominates in the south.

A suite of late post-mineralization pegmatite has been emplaced throughout the mine sequence in various orientations. Gold remobilization can occur at or near the pegmatite contact but is not common.

Gold mineralization is primarily hosted in iron-rich formations, particularly magnetite iron formations, banded iron-formation (BIF) and iron-rich carbonate formations, with other host rocks containing lesser quantities of gold. Higher grades are associated with the more intensely hydrothermally altered BIFs and

iron-rich carbonate units bounding and intercalated with the BIFs. High sulphide concentrations are generally associated with higher gold grades but higher gold grades can occur without significant sulphides.

### **1.5.1 URUCUM - TAP C TREND**

Deposits along the Urucum – TAP C Trend are emplaced within the north–south trending, multiply deformed mine sequence, bounded to the west by the Amapari Granite. Gold mineralization at Urucum and TAP C is predominantly stratabound within the BIF / iron formations and is characterized by disseminated pyrrhotite within the strong foliation. Elevated gold values can also be found in strongly altered but sulphide poor zones. Mineralization is commonly associated with pervasive silicification, but quartz veining is markedly absent.

### **1.5.2 TAP AB**

Mineralization lenses in TAP AB are similar in style to those described above for Urucum and TAP C. However, TAP AB contrasts with the above in several aspects related to weathering, dominant sulphide and structure. TAP AB mineralization is hosted in similar chemical sediments as the northern parts of the mine sequence. However, the mine sequence is more deeply weathered. Drillholes have shown that the oxidation in the mineralized zone can extend to 300m. It is not clear if this is structurally related (more porous shear zone), lithology/alteration related (mixture of carbonate and sulphide alteration with weaker pervasive silicification) or due to a deeper conductive/oxidizing source that may be driving an SP cell (electric self-potential) that accelerates weathering in the more sulphide rich and / or porous, structurally deformed mineralization zone.

At TAP AB, the sulphides are dominantly pyrite, with gold mineralization commonly associated with concentrations of 5–10% pyrite. This contrast to Urucum and TAP C where pyrrhotite dominates.

Structurally the northern part, TAP AB3, consists of two sub-parallel north-south orientated mineralization packages, an eastern and western sequence, both dip steeply to the east similar to the northern zones at Urucum and TAP C. At the southern end of TAP AB3 they are truncated by a late, sinistral, NW structure.

In TAP AB2 the mineralization packages continue with a more SSW orientation. In TAP AB1 the western zone suggests that it is part of an overturned anticline with a steep west dipping eastern limb, and moderately (~40°) dipping western limb, hosted by a carbonate sequence. The eastern zone is steeply dipping and appears to be tightly folded at the southern end of TAP AB1 resulting in repetition of the lithologies and associated mineralization within the TAP AB1 pit.

## **1.6 HISTORY**

Exploration and mine development prior to Great Panther's acquisition of the Project was conducted by Anglo American plc, AngloGold Ashanti Ltd, EBX Gold Ltd, Wheaton River Minerals Ltd., Goldcorp Inc., Peak Gold Ltd., New Gold Inc., and Beadell Resources Ltd (Beadell). Work completed included: geological reconnaissance; regional geological and regolith mapping; geochemical surveys (rock chip, soil and stream

sediment); airborne geophysical surveys (magnetic, radiometric, and digital elevation model (DEM)); ground geophysical surveys (magnetometer, very low frequency, and induced polarization time domain); auger, rotary air-blast (RAB), air core, reverse circulation (RC) and core drilling, mineral resource and mineral reserve estimates, and mining studies. Open pit mining operations feeding a heap leach operation ran from 2004–2009. Open pit mining operations feeding a carbon-in-leach (CIL) plant commenced in 2012.

Great Panther acquired Beadell in 2018 and has operated the mine continuously since that time. Great Panther has focused on confirmation and expansion of the resources and reserves in the current deposits and has initiated programs to evaluate underground mining within the Tucano Operations and in parallel developing the regional exploration potential.

## 1.7 DRILLING AND SAMPLING

Table 1-1 summarizes drilling supporting the mineral reserves and mineral resources estimations for the Project as of July 31, 2021 (the 2021 MRMR Estimation). Drilling that supports the Mineral Resource estimation process is primarily restricted to grade control RC drilling and resource definition RC and diamond drilling.

**Table 1-1: Drilling Supporting the 2021 MRMR Estimation**

Great Panther Mining Limited – Tucano Gold Mine

Database Totals							
Company	Year	Rotary Air Blast		Reverse Circulation		Diamond Drilling	
		Nº Holes	Drill Metres	Nº Holes	Drill Metres	Nº Holes	Drill Metres
Legacy	Pre-2010	18,675	93,983	6,761	220,534	1,117	159,376
Beadell	2010 -2018	3,867	35,906	9,751	435,685	460	87,985
Great Panther	2019-2021	921	10,062	1,638	75,809	170	38,836
<b>Total</b>		<b>23,463</b>	<b>139,952</b>	<b>18,150</b>	<b>732,028</b>	<b>1,747</b>	<b>286,198</b>

All drillholes are logged with special attention paid to core drillholes which are logged for lithology, alteration, mineralization, structure and geotechnical characteristics. (weathering, RQD, resistance etc). Drill core recoveries are in general excellent with average recoveries of 95% to 98% attained, depending on the deposit.

All drillhole collars are surveyed using a Leica 407 Total Station GPS and RC and diamond drillholes are surveyed using a Reflex Ez-North Seeking Gyro.

## 1.8 DATA VERIFICATION

Data verification completed by Great Panther includes a review of the methods and practices used to generate the resource database. This includes but was not limited to a review of drilling, sampling, analysis, and data entry processes. The verification included a review of the QA/QC methods and results,

standard database validation tests, and several site visits. The review of the QA/QC program and results are presented in Section 11.

Verification of the database was completed by external third parties, including: Maxwell Geoservices Ltd (database and quality assurance and quality control (QA/QC); 2012–2017; AMC Consultants (data verification in support of the 2018 Technical Report); Roscoe Postle Associates (data verification in support of the 2019 Technical Report and 2020 Technical Report). No material issues that would impact resource estimates have been identified. Much of the mineralization related to data generated prior to 2017 has been mined out.

Great Panther selected a number of drill holes to verify the described methods and practices. On these drill holes the following reviews were made:

- Visit to the core handling facility and a review of drill core collection, markup, logging, sampling, storage and security practices. No significant issues were found.
- Review of core logs for several drill holes during site visits. No significant issues were found. Significant improvements had been made since the 2020 Technical Report.
- Visits to and review of procedures at the Tucano sample preparation facility, the Tucano fire-assay laboratory and the Certified SGS Geochemistry laboratory in Belo Horizonte. No issues were identified.
- Reviewing the drill hole traces in three-dimensional (3-D), level plan, and vertical sections. No unreasonable geometries were found.
- Querying the database for missing or repeated data, unique headers, duplicate holes, and gaps or overlapping intervals. Ensuring that the total depth recorded in each drill hole database table was consistent. No issues were identified.
- Accuracy of geological interpretations and grade interpretations on section and plan, and in geological models. No unreasonable geometries were found.

As a result of the data verification, the QP concludes that the Project data and database are acceptable for use in Mineral Resource and Mineral Reserve estimation and can be used to support mine planning. Several recommendations for improvement have been made.

## **1.9 METALLURGICAL TEST WORK**

Tucano is an established operating mine. Metallurgical test programs are not routinely required. In the case of a specific necessity the sample procedure is defined to best resolve the issue and is reported in the relevant study report. There were no metallurgical test programs carried out during the period since the effective date (September 30, 2020) of the previous technical report.

## 1.10 MINERAL RESOURCE ESTIMATION

Mineral Resources are reported for the TAP AB, TAP C, Urucum, URE and Duckhead deposits, assuming open pit mining methods. Mineral Resources are estimated assuming underground mining methods for the URN, with small resources at TAP AB and URC. Mineral Resources are also estimated for stockpiled material.

Block models use selective mining unit (SMU) sizes that vary by deposit and assumed mining method. Parent cell sizes range from 8 x 20 x 20 m (URN underground) to 3 x 5 x 4 m (TAP AB, TAP C and Urucum open pits). Sub-cells range from 1 x 5 x 2.5 m (URN underground) to 0.625 x 2.5 x 1 m for the smaller URE deposit and Duckhead underground).

Modelling was conducted using commercially available Leapfrog and MineSight software. Variography was performed using Isatis and estimations with Datamine. Resource pits were generated using Hexagon Mine Plan Economic Planner.

Statistical analysis was conducted on a domain-by-domain basis. Mineralization wireframes were constructed as applicable to each deposit. All domains had hard boundaries for estimation purposes. Assays were capped prior to compositing and grade estimation, based on the exploratory data analysis. Assays were composited to 2 m.

For deposits potentially amenable to open pit mining methods, the following models were constructed:

- Primary topographic surfaces and the cut-and-fill surface topographies were used to generate updated in situ and backfill domains;
- Digital models of the nominal top of the fresh rock were constructed using available information obtained from drill holes and mining activities;
- Mineralization wireframes were constructed using cut-off grades and minimum mining thicknesses as applicable to the deposit;
- As applicable, structural trend surfaces were generated.

For deposits potentially amenable to underground mining methods, the following models were constructed:

- Crown Pillar surfaces were constructed, separating open pit material from underground;
- Mineralization wireframes were constructed using cut-off grades and minimum mining thicknesses as applicable to the deposit.

Densities were applied either as lithology type averages into the block models or interpolated using nearest-neighbour ("NN") methods.

Variography was completed for the deposits. Where individual wireframes had insufficient data the variography was applied to a domain.

Depending on deposit, estimation could be conducted in three passes (TAP AB, URN underground, Duckhead), two passes (Urucum open pit) or one pass. (URE). Interpolation methods included inverse distance weighting to the third power, ordinary kriging and NN.

Confidence categories were assigned using either, or a combination of, estimation pass number, distances to the nearest drill hole and mineralization characteristics.

Mineralization considered potentially amenable to open pit mining methods was constrained within conceptual Lerches–Grossmann (“LG”) shells generated in the Hexagon Mine Plan Economic Planner using US\$1900/oz Au and the cost and recovery parameters summarized in Table 1-2. Selected cut-off grades were 0.30 g/t Au for oxide material and 0.40 g/t Au for fresh rock. Open pit Mineral Resources were depleted using a topographic surface as at July 31, 2021.

**Table 1-2: Input Parameters, Open Pit Cut-off Grades**

Great Panther Mining Limited – Tucano Gold Mine		
Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1,900
Exchange Rate	R\$/US\$	5.00
Mining Cost	Units	Value
- Oxide	US\$/t	2.15
- Fresh Rock	US\$/t	2.68
Processing Cost	Units	Value
- Oxide	US\$/t	11.42
- Fresh Rock	US\$/t	13.91
General and Administration Cost	US\$/t	6.04
Gold Recovery		88%
Pit Discard Cut-off Grade	Units	Value
- Oxide	g/t Au	0.30
- Fresh Rock	g/t Au	0.40
Overall wall slope Angle		
- Oxide	Degree	36° - 40°
- Fresh Rock	Degree	47°-52°

**Table 1-3: Input Parameters, Underground Cut-off Grades**

Great Panther Mining Limited – Tucano Gold Mine		
Item	Unit	Value
Cut-off grade for MSO stope shapes (before dilution added)	g/t Au	1.6
Minimum mining width	m	2
Dilution skin width – total	m	1

Stope height 1	m	20
Stope height 2 from base	m	15
Stope height 3 from base	m	10
Stope increment - strike length	m	25
Minimum transverse pillar width	m	10
Include inventory within pit "reserve" pit design *	Flag (1/0)	yes
Conduct stope-adjacency smoothing	Flag (y/n)	no
Reference X start for stope shape grid & extent	Easting   m	401880   200
Reference Y start for stope shape grid & extent	Northing   m	99310   1075
Reference Z start for stope shape grid & extent	Elevation   m	-590   800
Maximum weathered rock inside stope shape	WEATH=5000 %	10
Block model: "urucum_ug_resources2015_v17"	Version   date	ugv17d #  8Oct2015

Mineralization considered potentially amenable to underground mining methods was constrained within potentially mineable shapes using Mine Stope Optimizer (MSO) software, using the assumptions in Table 1-3. The cut-off grade used to report the estimate is 1.6 g/t Au for fresh rock and 2.1 g/t Au in oxide mineralization. A 30 m thick zone underneath the resource shell acts as a crown pillar, separating the open pit and underground Mineral Resource estimates.

## 1.11 MINERAL RESOURCE STATEMENT

Measured and Indicated Mineral Resources are reported inclusive of those Measured and Indicated Mineral Resources that were converted to Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Mineral Resource estimates have an effective date of July 31, 2021.

The Qualified Person for the Mineral Resource estimate is Mr Carlos Henrique Barbosa Pires, F.AusIMM (CP). The Mineral Resource estimates are tabulated in Table 1-4.

Factors that may affect the Mineral Resource estimates include: metal price and exchange rate assumptions; changes to the assumptions used to generate the gold cut-off grade; changes in local interpretations of mineralization geometry and continuity of mineralized zones; changes to geological and mineralization shapes, and geological and grade continuity assumptions; density and domain assignments; changes to geotechnical, mining and metallurgical recovery assumptions; changes to the input and design parameter assumptions that pertain to the geostatistical block model estimation, changes to the input and design parameter assumptions that pertain to the conceptual pit constraining the estimates; changes to the input and design parameter assumptions that pertain to the conceptual mineable shapes constraining the estimates; and assumptions as to the continued ability to access the site, retain mineral and surface rights titles, maintain environment and other regulatory permits, and maintain the social license to operate.

**Table 1-4: Tucano Mineral Resource Estimate as of July 31, 2021**

Location/area	Measured			Indicated			Total Measured and Indicated			Inferred		
	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)
Open pit	5,651	1.20	217	18,863	1.17	711	24,514	1.18	928	1,476	1.10	52
Underground	0	0.00	0	2,493	4.41	353	2,493	4.41	353	5,306	2.73	466
Stockpile	1,400	0.50	22	0	0.00	0	1,400	0.50	22	0	0.00	0
Total	7,051	1.06	240	21,355	1.55	1,064	28,407	1.43	1,303	6,782	2.37	518

**Notes:**

1. Mineral Resources are classified using the 2014 CIM Definition Standards.
2. Mineral Resources are inclusive of Mineral Reserves.
3. Mineral Resources are reported with an effective date of July 31, 2021.
4. Since the effective date (September 30, 2022) of the previous technical report, new drilling results are available for the TAP AB, TAP C, and Urucum open pit resources.
5. Mineral Resources are estimated at various cut-off grades depending on mining method, mineralization style and haulage distances.
6. Mineralization wireframes were generated at 0.3g/t Au for open pit resources except for URCN where a 0.5g/t wireframe was used. Underground resources were calculated within a 1.6g/t Au wireframe. The minimum wireframe width is three metres.
7. Mineral Resources are estimated using a long-term gold price of US\$1900/oz and a US\$:BR\$ forex of 1:5.
8. The Company's mineral resource were prepared by Mr. Carlos Henrique Barbosa Pires, FAusIMM (CP), a full-time Tucano employee and a qualified persons as defined by NI 43-101.
9. Numbers may not add due to rounding.
10. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Mineral resources are subject to infill drilling, permitting, mine planning, mining dilution and recovery losses, among other things, to be converted into mineral reserves. Due to the uncertainty associated with inferred mineral resources, it cannot be assumed that all or any part of an inferred mineral resource will ever be upgraded to indicated or measured mineral resources, including, as a result of continued exploration.

## 1.12 MINERAL RESERVE ESTIMATION

Mineral Reserves were converted from Measured and Indicated Mineral Resources. Inferred Mineral Resources were set to waste.

The mine plan assumes open pit and underground mining using conventional mining methods and equipment.

Mineral Reserves are estimated, assuming open pit mining methods, for TAP AB, TAP C, Urucum, URE, and Duckhead. Mineral Reserves are estimated assuming underground mining methods for the URN underground project.

Pit optimisations were carried out using the MS Economic Planner module in the commercially available MinePlan software. The sequence of pit shells obtained from optimisations were analysed to define a

practical mining sequence for the ultimate pit designs. Internal, external, and operational dilution were included in the models.

**Table 1-5: Open Pit Marginal Grade Estimate**

Great Panther Mining Limited – Tucano Gold Mine								
Parameters	Units	URN	URCS	Tap AB1	Tap AB3	Tap C1	DH	URE
<b>Revenue</b>								
Gold Price	US\$/Oz Au	1,650	1,651	1,652	1,653	1,654	1,655	1,656
Exchange Rate	US\$/R\$	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Gold Payable	%	99.95%	99.95%	99.95%	99.95%	99.95%	99.95%	99.95%
Refining Charges	R\$/Oz Au	120.46	120.46	120.46	120.46	120.46	120.46	120.46
Royalties	%	2.85%	2.85%	2.85%	2.85%	2.85%	2.85%	2.85%
Avg Process Recovery	%	88%	88%	88%	88%	88%	88%	88%
Net Revenue	R\$/Oz Au	6,943	6,943	6,943	6,943	6,943	6,943	6,943
<b>Operating Cost</b>								
Grade Control	R\$/t	3.78	3.78	3.78	3.78	3.78	3.78	3.78
Extra Ore Haulage, Oxide	R\$/t	2.51	2.15	-0.87	-0.61	1.07	8.68	2.36
Extra Ore Haulage, Fresh	R\$/t	1.50	-1.01	-0.63	-0.91	0.02	6.11	3.40
Crusher Feed	R\$/t	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Processing, Oxide	R\$/t	57.08	57.08	57.08	57.08	57.08	57.08	57.08
Processing, Fresh	R\$/t	69.57	69.57	69.57	69.57	69.57	69.57	69.57
G&A	R\$/t	30.20	30.20	30.20	30.20	30.20	30.20	30.20
<b>Break Even CoG, Oxide</b>	<b>g/t Au</b>	<b>0.47</b>	<b>0.47</b>	<b>0.46</b>	<b>0.46</b>	<b>0.46</b>	<b>0.50</b>	<b>0.46</b>
<b>Break Even CoG, Fresh</b>	<b>g/t Au</b>	<b>0.53</b>	<b>0.52</b>	<b>0.53</b>	<b>0.52</b>	<b>0.53</b>	<b>0.56</b>	<b>0.54</b>
<b>Marginal CoG, Oxide</b>	<b>g/t Au</b>	<b>0.42</b>	<b>0.42</b>	<b>0.41</b>	<b>0.41</b>	<b>0.42</b>	<b>0.45</b>	<b>0.42</b>
<b>Marginal CoG, Fresh</b>	<b>g/t Au</b>	<b>0.48</b>	<b>0.46</b>	<b>0.47</b>	<b>0.46</b>	<b>0.47</b>	<b>0.50</b>	<b>0.48</b>

A marginal cut-off grade was calculated for each block individually based on its fresh rock/oxide rock content and distance from the block to the plant. The marginal cut-off grades were derived based on a gold price of US\$1,650/oz Au for all open pit deposits and operating costs sourced

from the current operations between May 2020 and April 2021, and mining contracts at a US\$/R\$ exchange rate of 1:5. Inputs to the cut-offs are summarized in Table 1-5

Underground operations are assumed to be conducted using either up-hole retreat or longitudinal retreat, longhole open stoping (Avoca) methods. Stope shapes were developed using the commercially available Mine Stope Optimizer (MSO) software. Design assumptions included:

- The typical stope height was 20 m (i.e., same as the sublevel interval), although some stopes near the upper resource boundaries were 10–15 m in height;

- Stope lengths for up-hole retreat were 50 m, whereas Avoca stopes were continuous without pillars;
- Cut-off grade of 2.4 g/t Au;
- Planned dilution of 0.5 m footwall plus 0.5 m hanging wall;
- Minimum mining width of 2 m plus 1 m of dilution;
- Minimum pillar distance between parallel lodes of 10 m;
- Stope increment strike length of 25 m;
- Isolated stopes requiring excessive development were not included in mine designs.

Ore losses were applied to the stope tonnes after the MSO stope shapes were generated (after subtracting the ore development tonnes).

Mineral Reserves were estimated using an incremental cut-off grade of 2.4 g/t Au, based on the parameters summarized in Table 1-6.

**Table 1-6: MSO Parameters for Underground Cut-off Estimation**

Great Panther Mining Limited – Tucano Gold Mine			
Area	Item	Units	Value
Revenue	Production rate	t/d	1,500
	Gold price	US\$/oz	1,250
	Metallurgical recovery	%	93
	Doré payable	%	99.95
	Exchange rate	\$R/US\$	3.8
	Refining cost	\$R/oz	77.78
	Royalties	%	3.14
	Ore value	US\$/g	35.55
Operating costs	Mining	US\$/t	50.00
	Milling	US\$/t	25.00
	G&A	US\$/t	10.00
	Total	US\$/t	85.00
<b>Cut-off grade</b>		<b>g/t Au</b>	<b>2.4</b>

Note: Incremental costs do not include development or contractor equipment leasing costs

### 1.13 MINERAL RESERVE STATEMENT

Mineral Reserves are reported using the 2014 CIM Definition Standards. The estimate has an effective date of July 31, 2021.

The Mineral Reserve estimate for the Project is presented in Table 1-7. Mineral Reserves were prepared by Mr. Felipe Fernandes, who is the Open Pit Advisor for Great Panther Mining, and subsequently reviewed and approved by GPM's COO, Mr. Fernando A. Cornejo.

Factors that may affect the Mineral Reserve estimates include: changes to the gold price assumptions; changes to pit slope and geotechnical assumptions; changes to the assumptions used to derive the stope outlines and the mine plan that is based on those stope designs; unforeseen dilution; changes to hydrogeological, pit and underground dewatering assumptions; changes to inputs to capital and operating cost estimates; changes to operating cost assumptions used in the constraining pit shell; changes to operating cost assumptions used in the constraining MSO designs; changes to pit designs from those currently envisaged; changes to stope designs from those currently envisaged; and changes to modifying factor assumptions, including environmental, permitting and social licence to operate.

**Table 1-7: Tucano Mineral Reserves Estimate as of July 31, 2021.**

Location/area	Proven			Probable			Total Proven and Probable		
	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)
Open pit	2,278	1.44	105	6,951	1.07	240	9,229	1.16	346
Underground	189	3.78	23	1,976	4.17	265	2,164	4.13	288
Stockpile	1,400	0.50	22	0	0	0	1,400	0.50	22
<b>Total</b>	<b>3,867</b>	<b>1.21</b>	<b>151</b>	<b>8,927</b>	<b>1.76</b>	<b>505</b>	<b>12,793</b>	<b>1.59</b>	<b>656</b>

**Notes:**

1. Mineral Reserves were classified using the 2014 CIM Definition Standards.
2. Mineral Reserve Estimates as of July 31, 2021
3. Open pit Mineral Reserves are estimated within designed pits above marginal cut-off grades that vary from 0.40 g/t Au to 0.45 g/t Au for oxide ore and 0.46 g/t Au to 0.50 g/t Au for sulphide ore. Underground Mineral Reserves were estimated using a cut-off grade of 2.4 g/t Au.
4. Mineral Reserves are estimated using an average long-term gold price of US\$1,650/oz and a Brazilian Real (R\$):US\$ exchange rate of R\$5.00:US\$1.00.
5. Mineral Reserves incorporate estimates of dilution and mineral losses.
6. A minimum mining width of 20 m was used for open pit Mineral Reserves and 3 m was used for underground Mineral Reserves.
7. Average metallurgical process recovery: 91.5%.
8. Numbers may not add due to rounding.
9. Numbers may not add due to rounding.

## **1.14 MINING METHODS**

### **1.14.1 OPEN PIT**

The mining method for the open pit operations is via conventional open pit mining with the operations strategy based on the use of a mining contractor. Since 2015, U&M Mineração e Construção S.A. (U&M), has provided Tucano with contract mining services, equipment and labour. In 2022, Minax Transportes e Construções Ltda (“Minax”) was contracted to provide mining services. Initially Minax will operate in parallel with the existing contractor that is scheduled to cease activities at the end of year 2022. Minax will continue through the current LOM plan. Mobilization of the new mining contractor began in Q1 2022 and will continue until end of Q2 2022. The new contractor is a Brazilian company using a new mining fleet, which will contribute to an improvement in overall mine performance.

In addition to earthmoving responsibilities for both waste and ore, the contractors are responsible for production drilling, pre-shear drilling, pit dewatering, ore re-handle, crusher feed, maintenance and supervision of their fleet of equipment. Six pits will be mined in the current LOM plan. TAP AB, TAP C and Urucum (URN & URCS) are currently in operation. Duckhead will be reactivated while URE is undergoing permitting.

Dewatering of pits, in particular the two deepest pits, Urucum and TAP AB, involves pumping from sumps and drainage channels in the pit bottom. Where required, relatively minor pit design revisions are made to incorporate intermediate elevation pit sumps and water collection/diversion ditches on pit highwalls.

The ultimate pit designs incorporate pit slope geotechnical parameters (bench face angle, inter ramp angles, and berm widths) for the oxide and fresh rock by pit sectors, that include haulage ramps, and take into account minimum mining widths based on the open pit mining equipment selected. Haulage ramps were designed at 12 m width for 30 m<sup>3</sup> class trucks and two-way traffic. For the final four benches in the bottom of the final pit design, the haul road was narrowed to 10 m, suitable for a 30 m<sup>3</sup> class truck and single-lane traffic. The maximum ramp gradient is 10%. All roads required a cap of crushed rock to facilitate all-season use. Pits were designed with 4 m operating bench heights.

The mining operations are based on the use of hydraulic excavators and a haul truck fleet engaged in conventional open pit mining techniques. Excavated material is loaded to trucks and hauled to either the run-of-mine (“ROM”), ore stockpiles, or the waste rock storage facilities (“WRSF”s). Ore sent to the ROM is stockpiled in defined areas and separated as either oxide or fresh, within various cut-off grade categories, to facilitate later blending to achieve the desired oxide/fresh rock proportion and grade required by the plant.

Table 1-8: Open Pit LOM Production Schedule

Period	un	Total	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4	2025 Q1	2025 Q2	2025 Q3
<b>Open Pit Mining</b>																			
ROM - Oxide	kt	5310	27	106	147	341	950	677	62	84	285	466	468	674	177	436	241	142	27
ROM - Fresh	kt	4622	95	223	126	269	575	23	116	621	593	470	387	191	244	307	205	147	29
Open Pit ROM Total	kt	9932	122	329	273	610	1525	700	178	705	878	936	855	865	421	744	446	289	56
<b>Stockpile Inventory</b>																			
ROM - Oxide	kt	587	0	0	23	1	29	245	201	0	38	2	29	0	3	18	0	0	0
ROM - Fresh	kt	99	0	0	0	0	16	21	29	0	17	0	1	0	0	14	0	0	0
Stockpile ROM Total	kt	686	0	0	24	1	45	266	230	0	55	2	30	0	3	32	0	0	0
<b>Total ROM, Pit + Stockpile</b>																			
ROM - Oxide	kt	5898	27	106	170	342	979	922	263	84	322	467	497	674	180	454	241	142	27
ROM - Fresh	kt	4720	95	223	127	269	591	44	144	621	610	470	388	191	244	321	205	147	29
Total ROM, Pit + Stockpile	kt	10618	122	329	297	611	1570	966	408	705	932	938	885	865	424	775	446	289	56
Au Grade	g/t	1.14	1.03	1.24	0.84	0.90	1.00	1.04	0.87	1.23	1.28	1.25	1.05	1.00	1.11	1.30	1.33	1.62	5.00
Contained Au	koz	389	4	13	8	18	51	32	11	28	38	38	30	28	15	32	19	15	9
ROM - Oxide Portion	%	56%	22%	32%	57%	56%	62%	95%	65%	12%	35%	50%	56%	78%	42%	59%	54%	49%	48%
Waste – Oxide Rock	kt	54,953	1,209	3,489	3,709	5,804	7,594	4,806	2,111	1,730	3,748	4,500	3,274	3,155	4,268	3,562	1,425	500	69
Waste - Fresh Rock	kt	32,937	1,562	1,866	1,566	2,176	2,154	1,647	3,818	3,944	2,706	1,841	1,350	1,789	2,464	2,243	925	778	108
Waste - Total	kt	87,890	2,770	5,355	5,274	7,980	9,749	6,454	5,928	5,674	6,455	6,341	4,624	4,943	6,732	5,806	2,350	1,278	177
Saprolite Portion	%	63%	44%	65%	70%	73%	78%	74%	36%	30%	58%	71%	71%	64%	63%	61%	61%	39%	39%
Strip Ratio	W/O	8.8	22.6	16.3	19.3	13.1	6.4	9.2	33.3	8	7.4	6.8	5.4	5.7	16	7.8	5.3	4.4	3.2
Total Moved - Oxide	kt	60,851	1,236	3,595	3,879	6,146	8,573	5,728	2,374	1,814	4,071	4,968	3,772	3,829	4,447	4,016	1,665	642	96
Total Moved - Fresh	kt	37,657	1,657	2,089	1,692	2,446	2,745	1,692	3,962	4,565	3,317	2,311	1,738	1,980	2,708	2,565	1,130	925	137
Grand Total Moved	kt	98,508	2,893	5,684	5,571	8,591	11,318	7,420	6,336	6,379	7,387	7,279	5,509	5,808	7,156	6,581	2,796	1,567	233
Oxide portion	%	62%	43%	63%	70%	72%	76%	77%	37%	28%	55%	68%	68%	66%	62%	61%	60%	41%	41%
Open pit mining rate	ktpd	65	47	62	62	94	123	78	68	70	80	79	60	64	78	71	31	17	3
<b>Plant Feed</b>																			
Plant Feed from Pit	kt	9,932	115	301	309	539	890	893	692	676	907	900	891	860	426	744	446	289	56
Plant Feed from Stockpile	kt	1,400	492	609	299	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant Feed - Oxide	kt	6,710	514	694	472	295	490	770	475	76	292	432	503	669	182	436	241	142	27
Plant Feed - Fresh	kt	4,622	93	216	135	244	400	123	217	600	615	469	388	191	244	307	205	147	29
Total Plant Feed	kt	11,332	607	910	607	539	890	893	692	676	907	900	891	860	426	744	446	289	56
Au Grade	g/t	1.08	0.60	0.77	0.66	0.95	1.32	1.02	0.60	1.26	1.30	1.28	1.04	1.00	1.11	1.33	1.33	1.62	5.00
Oxide Feed Portion	%	59%	85%	76%	78%	55%	55%	86%	69%	11%	32%	48%	56%	78%	43%	59%	54%	49%	48%
Nominal Rate per Cal Day	tpd	7,446	9,956	9,892	6,750	5,918	9,674	9,702	7,691	7,424	9,858	9,784	9,789	9,450	4,634	8,083	4,956	3,177	606
Plant Availability	%	75%	100%	99%	68%	59%	97%	97%	77%	74%	99%	98%	98%	95%	46%	81%	50%	32%	6%
Feed Rate, Plant Avail 92%	tpd	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

A quarterly pit production schedule was generated with the objective of meeting a nominal processing rate of 10,000 t/d at an average 93% annual plant availability. The LOM mining rate averaged approximately 52,265 t/d. The maximum mining rate was about 122,647 t/d. The open pits are scheduled to operate 365 days per year, 24 hours per day. The U&M work schedule assumed four crews working three 8-hr shifts.

The open pit, Reserve estimate gave a remaining three-year mine life, to Q3 2025. The Life of Mine (“LOM”) schedule for open pit mining based on current Mineral Reserves are presented in Table 1

### **1.14.2 UNDERGROUND**

The mining method for the underground operations at URN assumes the use of up-hole retreat or longitudinal retreat longhole open stoping (Avoca) methods, with the operations strategy based on the use of a mining contractor, using contract mining equipment and labour.

Barton’s rock quality index (Q), the modified Q value (Q’), and Bieniawski’s rock mass rating (RMR) classifications were used to estimate the stable spans for stopes and development, and ground control requirements. Data analysis indicated that there was little difference in rock mass condition between the hanging wall and backs of the stopes or between different locations within the orebody. The same rock mass classification was used for each zone and location. Ground control requirements should be light as ground conditions are expected to be good. Minimal groundwater inflows were expected in the underground mine. Dewatering infrastructure will consist of a series of sumps along the declines.

The mine layout is based on the following criteria:

- Twin declines accessing the north and south parts of the deposit;
- Portal situated on the north side of the URN open pit;
- North and south exhaust ventilation raises;
- 20 m sublevel interval;
- Stopes accessed by a footwall drive and crosscuts on every sublevel;
- Decline development initiates in Year 1;
- Mine plan targets Measured, Indicated and Inferred Mineral Resources down to RL -500 m (750 m below surface).

Approximately 2.1 Mt of ore at an average grade of 4.1 g/t Au will be mined and processed over the 6.5 mine life. An evaluation of the planned production rate and scheduling indicates that the deposit supports 450,000–500,000 t/a. Production rates will vary from year to year depending on the number of production fronts available in different areas of the mine.

Ventilation will be a pull-type (exhausting) system.

The underground mine would use some of the existing infrastructure built for the open pit operations such as the explosives magazines and warehouse. Additional surface infrastructure will include ventilation fans, mine dry change rooms, lamp room, office facilities, workshop, and mine rescue centre. Underground infrastructure will include electric compressors, power and communications distribution circuits, emergency egresses, and equipment service bays.

## 1.15 RECOVERY METHODS

The process flowsheet is based upon unit operations that are well proven in the gold mining industry. The flowsheet consists of a primary jaw crusher feeding a SAG mill/ball mill (“SAB”) grinding circuit. The ground ore is thickened prior to being treated in a “hybrid” CIL plant consisting of a single pre-leach tank followed by a six-tank CIL and carbon elution circuit, followed by detoxification of tailings. The design is currently based upon mining and processing of 3.6 Mt/a of ore and treating a blend of ore which is predominantly (70%) of the harder sulphide ore type.

The plant will require 17 MW when treating fresh rock ore, and about 15.5 MW when the mill feed is 30% oxide, 70% fresh rock. Process water is sourced from the Tailings Storage Facility (“TSF”), raw water is sourced from William Creek, and potable water is sourced from treated raw water. Process consumables are conventional for gold operations.

Tucano will be processing around 3.0 Mt/a of ore and treating a blend of ore which is predominantly (50%) of the harder sulphide ore type.

### 1.15.1 PROJECT INFRASTRUCTURE

Surface infrastructure to support the current operations is in place and includes: open pits; Waste Rock Storage Facilities, (“WRSFs”); TSF; processing facilities; mine operational / heavy equipment support facilities; central mine planning and administration building and mine operational support areas. (medical facility; geology, survey, mining engineering, supply, environment, and safety offices; core shed and exploration sample preparation facility; security office and security gate; nursery). More detailed information on infrastructure is outlined in Section 18.

Additional infrastructure as outlined in Section 1.14.2 and Section 18 will be required to support the planned underground operations.

The WRSFs are located as close as practicable to the open pits to minimize haul distances and haul truck cycle time for each pit phase, considering the pit waste disposal requirements, access road and facility layout, and geotechnical parameters. The WRSFs are constructed in a bottom-up configuration consisting of 10 m vertical lifts. The designed capacities of the WRSFs have sufficient capacity to accept the entire waste rock volume that will be mined from the open pits.

Two TSF systems are currently in operation; the NMP facility (integrated NMP and WPP1) and East Dam to level 137 metres above sea level. (“masl”). The tailings storage capacity is being extended with an increase in the East Dam to level 145 masl. Engineering studies are also underway for the West Pond Phase 2 (WPP2) and other potential options. On commissioning three new TSFs, East Dam, East–NW Extension and WPP2, there will be sufficient TSF capacity to store tailings until 2027 at a 3.5 Mt/a throughput rate.

Process water consists of recycled and other waste streams used in the process, including return water from the TSF. Raw water is sourced from William Creek, and sent to a water collection dam and used for the cooling system of the grinding mill motors or to a potable water treatment facility.

The Tucano Gold Mine power requirements are provided by two sources:

- 69 kVA, 20 MVA power line via CEA Equatorial;

- 12 MW continuous rated Aggreko diesel-powered generation system.

A progressive strategy for the upgrade of the power line and transformers of the CEA Equatorial line from 1.8 MW to 11.7 MW is planned but with the privatization of the state electrical authority, CEA, last year the study is under review by the new controllers.

Personnel living in Amapá account for approximately 80% of the workforce. Most of the workforce live in towns near the mine site with transport to Serra do Navio and Pedra Branca do Amapari provided by Great Panther daily. Personnel from Macapá also have transport provided by buses on a weekly basis. Managers and professional staff either commute weekly from the state capital Macapá, or from other cities in Brazil on a fly-in-flyout basis. There is a 142-person accommodation camp at the mine site.

## **1.16 ENVIRONMENTAL, PERMITTING AND SOCIAL CONSIDERATIONS**

### **1.16.1 ENVIRONMENTAL CONSIDERATIONS**

A complete environmental study, permitting, and social/community impact assessment was prepared by SRK Consultores do Brasil Ltda (SRK Brazil) in support of the planned operations in 2011. They also developed an Environmental Control Plan (PCA) to support environmental and social controls. The PCA covered the environmental aspects of mining, monitoring and management plans, and provided guidance on implementing various programs in the local communities.

Great Panther has a number of monitoring or rehabilitation programs in place. These include groundwater and surface water, fauna, air quality and noise monitoring, sedimentation control, and rehabilitation programs.

### **1.16.2 CLOSURE AND RECLAMATION PLANNING**

Mineral Engenharia e Meio Ambiente Ltda (MEMA), a third-party consultant reviewed and updated the operations closure plan in December 2020 with the inclusion of the Duckhead mine and an update of costs. Closure assumes equipment and facilities dismantling, reclamation of degraded areas and environmental monitoring during (active phase) and after closure (passive phase).

Closure costs were updated in 2021 and are estimated at US\$17.3 million.

### **1.16.3 PERMITTING CONSIDERATIONS**

All licences required for the operation of Tucano Gold Mine, mill, processing plant and constructed TSFs (including the East Dam RL 137 m) have been obtained or applications for renewals have been filed. Further permitting will be required for additional TSFs.

Great Panther expects to both receive and maintain all licensing requirements to support production during the LOM plan.

For implementation, the underground project will require a simplified environmental impact study, as it is within the current operational area, and an operating license. Work has been initiated on the first which is a requirement for the application for the Operational License.

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#### **1.16.4 SOCIAL CONSIDERATIONS**

As part of the Operation Licence requirements, Great Panther annually contributes capital to the Social and Environmental Compensation Funds of the local municipalities of Pedra Branca and Serra do Navio.

Great Panther actively engages with the local communities to create and maintain mutually beneficial relationships founded on understanding and optimizing the benefits the operations can have on regional development. Community relations personnel employed by Great Panther implement broad stakeholder engagement and social investment programs that focus on three main areas: socio-economic development, public health and safety, and education.

#### **1.17 MARKETS AND CONTRACTS**

No market studies are currently relevant as Tucano is an operating mine producing a readily saleable commodity in the form of doré. A contract is in place for doré sales. Silver credits are received from the refiner. Penalties can be applied in the refining contracts for any impurities; however, these are rare occurrences, and the penalties have not been excessive. The terms and conditions of refining and transportation agreements are considered to be within industry norms.

Commodity prices used in Mineral Resource and Mineral Reserve estimates are set by Great Panther's corporate group, and are based on short term and life of mine outlook for the gold price based on the opinion and after consultation, with finance and investment specialists. The current gold price provided for Mineral Reserve estimation is \$1,650/oz, and \$1,900/oz for Mineral Resource estimation. Exchange rate assumptions used in the economic analysis that support the Mineral Reserves is US\$1:BR\$5.

Major contracts include; contractor mining, equipment support, RC drilling, fuel supply, power generators, security, catering, assays, personnel transport, and refining. The various contracts were awarded following a competitive bidding process. Prices are within the industry range and comparable to other operations in Brazil. Contracts are negotiated and renewed as needed.

##### **1.17.1 CAPITAL COST ESTIMATES**

Capital and operating cost estimates are based on the LOM schedule as of July 31, 2021 which is based on mining and processing existing Mineral Reserves from open pit and stockpile sources. The LOM plan assumes contractor-operated open pit mining operations until the third quarter of 2025. Technical studies are being executed on the URN underground project with the objective of complimenting the open pit feed with higher grade underground feed.

Tucano is an operating mine; operating and capital costs are primarily based on actual operating and capital costs.

The open pit capital costs reflect those costs required to maintain the operations during the LOM plan (Table 1-9). The capital costs estimated for the open pit and tailings dam operations totals US\$11.2 million. The cost includes TSF expansion for both open pit and underground processing, power line upgrade, and contractor shop, plant and environmental improvements.

Table 1-9: Open Pit and TSF Capital Cost Estimates

Great Panther Mining Limited – Tucano Gold Mine					
Area	Unit	Total	Y1	Y2	Y3
Tailings dam expansions	US\$ 000	<b>7,796</b>	4,512	3,284	
Plant improvements	US\$ 000	<b>600</b>	400	200	
Mine Improvements	US\$ 000	<b>967</b>	717	250	
Environmental improvements	US\$ 000	<b>343</b>	173	170	
Power line	US\$ 000	<b>550</b>	250	200	100
Others	US\$ 000	<b>950</b>	500	250	200
Total open pit capital cost	US\$ 000	<b>11,206</b>	6,552	4,354	300

Underground capital lateral development is expected to cost approximately US\$25.3 million over the LOM. This cost excludes material handling costs, power, and diesel costs which have been allocated to operating costs. The underground infrastructure capital cost estimate is US\$12.0 million. Costs are based on supplier quotations and unit rates from past experience with similar projects. These numbers are being re-evaluated as part of the ongoing technical studies initiated in 2022. The underground infrastructure costs largely consist of electrical reticulation, ventilation, and dewatering system costs. They do not include mobile equipment capital costs which are included within rates for contractor development and production mining. The total underground capital cost estimate is provided in Table 1-10.

Table 1-10: Underground Capital Cost Estimates

Area	Unit	Total	Y1	Y2	Y3	Y4	Y5	Y6
Underground lateral development	US\$ 000	<b>25,290</b>	1,990	6,280	6,280	6,270	4,280	190
Underground infrastructure	US\$ 000	<b>12,010</b>	2,730	3,670	3,350	2,170	90	—
Surface infrastructure	US\$ 000	<b>13,030</b>	7,080	3,820	1,010	770	350	—
<b>Total</b>	<b>US\$ 000</b>	<b>50,330</b>	<b>11,800</b>	<b>13,770</b>	<b>10,640</b>	<b>9,210</b>	<b>4,720</b>	<b>190</b>

## 1.18 OPERATING COST ESTIMATES

LOM operating cost estimates include on-site and off-site costs:

- On-site: mining, process plant operating and maintenance, and G&A costs;
- Off-site: doré bullion transport and refining charges, and royalties.

Open pit operating costs are summarized in Table 1-11 and average US\$2.81/t moved. Costs are sourced from actual 2020 / 2021 operating costs and the unit mining costs defined in mining contracts. These costs include those of operating the equipment, the labour associated with operating the mine, the cost for explosives and diesel, as well as pit dewatering, road maintenance, and other activities.

**Table 1-11: Annual Open Pit Operating Cost Estimates**

Area	Unit	LOM	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023	2024	2025
Mining (OP)	US\$/t moved	2.81	2.48	3.43	2.78	2.48	2.52	2.51	2.58	7.07
Mining (OP)	US\$/t feed	26.62	26.82	33.65	44.94	32.11	21.78	22.18	22.26	41.59
Processing	US\$/t feed	17.77	15.28	18.76	21.11	15.06	15.30	16.50	18.01	29.57
G&A	US\$/t feed	2.21	1.54	2.36	2.65	1.62	1.56	1.93	2.10	7.49
Total	US\$/t	46.6	43.64	54.77	68.70	48.79	38.64	40.61	42.37	78.65

The underground operations are assumed to use a contractor for all development and production throughout the underground LOM. Underground mobile equipment costs are included in the contractor rates for development and production mining. LOM mining costs are estimated to be US\$50.00/t of ore milled and total operating costs, inclusive of processing and G&A, are estimated to be US\$75.80/t of ore milled. Underground operating cost estimates are provided in Table 1-12.

**Table 1-12: Annual Underground Operating Costs**

Year	Operating Cost (\$ M)
Year 1	2.3
Year 2	22.7
Year 3	30.7
Year 4	36.3
Year 5	29.6
Year 6	31.4
Year 7	8.8
<b>Total</b>	<b>161.8</b>

## 1.19 ECONOMIC ANALYSIS

Great Panther is using the provision for producing issuers, whereby producing issuers may exclude the information required under Item 22 for technical reports on properties currently in production and where no material production expansion is planned.

## 1.20 RISKS AND OPPORTUNITIES

The greatest opportunity at Tucano arises out of the limited exploration carried out by previous operators, both within the mine sequence and more importantly within a 20-kilometer radius of the Tucano mine plant.

Shallow exploration drilling along the mine sequence continues to increase the Mineral Reserve estimate. Deeper drilling beneath the URN pit has demonstrated the continuity of a high-grade (+6 g\*m Au) zone.

Mapping of zones of high-grade within historic data from mined portions of the Urucum - TAP C trend, together with limited deeper drilling, indicates several plunging high-grade zones along this trend. The down plunge extensions of these high-grade zones, require testing.

In 2021, Great Panther carried out extensive (+700 line kilometers) multi-element soil sampling programs over high potential exploration corridors defined in 2020, mostly within a 20 km radius of the Tucano plant. Results of this program are being received and interpreted. Prioritized exploration targets will be drill tested in the second half of 2022.

Permitting is a significant risk to scheduling. This can affect the timing of projects such as the TSF expansion, licensing of URE or the URN underground projects. In exploration programs it may cause delays in access to and detailed resource drilling of targets defined by the regional exploration programs.

Geotechnical conditions are in general good and can be managed, however the mine sequence has been deeply weathered and structurally deformed. As mining pits expand the probability of encountering areas of poor stability increase. However, the company's awareness of these issues is also increasing and pre-emptive steps are being built into general mining procedures.

## **1.21 INTERPRETATION AND CONCLUSIONS**

An economic analysis was performed in support of estimation of the Mineral Reserves; this indicated a positive cash flow using the assumptions detailed in this Report.

## **1.22 CONCLUSIONS AND RECOMMENDATIONS**

Great Panther increased the LOM of the open pit Mineral Reserves from the end of 2023 to 2025.

In part the increase in Mineral Reserves is due to the increase in gold price from \$1500/oz Au (used in September 30, 2020) to \$1650/oz Au. It was also due to a better understanding of the mineralization. The main mineralization trend is well defined with excellent continuity, however the multiple, economically mineralized lenses within the zone are more erratic and less continuous. As the pits become larger the presence of marginal ore within the mineralization trend or in hanging wall and/or footwall zones, become increasingly important. This material has to be removed, but in contrast to non-mineralized waste, it has an economic value that offsets may cover processing costs. Delineation of these zones led to a significant increase in mass, slight increase in overall ounces with a reduction in average grade. The higher-grade zones still exist but the amount of low-grade material added has reduced the average grade. Identification of the lower grade lenses or haloes will improve mine planning allowing optimal extraction of the mineralization.

The URN underground Mineral Reserves and Mineral Resources have not changed. In late 2020 the Company initiated drilling in the URN open pit area. Initially to test continuity of near surface high-grade gold zones for inclusion in the URN open pit plan. As drilling progressed and continuity of the zones became more evident, deeper drilling to test high-grade mineralization within the underground mine model was carried out. After the initial 8,000m program in the second half of 2021, an additional 11,000m program was initiated, scheduled for completion in the second quarter of 2022. In parallel, technical studies and permitting programs are underway on the URN underground project. These studies are critical

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to developing a detailed schedule to include the URN underground high-grade zone in the LOM plan and demonstrate the potential and importance, similar underground, high-grade zones along the mine sequence may have.

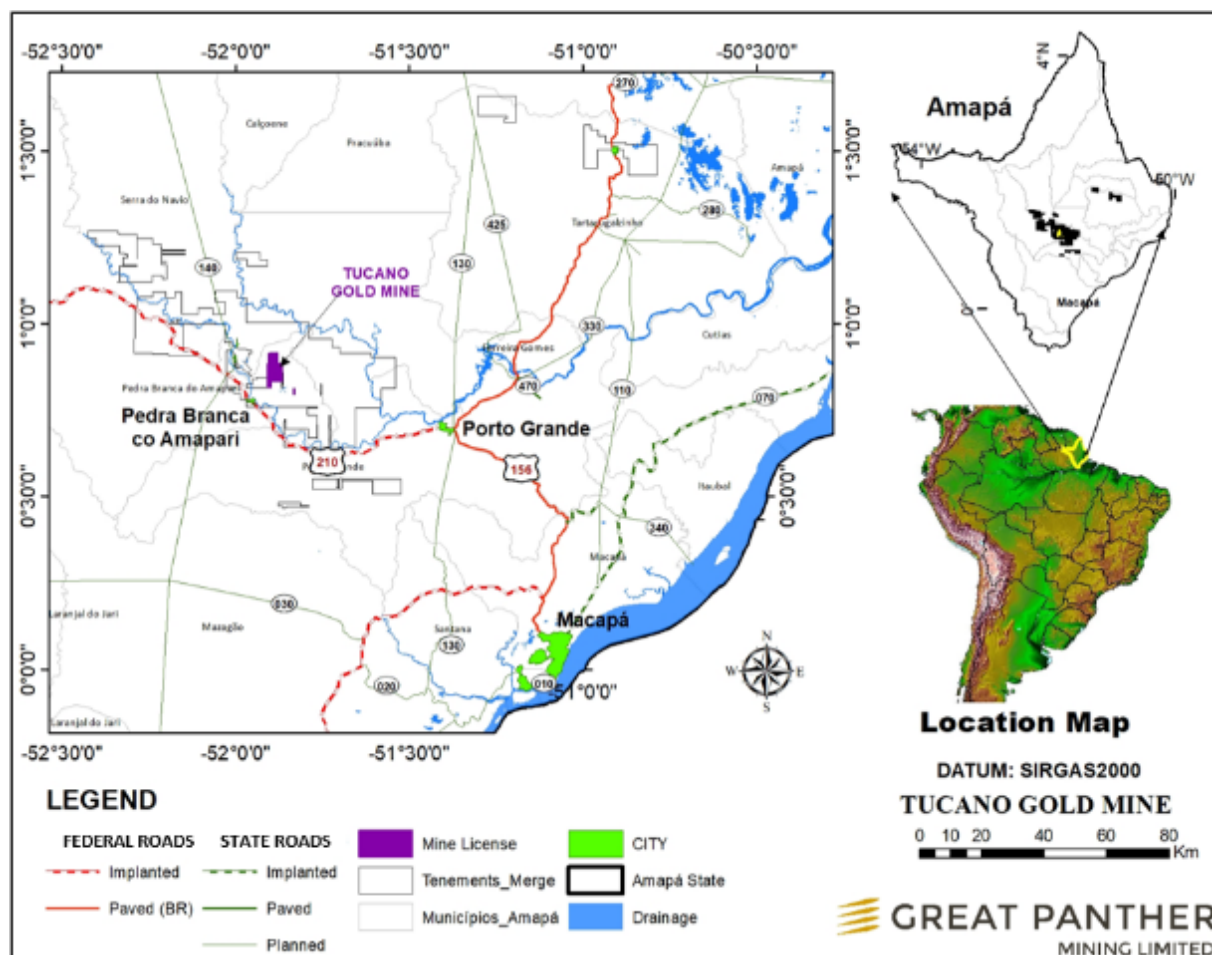
The data generated by Great Panther and supporting the 2021 MRMR Estimation meets industry standards for quality assurance and quality control. It is evident that all operational groups within Tucano are striving for constant improvement, which combined with increasing interaction between the groups, leads to improved processes and performance. Critical areas for improvement are improvements in the interpretation of lithology and alteration models, in particular relogging of the key zones of historic drill holes in areas of interest, improved capture and correlation of bench mapping with drill information and constant/regular updating of the wireframes and block models.

## 2. INTRODUCTION

### 2.1 INTRODUCTION

Collectively the Qualified Persons (QPs), prepared a technical report (this Technical Report) on the Tucano Gold Operations, Amapá State, Brazil (the Tucano Operations or the Project) for Great Panther Mining Limited (Great Panther).

The Project location is shown in Figure 2-1.



Great Panther holds a 100% interest in the Project through its wholly owned Brazilian subsidiaries, Mina Tucano Ltda., Tucano Resources Ltda., Mineração Serra de Canga Ltda. and Mineração Vale dos Reis Ltda who control the mining concession and exploration rights. The name “Tucano” is used interchangeably to refer to the parent and subsidiary companies.

## 2.2 TERMS OF REFERENCE

The Report was prepared to support the disclosure in Great Panther's news release dated April 26, 2022, entitled, "Great Panther Announces Updated Mineral Reserve and Mineral Resource of Estimates for the Tucano Gold Mine".

Units used in the Report are metric units unless otherwise noted. Monetary units are in United States dollars (US\$) unless otherwise stated. The currency in Brazil is the Real (BR\$).

Mineral Resources and Mineral Reserves are reported in accordance with 2014 CIM Definition Standards. Mineral Resources and Mineral Reserves were estimated in accordance with the 2019 Best Practice Guidelines.

## 2.3 QUALIFIED PERSONS

The following (table 2-1) serve as the qualified persons for this Technical Report as defined in NI 43-101, and in compliance with Form 43-101F1:

Table 2-1: Responsibilities of Qualified Person and Experts

Qualified Person	Position	Employer	Independent of Great Panther	Date of Last Site Visit	Professional Designation	Chapters in Technical Report
Mr. N. Winer	Vice-President Exploration	Great Panther Mining	No	March 2022	FAusIMM	Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 20, 24, 25, 26, 27
Mr. C. Pires	Snr. Resource Modeler/Geologist	Great Panther Mining	No	Tucano Mine employee	FAusIMM (CP)	Chapters 1, 10, 11, 12, 14
Mr. F. Cornejo	Chief Operating Officer (COO)	Great Panther Mining	No	March 2022	P.Eng.	Chapters 1, 2, 3, 13, 15, 16, 17, 18, 19, 20, 21, 25, 26
<b>Other Experts who assisted the Qualified Persons*</b>						
Expert	Position	Employer	Independent of Great Panther	Visited Site		Chapters in Technical Report
Mr. Felipe Fernandes	Corporate Manager: Open Pit Lead Advisor	Great Panther Mining	No	Tucano Mine employee		Chapters 15 & 16
Mr. Emerson Nogueira	Operations Manager	Great Panther Mining	No	Tucano Mine employee		Chapters 13 & 17
Mr. Marcus Cavalcanti	Administrative Manager	Great Panther Mining	No	Tucano Mine employee		Chapters 21
Mr Diogo Brandani	Corporate Manager: TSFs	Great Panther Mining	No	Tucano Mine employee		Chapter 18
Mr Raimundo Junior	Environmental Coordinator	Great Panther Mining	No	Tucano Mine employee		Chapter 20
Mrs. Mariana Fregonese	Vice-President Sustainability	Great Panther Mining	No	Great Panther Mining		Chapter 20

Mr. Fabio Marques	Director	Great Panther Mining	No	Tucano Mine Employee	Chapters 4, 5 and 6
<i>* In addition, several employees of Great Panther Mining provided information and data to the qualified persons</i>					

## 2.4 SITE VISITS AND SCOPE OF PERSONAL INSPECTION

The dates of each of QP's most recent personal inspection of the Tucano Gold Mine (site visits) were as follows:

- Mr. Fernando Cornejo – March 28 to March 31, 2022
- Mr. Nicholas Winer – March 14, to March 30, 2022,
- Mr. Carlos Pires is a senior employee of the Tucano Gold Mine, based on-site

## 2.5 EFFECTIVE DATES

There are a number of effective dates pertinent to the Report, as follows:

- Database close-out date for drilling and data entry: July 31, 2021;
- Effective date of the Mineral Resource: July 31, 2021;
- Effective date of the Geotechnical evaluation of URCS: March 1, 2022;
- Effective date of the economic analysis that supports the Mineral Reserve estimate: July 31, 2021;

The overall Report effective date is taken to be the date of the economic analysis that supports the Mineral Reserve estimate and is July 31, 2021.

## 2.6 INFORMATION SOURCES AND REFERENCES

Reports and documents listed in Section 3 and Section 27 of this Report were used to support preparation of the Report. Additional information was provided by Great Panther personnel as requested. Supplemental information was also provided to the QPs by third-party consultants retained by Great Panther in their areas of expertise.

Information pertaining to surface rights, royalties, environmental, permitting and social considerations, marketing and taxation were sourced from Great Panther experts in those fields as required.

## 2.7 PREVIOUS TECHNICAL REPORTS

Great Panther has previously filed the following technical reports on the Tucano Operations:

- Wolfe, B., Spicer, N., Batelochi, M., Lacourt, R., Moreno, J., O'Bryan, P., Walton, R., and Methven, G., 2018: Technical Report, Mineral Resource and Mineral Reserve Update for the Tucano Gold Mine:

report prepared by AMC Consulting for Great Panther Silver Limited, effective date 11 May, 2018 (the 2018 Technical Report).

- Pressacco, R., Cox, J.J., Andric, G., Cornejo, F.A., Hepworth, N., and Batelochi, M.A., 2019: Technical Report on the 2019 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapá State, Brazil: report prepared by RPA Consulting for Great Panther Mining Limited, effective date 31 December, 2019 (the 2019 Technical Report).
- Pires, C.H.B., Cornejo, F.A., Hepworth, N., Winer, N., Pressacco, R., and Ciuculescu, T., 2020: Amended and Restated Technical Report on the 2020 Mineral Reserves and Mineral Resources of the Tucano Gold Mine, Amapa State, Brazil: report prepared for Great Panther Mining Limited, effective date 20 (the 2020 Technical Report).

## **3. RELIANCE ON OTHER EXPERTS**

### **3.1 INTRODUCTION**

The Tucano Gold Mine is an operating gold mine purchased by Great Panther in March 2019. The mine is a well established open pit operation that has produced approximately 1,455,000 ozs since commencing operations in 2005. The Company has its own Administrative and Finance areas who have provided the information in Sections 4, 19, 21, (Royalties, Marketing, Operating costs etc). Lawyers are retained to manage all legal aspects of the operations including mineral rights, surface rights, and property agreements. The QPs have relied upon the following other expert reports and evaluations, which provided information regarding

- Tenements: FFA Legal, retained to manage, advise and represent the Company.
- Geotechnical studies: SRK Consulting International (in course) & Knight Piésold & Co.
- Mine Closure Plan: Mineral Engenharia e Meio Ambiente Ltda (MEMA)

### **3.2 MINERAL TENURE, SURFACE RIGHTS, AND ROYALTIES**

The operating mines at Tucano are located within the Mining Concession 851.676/1992 granted on April 13, 2004. URE and Duckhead deposits are not in operation. URE lies within an application for a Mining Concession (Proc: 850.865/1987) and Duckhead an active Mining Lease, (Proc: 858.079/2014), granted on October 23, 2014 and valid until October 15, 2044. Great Panther retains the specialised legal and mineral tenure consultants, FFA Legal based in Rio de Janeiro to monitor, advise and represent Great Panther in matters related to its mining tenure, and extensive portfolio of exploration licenses, including representation before the relevant authorities with respect to maintaining compliance on the portfolio.

Surface rights are managed by Mina Tucano Ltda., by its Social/Environmental department at Tucano, while Royalties are managed through the Mina Tucano Finance department in Rio de Janeiro. The QPs have fully relied upon the information derived from these consultants and employees, in their areas of expertise.

This information is used in Section 4 of this Technical Report. It is also used in support of the Mineral Resource estimate in Section 14, the Mineral Reserves estimate in Section 15, and the financial analysis in Section 22.

### **3.3 ENVIRONMENTAL, PERMITTING AND SOCIAL**

The QPs have fully relied upon the experts within Mina Tucano Ltda's., Environmental / Social department at Tucano and Mina Tucano's Legal Counsel, who prepared the information used in Section 20 of this Technical Report.

This information is also used in support of the Mineral Resource estimate in Section 14, the Mineral Reserves estimate in Section 15, and the financial analysis in Section 22.

### **3.4 TAXATION**

The QPs have fully relied upon information supplied by external and internal experts retained by Great Panther for information related to taxation as applied to the financial models.

This information is used in the financial analysis in Section 22, and in support of the Mineral Reserves estimate in Section 15.

## 4. PROPERTY DESCRIPTION AND LOCATION

### 4.1 INTRODUCTION

The Tucano Operations are located in Amapá State, Brazil, at latitude 0.85°N and longitude 52.90°W, approximately 200 km from Macapá, the state capital.

Access is by road from the capital, Macapá to Porto Grande, approximately half-way, followed by an all-weather gravel road from Porto Grande to Pedra Branca (Figure 4-1). Tucano can also be reached by small plane from Macapá. Pedra Branca has a 1,200m long gravel strip and the mine is served by a 1,100m gravel strip.

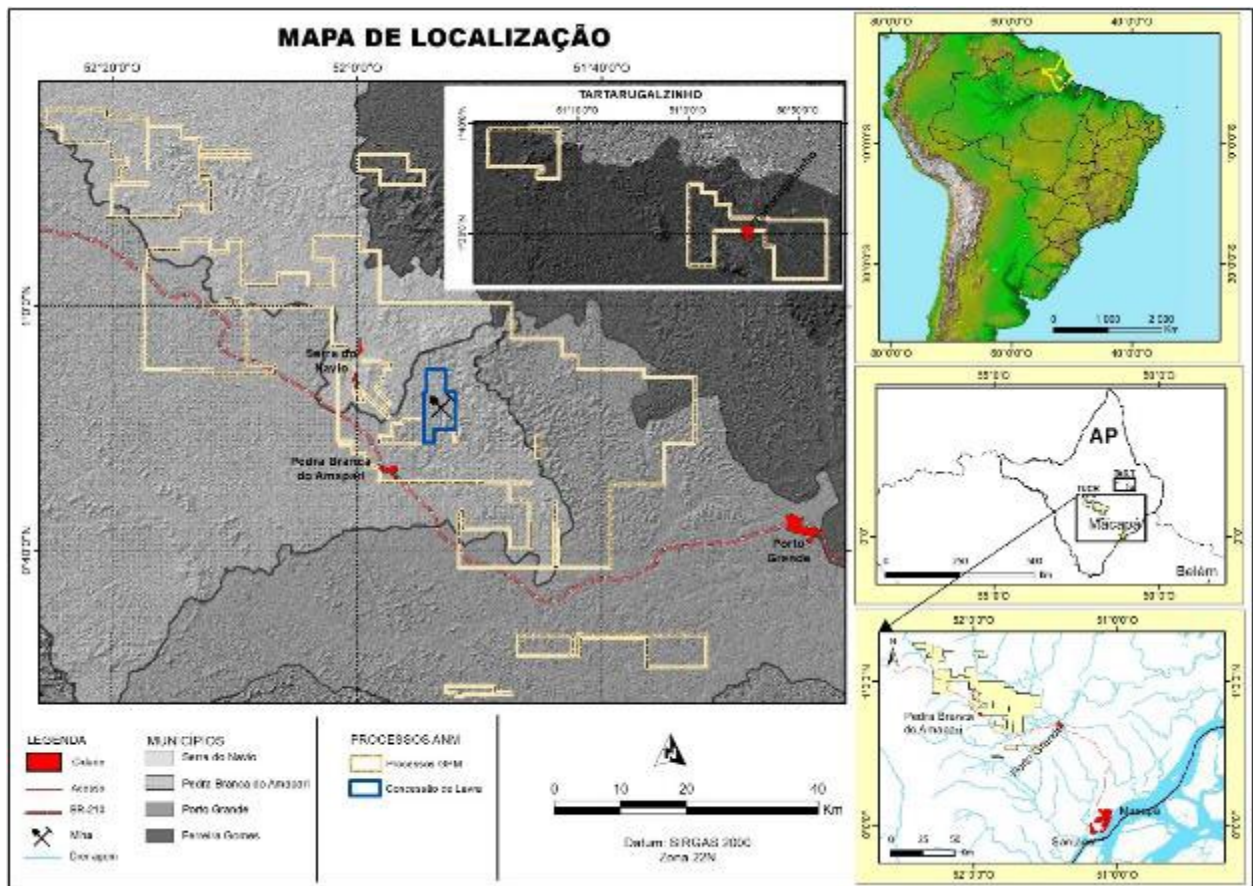


Figure 4-1: Tucano Area of Interest Location Map

## **4.2 PROPERTY AND TITLE IN BRAZIL**

### **4.2.1 OVERVIEW**

Under the Brazilian Constitution, the Federal Government owns all mineral resources. Mineral rights are distinct from surface rights. The Brazilian mining sector is governed by the 1967 Mining Code and Mining Regulations that came into force in December 2017 together with other regulations issued by the National Mining Agency (“ANM”) as required.

Brazil also has legislation and legal guarantees related to the exploitation and use of water rights.

### **4.2.2 MINERAL TITLE**

There are two levels of mineral tenure: exploration licences and mining concessions.

Exploration licenses may be granted for a period of 1–3 years, for specific commodities as requested by the applicant. If a positive exploration report is submitted, the license may be extended for a period, equal to or less than the original period. A granted exploration licence provides the licence holders with the right to undertake exploration activities.

Prior to initiating field activities, the license holder must have an agreement in place with surface owners, if not on crown land. In Amapá, the holder is also required to obtain an Operational License for Exploration, (Licença Operacional para Pesquisa, (“LOP”)). This is emitted by the Secretaria de Estado do Meio Ambiente e Recursos Naturais (SEMA), the state environmental authority.

The exploration licence is a preliminary stage granted to the applicant to explore for and discover a mineral deposit that can be converted to mineral resource or reserve. The exploration license provides the holder, on discovering a mineral resource or reserve to apply for a mining concession. Provided that the holder meets all mine permitting and environmental impact study requirements the application will be approved.

The following obligations must be complied with:

- Start exploration within 60 days, counted from the date of publication of the licence or from the date access to the relevant properties is obtained;
- Inform and notify the ANM of any discoveries of mineralization with commodities that were not included in the titleholder’s list of authorized commodities;
- Not interrupt the exploration activities without reason for more than three consecutive months or for more than 120 non-consecutive days during the license term;
- Pay all relevant fees, particularly the annual land tax;

- Request approval from the ANM (i.e., an extraction permit) before removing any substances from the license area for analysis or test work;
- Pay any required compensation to the surface owner or possessor;
- Prepare and present a final exploration report to the ANM. This may be a negative report if exploration results were not satisfactory or a positive report if there is an indication of a mineral resource or reserve.

Once a positive exploration report is approved by the ANM, the licence holder has a year to apply for a mining concession.

The application must contain, among other things, a detailed economic viability study setting out:

- a description of the operations to be undertaken;
- projects or drafts relating to the method of operation to be adopted and production scale, including lighting, ventilation, logistics, signage, workplace health and safety, transportation and storage of the minerals, power, water and air supplies, and hygiene measures for the mine and the mining operation;
- rescue and retrieval plans;
- plan for control of the environmental impacts in the mining operations;
- plan for the mine closure;
- installation licence issued by the relevant State environmental agency.

Once the ANM approves the mining concession, it will be granted by publication in the Federal Gazette and registered with the ANM, or by gazetted order of the Minister for Mines and Energy.

Within 90 days of the publication, the holder must apply for possession (emissão da posse) of the surface area that is required to enact the Economic Development Plan. The ANM will then draft an “Access Term” that must be signed by all stakeholders. If an agreement is not already in place, the owner of the surface area is entitled to royalties that are equivalent to 50% of the amount paid as the Compensation for the Exploitation of Mineral Resources (Compensação Financeira pela Exploração de Recursos Minerais or “CFEM”).

Work must commence within six months of the granting of the mining concession. Annual production reports must be filed. Assuming all other conditions are met, mining concessions remain valid until the deposit is depleted.

The holder can conduct mining activities only in the area covered under the concession agreement after the agreement has been registered with the ANM, and the appropriate Operating License (Licença de Operação) is issued. If additional minerals are discovered, the mining concession must be amended to include the new list of minerals.

### **4.2.3 SURFACE RIGHTS**

Surface rights in Brazil are separate from mineral rights. Under the mining law, mining rights holders have the right to use and access areas that are planned for exploration or exploitation. Rights of way and easements can be granted to mining rights holders over public and private lands.

Typically, the mining rights holder enters into an agreement with the affected surface rights holder in return for a compensation fee for the land use. Where disputes arise, a mining rights holder may apply for a local court order to allow a judge to establish the appropriate compensation fee to be paid to the surface rights holder.

Great Panther holds all surface rights required to support the life-of-mine (LOM) plan (Figure 4-2 below).

Where exploration activities are conducted on ground where some form of surface rights exist, Great Panther may secure access through a combination of rights-of-way, leases and disturbance compensation agreements. The majority of the exploration areas cover uninhabited tracts of land that belong to the State.

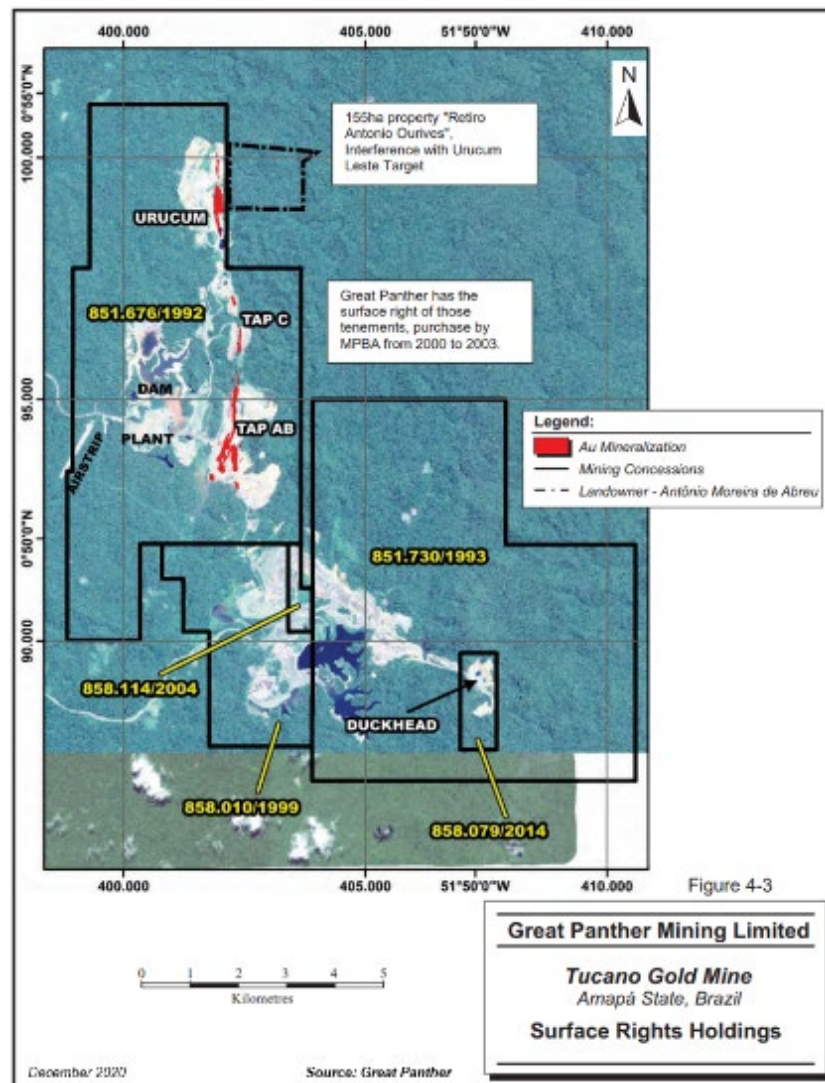


Figure 4-2: Surface Rights

#### 4.2.4 WATER RIGHTS

All water bodies are considered to be in the public domain, and are separated into:

- Federal water bodies: lakes, rivers and any water courses on lands under Federal authority; those that flow through more than one State; those that serve as a frontier with another country, or flow into or originate in another country; as well as marginal lands and riparian beaches.

- State water bodies: Groundwater and rivers located entirely within the territory of a single State, unless classified as a Federal water.

All rivers within the Tucano project area are State water bodies.

Law 9,433 of 1997 established the National Water Resources Policy (NWRP), created the National Water Resources Management System (NWRMS), and defined a catchment (river) basin as the unit for water resource planning. The law includes the principle of multiple water uses, thereby putting all user categories on an equal footing for access to water resources.

The organizational framework administering water includes the National Water Resources Council (NWRC), State Water Resources Councils (SWRCs), River Basin Committees (RBCs), State Water Resources Management Institutions (SWRIs) and Water Agencies (WAs).

In 2003, to facilitate the management of Brazilian water resources, the country was divided into 12 hydrographic regions; however, these do not coincide with the 27 state political divisions. The NWRC is responsible for resolving disputes over use of water for basins at the Federal level, and for establishing guidelines necessary to implement the institutional framework and instruments contained in the NWRP. The SWRCs are responsible for basins at the State level. The SWRIs are responsible for implementing the guidelines set by the SWRCs. The RBCs and WAs cover the actual water regions, which may be part of more than one State.

#### **4.2.5 GOVERNMENT MINING TAXES, LEVIES OR ROYALTIES**

The main royalty is the CFEM which varies depending on the mineral product. For gold it is 1.5%. The CFEM royalty is split with 75% of the royalty payable to the municipality, 15% of the royalty is paid to the state government and the remaining 10% of the royalty is paid to the federal government. Tucano is a gold mine. There are no significant by products in terms of valor, but silver represents around 10% by volume.

#### **4.2.6 FRASER INSTITUTE SURVEY**

The QPs used the Investment Attractiveness Index from the 2020 Fraser Institute Annual Survey of Mining Companies report (the Fraser Institute survey) as a credible source for the assessment of the overall political risk facing an exploration or mining project in Brazil.

The QPs used the Fraser Institute survey because it is globally regarded as an independent report-card style assessment to governments on how attractive their policies are from the point of view of an exploration manager or mining company senior management and forms a proxy for the assessment by the mining industry of the political risk in Brazil. In 2020, the rankings were from the most attractive (1) to the least attractive (77) jurisdiction. Brazil ranked 38 out of 77 jurisdictions in the attractiveness index survey in 2020; 56 out of 77 in the policy perception index; and 24 out of 77 in the best practices mineral potential index.

### **4.3 PROJECT OWNERSHIP**

Ownership of mining or exploration rights is by way of wholly owned Brazilian subsidiaries of Great Panther. They are; Mina Tucano Ltda, Tucano Resources Mineração Ltda, Mineração Serra da Canga Ltda and Mineração Vale dos Reis Ltda. (Figure 4-3).

The Project consists of 39 tenements divided into applications, exploration licences and mine concession, totalizing 197.285 ha, as summarized in Table 4.1. The location and status is illustrated in Figure 4-4 below. The active Tucano mine operations are within mining concession 851.676/1992, wholly-owned by Great Panther. The reserves in URE and Duckhead are respectively, in the mining concession application 850.865/1987 and a mining lease (858.079/2014) in the name of DEV Mineração S.A. ("DEV") The lease is governed by a private contract between Mina Tucano Ltda and DEV.

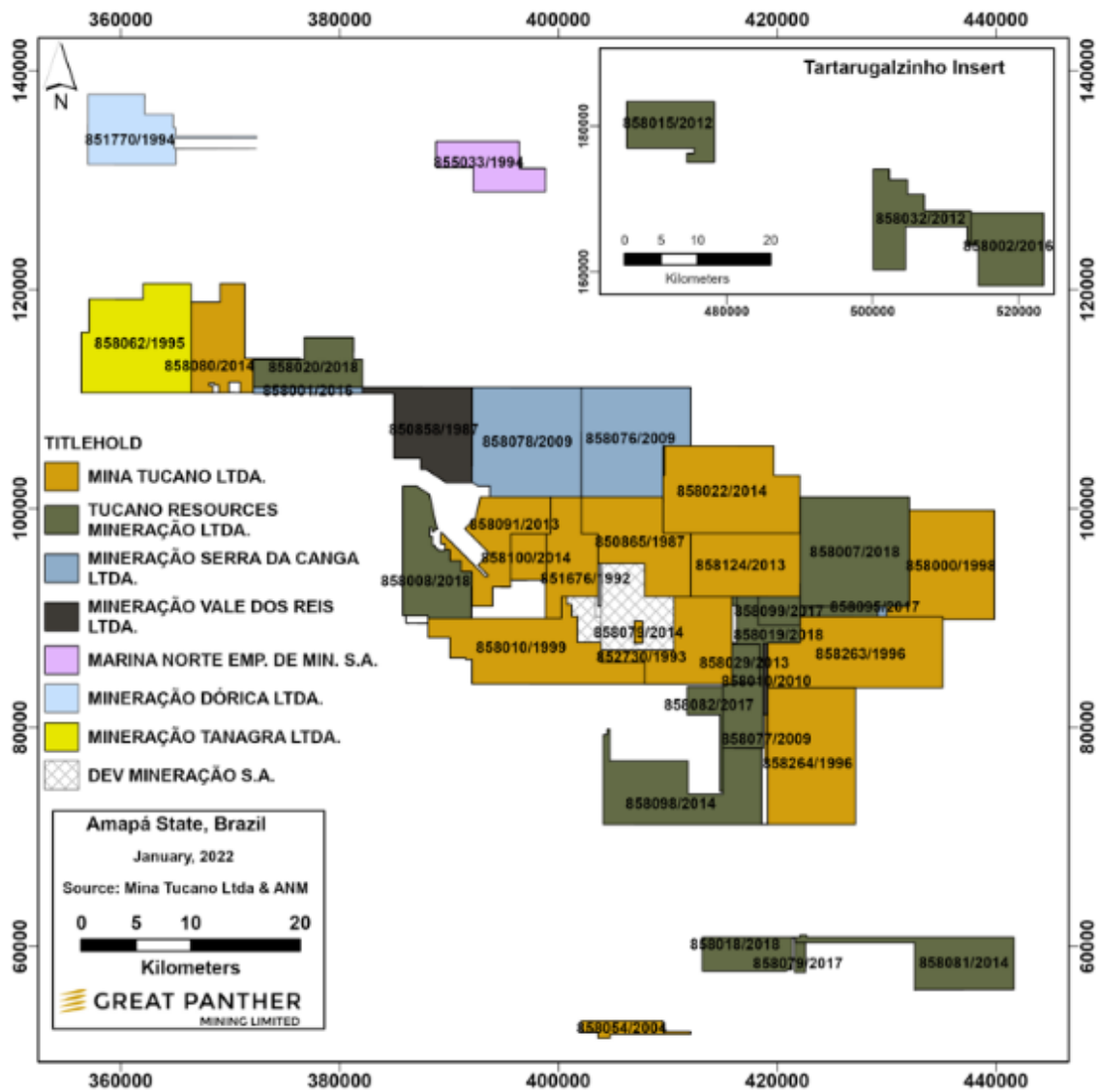


Figure 4-3: Mineral Tenement Ownership

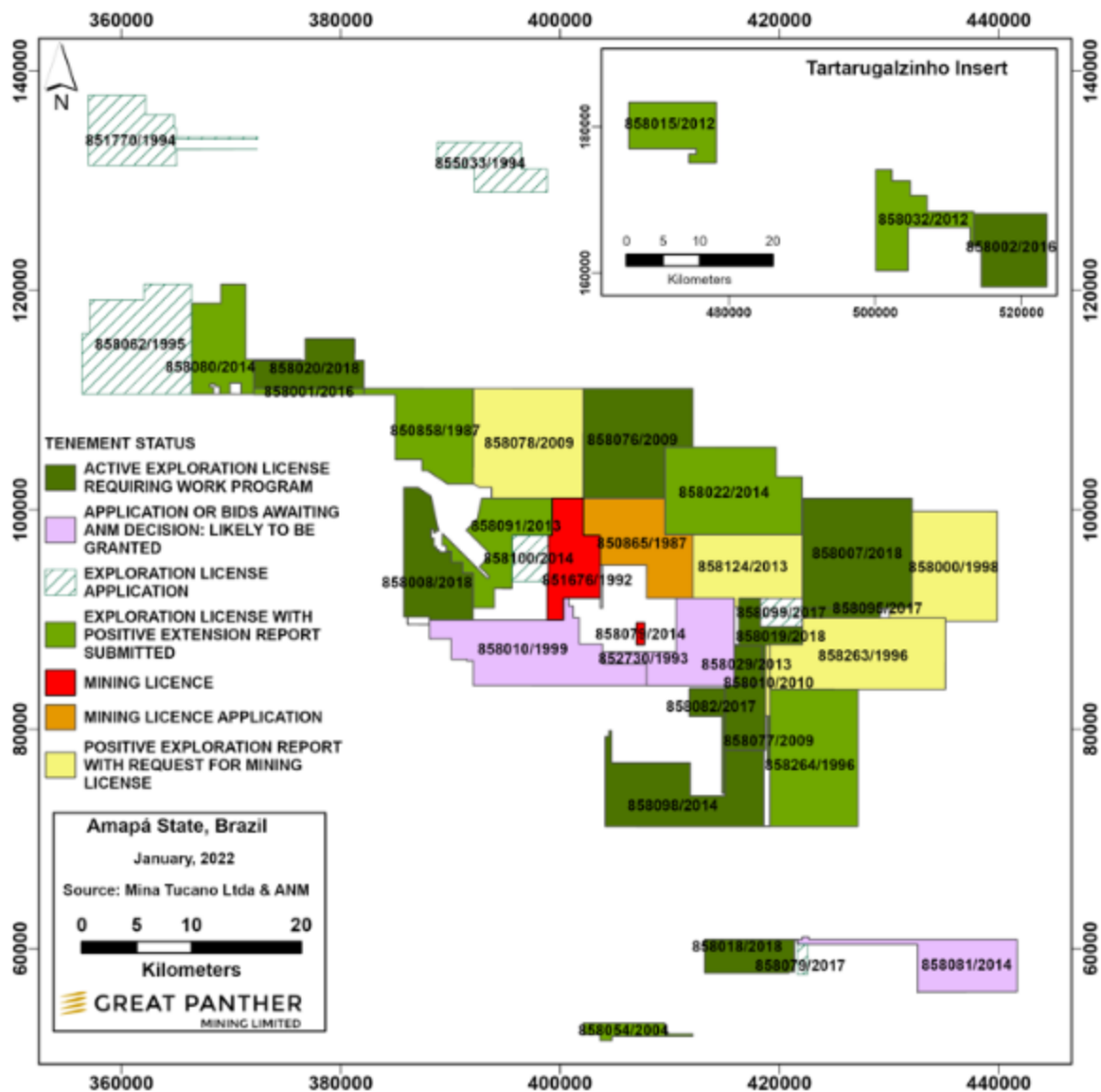


Figure 4-4: Mineral Tenement Status

Table 4-1: Mining and Exploration Licenses

Great Panther Mining Limited – Tucano Gold Mine					
Process Number	Title Holder \ Applicant	Area (ha)	Phase	Annual Rent (USD)	End Date*
<b>ACTIVE MINING LICENSES OR MINING LICENSE APPLICATION</b>					
851.676/1992	Mina Tucano Ltda.	3971	Mining License		
850.865/1987	Mina Tucano Ltda.	6112	Application for Mining License		
858.079/2014	DEV Mineração S.A.	150	Mining License Lease		
<b>POSITIVE EXPLORATION REPORTS WITH REQUESTS FOR MINING LICENSES</b>					
858.263/1996	Mina Tucano Ltda.	9691	Exploration: Request for Mining License		
858.000/1998	Mina Tucano Ltda.	7884	Exploration: Request for Mining License		
858.078/2009	Mineracao Serra da Canga Ltda.	9823	Exploration: Request for Mining License		
858.010/2010	Mineração Vale dos Reis Ltda.	290	Exploration: Request for Mining License		
858.124/2013	Tucano Resources Mineracao Ltda.	5813	Exploration: Request for Mining License		
<b>ACTIVE EXPLORATION LICENSES REQUIRING WORK PROGRAMS</b>					
858.082/2017	Tucano Resources Mineracao Ltda.	1038	Exploration: 1st Phase	\$ 784	17/12/2022
858.095/2017	Tucano Resources Mineracao Ltda.	644	Exploration: 1st Phase	\$ 486	17/12/2022
858.007/2018	Tucano Resources Mineracao Ltda.	9992	Exploration: 1st Phase	\$ 7.547	17/12/2022
858.008/2018	Tucano Resources Mineracao Ltda.	5148	Exploration: 1st Phase	\$ 3.888	17/12/2022
858.018/2018	Tucano Resources Mineracao Ltda.	2527	Exploration: 1st Phase	NA	15/08/2022
858.019/2018	Tucano Resources Mineracao Ltda.	3736	Exploration: 1st Phase	\$ 2.822	2/11/2022
858.020/2018	Tucano Resources Mineracao Ltda.	3452	Exploration: 1st Phase	\$ 2.608	2/11/2022
858.076/2009	Mineracao Serra da Canga Ltda.	8807	Exploration: 2nd Phase	NA	15/04/2022
858.077/2009	Mina Tucano Ltda.	124	Exploration: 2nd Phase	\$ 141	7/09/2023
858.002/2016	Tucano Resources Mineracao Ltda.	9408	Exploration: 2nd Phase	\$ 10.669	18/06/2024
858.029/2013	Tucano Resources Mineracao Ltda.	919	Exploration: 2nd Phase	\$ 1.042	19/12/2022
858.098/2014	Tucano Resources Mineracao Ltda.	8006	Exploration: 2nd Phase	\$ 9.079	14/06/2024
<b>EXPLORATION LICENCES WITH POSITIVE EXTENSION REPORTS SUBMITTED</b>					
850.858/1987	Mineração Vale dos Reis Ltda.	5644	Exploration: 1st Phase Report submitted		
858.054/2004	Mina Tucano Ltda.	971	Exploration: 1st Phase Report submitted		
858.015/2012	Tucano Resources Mineracao Ltda.	8280	Exploration: 1st Phase Report submitted		
858.032/2012	Tucano Resources Mineracao Ltda.	8476	Exploration: 1st Phase Report submitted		
858.091/2013	Mina Tucano Ltda.	4469	Exploration: 1st Phase Report submitted		
858.022/2014	Tucano Resources Mineracao Ltda.	9348	Exploration: 1st Phase Report submitted		
858.080/2014	Mina Tucano Ltda.	4593	Exploration: 1st Phase Report submitted		
858.001/2016	Mineracao Serra da Canga Ltda.	543	Exploration: 1st Phase Report submitted		
858.002/2016	Tucano Resources Mineracao Ltda.	9408	Exploration: 1st Phase Report submitted		
858.264/1996	Mina Tucano Ltda.	10000	Exploration Renewal Requested		
<b>EXPLORATION LICENSE APPLICATIONS</b>					
855.033/1994	Marina Norte Emp. de Mineracao S.a.	3260.5	Exploration Application		
851.770/1994	Mineração Dórica Ltda.	4747	Exploration Application		
858.062/1995	Mineração Tanagra Ltda.	8982	Exploration Application		
858.100/2014	Mina Tucano Ltda.	1377	Exploration Application		
858.079/2017	Tucano Resources Mineracao Ltda.	269	Exploration Application		
858.099/2017	Tucano Resources Mineracao Ltda.	997	Exploration Application		
<b>AWAITING ANM DECISION: LIKELY TO BE GRANTED</b>					
852.730/1993	Mina Tucano Ltda.	5530	Bid on Zamin Mining License Reduction		
851.771/1994	Mineração Dórica Ltda.	8750	Exploration Application - under appeal		
858.010/1999	Mina Tucano Ltda.	8634	Bid on Zamin Mining License Reduction		
858.081/2014	Tucano Resources Mineracao Ltda.	4875	Exploration Application - under appeal		

\* End Date as of July 2021. Includes extension granted by the ANM in response to COVID19.  
All other expiry dates depend on time frames triggered by an ANM decision date.

## 4.4 AGREEMENTS

In 2005, the then owner of Mineral Rights 852.730/93, 858.010/99 and 858.114/04, Mineracao Pedra Branca de Amapari (“MPBA” now Mina Tucano Ltda) entered into an agreement with DEV (then known as EBX Mineracao Ltda) giving DEV the right to explore for iron ore and other non-precious metals, with the exception of copper, in the tenements. On discovery of a deposit a mining lease agreement was to be enacted under which DEV would pay MPBA a lease fee equal to 1% of the gross sales. MPBA retained the right to conduct exploration and exploitation within the lease areas. DEV developed the Amapari iron ore mine in the tenements and sold the project to AngloFerrous, who later sold the area to Zamin Amapa Mineração S.A.. After Zamin entered in receivership, DEV negotiated the iron ore mineral rights and debt with the authorities.

The Company’s Duckhead deposit lies within the iron ore mining concession 852.730/93, discussed above. On discovery of the deposit, Tucano’s previous owner, Beadell S.A, entered into an agreement with Zamin Amapá Mineração S.A whereby Mina Tucano Ltda was ceded the the gold rights through a mining lease (Proc. 858.079/2014), which lies within the iron ore mining concession. DEV is honoring the lease agreement.

## 4.5 ROYALTIES AND ENCUMBRANCES

Gold production is subject to the CFEM royalty, which is 1.5% as defined by the Mining Code (see Section 4.2.5).

The State of Amapá levies the TRFM royalty. This is described as a royalty for the Control, Monitoring, and Supervision of Research Activities for the Mining, Exploration and Exploitation of Mineral Resources. The royalty is calculated based on the grams of gold produced multiplied by an index. The current index is BR\$ 4.1 multiplied by a factor of 0.4. The index is published monthly by the Amapa Tax Secretary. Great Panther negotiated to reduce the factor applied to 0.25 for 2020 and beyond. The reduced factor has been approved by the authorities.

Great Panther has a community program under which it pays a 1% (maximum) royalty over the gross proceeds from gold sales from Tucano to support socio-economic and community development of the municipalities of Pedra Branca do Amapari and Serra do Navio, which are located near the Tucano Operations.

On 13 exploration tenements, owned or previously owned by Mineracao Vale dos Reis Ltda (“MVR”) a Commodities Royalty is due to the previous owners of MVR. The royalty is levied at 0.75% of commodity sales revenue, less transport, insurance expenses and royalties payable. Mr. Winer, Vice President Exploration of Great Panther, is a former partner of MVR and accordingly, if a Commodities Royalty becomes payable, Mr. Winer would be a recipient of part of the royalty.

## 4.6 PERMITTING CONSIDERATIONS

Permitting considerations for operations are discussed in Section 20. The situation of the key mine operations permits are summarized below and in Table 4-2:

- Operating License for the Tucano Mining Concession: granted on November 11, 2015 and valid to July 12, 2021. The renewal was submitted on time and meeting all requirements and is currently awaiting publication. The renewal has been approved by the state environmental authority ("SEMA-AP") and is awaiting publication.

**Table 4-2: Permits for Key Mining Areas**

ANM		License to Operate				Area	Vegetation Suppression Authorization (ASV)				
Number	Status	Number	Situation	Granted	Expires		Objective	Number	Granted	Expires	Há
851.676 1992	Mining License	223 2015	In renewal*	09/11/ 2015	12/07/ 2021	Norte URN	Drilling	21617774	Awaiting inspection		
						TAP D	Drilling	21617773	Awaiting approval		
						TAPC Urso	Drilling / WRSF	21617770	Awaiting approval		
						Morro do Macaco	Drilling / WRSF	4001.815/ 2016	Awaiting inspection		
						Torres	Drilling	4001.956/ 2016	Awaiting inspection		
	Tailings Facility	0035 2020	Granted	27/08/ 2020	27/08/ 2026	NMP	TSF				
						East Dam Fase 1	TSF Expansion	2016.5.20 22.53409	20/01/ 2022	20/01/ 2023	25ha
								21617782	Awaiting approval		11ha
						WPP2	TSF Expansion	4001.612- 2011	Awaiting inspection		118ha
								4000.08. 014045	Awaiting inspection		71ha
850.865 1987	Mining License Application	223 2015	Inclusion requested			URE Mine	Mining	21610501	Awaiting inspection		6ha
		205 2016	In renewal*	29/06/ 2016	29/06/ 2022	URE West (exploration)	Drilling	21617777	Awaiting inspection		25ha
858.079 2014	Mining License Lease	223 2015	Granted	29/06/ 2016	29/06/ 2022	Duckhead		NA			

\* License remains valid during the renewal phase.

- **Tailings Storage Facility:** Tucano currently has an Operating License for the TSF which is valid to August 27, 2026 and covers the NMP integrated and East Dam Phase 1 facilities. The East Dam Phase 1 to a crest elevation of 134 metres above sea level was completed in 2021. There is a permit submission in place for Phase 2 of the East Dam to a crest elevation of 145 metres above sea level.

## 4.7 ENVIRONMENTAL CONSIDERATIONS

Environmental and closure considerations for operations are discussed in Section 20.

Existing environmental liabilities include the open pits, process plant, mining facilities, waste rock storage facilities (WRSFs), tailings storage facilities (TSFs), roads and easements. Environmental and closure considerations for operations are discussed in Section 20.

On December 21, 2021, the Amapa State Environmental Agency (the "Agency") delivered three Notices of Infraction (the "Notices") to Mina Tucano Ltda. The Notices were issued in connection with the Agency's investigation of a fish mortality event at Areia and Silvestre Creeks, and its assertion that the incident was caused by a leak in a reclaimed water pipe at the Tucano mine site.

Great Panther has filed a defense applying for the cancellation of the Notices. Preliminary water quality assaying and fish toxicology results do not point to a causal link between the activities of the Tucano mine and the fish mortality event.

Other than normal operational liabilities and the event mentioned above, there are no known environmental liabilities at Tucano.

In 2006, a large part of Amapa was declared a State Forest ("Flota": Lei Nº 1.028, 12/07/2006, Figure 4-5) for the sustainable management of renewable and non-renewable resources. The Tucano mining license, Duckhead mining lease and URE mining application, all sit outside the State Forest limits. Certain exploration areas lie within the limits of the Flota or its 1km buffer zone. The Decree and Management Plan (Plano de Manejo da Floresta Estadual do Amapa, Feb, 2014) allow mineral exploration, and the mining and environmental authorities have continued to grant tenement and exploration permits within the Flota. Recent debate in the political and legal spheres on the interpretation of the Flota decree and the Management Plan have led to uncertainty in their interpretation and application. This has resulted in delays in awarding new permits. This is believed to be temporary but requires close alignment with local, state and federal authorities.

Table 4-3, lists environmental permits (LOPs and ASVs) obtained or under application for key targets in the regional exploration program:

Table 4-3: Exploration License Environmental Permitting

ANM		LOP - SEMA			ASV - SEMA	
Tenement	Target	Status	License	Expiry Date	Status	License
850.865/ 1987	URE	Yes	LO 205/201 6	29/06/2022	Requested	21617777 SINAFLO
858.078/ 2009	Lona Amarela	Yes	LO 056/201 9	11/09/2025	Requested	21612677 SINAFLO
858.076/ 2009	Saraminda	Yes	LO 015/202 0	26/08/2026	Requested	21612612 SINAFLO
858.022/ 2014	Josefa/Bicicleta	Yes	LO 210/201 8	31/12/2024	In preparation	
858.124/ 2013	Mutum	Yes	LO 209/201 8	31/12/2024	Renewing	4002.323/ 2014
858.029/ 2013	Janaina	Yes	LO 204/201 9	29/06/2022	Requested	
858.018/ 2018	Piquiá	Renewing	LO 010/201 4	18/09/2016	No	
858.091/ 2013	Timbó	Reactivate. Archived: 2013	LO 015/201 7	08/02/2023	No	

## 4.8 SOCIAL LICENSE CONSIDERATIONS

Social licence considerations for operations are discussed in Section 20. The Company and its subsidiaries have social license to operate the Tucano Mine and explore the surrounding exploration areas. The Company maintains early and open communication with the state and local authorities, local communities and preferentially hires and buys locally. The Company also invests in programs and projects in the communities within the area of influence of the mine, focused on infrastructure improvement, skills training, education, behavioural change, and strengthening of local institutional and leadership skills. (refer to the Great Panther 2020 Sustainability Report “Mining for Good” on the Company website)

The Tucano mine workforce is nearly 100% Brazilian with the majority of the employees and contractors living in the nearby communities of Pedra Branca do Amapari, or Serra do Navio, or working on a 5-day by 2-day roster from the capital, Macapá.

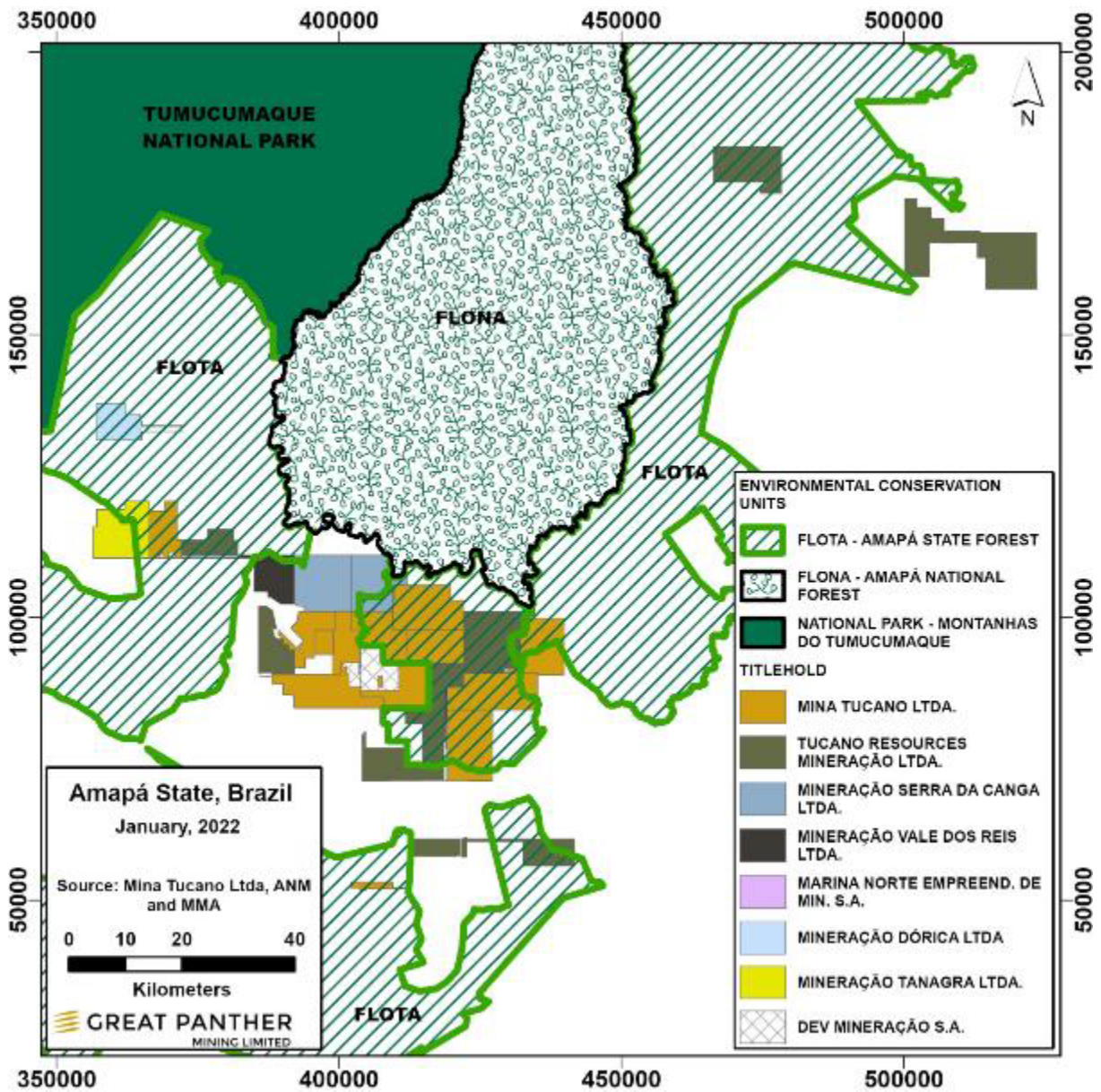


Figure 4-5: Environmental Areas and Tucano Exploration Permits

## **4.9 SIGNIFICANT RISK FACTORS**

Beyond the risk factor mentioned below, the authors are unaware of any other significant factors or risks associated with the Project that may affect access, title, or the right or ability to perform work on the property.

The Tucano mine is a licensed operating gold mine and land and access rights to the mining area have been secured. The majority of operating permits both for exploration and the mine are related to adhering to environmental regulations. The interpretation of these regulations is often unclear and, as a result, obtaining permits in a timely manner has proven difficult due to the ambiguities in the interpretation of the laws and regulations. This lack of clarity has resulted in delays in the processing of permits, including those of Tucano.

## **4.10 QP COMMENTS ON “ITEM 4; PROPERTY DESCRIPTION AND LOCATION”**

The QP notes the following:

- Information provided by Great Panther and experts retained by Great Panther supports the interpretation that the granted mining concessions and exploration permits are valid;
- Great Panther currently has, and holds the expectation of renewal of, the specific mining, operational and environmental permits required to support the LOM plan;
- Great Panther holds sufficient surface and water rights to support the LOM plan;
- Operating, social and environmental liabilities associated with the Project are those expected to be associated with an operating open pit mine;
- Delays or uncertainties in permitting need to be closely monitored and where possible, addressed through transparent dialogue with the authorities.
- To the extent known to the QP, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the Project that have not been discussed in this Report.

## 5. ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

### 5.1 ACCESSIBILITY

Road access from Macapá to the Project is via a 100 km long sealed road from Macapá to Porto Grande, then 75 km by unsealed road to Pedra Branca do Amapari, and finally 17 km of unsealed road to the mine site. See Figure 5-1.

The Tucano Operations are serviced by a 1,100 m airstrip located approximately 800 m from the main entrance gate to the Tucano mine. Charter flights from Macapá to Tucano take approximately 50 minutes.

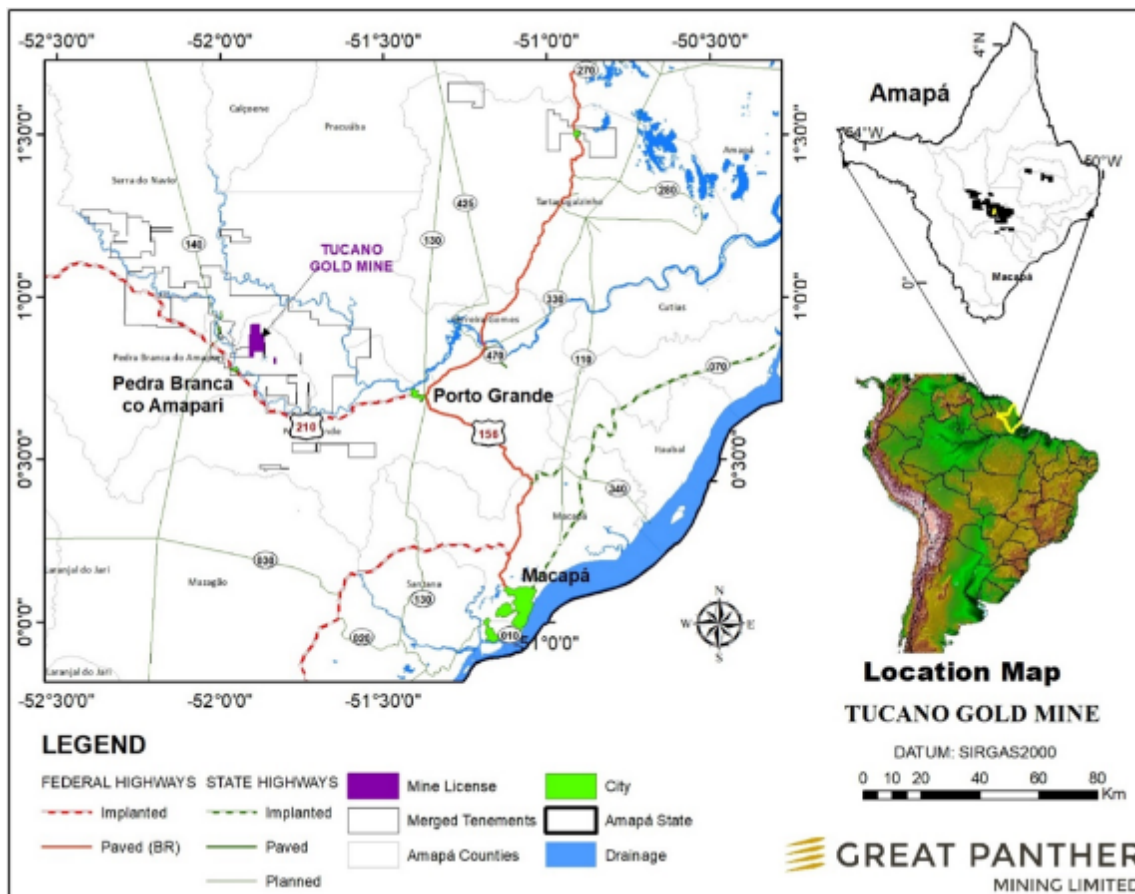


Figure 5-1: Location and Access

A helipad was constructed near the CIL plant and is used to transport product and for emergency transport of personnel.

## 5.2 CLIMATE

The Project is located close to the equator and classified as a tropical monsoon region (Figure 5-2). The project has high humidity along the year with highest rainfalls during the wet season between January to June; however, rainfall events in the drier months are still frequent. The average rainfall is around 2,400 mm, (Table 5.1) and the average evaporation rate is about 1,424 mm associated with temperature that range from 21° C through to 34° C.

Mining activities are conducted year-round as are exploration activities. During periods of high rainfall, activities are adapted.

**Table 5-1: Monthly Rainfall (mm), 2008 - 2021**

Great Panther Mining Limited – Tucano Gold Mine													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2008	262	225	358	292	442	258	319	30	90	77	5	150	2.507
2009	208	404	218	247	413	263	178	51	11	34	5	150	2.181
2010	304	225	262	334	268	160	196	184	57	33	91	186	2.300
2011	249	244	306	320	317	160	238	147	43	95	69	71	2.257
2012	222	281	257	240	182	166	171	109	41	104	52	218	2.043
2013	218	268	196	284	236	103	248	209	104	72	24	151	2.115
2014	196	361	297	303	474	233	145	88	58	133	65	64	2.417
2015	233	318	278	362	367	191	164	45	38	34	29	145	2.204
2016	255	213	447	362	165	267	189	73	64	54	9	208	2.306
2017	331	259	283	276	192	302	88	99	123	130	36	224	2.343
2018	142	353	313	354	320	242	231	31	94	48	124	331	2.583
2019	364	336	234	415	408	201	271	115	74	71	265	276	3.029
2020	149	210	350	457	404	384	145	116	75	50	282	105	2.728
2021	225	350	483	418	444	155	250	118	96	87	224	260	3,110
Average	240	289	306	333	331	220	202	101	69	73	91	181	2215

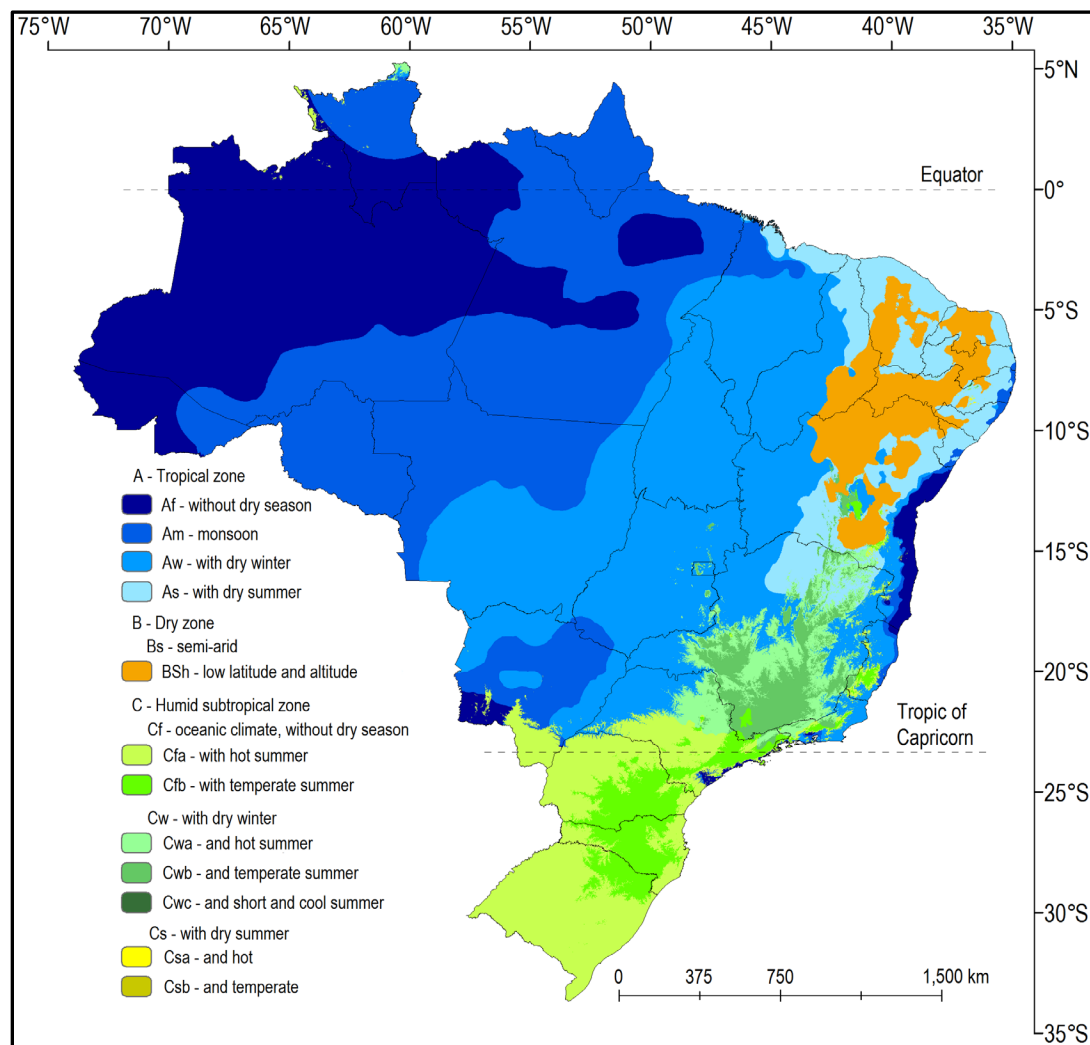


Figure 5-2: Climate Classification

### 5.3 LOCAL RESOURCES AND INFRASTRUCTURE

The towns of Pedra Branca do Amapari (17,625 population) and Serra do Navio (5,577 population), located about 40 minutes drive from Tucano, are the closest and provide the majority of Tucano workers. Most supplies come from the capital, Macapá or transported from southern Brazil.

Most of the workforce is transported by bus from Serra do Navio, Pedra Branca do Amapari, and other small surrounding communities. Most of staff come from Macapá while specialised professional positions are generally filled on a fly-in fly-out basis from other cities in Brazil.

Infrastructure that has been constructed at the mine site to support the operational activities include staff accommodation, administrative complex, warehouse, mechanical workshop, fuel stations, ambulatory,

physical and chemical laboratories, processing plant, refectories, and offices. Sufficient surface area exists for all necessary surface facilities, including the tailings disposal facilities and waste rock dumps and stockpiles to support the LOM, as discussed in Section 18.

## 5.4 PHYSIOGRAPHY

Topography within the operations area ranges from 17– 427m above sea level. (“asl”) (Figure 5-3). To the northeast is an old laterite plateau that in the region of the mine was incised by river valleys generating low rolling hills beneath the elevation of the plateau. The process plant is an elevation of about 143 m asl.

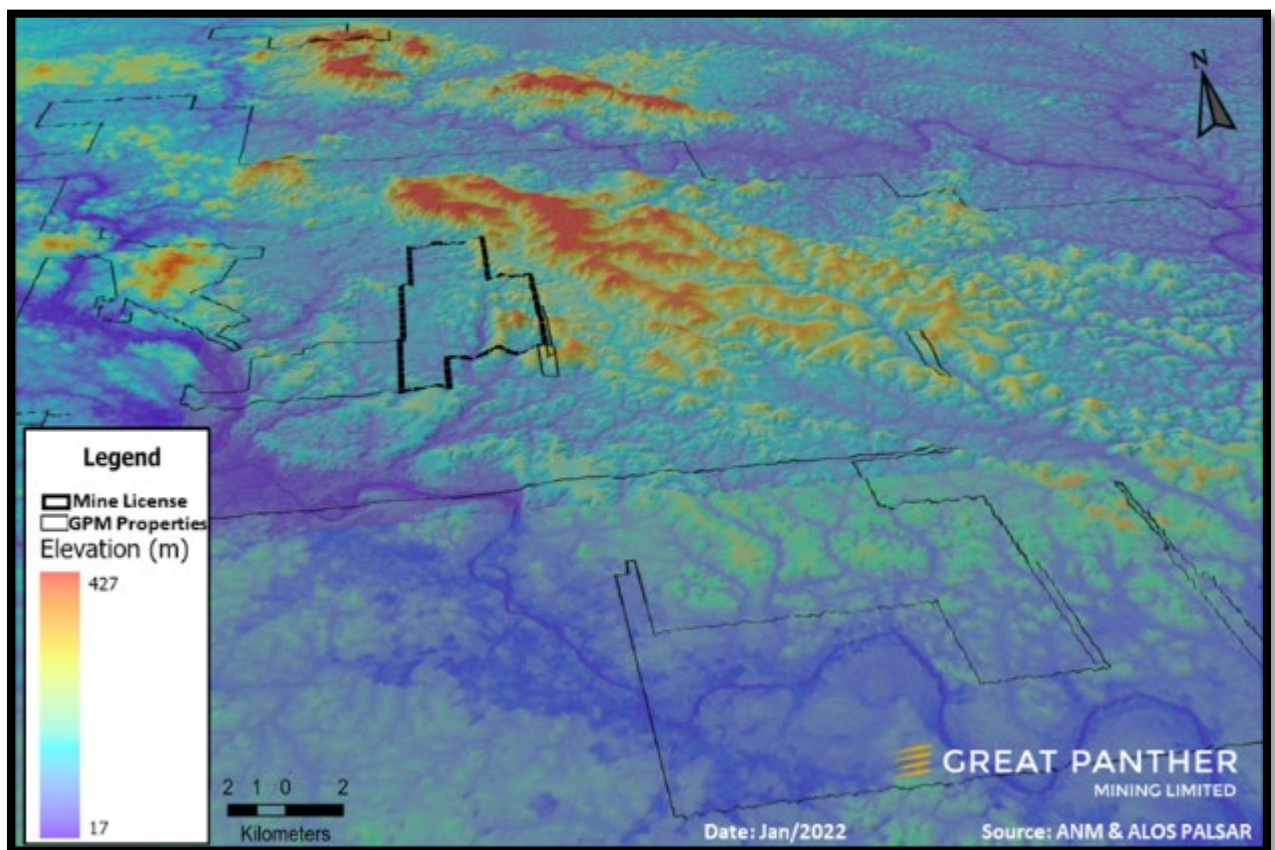


Figure 5-3: Tucano Digital Elevation Model

The hydrography of the Amapá State is subdivided into three hydrographic regions (Figure 5-4): Oiapoque basin, located in the northern portion of the state; Araguari basin, in the central portion; and Jari basin, in the south of Amapá. The region in which the Company’s mining concession is located is part of the Araguari Basin, located in between the Amapari and Araguari rivers. The William, Urucum and Arrendito streams are the main drainages that crosscut the mine areas.

The vegetation of Amapá State corresponds to at least four basic ecosystems: Coastal Forest subject to flooding, Cerrado, the Cerrado-Forest transition and “Terra Firme” Forest. (Figure 5-5). Tucano is located in Terra Firme Forest ecosystem with a predominance of well-developed tropical forest characterized by tall trees with interconnecting canopies and a second lower layer of semi-dense vegetation.

To the north and east of the area of interest of Tucano are situated the Tumucumaque National Park, National Forest and the Waiapi Indian Reserve. In 2006 a large state forest, Flota, was created as a buffer zone around these preservation areas with the intent of providing controls and promoting sustainable development of the renewable and non-renewable resources. The Flota Management Plan explicitly allows mineral exploration to be carried out within the Flota. The Mining Concession and Mining Lease are outside of this zone of sensitivity while a portion of the exploration licenses lie within the zone.

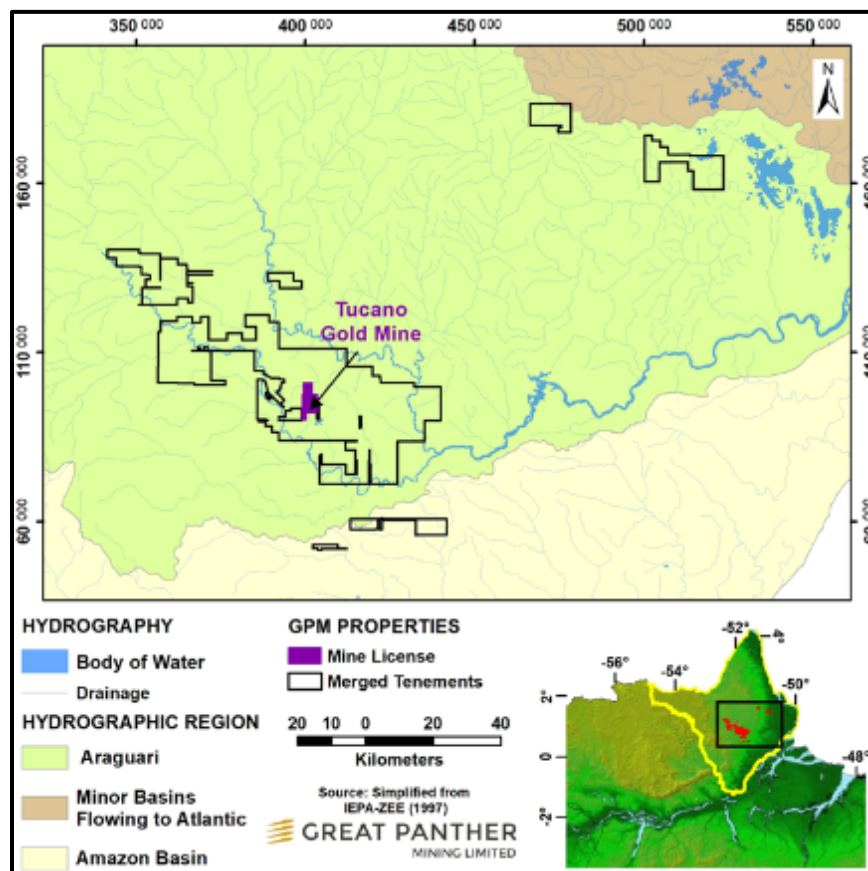


Figure 5-4: Central Amapá State – Hydrographic Regions



Figure 5-5: Ecosystems of the State of Amapá

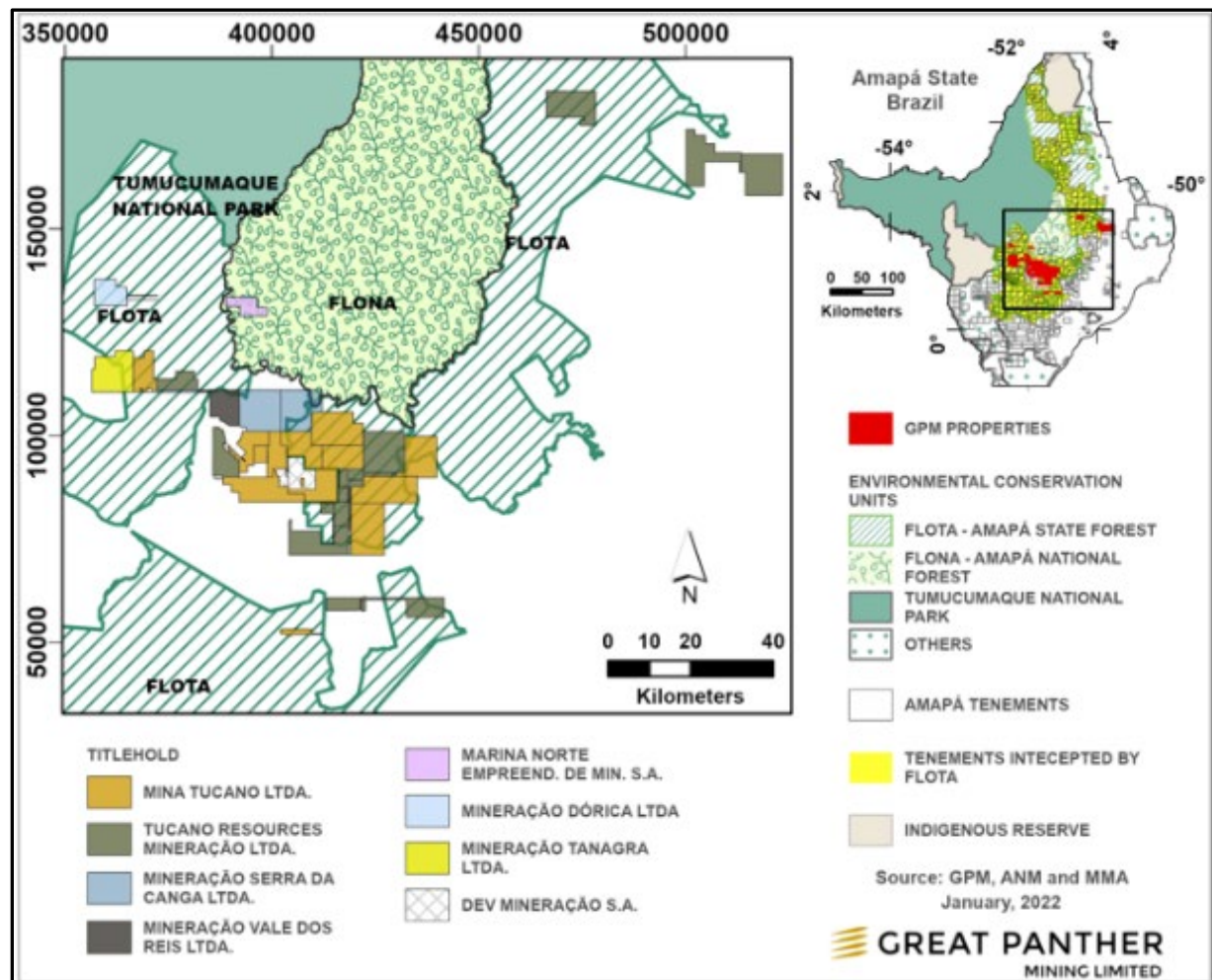


Figure 5-6 Exploration Licenses and the FLOTA

## 5.5 QP COMMENTS ON “ITEM 5; ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY”

The QP notes:

- Tucano is an operating mine with year-round production.
- Key infrastructure for the current operations has been built on site and it is sufficient for the LOM plan (see discussion in Section 18).
- The existing local infrastructure, availability of staff, methods whereby goods could be transported to the Project area, are well-established and well understood (see discussion in Section 18).

- There is sufficient suitable land available within the mineral tenure and surface rights held for installations such as the process plant and related mine infrastructure, sufficient for the LOM plan.
- Surface rights have been secured for infrastructure and mining within the LOM plan and are discussed in Section 4.6.

The aspects discussed above support the definition of Mineral Resources and Mineral Reserves

## **6. HISTORY**

### **6.1 EXPLORATION HISTORY**

The Project exploration and development history is summarized in Table 6-1.

In the mid-1990's, as part of a major regional exploration program in Amapa and northern Para states, Elio Horikava of Anglo American Plc discovered a mineralized shear zone extending north from the Marivaldo garimpo located close to the URS pit. From 1995, Anglo American and then AngloGold ("AGA") continued exploration culminating in a feasibility study for the oxide Mineral Resources in October 2002.

In May 2003, the Tucano Mine was acquired by EBX Gold Ltd ("EBX"). EBX carried out further feasibility studies on the oxide mineral resources and a pre-feasibility study for the sulphide mineralization.

In January 2004, Wheaton River Minerals Ltd. acquired the project and initiated mine construction in July 2004, with the first gold poured in late 2005. In January 2009, the Tucano Mine was placed on care and maintenance due to the inability to treat transition material (not fully oxidized) in the deeper portions of the pits.

In 2010, Beadell Resources Ltd. (Beadell), acquired the Tucano Mine and commenced construction of a CIL plant. Mining and stockpiling of ore commenced in 2011 and the CIL plant was commissioned in November 2012. Beadell upgraded the plant from 2018 to 2019, including a ball mill, pre-leach thickener, leach tank, and oxygen plant.

On March 5, 2019, Great Panther announced the acquisition of Beadell.

### **6.2 PRODUCTION HISTORY**

Production since mining operations commenced is categorized by year and operator in Table 6-2. A total of 326,418 oz has been produced by Great Panther.

The main active orebodies are URN, URCS, TAP C1 and TAP AB. Historical production has also come from URCN, URS, TAP C3, TAP D0 & D1 and Duckhead. The company plans production from URE, URN, URCN, URCS, TAP C3, TAP C1, TAP D0 and Duckhead (Figure 6-1).

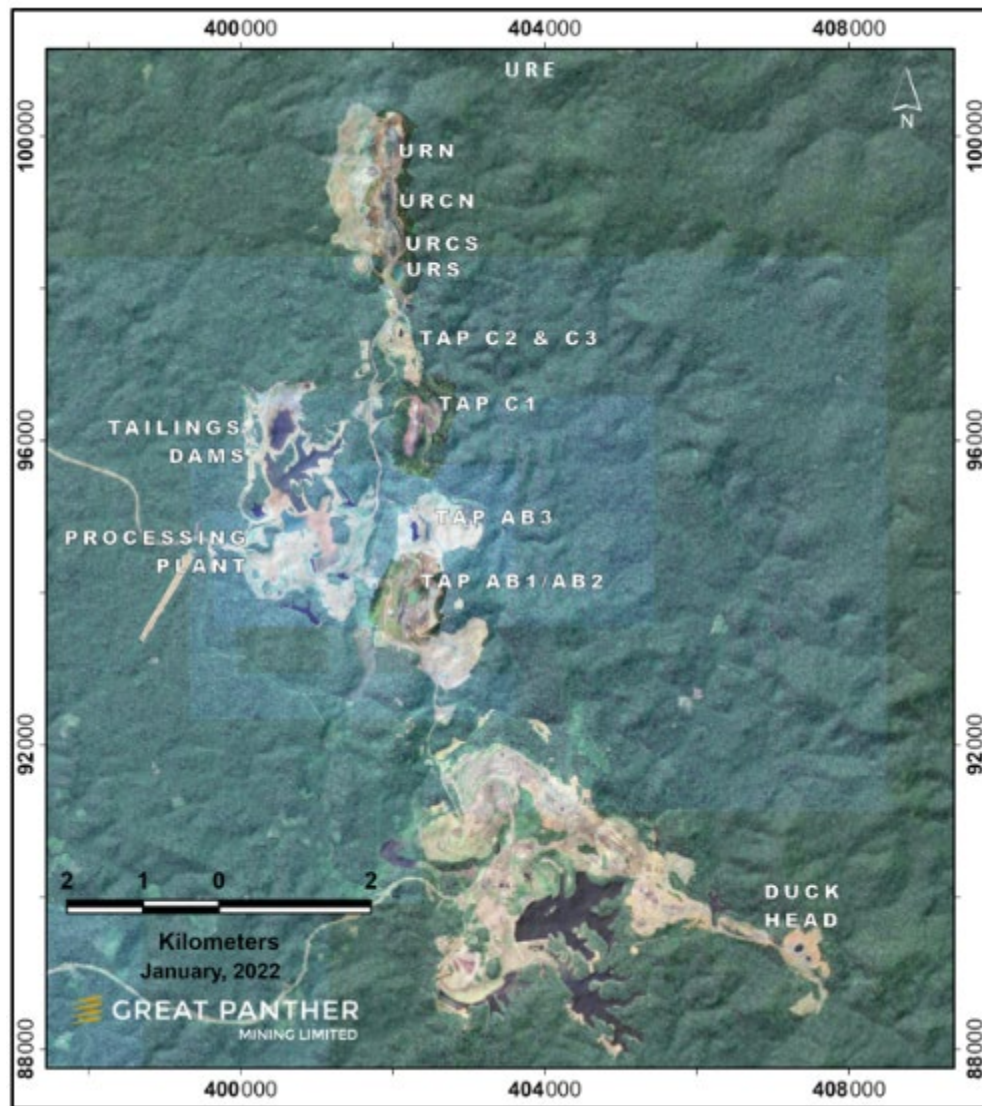


Figure 6-1: Tucano Mine Sequence Target Locations

**Table 6-1: Ownership and Exploration History**

Year	Company	Comment
1994–2002	Anglo American Plc	Airborne magnetic, radiometric, and digital elevation model (DEM) survey in 1998; airborne geophysics program (magnetic, electromagnetic, radiometric, and DEM) in 2000.
		Completed 78,134 soil, 1,349 stream sediment and 3,674 rock chip geochemical samples; identified elevated gold values in many areas.
		Geological mapping
		Completed feasibility study on oxide mineralization
2003–2004	EBX Gold Ltd (EBX)	Completed pre-feasibility study on the sulphide mineralization and a feasibility study on the oxide mineralization.
		Created Mineracao Pedra Branca do Amapari (MPBA). MPBA entered into an indemnity judicial agreement with 32 squatters/surface owners, for use and occupation of the surface for mining purposes.
		Ground geophysical surveys (magnetometer, very low frequency (VLF), and induced polarization (IP) time domain).
2004	Wheaton River Minerals Ltd. (Wheaton River)	Acquired Project. Mine construction began in July 2004
2005	Goldcorp Inc.	Acquired Wheaton River. First gold poured late 2005
2007		Sold Tucano mine to Peak Gold Ltd. (Peak Gold)
2008	Peak Gold	Merged with Metallica Resources Inc. and New Gold Inc. and renamed as New Gold.
2009	New Gold	Heap leach operations placed on care-and-maintenance
2010–2018	Beadell Resources Ltd. (Beadell)	Acquired the Tucano mine through in-country subsidiary Beadell Brazil Ltda. Restarted mining, commissioned carbon-in-leach (CIL) plant in 2012.
		Merged and re-processed airborne and ground geophysical datasets.
		Collected 3,907 soil, 263 stream sediment and 1,073 rock chip geochemical samples.
		Geological mapping
		Plant upgraded in 2018.
2019	Great Panther	Acquired Beadell.
2020	Great Panther	In regional scale geological mapping and interpretation, 612 soil samples, 9,752m of RAB, 1,574m of auger, 788m of DD, in Near mine 14,754m of DD and 4,860m of RC
2021	Great Panther	Regional geological interpretation (target generation), 710 km of cut lines, 14,470 soil analysis, 202km of ground mag, 22,065m of DD near mine drilling including 8,000m to test the feasibility of UG mine, 472m regional DD drilling, 8,280m of RC near mine drilling, 3,050m of near mine RAB drilling, 3,404m of regional RAB drilling, 4,725m of auger drilling

Table 6-2: Historical Gold Production from the Tucano Mine

Year	Company	Gold Production (oz)
2005	Wheaton River/Goldcorp	24,715
2006	Goldcorp	84,212
2007	Goldcorp/Peak Gold/New Gold	96,426
2008	New Gold	86,993
2009	New Gold	16,240
2010	New Gold/Beadell	8,118
2011	Beadell	—
2012	Beadell	1,108
2013	Beadell	175,990
2014	Beadell	156,582
2015	Beadell	123,027
2016	Beadell	145,870
2017	Beadell	129,764
2018	Beadell	123,296
2019	Beadell/Great Panther	123,867
2020	Great Panther	80,031
2021	<u>Great Panther</u>	79,348
TOTAL		<b>1,455,587</b>

## 7. GEOLOGICAL SETTING AND MINERALIZATION

### 7.1 REGIONAL GEOLOGY

The Project is situated within the Amazon Craton in northeast Brazil. The craton is dominantly a granite gneiss complex that was rifted resulting in long narrow belts of supracrustal rocks. These rifts of supracrustal volcano-sedimentary lithologies were deformed and intruded producing greenstone belts. In the northern Brazil and Guyanas region, remoteness and lack of outcrops due to deep weathering prevent detailed stratigraphic and structural mapping across most of the greenstone belts. However, stratigraphic and structural elements typical for greenstone belts worldwide are recognized in most South American greenstone belts. Tucano sits within part of the Proterozoic Vila Nova greenstone belt in the southern portion of Amapá.

The 1.75 to 2.26 billion years old Vila Nova Greenstone sequence is characterized by a typical 'greenstone belt' paragenesis, composed of an extensive mafic volcanic sequence, now amphibolites, representing early parts of the rift system overlain by clastic metasedimentary sequence interspersed with meta-basalts and meta-andesites. In the region of the hiatus of volcanic activity subordinate layers of iron and manganese rich formations, calc-silicate schists, and marbles occur. The package is affected by several orogenic deformation events under low to medium metamorphic conditions. Peak metamorphism reached upper greenschist and middle amphibolite facies.

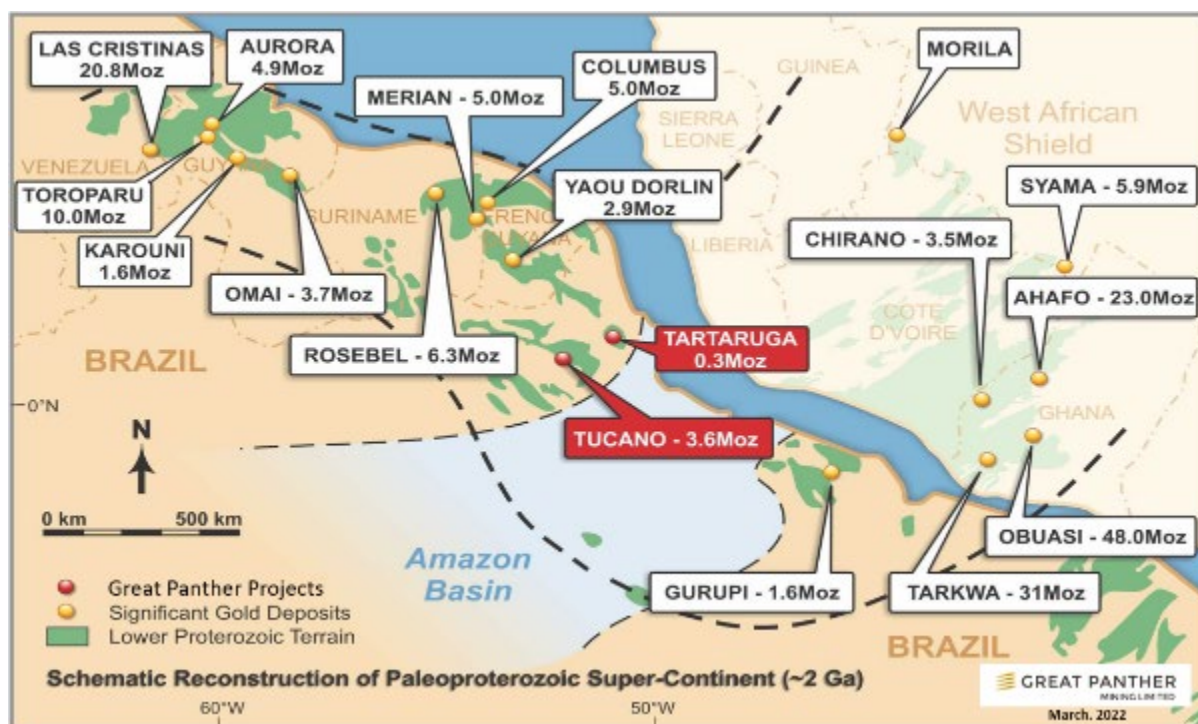


Figure 7-1: West Africa – NW South America: Gold Deposits and Resources

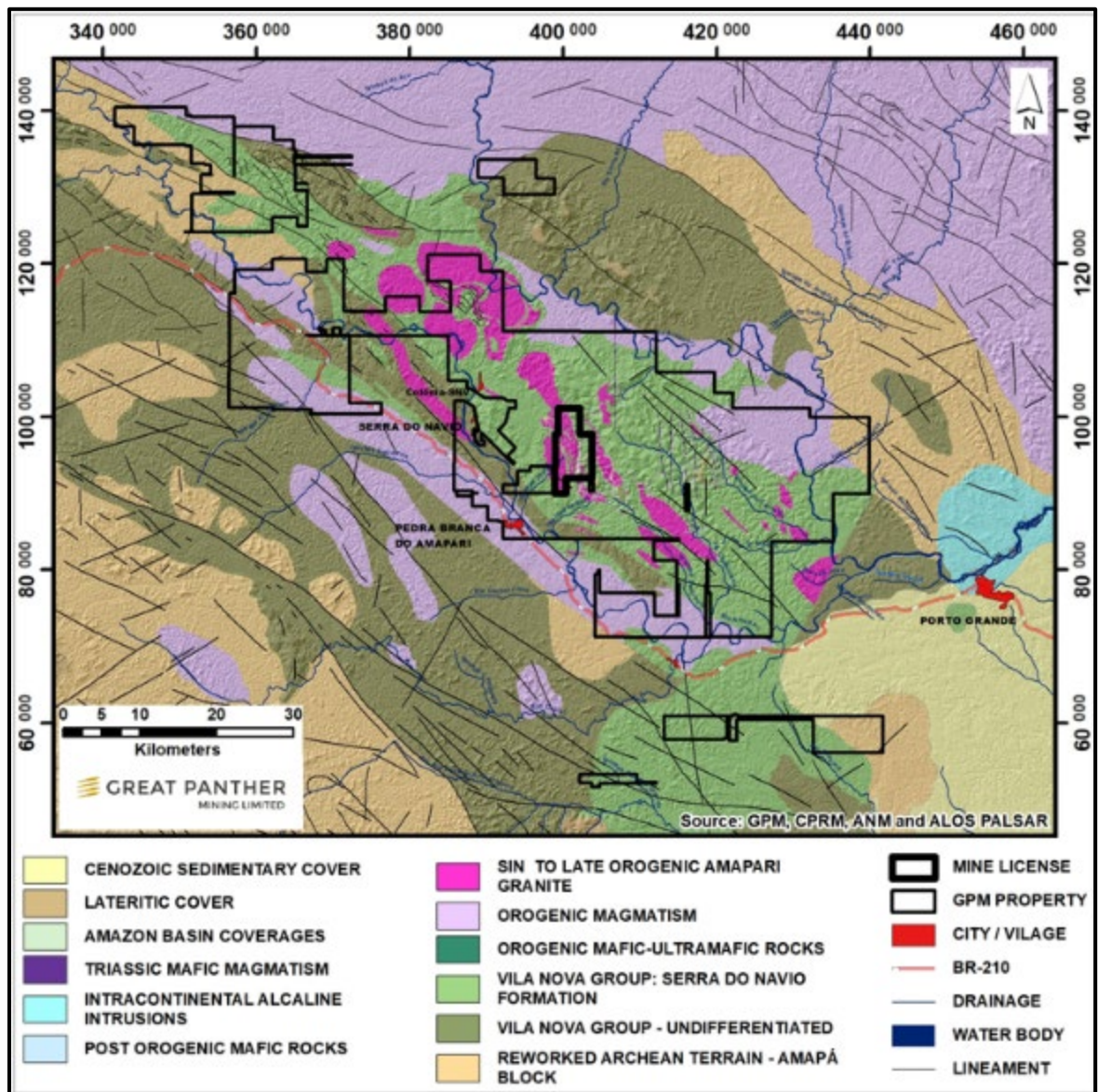


Figure 7-2: Tucano Regional Geologic Setting

## 7.2 PROJECT GEOLOGY

### 7.2.1 WEATHERING

Laterite and lateritic colluvium are common throughout the area and tend to be thicker over topographic highs, consistent with truncation of an extensive, mature lateritic plateau that probably covered the region. The Tucano mine sequence is interpreted as an eroded section on the southwestern flank of the remnants of the extensive laterite plateau. The thickness and characteristics of the weathering sequence are highly variable and dependent on lithology, structure and morphology. In general, the weathering profile ranges from 30 – 60 m but can reach 300 m within deep fault / shear zones.

The base of the profile is marked by Saprock - oxidized semi-consolidated rock with a sharp transition to saprolite. Saprolite preserves textures of the protore but the minerals have been intensely weathered to clays. Above the saprolite zone in regions where the profile is preserved, is a mottled zone. This zone lacks textures and is marked by the presence of concentrations of hematite / limonite / goethite which can prograde upwards into pisolitic laterite that in places can form metric zones of massive ferricrete, occasionally overlain by a layer of darky red clays formed by the breakdown of the ferricrete.

In the region of the mine sequence where the weathering profile is truncated, the truncation generally occurs within the saprolite zone. The upper contact of the saprolite zone is marked by an irregular stone-line which is the base of a plasma zone. This plasma zone is devoid of any structure and is generally a highly leached porous zone. The stone line occurs at the porosity interface and is generally highly irregular. The plasma zone is not transported but represents highly leached in-situ saprolite.

Colluvium is a general term that has been used to describe the extensive surficial zone that may host secondary mineralization. This was an important source of mineralization in the initial phase of mining.



Figure 7-3: Tucano Weathering profile

Colluvium can be a surficial layer of locally transported material, such as scree on the edge of topographic

breaks, or it has been erroneously applied to the plasma zone described above. (early field mapping interpreted the stone-line as representing an erosional surface). In both cases the gold is typically secondary and tends to be concentrated towards the base of the zone. Most of the mineralized colluvium has been mined but zones can still be found flanking the mine but with limited distribution and generally at lower grades.

### **7.2.2 LITHOLOGIES**

The major lithologies in the Tucano mine area are summarized in Table 7.1 and a geology map of the mine sequence is included as Figure 7-4.

The main lithologies in the mine sequence include amphibolite schists, iron formations, banded iron formations (BIF), carbonate rocks, sedimentary schists and quartzites. These units are extensively intruded by granitic pegmatites. Late diabase dykes, and gabbro bodies cut the sequence. The metasedimentary package is similar to the Serra do Navio Formation to the west that was mined by Indústria e Comércio de Minerios S/A (ICOMI) for manganese.

Table 7-1: Tucano Mine Lithology Units

Unit	Type	Domain	Abbreviation	Unit	Mineralogy
Alluvium		Alluvium	LOA	Alluvium	Sandy clay sediments
			MOA	Alluvium Mineralized	Sandy clay magnetic sediments (magnetite and goetite) with probable gold content
Colluvium		Colluvium	LOC	Undifferentiated Colluvium	Undifferentiated Colluvium
Laterite		Laterite	LLJ	Laterite	Ferruginous concretions
Intrusive rocks		Dykes	MMD	Gabbro/diabase	Plagioclase, pyroxene and magnetite
		Dykes	FGR	Pegmatites/Granites	Leucogranites with biotite, granet and / or tourmaline
Vila Nova Group	Clasto-pelitic sedimentary unit	Quartz domain	ZXQ	Muscovite quartzites	Muscovite quartzite, locally with fuchsite and /or sillimanite
		Pelitic domain	ZQJ	Muscovite Quartz Schist	Quartz–muscovite–biotite–schist with garnets
			ZXG	Graphite Schist	Graphite, biotite and quartz
			ZXX	Quartz–mica schists	Quartz–biotite–muscovite schist with garnets, interspaced with lenses of calc-silicates, iron formation and muscovite
	Clasto-chemical sedimentary unit	Transitional unit	ZAP	Para Amphibolite	Quartz–grunerite cummingtonite schist with garnets, chlorite and biotite; Quartz–amphibole schists and amphibole schists with lenses of silicate facies iron formation and calc-silicates
	Chemical sedimentary unit	Ferruginous domain	SIB	Banded iron formation	Diopside-hematite-grunerite-quartz, Hematite/magnetite-grunerite-hornblende-quartz
			SJ	Iron formation (facies Oxide and Silicate)	Grunerite–quartz–magnetite, sometimes with garnets, diopside and / or hornblende
			MIN	Orebody	Gold mineralization associated in BIFs or Calc-silicates with sulfides, mainly pyrrhotite followed by minor pyrite content
		Calc-magnesian domain	SCS	Calcissilicate	Grunerite-hornblende-diopsides with quartz, Actinolite–tremolite–diopsides, amphibole–diopsides with epidote, biotite and garnets
			SBJ	Carbonate Rock	Calcic marble, serpentine marble with tremolite, forsterite, fayalite, hastingsite, chlorite and magnetite; actinolite–tremolite–carbonate schists
	Volcanic unit		UMR	Ultramafic Rocks	Pyroxene, amphibole, olivine and biotite
			ZAM	Undifferentiated Amphibolite	Undifferentiated Amphibolite
			ZAO	Ortho-amphibolites	Plagioclase amphibolite, biotite–amphibole schists, plagioclase–cummingtonite–hornblende schists
Basement			GN	Gneiss	Feldspar (potassium feldspar and plagioclase); quartz; biotite; hornblende; garnet and epidote.



### 7.2.3 STRUCTURE

The Tucano gold mine is a N-S trending sequence of multiply deformed, near vertical volcano-sedimentary units along a seven-kilometre trend. The mine sequence is bounded to the west by the north-south trending margin of the Amapari Granite. The mine sequence is interpreted as the western limb of a N-S trending antiform.

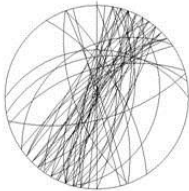
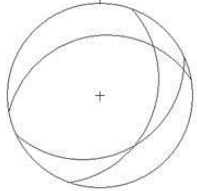
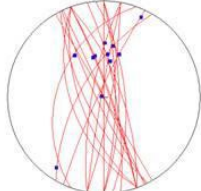
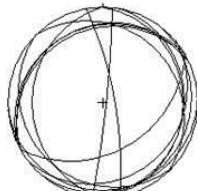
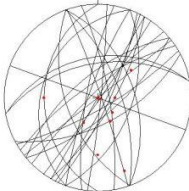
Within the mine sequence major shear zones strike N-S and are sub-vertical. The major shear exposed in the pits varies in width but is commonly 10-20m wide. It comprises an intense planar shear foliation indicative of mylonite and is interpreted as forming in early D1. The sense of shear is difficult to ascertain due to reworking of the shear during progressive deformation events. A tentative oblique sinistral, west-side-down sense of shear is ascribed, and a moderately plunging extension lineation with plunge at 50→045 has been observed. (Figure 7-5)

At least four deformation events are recognized that developed brittle and ductile features. Stress from these subsequent events was commonly accommodated by the pre-existing mylonitic fabric. Many of the late faults are a distinctive pistachio green color due to epidote.



Figure 7-5: Photo Indicating Plunge Lineation

Table 7-2: Structural History within the Tucano Mine

Deformation	Features	Total cleavage and fault data distributions
D1	Penetrative foliation that is steeply dipping and NE-SW to N-S striking parallel to lithological layering. Tight, mesoscale folds that have steep plunges and commonly defined by isolated intrafolial hinges	
D2	Rare recumbent folds with wavelengths of several 10's of cm to 1m. The S2 axial plane has a low dip and F2 folds have a low plunge. Noted predominantly in the AB1 area.	
D3	Open mesoscale folds of S1. Fold axes have variable plunges in the S1 but dominantly plunge moderately to the north.	
D4	Low to moderately dipping fracture cleavage that rarely shows accommodate of shear. Developed predominantly in all pits from AB2 north with best development at Urucum.	
Post-D4 faults	Numerous orientations, although a NE-SW strike subparallel to S1 is most common. Extension lineations most commonly have moderate to steep plunges.	

\*Olinda Gold, Brett Davis

## 7.2.4 ALTERATION

Mineralized zones show intense hydrothermal alteration, particularly pervasive silicification, carbonatation and sulfidation (Figure 7-6). Alteration is more intense in proximity to the more reactive chemical units such as BIFs and Calc-silicates. Alteration within the mineralization zones is generally marked by sulfidation, particularly pyrrhotite in the north to more dominantly pyrite in the south. Carbonate alteration can be extensive occurring in the chemical, sedimentary and mafic units. Silicification tends to be distal to the mineralization zone in the flanking sediment derived schists. i.e. quartz veining is not generally associated with the mineralization but the alteration trend did form a extensive topographic high.

Amphibole / garnet / tourmaline alteration observed in core is probably related to the late intrusion events. There is no clear relationship with the gold mineralization.

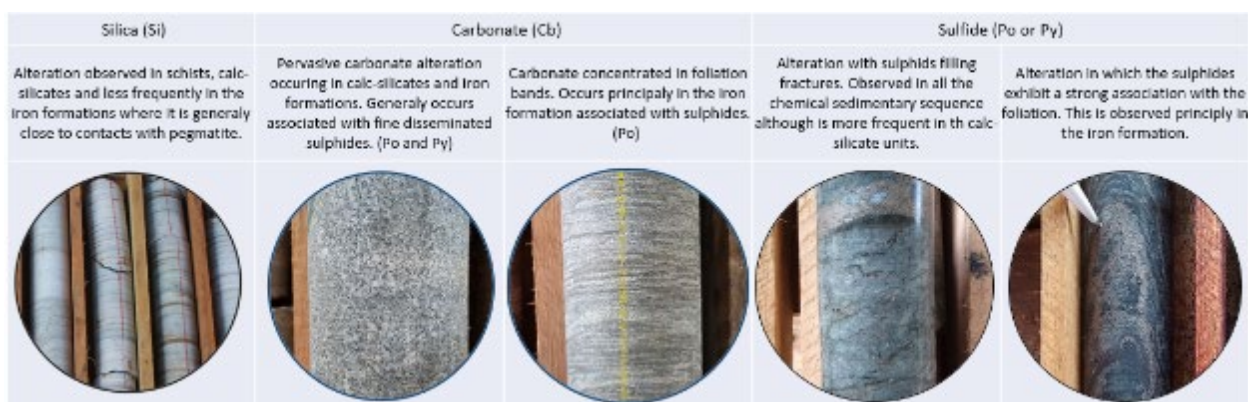


Figure 7-6: Photos of Core Illustrating Alteration Styles

## 7.2.5 MINERALIZATION

The mineralization zones on the north end of the mine sequence dip vertically to steeply to the east. Within the generally steeply dipping ore planes, higher grade zones are often found with shallow north plunges, interpreted to be controlled by gently plunging F2 fold hinges and more steeply dipping, fault intersections. On the southern end, at TAP AB the mineralization splits with a shallow dipping (~65°W) western ore zone hosted by calc-silicate units and a vertical eastern ore zone associated with iron formation. To the south of TAP AB the mine sequence is poorly defined. It swings to the southeast where Duckhead lies in the fold closure at the end of the sequence, approximately 4 kilometres from TAP AB.

The location of the key deposits is shown in Figure 7-7. Table 7-3 shows a description of length, width, depth, and continuity for each deposit.

Along the mine sequence, gold mineralization is associated with iron and carbonate-rich units of the chemical sedimentary sequence known as the William Formation. Gold mineralization is predominantly associated with the BIF facies, but carbonate and calc-silicate rocks also host economic mineralization. In

fresh rock, gold is generally associated with intense sulfidation in BIF units, or as low to no sulfidation gold mineralization within the calc-silicate and carbonate units. Pyrrhotite is the dominant sulphide in the northern parts of Tucano and pyrite in the south.

Pyrrhotite and pyrite occur in several forms: Disseminated, where it is observed in equigranular and anhedral millimetric crystals, dispersed in the rock matrix; strings or veinlets within foliation, or, veinlets or veins filling fractures, generally discordant with the main foliation of the rock and varying from mm up to decimetres in width. Sulphides also occur associated with carbonates and in breccias, as matrix within massive to semi-massive breccias that reach 10cm to 1m thickness. Grades in general tend to follow the amount of sulfide although high grade mineralization without significant sulphides does occur.

**Table 7-3: Dimensions of Tucano Mineralized Zones**

Great Panther Mining Limited – Tucano Gold Mine						
Deposit	Pit / Area	Length of Mineralization (m)	Average Width (m)	Depth defined by drilling (m)	Continuity of Mineralization Down Plunge (m)	Average gold grade (g/t)
TAP AB	TAP AB1	580	9	300	450	0,78
	TAP AB2	600	5,5	350	440	
	TAP AB3	420	5,5	460	480	
TAP C	TAP C1	800	6	150	150	0,58
	TAP C3	450	7	300	150	
	TAP C3N	350	5,5	90	150	
Urucum	URN/URCN	1000	4	780	550	1,04
	URS/URCS	1300	10	360	750	
Urucum East	URE	280	7	75	180	0,74
Duckhead	Main Lode	80	12	210	220	
	HW Lode	90	15	165	180	

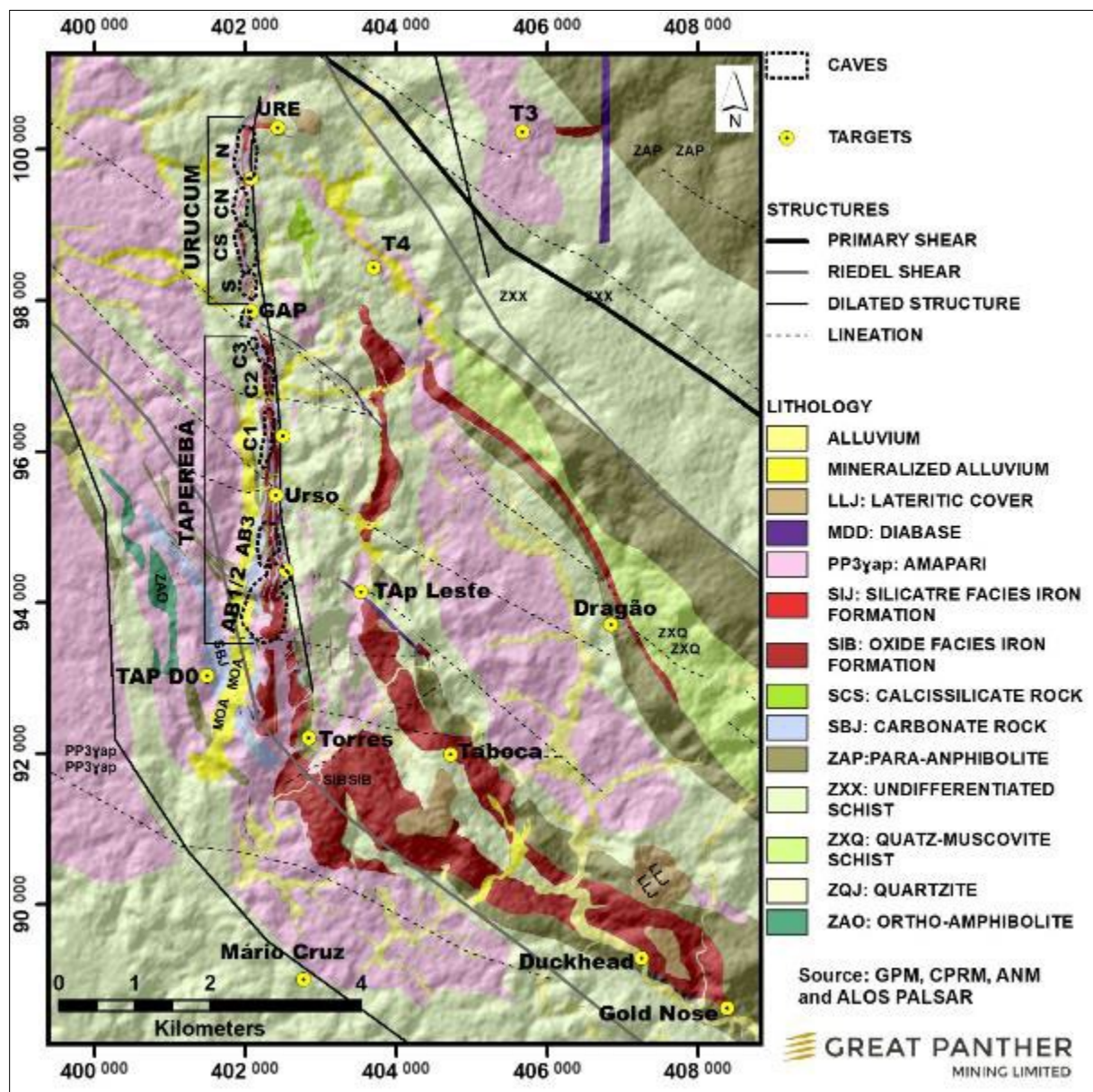


Figure 7-7: Tucano Mine Sequence and Key Deposits

### 7.3 DEPOSIT DESCRIPTIONS

The principle deposits form a 7 kilometre long lithologic-structural corridor referred to as the mine sequence. From north to south the deposits are Urucum (URN, URCN, URCS, URS), TAP C and TAP AB. Duckhead and URE are associated with fold hinges within the mine sequence, off the main north-south structure. (Figure 7-7).

The mineralization zone is generally decametric (~50 to +100m) in width being made up of a series of 1 – 8m wide, steeply dipping, sub-parallel, economically mineralized lenses. Quartz veining is rarely present, and veins are defined by the continuity of grades within zones of strong sulphide and /or carbonate alteration, generally within or near the contact of iron formations and the calc-silicate unit.

A suite of late post-mineralization pegmatites have been emplaced throughout the sequence in various orientations. Gold remobilization can occur at or near the pegmatite contact but is not common.

The gold mineralization style in all the orebodies follow the description of chapter 7.2.5 while overall ore body dimensions are summarized in Table 7-3.

### 7.3.1 URUCUM AND TAP C DEPOSITS

The Urucum – TAP C zones are emplaced within the north–south trending, multiply deformed, mine sequence, bounded to the west by the Amapari Granite. Gold mineralization at Urucum and TAP C is predominantly stratabound within the BIF and is characterized by disseminated pyrrhotite within the shear zone fabric. Elevated gold values can also be found in strongly altered but sulphide poor zones. Mineralization is commonly associated with pervasive silicification, but quartz veining is markedly absent.

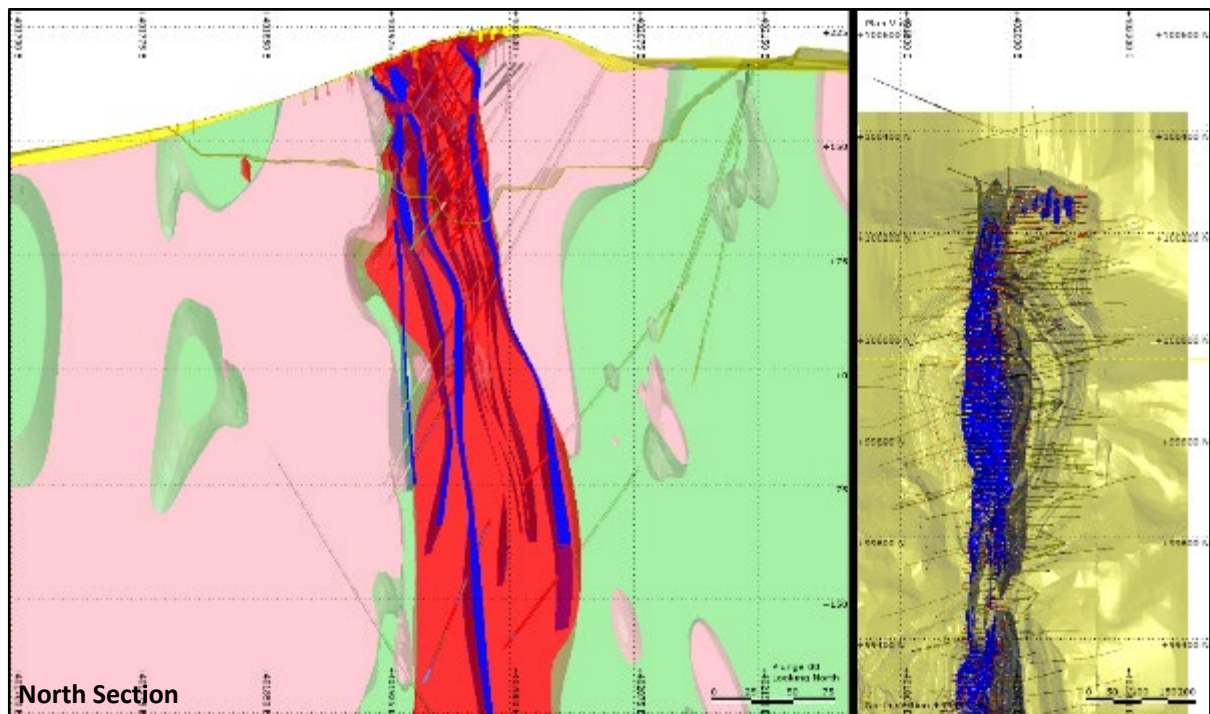


Figure 7-8: Urucum North -Typical Section

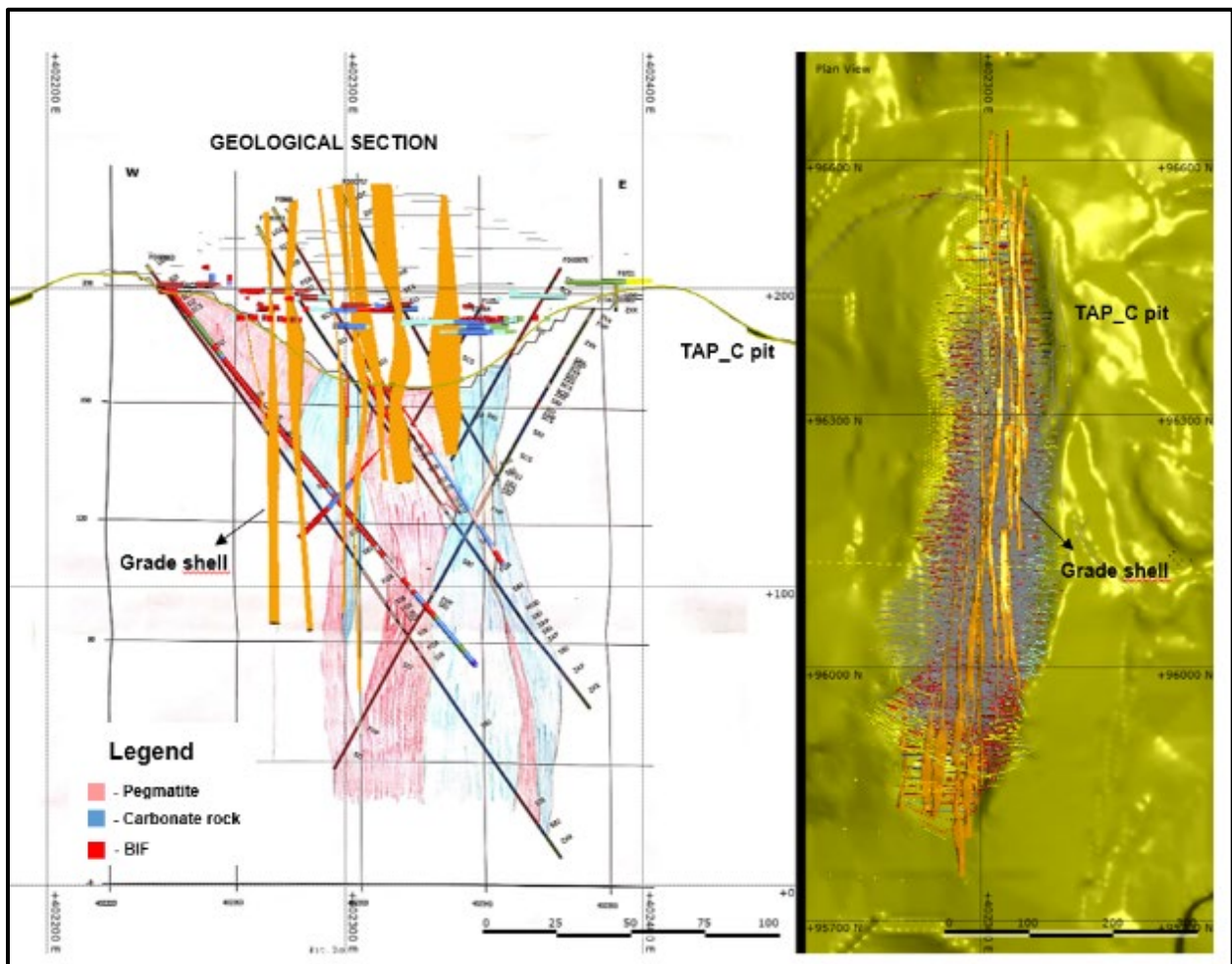


Figure 7-9: TAP C - Typical Section

### 7.3.2 TAP AB

Overall the TAP AB deposit is similar to Urucum and TAP C but has several important differences. The northern part, TAP AB3, consists of two sub-parallel mineralization packages, an eastern and western sequence. Both dip steeply to the east. They are truncated and separated from the mineralization in TAP AB2 by a late, sinistral NW structure. In TAP AB2 they continue with a more SSW orientation.

Continuing south to TAP AB1, it would appear that the western zone may be part of an overturned anticline with a steep west dipping eastern limb, and moderately ( $\sim 40^\circ$ ) dipping western limb hosted by a carbonate sequence. The eastern zone coming down from TAP AB2 is steeply dipping and appears to be tightly folded resulting in repetition of the zone within the TAP AB1 pit.

In all portions of TAP AB, the mineralization is hosted in similar chemical sediments as the northern parts of the mine sequence. However, in TAP AB the BIF's are wider, and the mine sequence is more deeply weathered. Drillholes have shown that the oxidation in the mineralized zone can extend to 300m depth beneath TAP AB. It is not clear if this is structurally related (more porous shear zone), lithology/alteration related (mixture of carbonate and sulphide alteration with weaker pervasive silicification) or due to a deeper conductive/oxidizing source that may be driving an SP cell (electric self potential) that accelerates weathering in the more porous structurally deformed zone.

Lastly, the sulphides at TAP AB are dominantly pyrite, with gold mineralization commonly associated with concentrations of 5–10% pyrite. Pyrrhotite only occurs as trace in TAP AB.

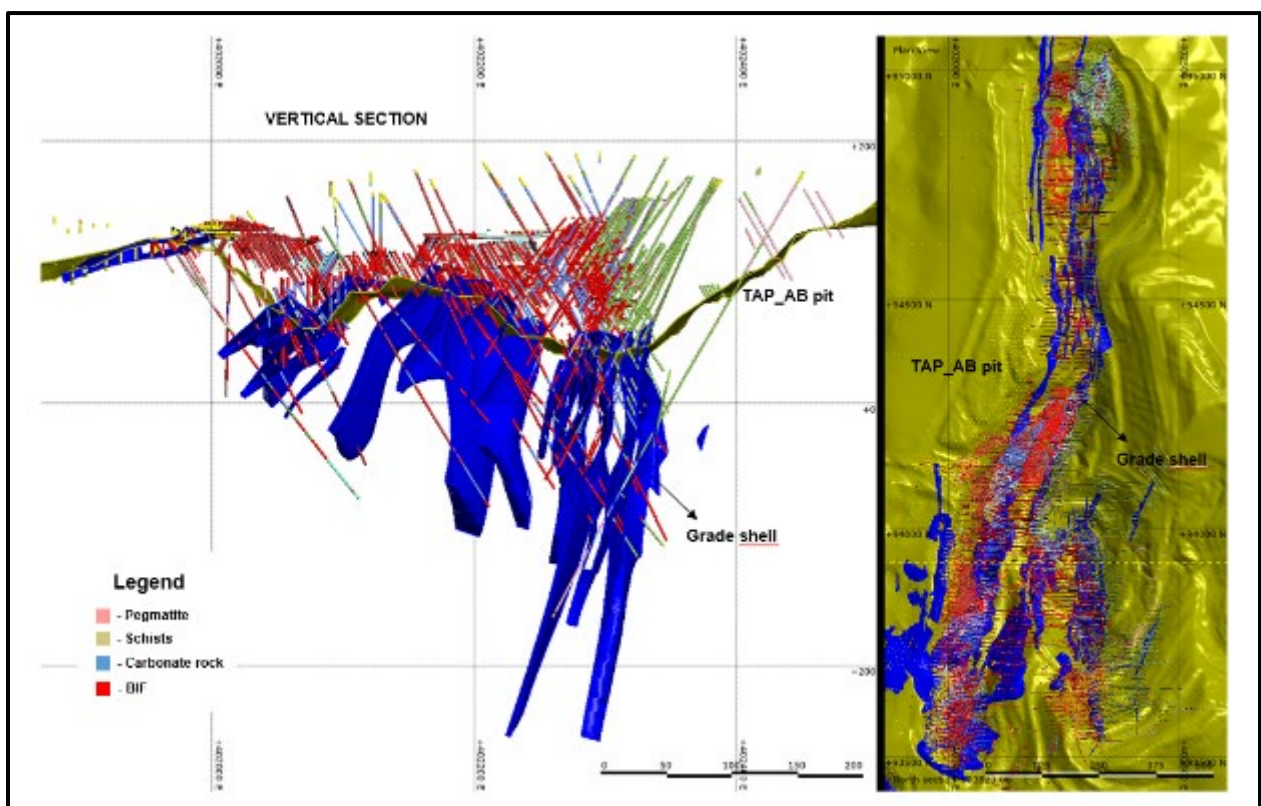


Figure 7-10: TAP AB - Typical Section

### 7.3.3 URUCUM EAST (“URE”)

Mineralization at URE is hosted in a wedge of dominantly carbonate units and with lenses of an iron rich unit, located inside a swarm of shallowly north dipping ( $-30^\circ$ ) pegmatite sills that have intruded the host schist unit. It is cut by a series of NNW structures. URE is undergoing permitting and mineralization has not been exposed by mining.

### 7.3.4 DUCKHEAD

The Duckhead deposit is located southeast of the TAP AB deposit. Mineralization at Duckhead is controlled by the interpreted intersection of steep east-west striking shear zones with a BIF to form, steep, west plunging high grade shoots. The texture and mineralogy along the shear zone indicate high-temperature hydrothermal alteration, particularly silicification and sulfidation, bearing auriferous pyrite.

The Duckhead deposit is divided into two zones. The Main Lode is 80 m long, 12 m wide and drill tested to 210 m depth. It has a down-hole plunge continuity of 220 m. Mineralization at the Hanging wall (“HW”) Lode is 15 m thick, has been drill tested to 165 m depth. It has a down-hole plunge continuity of 180 m with 90 m in strike extent.

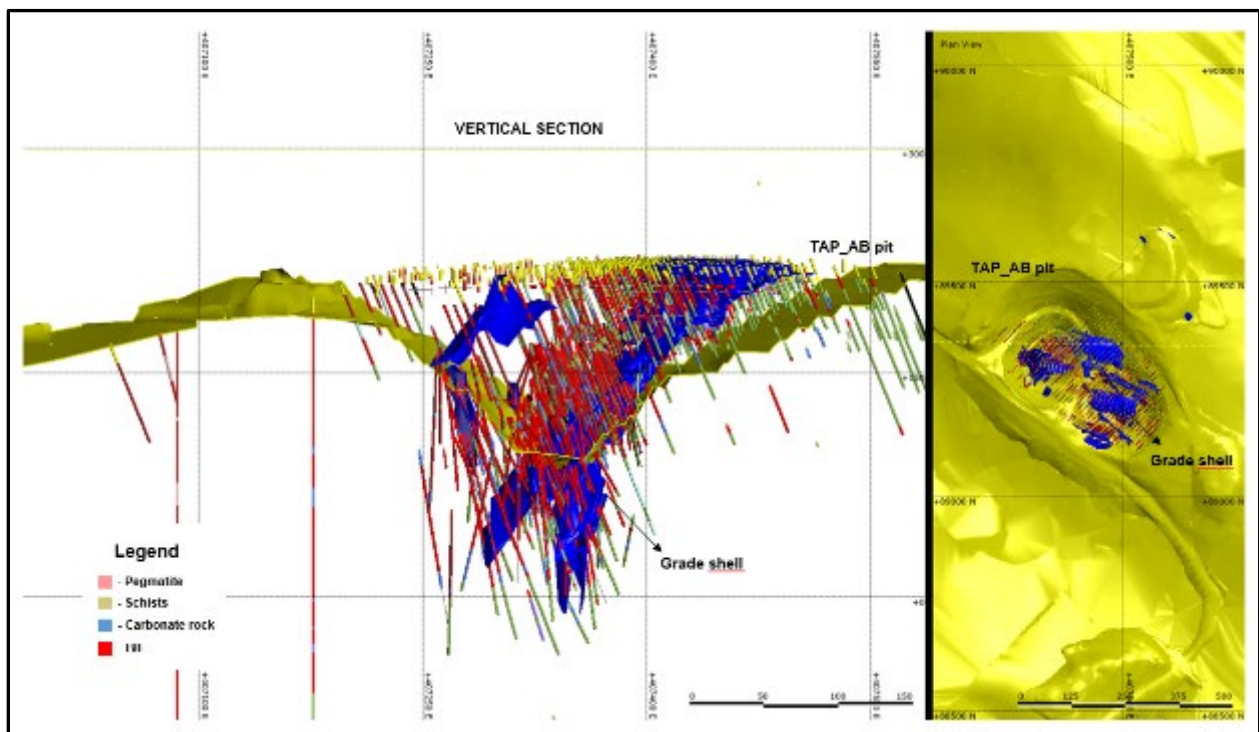


Figure 7-11: Duckhead - Typical Section

## 7.4 PROSPECTS/EXPLORATION TARGETS

Prospects are discussed in Section 9.

## **7.5 QP COMMENTS ON “ITEM 7: GEOLOGICAL SETTING AND MINERALIZATION”**

The QP notes the following:

- The understanding of the deposit geology and mineralization have developed over time. In the early days, the deep weathering hindered interpretations.
- The deposit was emplaced prior to peak deformation. Now that pits are generally in fresh rock the geology is clearer, and the structural complexity of the mineralization is more evident.
- The knowledge of the deposit is sufficient to support Mineral Resource and Mineral Reserve estimation and mine planning.
- The interpretation and understanding of the controls on the mineralization at Tucano are important for application in the near mine and regional exploration to extend the LOM.

## 8. DEPOSIT TYPES

### 8.1 OVERVIEW

The deposits at Tucano are examples of orogenic, structurally controlled Proterozoic gold deposits. They have the added, positive characteristics of being associated with BIF formations and evidence of intrusive activity that occurred before, and possibly during, the mineralization event.

The age and structural controls at the Tucano Gold Mine exhibit similarities to Birimian, Orogenic Gold deposits in West Africa and other Proterozoic deposits in the Guianas of northern South America. Figure 8-1 shows a reconstruction of the Guiana Craton with the West Africa Shield showing the location of the major gold deposits in the area.

While Tucano shows many of the key attributes of the Orogenic gold deposit category, it is hosted by banded iron formations and occurs along strike of the Amapari iron ore deposit, previously mined by Anglo Ferrous of the Anglo-American group.

The district-scale potential for BIF-hosted gold deposits is another attribute that places this deposit type on the radar of both Junior explorers and major producers. “Like VMS deposits, they are often found in clusters. This characteristic is highly attractive to major gold companies looking for new deposits that can be developed into mines with longevity,” said Goldsmith, a member of the Society of Economic Geologists and the American Institute of Mining and Metallurgical Engineers. Both Orogenic and Banded iron formation-hosted gold deposits have the potential to become large-tonnage mines with extended mining lives.

While Tucano shows many of the key attributes of the Orogenic gold deposit category, it is hosted by banded iron formations and occurs along strike of the Amapari iron ore deposit, previously mined by Anglo Ferrous of the Anglo-American group.

The district-scale potential for BIF-hosted gold deposits is another attribute that places this deposit type on the radar of both Junior explorers and major producers. “Like VMS deposits, they are often found in clusters. This characteristic is highly attractive to major gold companies looking for new deposits that can be developed into mines with longevity,” said Goldsmith, a member of the Society of Economic Geologists and the American Institute of Mining and Metallurgical Engineers. Both Orogenic and Banded iron formation-hosted gold deposits have the potential to become large-tonnage mines with extended mining lives.

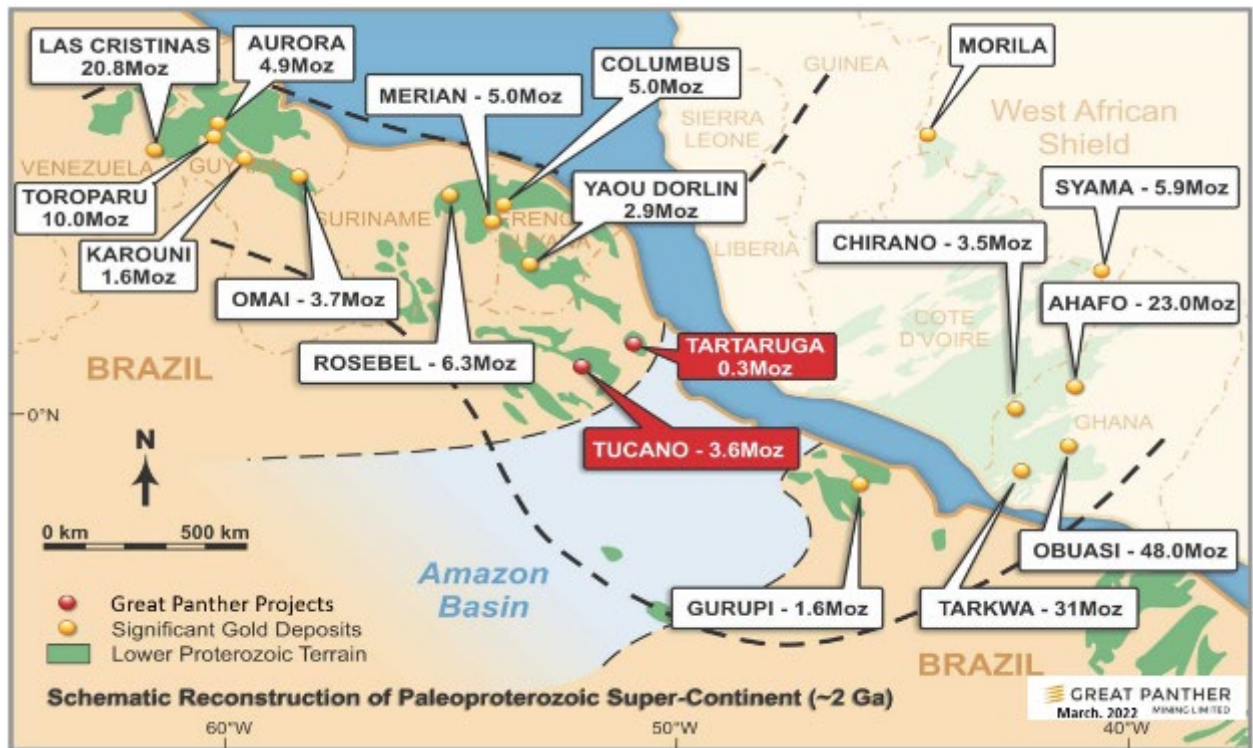


Figure 8-1: Reconstruction of the Guiana Craton and West Africa Shield

## 8.2 QP COMMENTS ON “ITEM 8: DEPOSIT TYPES”

The QP considers that the exploration programs based on the Orogenic and BIF type gold deposit models being used by Great Panther, are appropriated for exploration targeting and modelling both along the mine sequence and in the extensive regional tenement portfolio.

## 9. EXPLORATION

In addition to the active mining concession, Great Panther has a large portfolio of contiguous exploration tenements. This package was first amassed in the 1980's by Mineração Vale dos Reis but only saw sporadic exploration. Data and work programs completed prior to Great Panther's acquisition of the project in March 2019, are referred to as legacy data or legacy programs and summarized in Section 6.

Exploration along the 7-kilometre-long mine sequence between the Urucum and TAP AB deposits relies on drilling programs and is described in the next section.

The Great Panther regional exploration tenement portfolio lies within a trend of approximately 90 kilometers by 20 kilometers covering an underexplored, Proterozoic aged greenstone belt. The multiple gold deposits along the 7-kilometre-long Tucano Gold mine sequence, demonstrate the gold potential within the Vila Nova Belt. What is unusual in Proterozoic or Archean greenstone belts, where a significant deposit is known, is to not have additional deposits or mines. Most belts host several gold deposits, often of different size and styles of mineralization. Even compared to other similar belts in the Guiana - West African shield, it is evident that the Vila Nova belt lacks the same level of exploration activity. While there is not always a direct correlation, between exploration and discovery, recent exploration activities carried out by Great Panther over the last 24 months and discussed below, lead Great Panther to believe that the belt warrants quality, focused exploration.

Great Panther has good quality, regional aero-geophysical data that covers approximately 3,000 square kilometers. In 2020 the Company focused on the compilation of legacy information and detailed interpretation of the aerogeophysical datasets. This led to the identification of favorable exploration corridors or targets within the belt which have elevated exploration potential. Through the detailed interpretation and analysis of the structural and lithologic information contained in the regional aero-geophysical datasets:

- Mapped regional structures and clustered them by association with deformational events. Four deformational events are recognized in the aero-geophysical data.
- Identified the two key deformational events most likely related to the introduction of mineralization; syn/post-D1 and syn/post-D2. Based on structures associated with these deformational events, key target areas have been identified, (Riedell shears, Principal Shears, kinks and low-pressure zones) that may have focused mineralized hydrothermal solutions along favorable fluid pathways.
- Separated igneous events allowing prioritization as potential sources for heat to drive the plumbing systems and/or as sources of the hydrothermal solutions, and for pre-mineralization intrusions, that may have generated favorable structural settings for the emplacement of mineralization.
- Mapping of lithologic units with characteristic geophysical signatures, that potentially reflect reactive (iron formations, carbonate or manganese rich formations) or high porosity zones. These may be indicated by magnetic anomalies or conductive zones.

Low detection limit soil geochemistry was the initial phase choose to define targets within the prospective corridors due to costs and possibility to evaluate large areas in relative short time. In 2021,

following the definition of the high priority exploration corridors the company initiated, 700-line kilometers of multi-element geochemical soil sampling. To date around 14,500 samples have been collected on regional grids with a sample spacing of 400x40 meters (lines x sample station). 300-line kilometers or 7,000 soil samples are still required to complete coverage of the priority corridors.

A number of significant targets, including Lona Amarela and Mutum were first identified in the 1990's however these were not followed-up within their regional context or with integrated exploration programs. These are being evaluated with soil grids of 80x40 or 160x40 meters, depending on the target, followed by auger and/or RAB drilling. If warranted, they will be tested by RC and DD for resource definition.

A critical part of both the regional exploration programs and the resource extension drill programs along the mine sequence, is understanding the exploration model. The legacy resource modelling is based on gold grades. Great Panther is developing a lithology and alteration base using mapping, logging and multi-element geochemistry. This is allowing the company to dismantle dogmas previously held and focus on collection of critical information for developing the exploration model. Great Panther believes that this approach will not only allow reserve replacement to be efficiently carried out but give the necessary tools to allow the regional exploration to develop long term resources.

Great Panther expects these parallel programs of focused exploration will maximize the potential for exploration success. While programs are run in parallel from an operational perspective to ensure efficiency and focus, a critical part of the success of these programs will be the harnessing the technical knowledge and experience of the exploration team across the programs.

Summaries of the exploration results obtained by Great Panther since the last Tucano Technical Report can be found in news releases issued by Great Panther in 2020 and 2021.

## **9.1 GRIDS AND SURVEYS**

In 2021 over 700-line kilometres of soil grids were opened and sampled. A further 200-line kilometres of ground magnetics was collected to compliment the interpretation of the soil geochemistry. Grid line spacing is defined according to the objective. Regional soil grids vary from 400x40 meters to 80x40m depending on the stage of knowledge, objective (regional, fast track, detailed) and complimentary activities. (Figure 9-1).

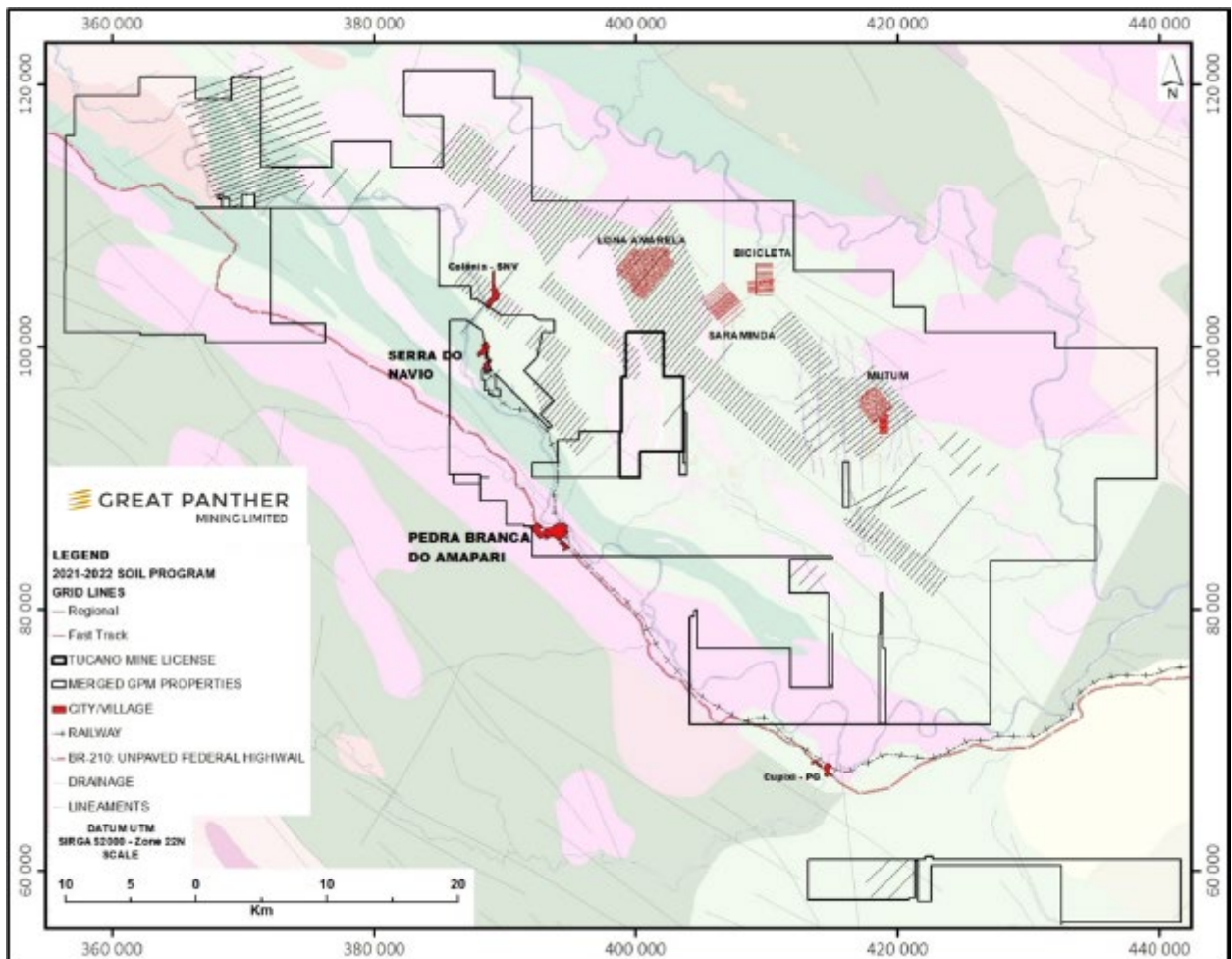


Figure 9-1: Tucano - Regional Soil grids

The primary source of regional topographic data is the ALOS PALSAR (Advanced Land Observing Satellite; Phased Array type L-band Synthetic Aperture Radar), Digital Elevation Model (DEM) (Figure 9-2). The nominal spatial resolution is 12.5 meters however, to comply with US Government regulations the data is down graded to a resolution of 30 meters. Total station GPS theodolites are used for surveying drill holes and implantation/transfer of topographic landmarks for soil programs. The integration of DEM and total station data produces an improved topographic database.

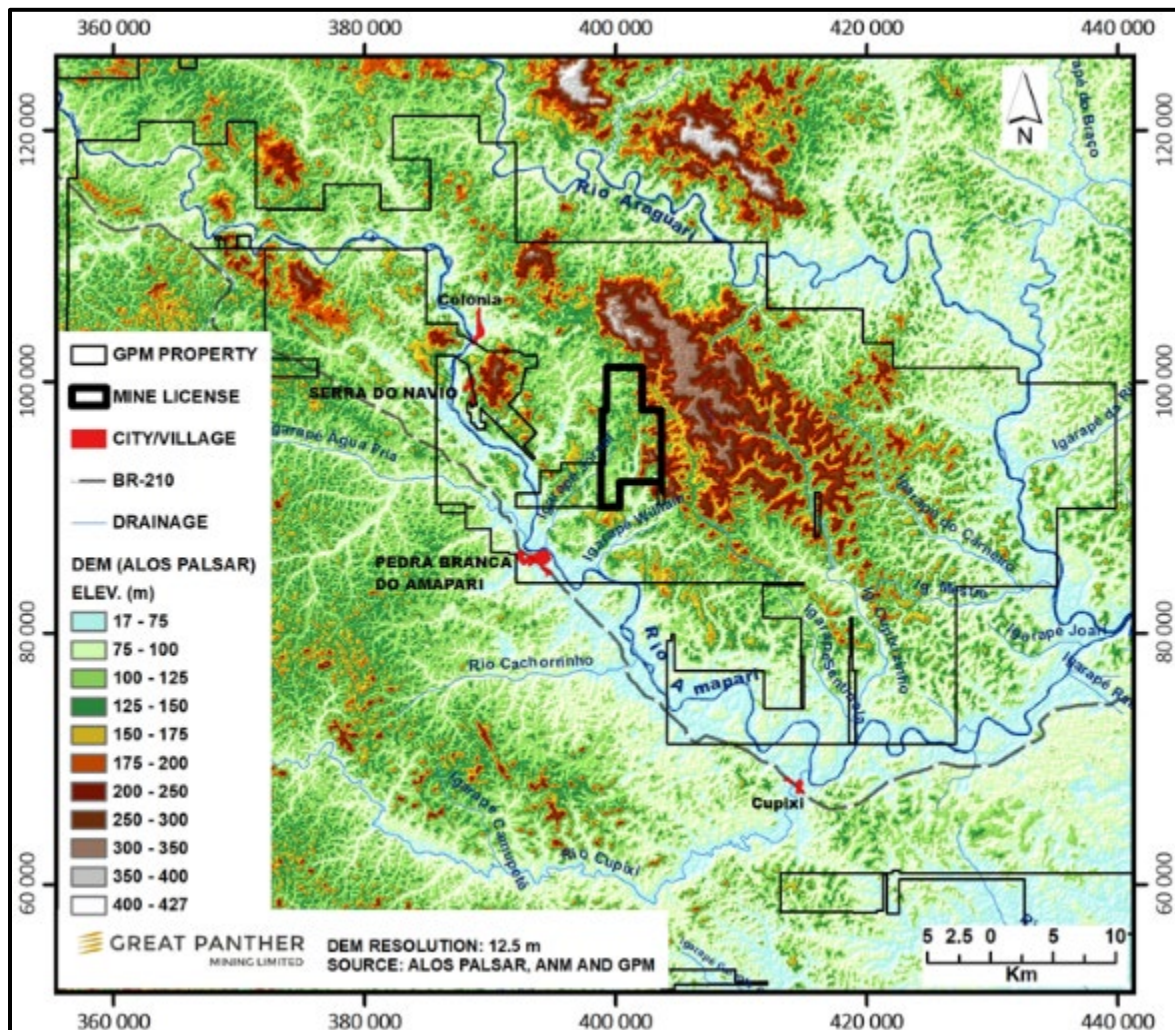


Figure 9-2: Tucano AOI and ALOS PALSAR DEM

## 9.2 GEOLOGICAL MAPPING

A number of phases of geological mapping were conducted along the Project history. MPBA and Beadell mapped at regional-detail scales. Outcrops are generally scarce; however, the composition of the soil, blocks, boulders and colluvium cover indicated underlying geology, which in conjunction with geophysics, allowed preliminary geologic interpretations. Mapping typically occurred in conjunction with soil sampling along defined sampling lines (Figure 9-3).

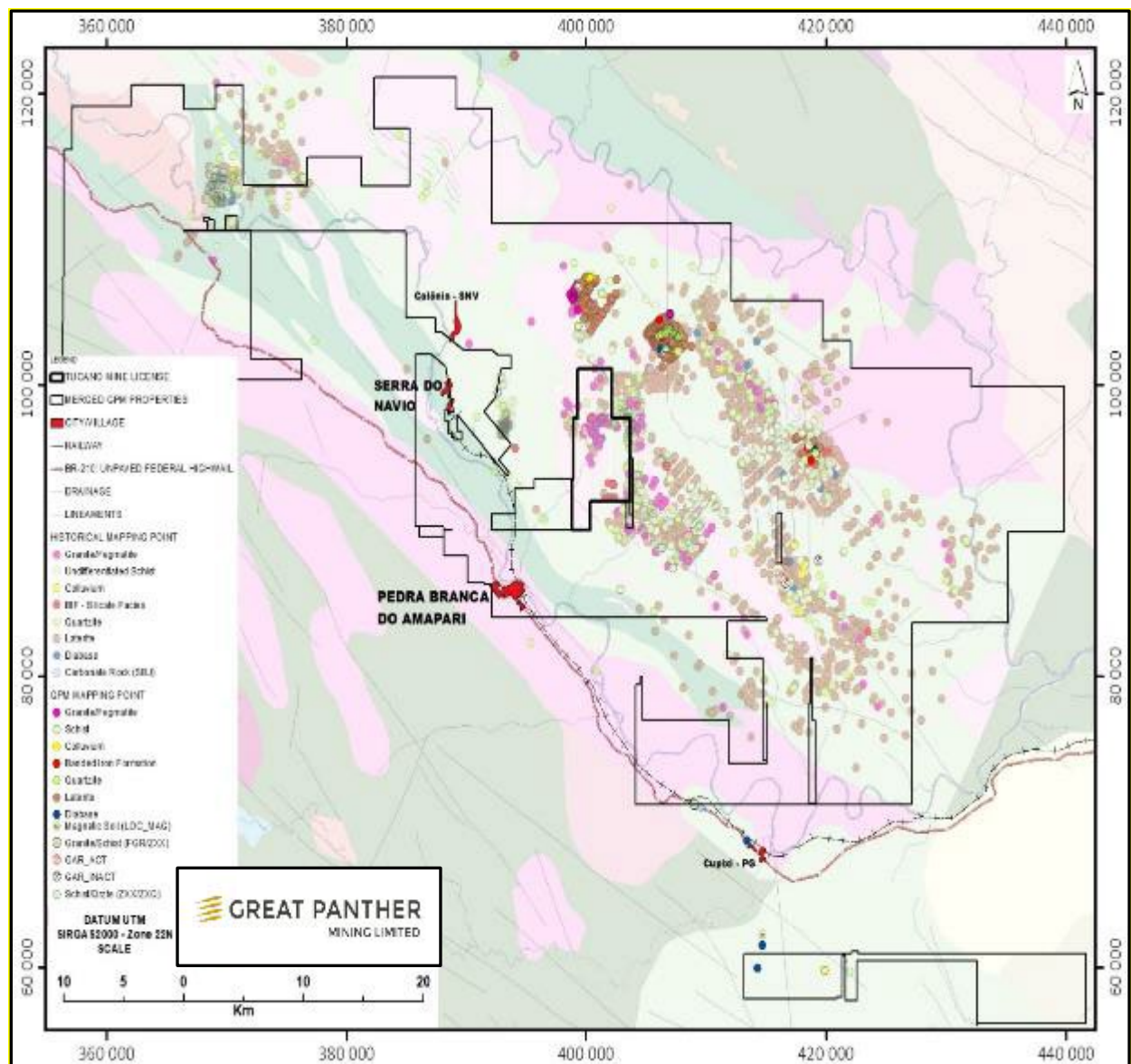


Figure 9-3: Tucano Regional Geological Mapping Points

### 9.3 GEOCHEMICAL SAMPLING

Recent exploration within the regional tenement portfolio was initiated by Beadell in 2017. They conducted a regional stream sediment sampling program, generating 263 samples sent for fine fraction (200 mesh) bulk leach extractable gold analysis. Samples were collected at approximately 700 m spaced centres, typically one sample per stream tributary. Each sample involved compositing micro-samples from 35 points along a 100 m length of stream.

The interpretation of stream sediment data shows an anomalous gold distribution over almost the entire research area, with the best results found in the Central (Tucano mine and surrounding area) and Northwest portions of the area.

Between 2017 and 2018, Beadell conducted soil sampling on a 400 m x 40 m grid, later tightening to 200 m x 40 m spacings. A total of 3,907 samples were collected. During the program a total of 1,073 rock chip samples were also collected.

The consolidated rock geochemistry data shows best results on Central portion, in special on Tucano mine trend.

In 2021 Great Panther collected around 14,500 soil samples. Samples are collected at 30 - 40 centimeters depth with 3 to 5kg of soil being collected, laced on a plastic sheet and manually disaggregated with the coarse lateritic fraction discarded. The sample is homogenized and quartered separating 1 to 2kg of material which is described, bagged and sent to the exploration sample preparation facility at Tucano. The sample is dried, crushed and pulverized. A 200-300g aliquot is split and sent to the ALS laboratories facilities in Belo Horizonte. The analysis process involves homogenization followed by separation of a 5g sample for dissolution by aqua regia and analysis using ICP-MS for gold and low detection limit multielement geochemistry, AuME-TL43. Figure 9-4 shows preliminary data from Mutum indicating a structural trend associated with anomalous gold soil geochemistry. The target will be followed-up in 2022.

## **9.4 GEOPHYSICS**

### **9.4.1 AIRBORNE**

In 1998 LASA Engenharia e Prospecções S.A were contracted by AngloGold Ashanti Ltda to fly two blocks in the Tucano region collecting aeromagnetic and radiometric data. A total area of 10,377 km<sup>2</sup> was covered with 250 metre spaced lines at an elevation of 100 m in two areas, AP1 (Eastern Area) and AP2 (Western Area).

In 2001, AngloAmerica's proprietry Spectrem electromagnetic system was brought to Brazil to fly the Quadrilátero Ferrífero in Minas Gerais and the Tucano Belt in Amapá for AngloGold Ashanti. The survey was flown on 200 m spaced lines.

In 2004, the CPRM - Companhia de Pesquisa de Recursos Minerais, (state exploration company) and the Serviços Geológico do Brasil (Geological Survey of Brazil) flew a government funded airborne magnetic, radiometric survey covering the Araguari River Project area in Amapá State. The survey covered 10,872 km<sup>2</sup> at an elevation of 110 m and a line spacing of 500 m.

In 2015, Beadell contracted Southern Geoscience Consultants (SGC) in Australia to merge and re-process the various airborne and ground geophysical datasets.

For the airborne magnetic datasets, the AP1 survey was excluded as it was superseded by the higher resolution Spectrem survey (Figure 9-4.D). The processing of the airborne magnetic datasets involved re-projection to a common SAD69 22N datum, re-gridding, merging, and filtering.

Filters applied to the merged total magnetic intensity (TMI) dataset included:

- Reduction to Pole (RTP).
- First Vertical Derivative (1VD).
- Analytical Signal (AS)
- Analytical Signal of the Vertical Integral (ASVI) of the TMI.

An example of the merged, re-processed images from the SGC along with the Tucano tenement outline is shown in Figure 9-4. Banded iron formations (BIFs) and late cross cutting diorite dykes are shown as magnetic highs in red.

SGC also merged all four datasets for the following radiometric elements: K, U, Th, and TC (total count) using a grid cell of 100 m for the Araguari dataset and a grid cell of 50 m for the others. K and U were not used from the Spectrem dataset due to an issue with the processing of these channels.

#### **9.4.1.1 Airborne Electromagnetic Survey**

An airborne electromagnetic survey was conducted in January 2001, for AngloGold Ashanti. A total of 4,601 kilometres of line data were collected on 200 m spaced lines before the EM Bird (sensor) was lost and thus an estimated 750 line-kilometres of the survey was not completed. In addition to airborne electromagnetic survey, aeromagnetic, radiometric, and digital elevation model data were also collected.

The data was processed by Spectrem in South Africa. A large number of good quality bedrock conductors were identified in the largely resistive environment. Most of these conductors seem to be due to carbonaceous units although many of those could also be ascribed to sulphide-rich horizons. A number of conductors, identified as BIFs with associated sulphides, are of interest as gold exploration targets. High conductivity-thickness product AEM anomalies with a magnetic association are potentially indicative of pyrrhotite rich sulphide conductors.

#### **9.4.2 GROUND GEOPHYSICS**

In 2004, MPBA contracted AFC Geofísica Ltda to carry out ground geophysical surveys using the following methods, magnetometer, very low frequency (VLF), and induced polarization (IP) time domain over the TAP AB, TAP D, Urucum, Vila do Meio, and URE areas. The first stage of the geophysical survey included four lines ranging from 300–800 m in length as a baseline against known mineralization at Urucum, TAP D, and TAP AB, as these zones were already defined by drilling.

At Vila do Meio and URE, only IP and magnetometer surveys were completed along eight lines for a total length of 6,100-line m, and 8,350-line m, respectively. Initial surveys used magnetometer readings at 10 m intervals and an IP spacing of 25 m was used on short dipole-dipole lines up to 400 m in length, with a combination of dipole-dipole and gradient array on longer lines up to 800 m in length. At URE and Vila do Meio, magnetometer reading spacing was at 25 m and the IP dipole was 50 m with some lines employing a combination of dipole-dipole and gradient array. Anomalism associated with mineralization was

detected on all lines in the IP. The magnetometer was excellent in defining the BIF. IP conductors in areas without drill information were identified and flagged for follow-up work.

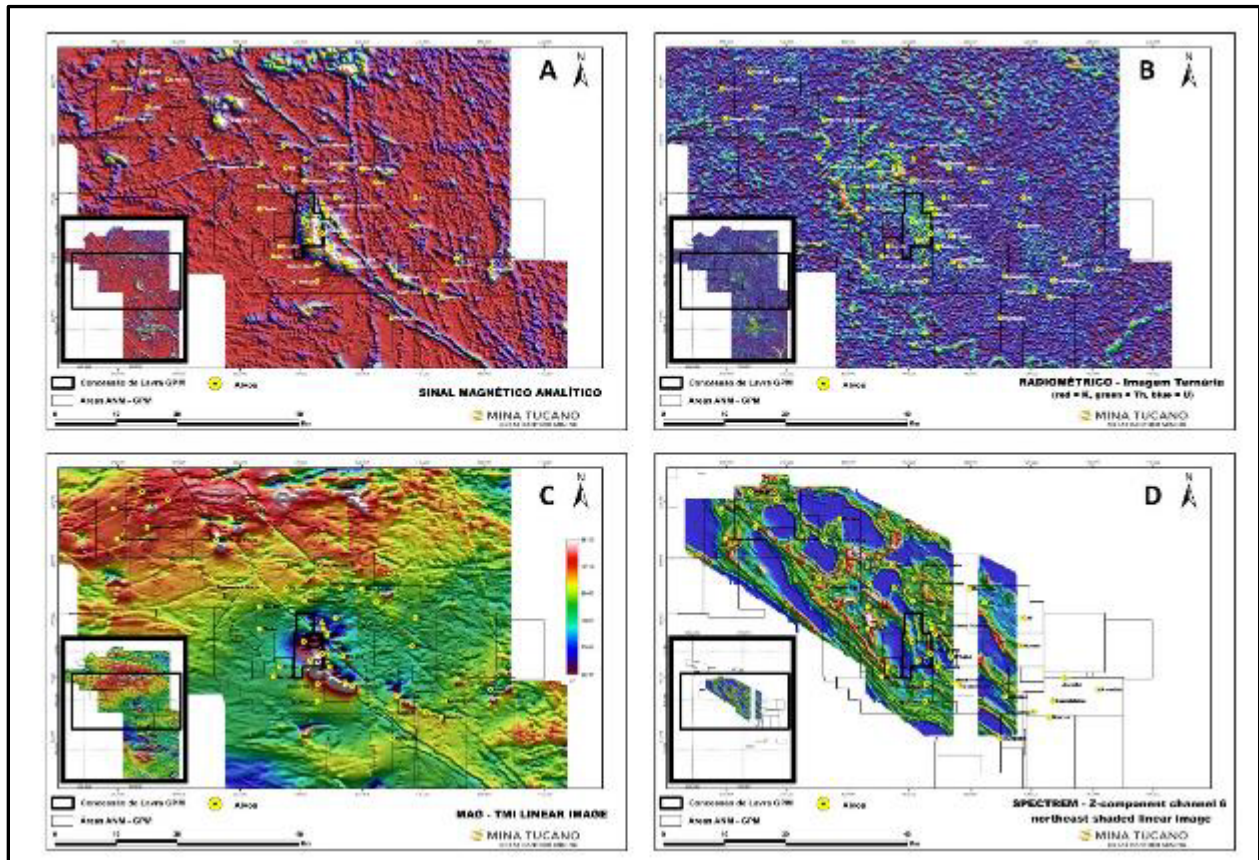


Figure 9-4: Tucano Aerogeophysics. A:Analytic Signal; B:Radiometric; C:Total Magnetic Intensity; D:Spectrem

In 2015, Southern Geoscience Consultants re-processed the ground magnetic data for Vila do Meio with the aim of providing information in the Spectrem data gap area; however, the resolution of the image was considered poor. It was recommended to close the reading spacing to 10 m to improve resolution. A review of the ground IP dataset was not undertaken by SGC

In August 2021, Great Panther initiated ground magnetic surveying of soil grids. Surveys are conducted by the exploration team and data quality and processing is carried out by AFC Geofísica Ltda ("AFC"). AFC generate Analytical Signal (AS) and Total Magnetic Intensity (TMI) maps, as well as a 3D Magnetic Inversion models. (Figure 9-5 and Figure 9-6). These products are used to compliment the interpretation of the geochemistry data, delineating structures, recent diabase dikes and magnetic lithologies, especially banded iron formations, a preferred host of gold on the property.

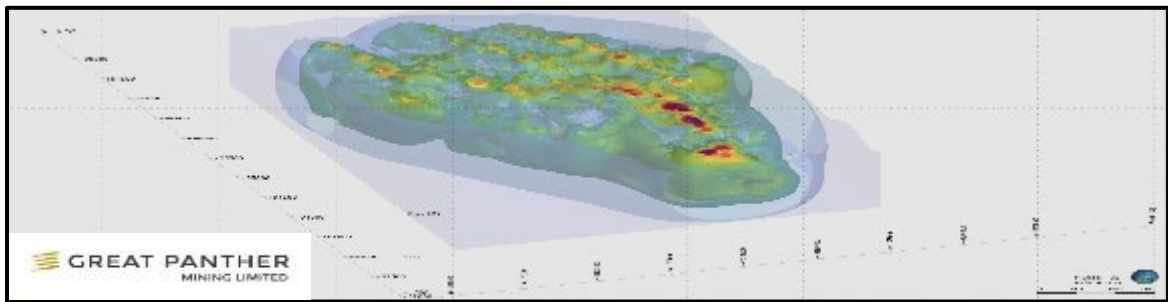


Figure 9-5: Magnetic Inversion over the Mutum Trend – 3D Model

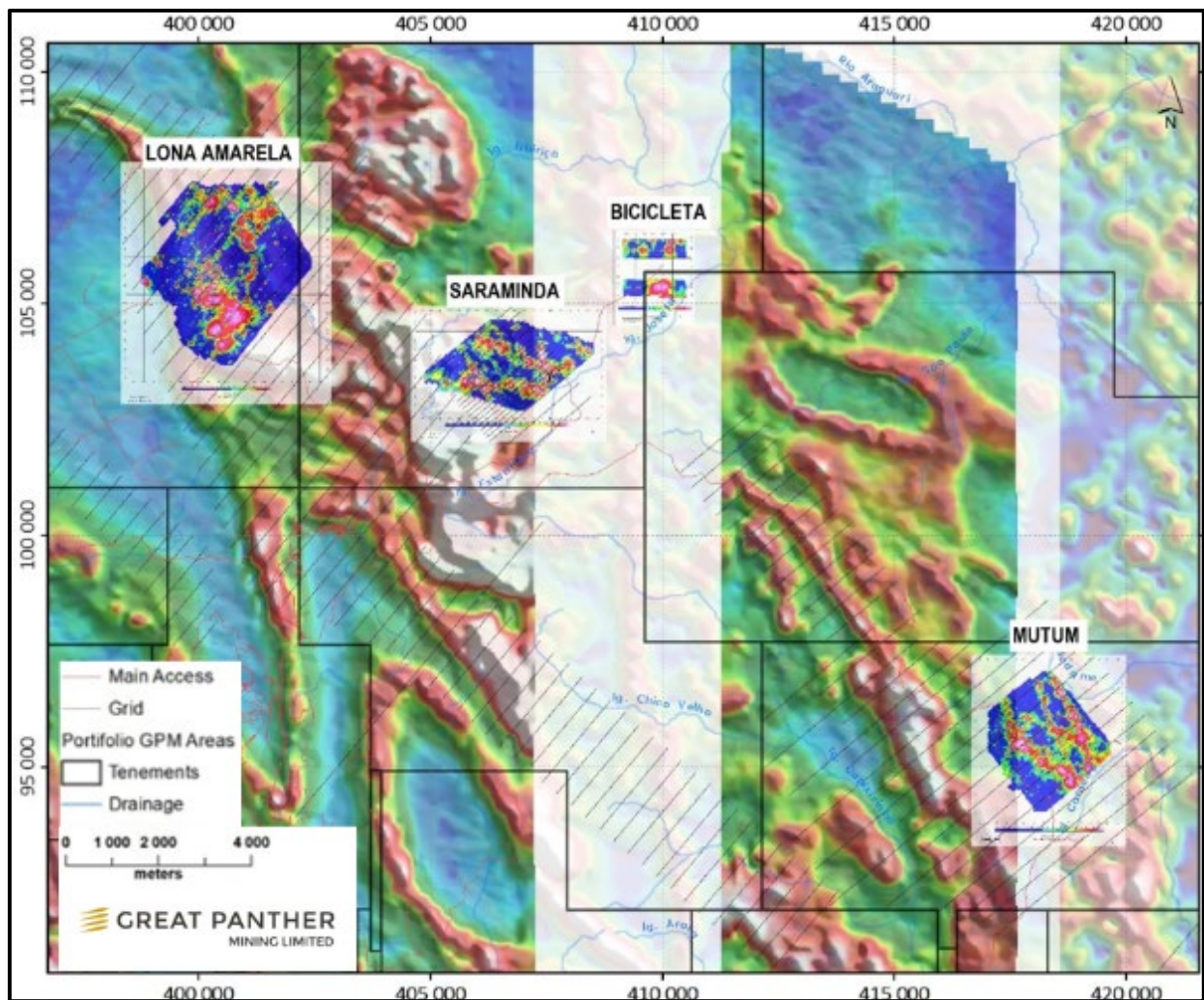


Figure 9-6: Ground Geophysics on Fast Track Targets over Spectrem Conductivities

## 9.5 DATA REVIEWS

### 9.5.1 GEOPHYSICAL INTERPRETATION

A review of the re-processed geophysical data was undertaken by Great Panther personnel in 2020. Structures were mapped and then separated and grouped into chronologic / deformational events. Four regional deformation events are recognized in the airborne geophysical data. Mineralization is interpreted to have been probably associated with the D1 and D2 structures. Therefore, a detailed evaluation was carried out of these structures to generate a structural framework model. Based on this model, favorable structural loci including Riedell shears, principal shears, kinks and low-pressure zones were identified and prioritized for exploration. (Figure 9-7 and Figure 9-8).

In a second interpretation, intrusion were outlined based on the geophysical data, and prioritized based on their shape, (age), lithology / oxide state (radiometric and magnetic signatures) and associated alteration haloes. These intrusions were considered to be potential heat sources that could be a source of and a mobilization factor in hydrothermal solutions (Figure 9-9).

Lastly, detailed geophysical stratigraphic units representing iron-, carbonate- or manganese-rich formations were mapped. These units potentially are chemically reactive with mineralizing fluids.

Based on the results above the greenstone belt was separated into three distinctive domains with characteristic, lithology, structure and intrusive histories (Figure 9-8). The southern domain is dominantly a clastic sedimentary domain with long primary and secondary transpressional structures. The central domain is presumed to host mixed volcanic and sedimentary units with well developed transpressional structures, marked by extensive intrusive activity. The northern domain is dominantly a mafic volcanic zone. Due to lack of magnetic and resistivity contrasts, neither structures nor lithological variations are as evident as in the previous domains. From an exploration perspective the southern and middle domains are considered to be highly prospective while the northern domain requires additional work to understand its prospectivity.

## 9.6 QP COMMENTS ON “ITEM 9: EXPLORATION”

The QP notes the following:

- Exploration data that has been generated and interpreted is at an appropriated scale for the stage at which the exploration programs are found. The current understanding of the greenstone belt represents the knowledge derived through the interpretation of the data to date.
- Data analysis indicate exploration potential in the near-mine areas including some targets in a radius of 20kms around the mine, defined as the Fast Track program.
- An appropriate target ranking and work prioritization process has been developed, and guides the investments in regional work. The work has been carried out according with the best practices, with the use of recognized professionals, contractors, certified laboratories and industry standard process of quality control.

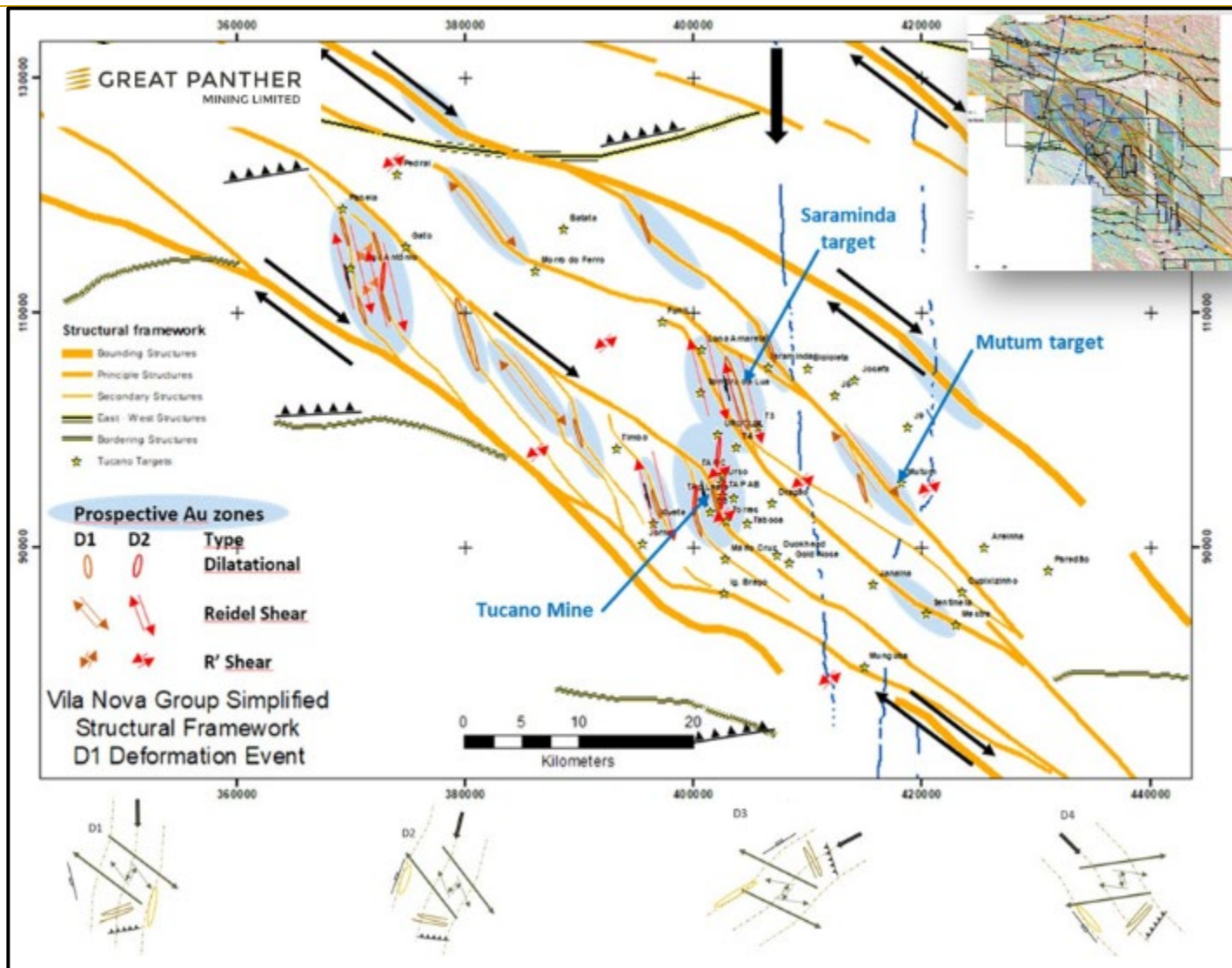


Figure 9-7: Interpretation of Regional Aerogeophysics - Structures and Deformational Events

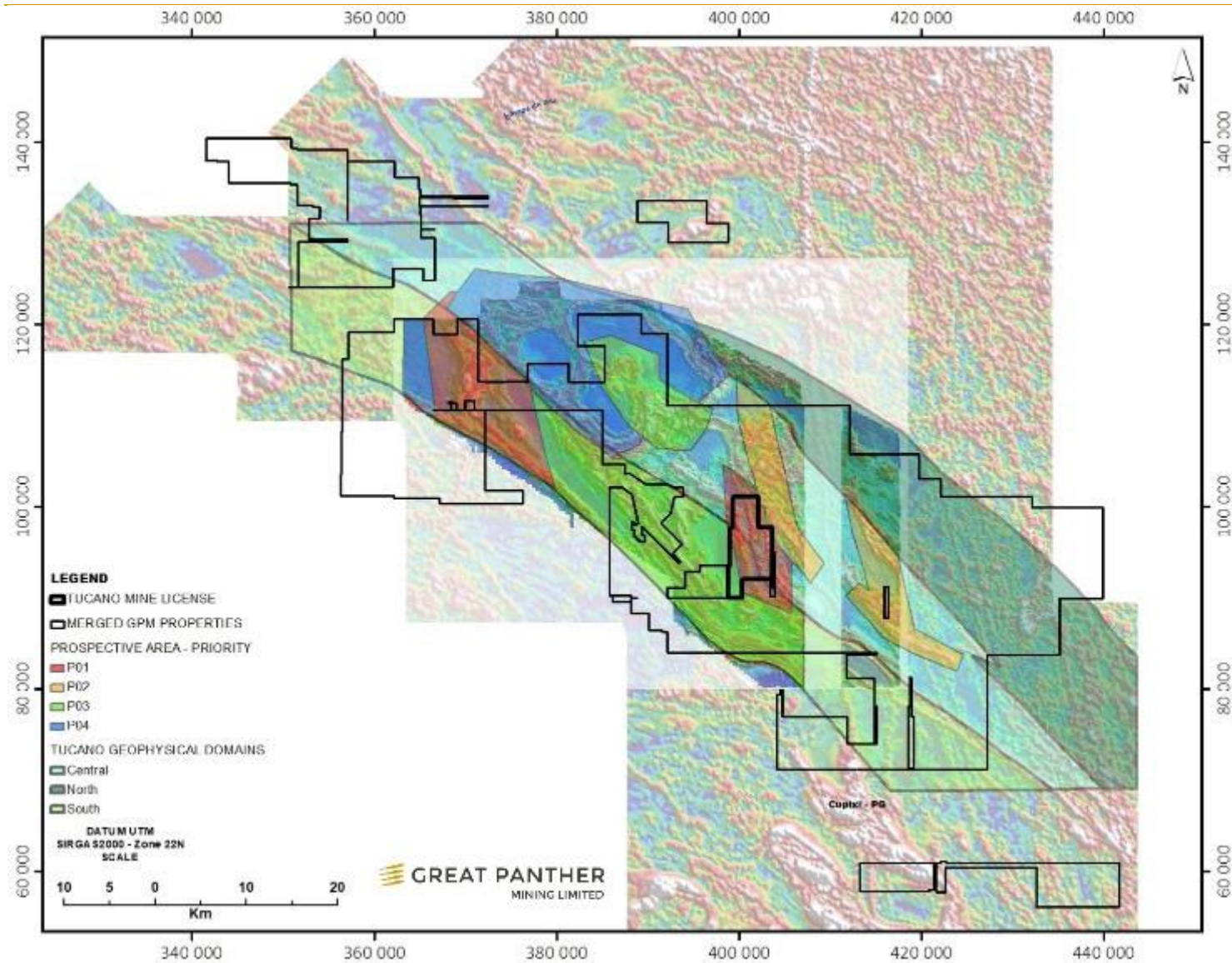


Figure 9-8: Geophysical Interpretation - Tucano Prospective Areas

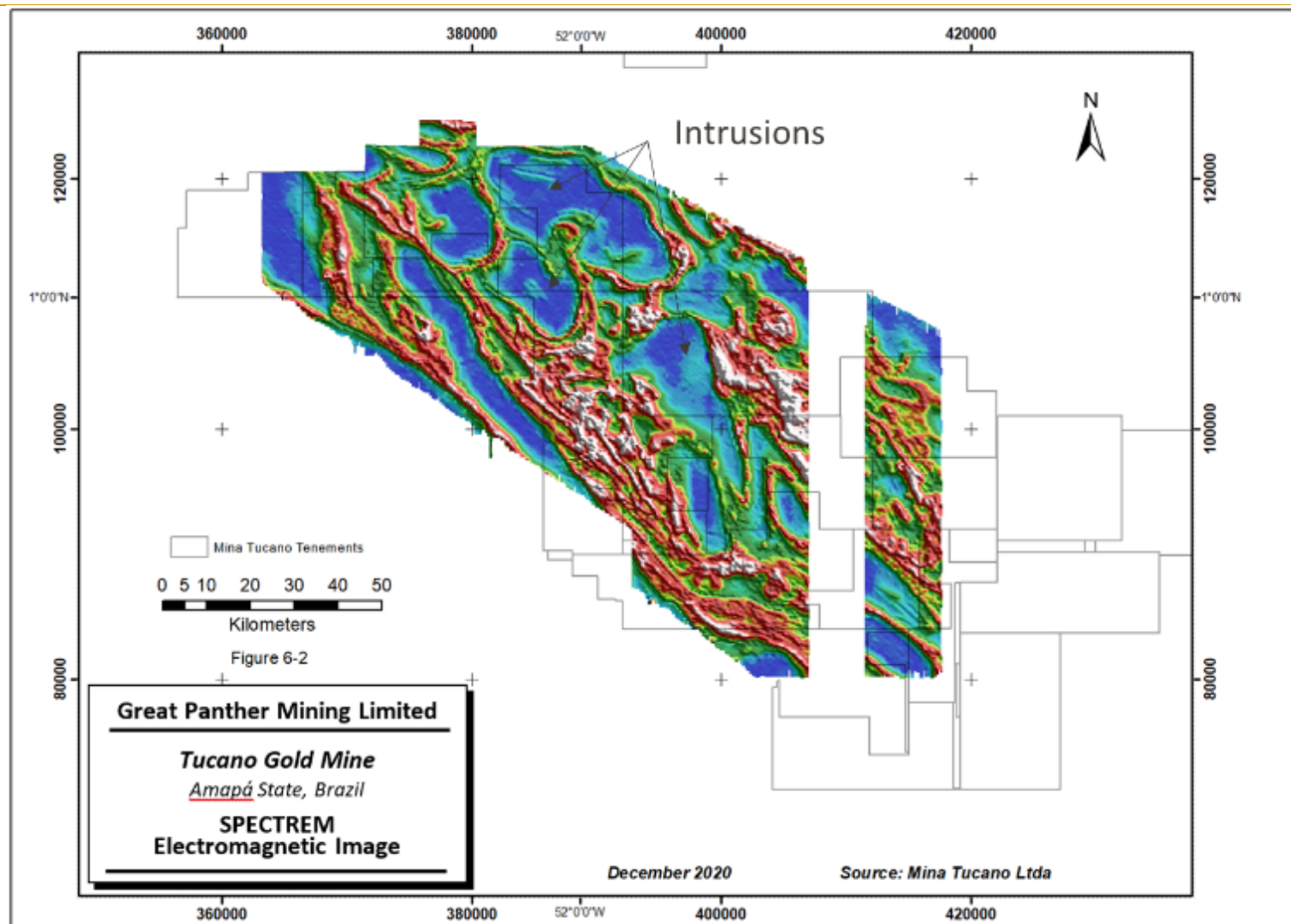


Figure 9-9: Airborne Conductivity Image (Spectrem)

## 10. DRILLING

### 10.1 INTRODUCTION

Table 10-1 and Figure 10-1 summarize drilling supporting the 2021 MRMR Estimation. Table 10-2 summarizes the drilling by deposit.

**Table 10-1: Drilling Supporting the 2021 MRMR Estimation**

Great Panther Mining Limited – Tucano Gold Mine

Database Totals							
Company	Year	Rotary Air Blast		Reverse Circulation		Diamond Drilling	
		Nº Holes	Drill Metres	Nº Holes	Drill Metres	Nº Holes	Drill Metres
Legacy	Pre-2010	18.675	93.983	6.761	220.534	1.117	159.376
Beadell	2010 -2018	3.867	35.906	9.751	435.685	460	87.985
Great Panther	2019-2021	921	10.062	1.638	75.809	170	38.836
	<b>Total</b>	<b>23.463</b>	<b>139.952</b>	<b>18.150</b>	<b>732.028</b>	<b>1.747</b>	<b>286.198</b>

Figure 10-2 and Figure 10-3 are cross-sections through the TAP AB and Urucum deposit that exemplify the interpretation of wireframes from the drillhole data.

### 10.2 DRILL METHODS

#### 10.2.1 AUGER

Auger drilling is used as a first-pass evaluation tool. Auger holes are typically small diameter, usually 10 to 15 cm. Great Panther currently uses a cone auger. If the auger hole encounters the water table, the drill hole is abandoned. Auger samples are typically taken on a line spacing of 160 to 40 m, with holes spaced at 40 to 10 m intervals, depending on the detail required, with sampling along 1 m intervals. Auger drilling is used as an exploration tool. Auger drill results have not been used in the estimation of Mineral Resources in this Technical Report.

#### 10.2.2 ROTARY AIR BLAST (“RAB”)

RAB drilling is used as a first-pass evaluation tool. Rotation (blade), roller, and impact (hammer) drilling methods were employed over the Project history. RAB holes are typically drilled to refusal, or to the water table.

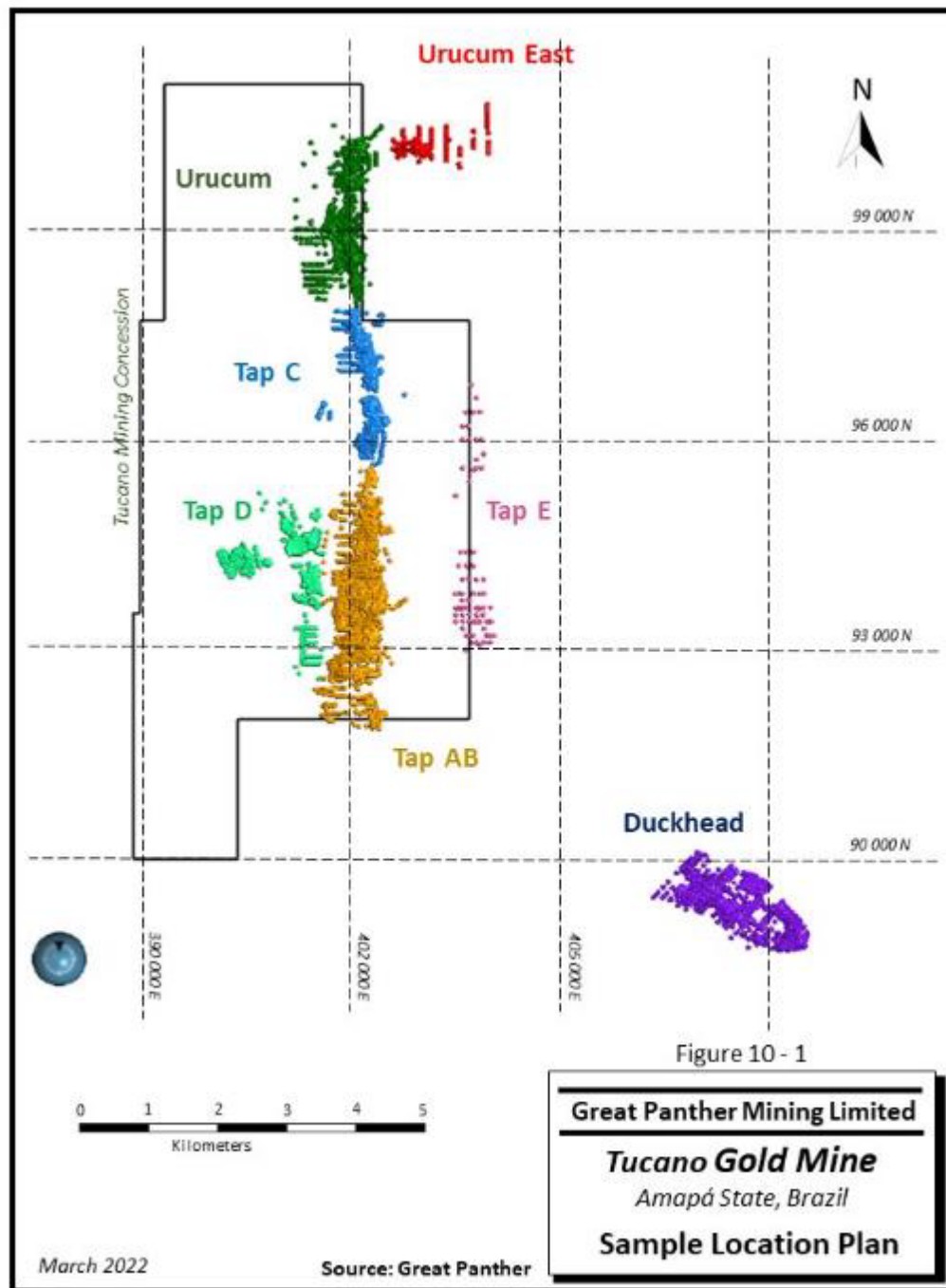


Figure 10-1: Plan Illustrating Drillhole Coverage

**Table 10-2: Drilling by Deposit**

Great Panther Mining Limited – Tucano Gold Mine

<b>Urucum East Deposit</b>							
Company	Year	Rotary Air Blast		Reverse Circulation		Diamond Drilling	
		Nº Holes	Drill Metres	Nº Holes	Drill Metres	Nº Holes	Drill Metres
Legacy	Pre-2010	0	0	4	304	68	6.737
Beadell	2010 -2018						
Great Panther	2020			16	1.778	16	2.931
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>2.082</b>	<b>84</b>	<b>9.668</b>
<b>Urucum Deposit</b>							
Company	Year	Rotary Air Blast		Reverse Circulation		Diamond Drilling	
		Nº Holes	Drill Metres	Nº Holes	Drill Metres	Nº Holes	Drill Metres
Legacy	Pre-2010	2.096	18.197	1.662	70.231	258	60.412
Beadell	2010 -2018	782	6.066	2.554	97.489	79	28.508
Great Panther	2019	164	1.559	594	26.142	36	7.992
	2020	17	201	457	19.491	19	5.523
	2021	133	1.222	301	14.925	27	7.637
	<b>Total</b>	<b>3.192</b>	<b>27.245</b>	<b>5.568</b>	<b>228.277</b>	<b>419</b>	<b>110.072</b>
<b>Tap C Deposit</b>							
Company	Year	Rotary Air Blast		Reverse Circulation		Diamond Drilling	
		Nº Holes	Drill Metres	Nº Holes	Drill Metres	Nº Holes	Drill Metres
Legacy	Pre-2010	3.684	15.837	1.622	42.944	146	16.791
Beadell	2010 -2018	60	637	1.625	54.099	13	1.148
Great Panther	2021	32	383	38	2.662	30	4.874
	<b>Total</b>	<b>3.776</b>	<b>16.857</b>	<b>3.285</b>	<b>99.705</b>	<b>189</b>	<b>22.813</b>
<b>Duckhead Deposit</b>							
Company	Year	Rotary Air Blast		Reverse Circulation		Diamond Drilling	
		Nº Holes	Drill Metres	Nº Holes	Drill Metres	Nº Holes	Drill Metres
Legacy	Pre-2010	676	4.257	734	20.427	185	15.518
Beadell	2010 -2018	58	446	789	54.429	132	17.969
	<b>Total</b>	<b>734</b>	<b>4.703</b>	<b>1.523</b>	<b>74.856</b>	<b>317</b>	<b>33.486</b>
<b>Tap AB Deposit</b>							
Company	Year	Rotary Air Blast		Reverse Circulation		Diamond Drilling	
		Nº Holes	Drill Metres	Nº Holes	Drill Metres	Nº Holes	Drill Metres
Legacy	Pre-2010	12.219	55.692	2.739	86.629	460	59.918
Beadell	2010 -2018	2.967	28.757	4.783	229.668	236	40.360
Great Panther	2019	205	1.356	9	223	12	2.408
	2020	112	1.524	218	10.306	30	7.472
	2021	258	3.817	5	282		
	<b>Total</b>	<b>15.761</b>	<b>91.146</b>	<b>7.754</b>	<b>327.108</b>	<b>738</b>	<b>110.159</b>

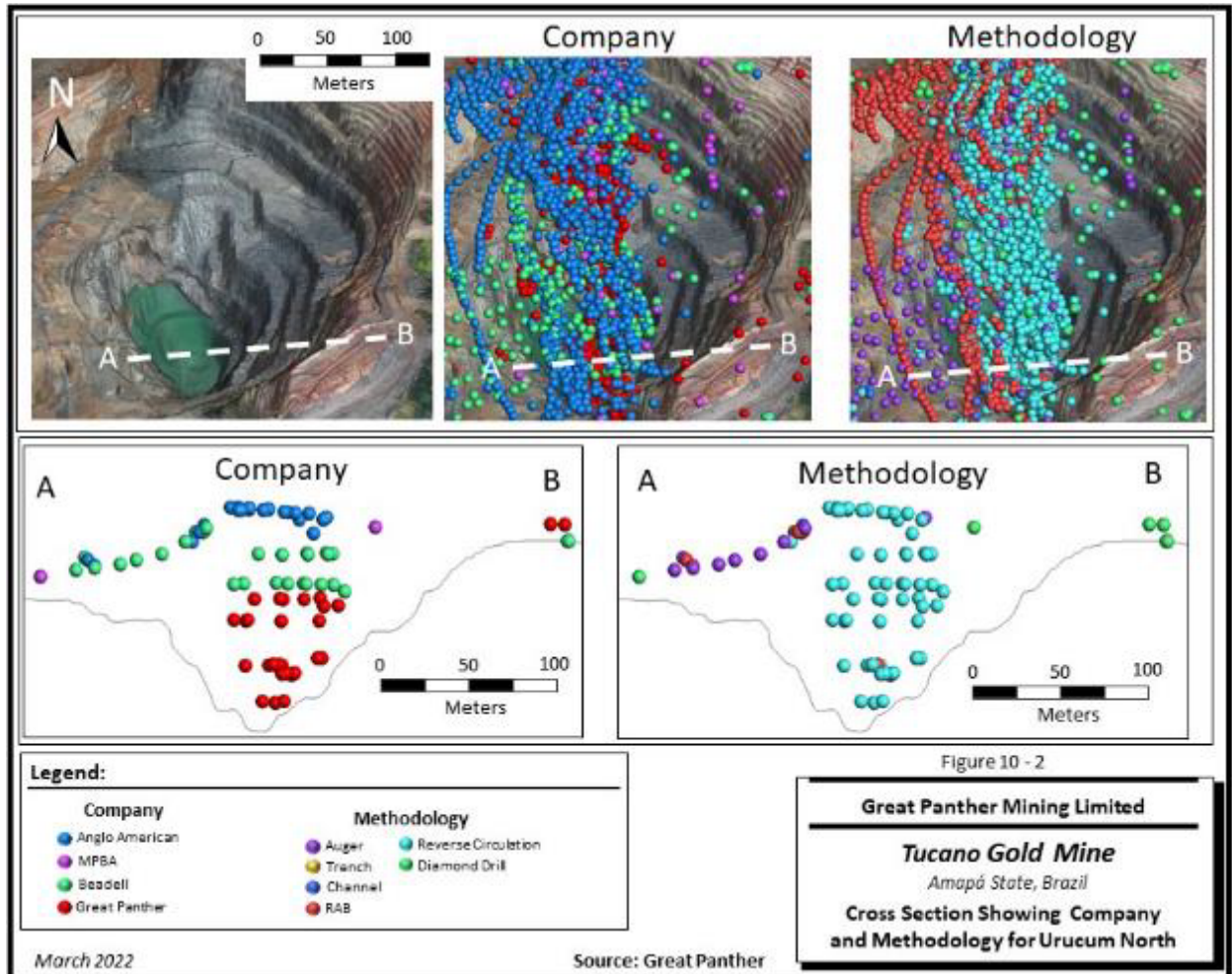


Figure 10-2: Urucum North - Illustration of the Evolution of Drill Programs by Company and Type.

No information is available as to RAB rig types used in legacy drilling exploration programs. Great Panther currently uses a PWH-5000 model RAB rig obtained from Beadell for its regional exploration programs.

RAB holes are vertical and were completed on exploration lines nominally spaced 100 m apart, with a drill hole every 40 m, and infill drilled, if anomalous gold values were returned, to lines spaced 20 m apart with a drill hole every 10 m. Samples are collected to represent 1 m vertical intervals.

### 10.2.3 RC

RC drill holes are primarily completed for grade control, resource extension and infill definition programs.

No RC drilling was conducted prior to Beadell programs. RC drilling carried out by Beadell used a track-mounted Schramm T60 with a track-mounted auxiliary booster operated by McKay Sondagens. In 2019, Great Panther contracted RC drilling from Geosedna Perfurações Especiais SA, who use two types of drill rigs: an RC Explorac 50 and a Prominas A15 (made in Brazil)

RC drilling used face sampling hammer techniques rather than conventional RC methods where possible. Bit sizes ranged from HQ to NQ. Where necessary, drill collar casing was used in the first 6 m of the drill hole to stop cave in and maintain good workable access to the drill hole. Samples are collected to represent 1 m drill intervals.

RC chips are stored in lidded, plastic chip trays, and are kept in the exploration core storage facilities on site at Tucano.

#### **10.2.4 DIAMOND DRILLING**

Core drilling programs are completed in support of deeper open pit and underground resource exploration and definition drilling.

No information is available as to rig types used for Legacy core drilling programs. Great Panther employed the Brazilian drilling contractor Geosol, who used three skid-mounted Brazilian Maquesonda Mach 1200 rigs and a truck-mounted Longyear LF-70 rig.

Drill sizes include HQ (63.5 mm core diameter) and NQ core (47.6 mm). HQ core is typically used from the surface down to a few metres into hard rock from which point drilling is performed with NQ.

Transportation of core from the drill site to the sample yard is performed by the drill contractor with core only being accepted after going through core validation procedures described in Section 11.1.5, at the core logging facility on site. Lids are nailed on all core boxes before being transported.

Core is stored in purpose-built, undercover racks at the Tucano exploration core yard.

### **10.3 LOGGING PROCEDURES**

#### **10.3.1 AUGER, RAB AND RC**

Auger, RAB and RC samples consist of drill cuttings which are bagged in large, heavy duty plastic sacks to produce a representative sample over the sampled interval, generally 1 m. They first go to the physical preparation laboratory where they are dried and disaggregated. Approximately 100g of sample is separated in a identified plastic recipient and provided to the geologists to log lithology, mineralization, alteration, weathering and material resistance/hardness.

#### **10.3.2 DRILL CORE**

Core is orientated, continuity and depths are validated and boxes fully labeled by the project geologist and trained core yard personnel in preparation for a photographic log. This is followed by lithologic,

alteration, mineralization, structural and geotechnical logging. (weathering, RQD and material resistance/hardness)

### **10.3.3 RECOVERY**

Auger, RAB and RC recoveries were not routinely recorded.

Core recoveries obtained by Great Panther are considered excellent and average between 95% and 98% depending on deposit and location.

### **10.3.4 COLLAR SURVEYS**

RAB, RC and Diamond drill collars were surveyed using Total Station or Geodesic GPS. Great Panther staff use a Leica 407 Total Station.

### **10.3.5 DOWNHOLE SURVEYS**

Beadell used a Reflex Maxibore II unit for measuring down-hole deviation in core holes. Currently, Great Panther uses a Reflex Gyro tool for RC drilling, and a Reflex Ez-North Seeking Gyro for core holes.

Great Panther surveys deeper core holes for assessment of underground resources at 50 m intervals to monitor drilling deviation and shorter drill holes for open pit resource evaluation at 100 m intervals. The Maxibore II system used by Beadell was run after the drill hole was completed with readings at 3 m intervals down the hole.

Downhole surveys are not performed on RAB drillholes which are vertical.

### **10.3.6 GRADE CONTROL**

Grade control drilling is carried out on a nominal 10 mN x 12 mE grid with infill to 10 mN x 6 mE over mineralized zones. Grade control samples are systematically collected using RC drill rigs sampling on 1 m intervals. The information is used to prepare the final mining layouts for ore/waste control. If required, additional grade control information is obtained by means of channel sampling and sampling of blast hole cuttings drilled by RAD drill rigs.

### **10.3.7 SAMPLE LENGTH/TRUE THICKNESS**

Due to the general north-south strike of the mineralized zones, exploration, delineation, and grade control drill holes are typically orientated to azimuth 90° or 270°, depending on the dip of the lodes. In isolated cases, drill access limitations may require alternative azimuths to reach the drill target zone. Dips of - 50° to -90° can be achieved by the T60 Schramm RC rig whereas dips of -55° to -90° are possible with the core rigs. Most holes are orientated with dips of around -60°.

True thicknesses of mineralized intervals were calculated based on the drillhole orientation compared to the geometry of the wireframe of the ore zone.

## **10.4 DRILLING SINCE DATABASE CLOSE-OUT DATE**

The effective date of the drilling database for the 2021 MRMR Estimation is July 31, 2021. From July 31, 2021 to March 31, 2022, exploration, resource definition and grade control drilling has continued as summarized in Table 10-3. This data is not included in this Technical Report.

## **10.5 QP COMMENTS ON “ITEM 10: DRILLING”**

In the opinion of the QP, the quantity and quality of the logged geological data, collar, and downhole survey data collected in the exploration and infill drill programs are sufficient to support Mineral Resource and Mineral Reserve as follows:

- Core and RC logging meets industry standards for gold exploration;
- Collar surveys have been performed using industry standard instrumentation;
- Downhole surveys were performed using industry standard instrumentation;
- Recovery data from core and RC drill programs are acceptable;
- Drill orientations are generally appropriate for the mineralization style and the orientation of mineralization for the bulk of the deposit area;
- Drilling has generally been done at regularly-spaced intervals and is considered representative of the deposit. Drilling was not specifically targeted to the high-grade portions of the deposits, rather, a relatively consistent drill spacing was completed.

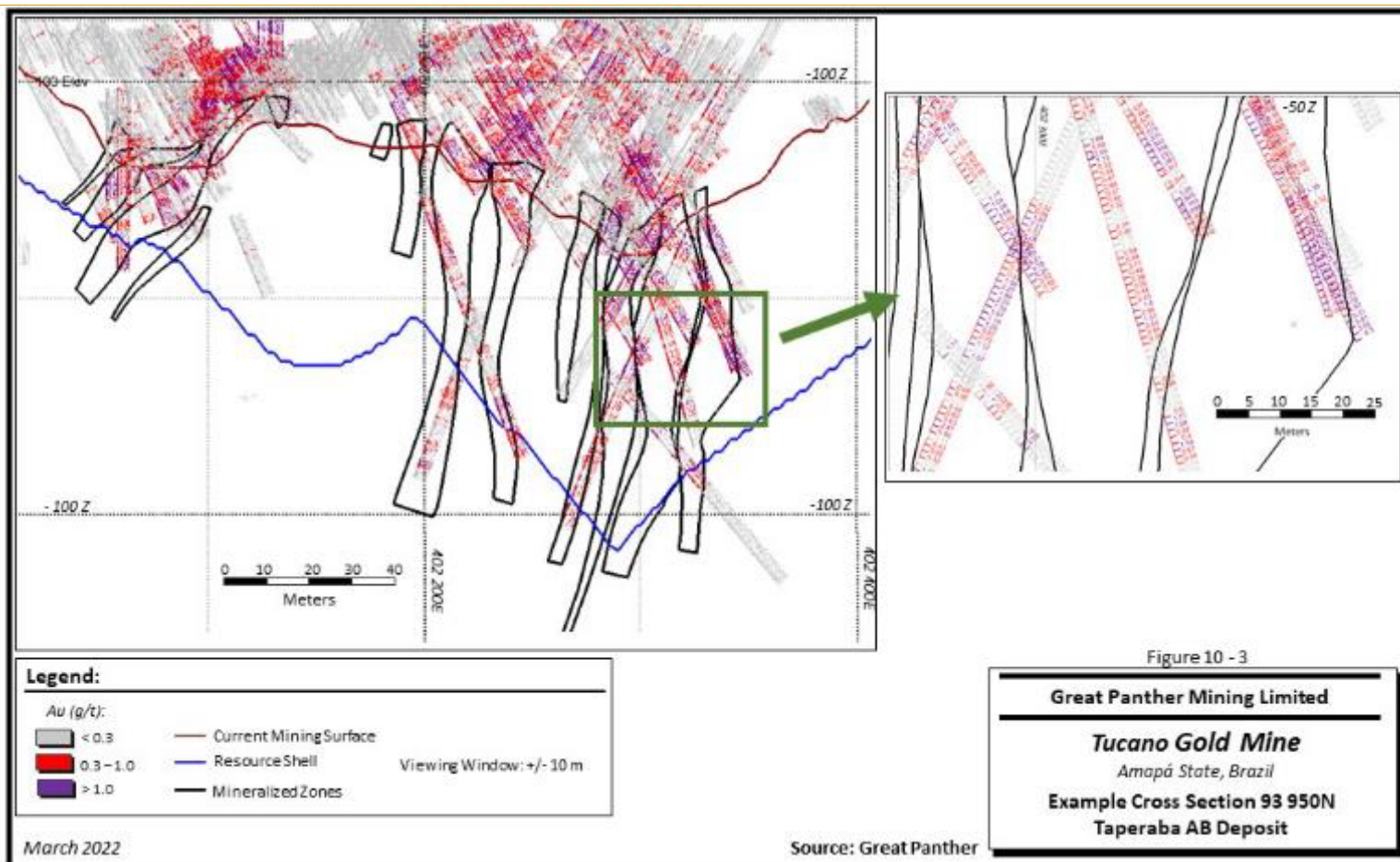


Figure 10-3: Typical Drill Cross-Section, TAP AB

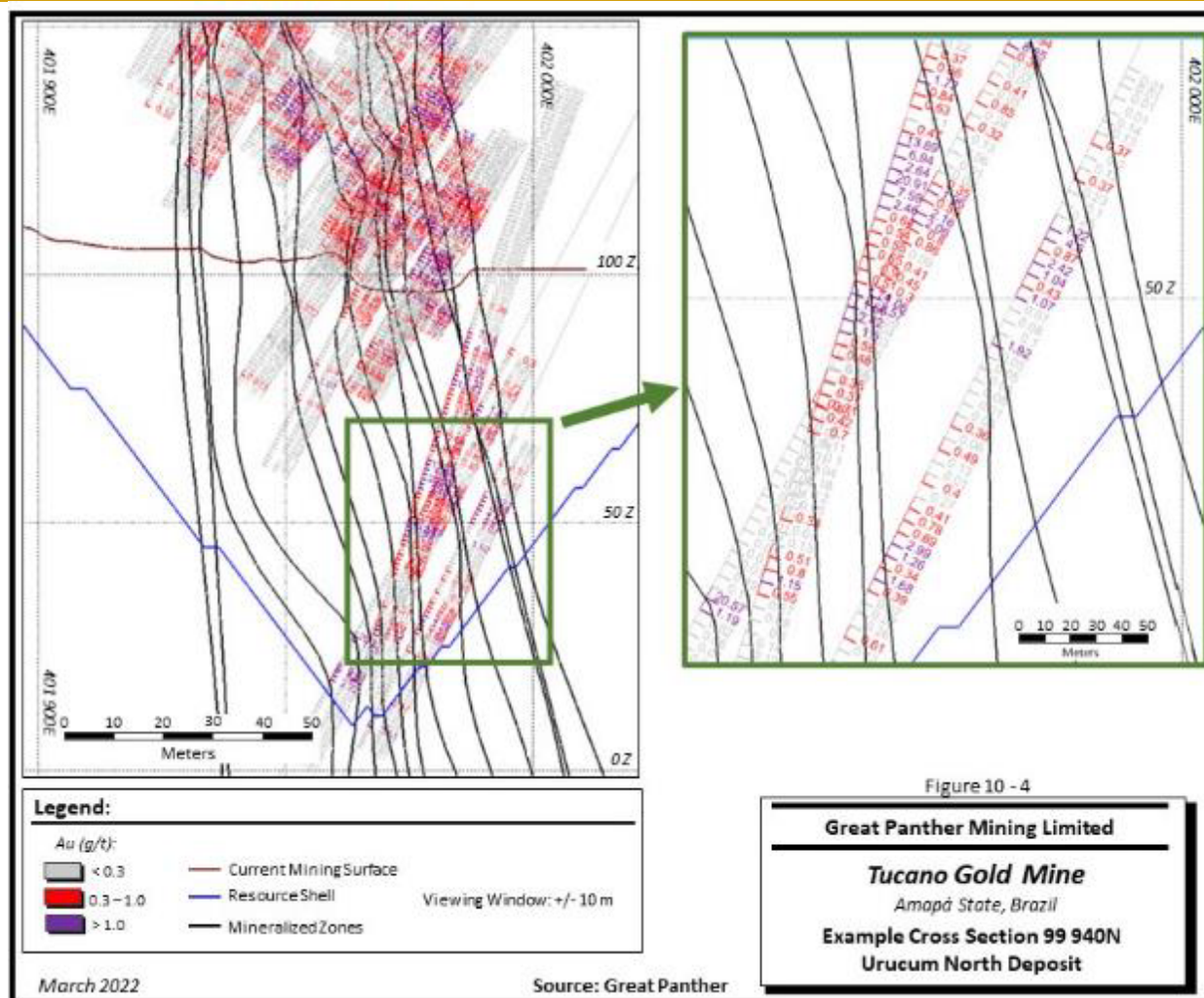


Figure 10-4: Typical Drill Cross-Section, Urucum

## **11. SAMPLE PREPARATION, ANALYSES, AND SECURITY**

### **11.1 SAMPLING METHODS**

#### **11.1.1 GEOCHEMICAL**

For legacy (pre-2011) regional soil and stream sediment sampling, there is no documented, detail protocol available defining the procedures used to collect samples. It is known that the regional legacy data suffered from errors that have been identified in the early stream sediment sampling procedure and QA/QC from two of the laboratories. The legacy data is not used in the evaluation or planning of regional exploration programs.

During the Great Panther and Beadell soil sampling campaigns, soil samples were collected from the B soil horizon using a post-hole digger to a depth of 30–50 cm. Approximately 1 - 3 kg of material was collected.

#### **11.1.2 AUGER**

Auger advances are restricted to the cone used to cut the sample. These are generally 30 – 40cm in height and thus the sample is extracted every 30cm. The samples are composited over 1 m intervals, mixed then quartered, described / labelled, and bagged for transport to the Tucano, exploration sample preparation facility.

#### **11.1.3 RAB**

RAB samples were collected as the sample is lifted to the surface by compressed air injected into the drillhole. The sample is collected in aluminum or plastic trays placed around the drillhole collar with drillhole chips being composited over 1 m intervals. The sample is described and whole sample bagged and sent to the exploration sample preparation facility.

#### **11.1.4 RC**

RC samples are collected in the same manner as RAB samples with the main differences reflecting the size of the RC drill rigs. Sample passes through a cyclone to reduce the force of the compressed air used to lift the sample to the surface and then pass through an adjustable cone splitter. A sample ranging from 2–6 kg in size is collected for each drill metre advanced. Exploration samples are sent to the Tucano exploration sample preparation facility while grade control samples go to the Tucano mine sample preparation facility.

#### **11.1.5 CORE**

On receipt of closed core boxes from the drill contractor, the core is verified for integrity. This involves orientation and reconstitution of the core intervals, joining up core breaks, verifying for loss of recovery

and verification of depth labels. Once approved, the core boxes are re-labeled using metal tags and marker pens and then photographed.

Following the verification process core is aligned and marked for cutting, using orientation information from a Reflex ACT core orientation instrument used during the drilling procedure. Prior to cutting geotechnical measurements are made along its length. The core is then logged by the geologist and sampling intervals defined. Core is nominally sampled on 1 m intervals, but sample lengths could range from 0.6–1.4 m at the geologists discretion to coincide with lithology or alteration/mineralization boundaries. Depending on the stage of the project sampling is either along the full length of the drillhole (new targets or regional targets) or over observed mineralization and up to 20 m either side of it.

The core is then cut and half of the core collected for the pre-defined sample intervals. This is sent to the Tucano exploration sample preparation facility for sample preparation.

## **11.2 METALLURGICAL SAMPLING**

Initial metallurgical testwork was completed to support heap leach operations. Testwork that supports the current plant design was conducted by consultants Ausenco, SGS Geosol, Testwork Process Development Ltd.; Ray Walton Consulting Inc., MPH Minerals Consultancy Ltd., SRK Consulting Inc., and Outotec. This testwork included: mineralogy, comminution, determination of grind size and cyanidation conditions, gravity response, variability leach testwork, tailings characterization, oxygen uptake, carbon kinetics, slurry viscosity, lime demand, and cyanide destruction.

Beadell's later work initially focused on remediating low gold recoveries and coarse grind sizes that were impacting the plant in 2016 by comparing plant actual to plant design performance. This resulted in recommendations to expand the plant through additional grinding power, installing a pre-leach thickening step, increasing the residence time, and changing reagents at the CIL step. Testwork included bottle rolls on sulphide material. Results of the sulphide tests were variable, and not in line with expectations, so additional tests were recommended.

In 2017, SGS Geosol undertook bottle roll testing on a new set of composites from the TAP AB and Urucum deposit areas. This resulted in recommendations to change the leach residence time, as a residence time of 24 hours and a grind size of P80 75 µm was optimum given the plant grind capability.

Metallurgical tests show similar average recoveries regardless of deposit but vary considerably as a function of the average grade of the plant feed. Tests indicate average grade recoveries of; above 1.51g/t Au produce recoveries above 93%, between 0.81g/t to 1.50g/t Au at 91% and below 0.80g/t Au at 90% recovery. There is no significant difference between oxide and sulphide ore.

The principal risk for a deleterious element in the doré comes from the presence of copper in localized veins within the mine. When necessary, this is managed through blending.

Tucano is an established operating mine so metallurgical sample programs are not routinely required. In the case of a specific necessity the sample procedure is defined to best resolve the issue and is reported in the relevant study report. No metallurgical test work programs have been carried out since the effective date (September 30, 2020) of the previous technical report.

### 11.3 DENSITY DETERMINATIONS

Core is routinely measured for bulk density using the Archimedes method, with the bulk density of the oxide core measured immediately after drilling to determine the wet bulk density prior to drying and the subsequent dry bulk density.

The procedure uses the weight of an intact 15 cm length of whole core that is measured in air and again in water. Bulk density is calculated by the formula:

$$\frac{\text{weight in air}}{(\text{weight in air} \text{ minus weight in water})}$$

As oxide and transitional rock normally contains moisture, the sample is wrapped in plastic film and weighed while the core is still wet / moist, soon after being received from the drill rig. This enables the wet density to be calculated. The core is then oven dried, and the procedure repeated to attain the dry density.

There are approximately 110,098 density determinations available for ore and waste. Densities range from 1.3 t/m<sup>3</sup> to 4.39 t/m<sup>3</sup>.

### 11.4 ANALYTICAL AND TEST LABORATORIES

Great Panther has two sample preparation facilities that are geographically separate at Tucano.

- The first is a run-of-mine (ROM) sample preparation facility, for grade control samples
- The second for exploration and resource definition drilling.

An on-site laboratory is used for analysis of resource, exploration and grade-control samples. These facilities are not independent and are not accredited. However, the laboratory does participate in a yearly round-robin of Brazilian commercial and private mineral geochemistry laboratories and is highly rated in these surveys. In the 4th round robin (December 2021) the Tucano laboratory ranked 2nd in accuracy and 3rd in precision of 8 laboratories tested.

All resource definition and exploration samples that are to be included in MRMR estimations are sent to SGS Geosol Laboratorios Ltda (SGS Geosol) in Belo Horizonte, Brazil. SGS Geosol is accredited by ABS Quality Evaluations Inc and complies with the requirements for ISO 9001:2015, ISO 14001:2015 and ISO/IEC 17025:2005 for selected analytical techniques. The laboratory is independent of Great Panther.

The ALS Laboratory in Belo Horizonte is the check or umpire laboratory for resource drill samples. The laboratory is independent of Great Panther.

The ALS Laboratory is used for multi-element geochemical analysis of soil and stream sediment samples. Samples are prepared in Belo Horizonte and analysed by the ALS Laboratory in Lima, Peru.

## 11.5 SAMPLE PREPARATION AND ANALYSIS

Only RC and Diamond Drilling assay results have been used in the 2021 MRMR Estimation.

RC samples and samples from the upper, oxidised sections of diamond drill holes, are dried at 140°C, crushed to -2 mm (if aggregated) and riffle split to 1 kg. Samples of fresh diamond drill core are dried at 105°C, crushed to -8 mm then to -2 mm and split to 1 kg. Both RC and core samples are then pulverized to 95% passing 105 µm. The final pulp is quartered to achieve two pulp samples of 100 g to 200 g each.

Sample analysis is undertaken at all laboratories using a 30 g charge, with the gold concentration being determined by means of fire assay with an atomic absorption spectroscopy (AAS) finish. The lower detection limit for the ROM laboratory is 0.01 g/t Au and the lower detection limit for both the SGS Geosol and the ALS laboratories is 0.005 g/t Au.

## 11.6 QUALITY ASSURANCE AND QUALITY CONTROL

### 11.6.1 LEGACY

A large part of the Great Panther drilling database, especially channel, trench, auger and RAB drilling is legacy (pre-2010) information developed by previous owners. A large part of this data reflects the sub-horizontal 'colluvium' zone or surficial parts of the deposits that have been mined.

### 11.6.2 QUALITY ASSURANCE AND QUALITY CONTROL REPORTING

In 2018, Maxwell Geoservices (Maxwell) of Fremantle carried out a QA/QC data analysis on the results of multiple drilling programs carried out by Beadell during the period 2010 to 2018. The results are presented in Wolfe, et. al. (2018).

In 2019, the Beadell historical datasets were organized, validated and migrated to Great Panther's acQuire database. The QA/QC of the database was evaluated by Roscoe Postle Associates Inc. ("RPA") and reported on in March 2020, with an effective date of September 30, 2019.

In January 2021, Great Panther reported on an evaluation of the QA/QC between September 30, 2019 to July 31, 2020.

For the 2021 MRMR Estimation, the effective dataset are between August 1, 2020 and July 31, 2021 and involves an evaluation of QA/QC samples included in exploration, resource definition and grade control drilling programs. The assay results of the drilling programs comprise the following:

- Exploration and Resource Definition drilling programs, 2,166 samples in 83 batches sent to SGS Geosol.
- Grade Control drilling programs: 31 678 samples in 692 batches sent to Tucano Gold Mine laboratory.

A summary of the QA/QC samples used in 2021 is provided in Table 11-1:

Table 11-1: Summary of QA/QC Sample Frequency

Item	Resource Definition Drilling		Grade Control Program	
	Number	Frequency	Number	Frequency
Standards	125	6.52%	915	3.10%
Blanks	96	5.01%	1 294	4.39%
Field Duplicates	27	1.41%		
<b>Number of Batches</b>	<b>83</b>		<b>692</b>	

### 11.6.3 GREAT PANTHER

Certified Reference Materials samples (CRM or standards), blanks, and duplicates are inserted in the sample sequence by Great Panther staff at semi-regular intervals to monitor laboratory accuracy and precision as well as sampling sequencing and precision. The insertion frequency was approximately:

- Standards: 6.5% at SGS Geosol, 3.1% at Tucano laboratory;
- Blanks: 5.0% at SGS Geosol, 4.4% at Tucano laboratory
- Duplicates: 1.4% at SGS Geosol

5% of SGS samples are re-analysed by ALS in Belo Horizonte as Laboratory Duplicates as are 2 – 3 % of Tucano Laboratory samples re-analysed by SGS Geosol.

Failure control consists of checking all received Certificates from the laboratories and comparing the QA/QC sample results with the reference or expected grade. If the QA/QC sample result is outside defined thresholds, the database manager looks in detail at the total batch, contacts the responsible laboratory and makes an action plan to re-assay part or all of the batch. Figure 11-1 and Figure 11-2 shows that the average failure rate is less than 5% in each batch. All batches with failures have been re-analysed and data only included in the database once received without QA/QC failures.

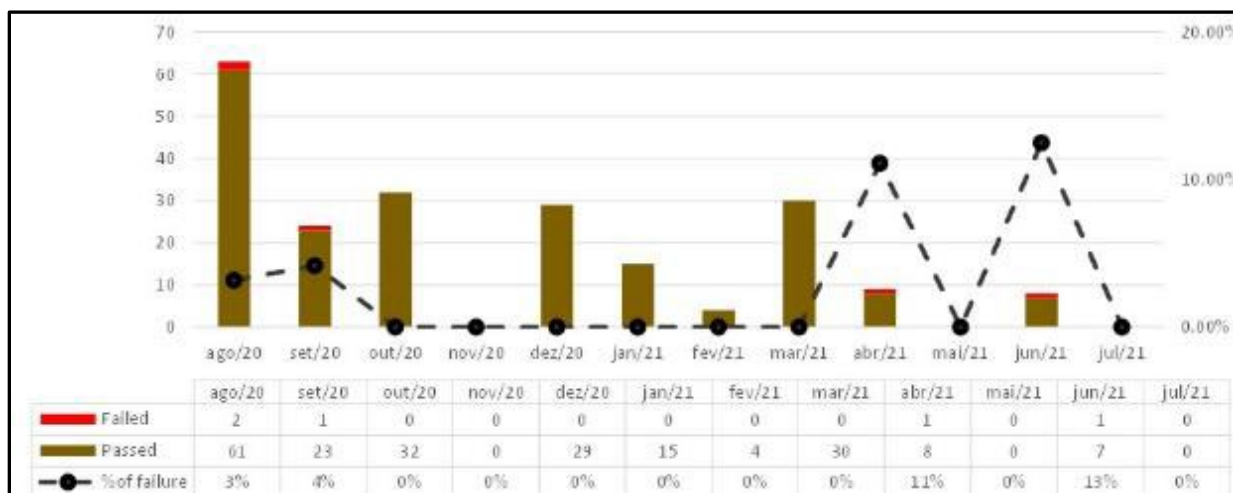


Figure 11-1: : CRM Samples Submitted to the SGS Geosol Laboratory

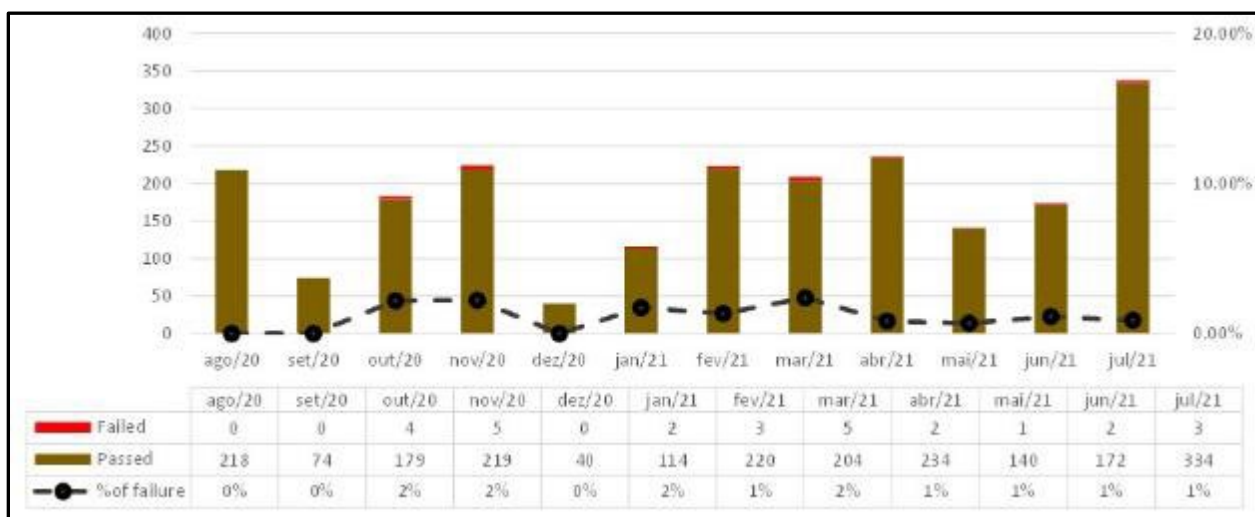


Figure 11-2: CRM Samples Submitted to the Tucano Laboratory

### 11.6.3.1 Standards

Eighteen Certified Reference Material standards were purchased from SGS Geostats Pty Ltd., and cover gold grade ranges from 0.1 to 16.4 g/t Au. Figure 11-3 and Figure 11-4 represent the “z-Score” that normalizes results to the Standard deviation (“SD” where 1 SD = 1 z-score unit). This allows the different CRMs to be presented in a single graph. Table 11-2 and Table 11-3 show the z-score for CRM material inserted in batches sent to SGS Lab (Resource Definition) and Tucano Lab. (Grade Control). Table 11-2 indicates the grade ranges where failures occurred on the first round of analyses of the batch.

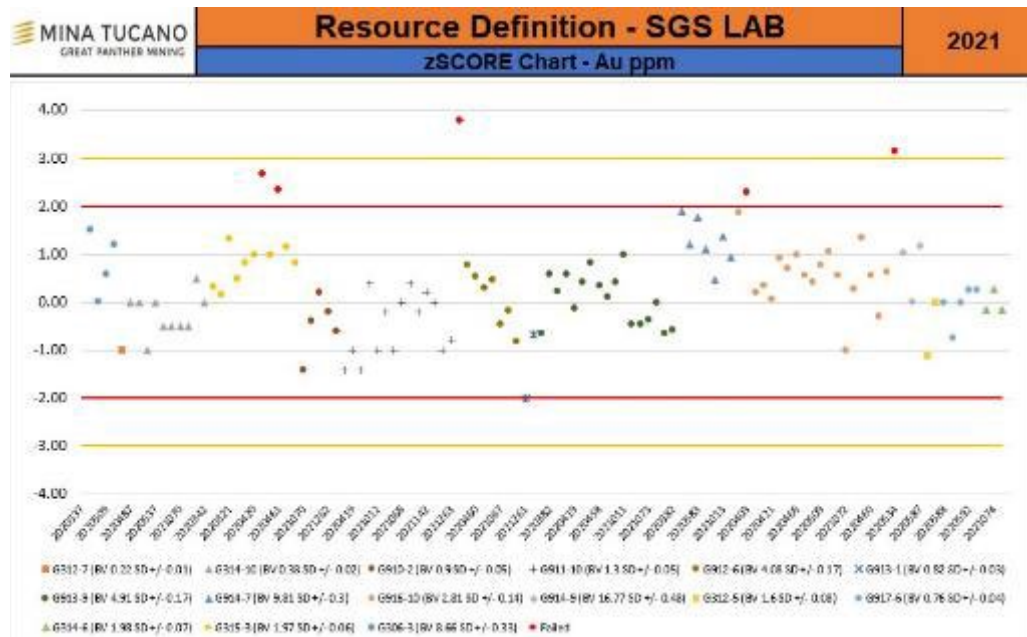


Figure 11-3: z-Scores for CRMs sent to SGS Geosol Laboratory

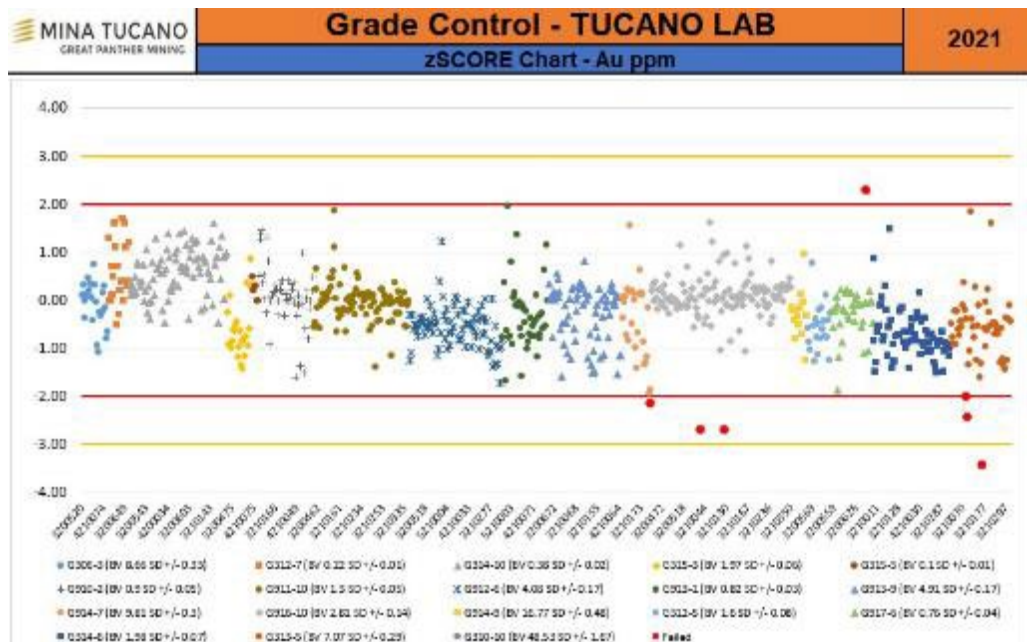


Figure 11-4: z-Scores for CRMs sent to Tucano Laboratory

Table 11-2: Analysis of Results of CRM Samples, SGS Geosol

Resource Definition - SGS Geosol Lab							
QA/QC Control Chart							
Grade Range (g/t Au)	CRM Standard	Nominal Value (g/t Au)	Results (av g/t Au)	Samples Submitted	Number of Failures	Failed %	Bias %
Blank	BLANK	0.005	0.005	101			1
0.00 - 0.30	G312-7	0.22	0.21	1			-5
0.25 - 0.60	G314-10	0.38	0.38	10			-1
0.70 - 1.10	G917-6	0.76	0.76	5			0
0.70 - 1.10	G913-1	0.82	0.78	2			-5
0.70 - 1.10	G910-2	0.9	0.88	5			-3
1.00 - 1.50	G911-10	1.30	1.29	15	1	7	-1
1.5 - 1.75	G312-5	1.60	1.56	2			-3
1.75 - 2.20	G315-3	1.97	2.04	11	2	18	3
1.75 - 2.20	G314-6	1.98	1.99	4			1
2.00 - 5.00	G916-10	2.81	2.92	20	2	10	4
3.50 - 6.00	G912-6	4.08	4.09	7			0
3.50 - 6.00	G913-9	4.91	4.92	17			0
6.00 - 10.00	G306-3	8.66	8.94	4			3
6.00 - 10.00	G914-7	9.81	10.18	7			4
12.00 - 20.00	G914-9	16.77	17.13	3			2
				<b>113</b>	<b>5</b>	<b>4%</b>	

#### 11.6.3.2 Blanks

Each sample batch has a blank sample (white quartz) in the first position to ensure no cross-batch contamination between runs and an additional blank samples is inserted for each additional 20 samples.

The lower detection limit was defined using 5% of the cut-off grade in the open pit operations, which historically was 0.52 g/t Au. An assay value of 0.026 g/t Au was the maximum accepted value for blank assays, otherwise the batch was re-assayed. Blank performance during the Great Panther drill campaigns was acceptable.

Any fails in blank sample results result in a reanalysis of the respective batch. In 2021, no fails were observed in assays by SGS Geosol and only 6 were observed from the Tucano Laboratory. After reanalysis the batches returned without QA/QC errors.

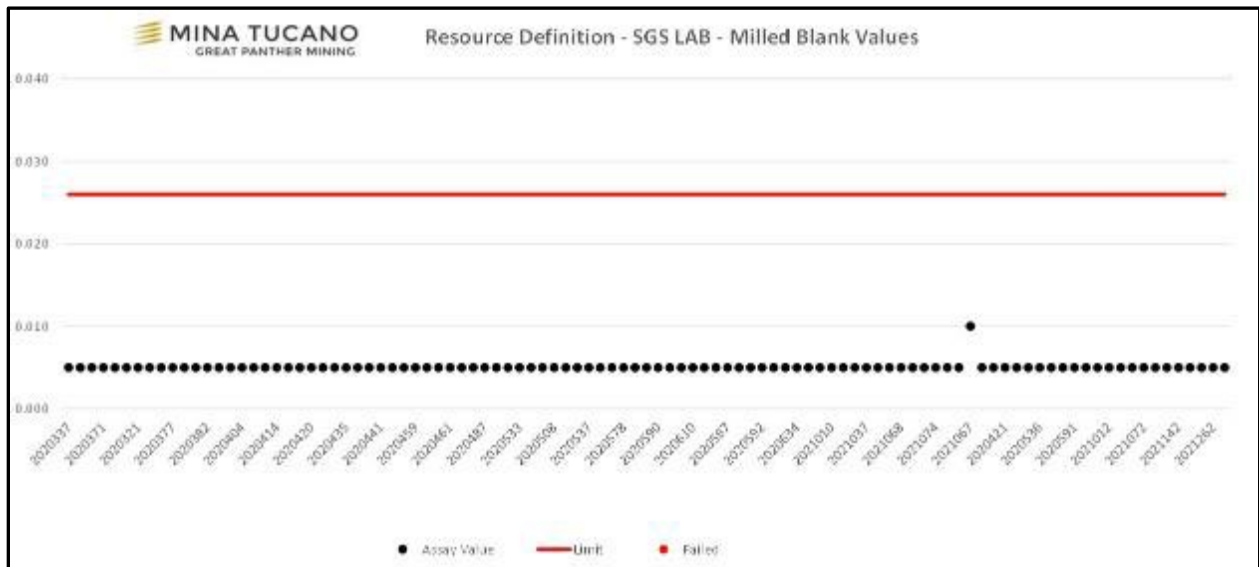


Figure 11-5: Blank Sample Results - SGS Geosol Laboratory

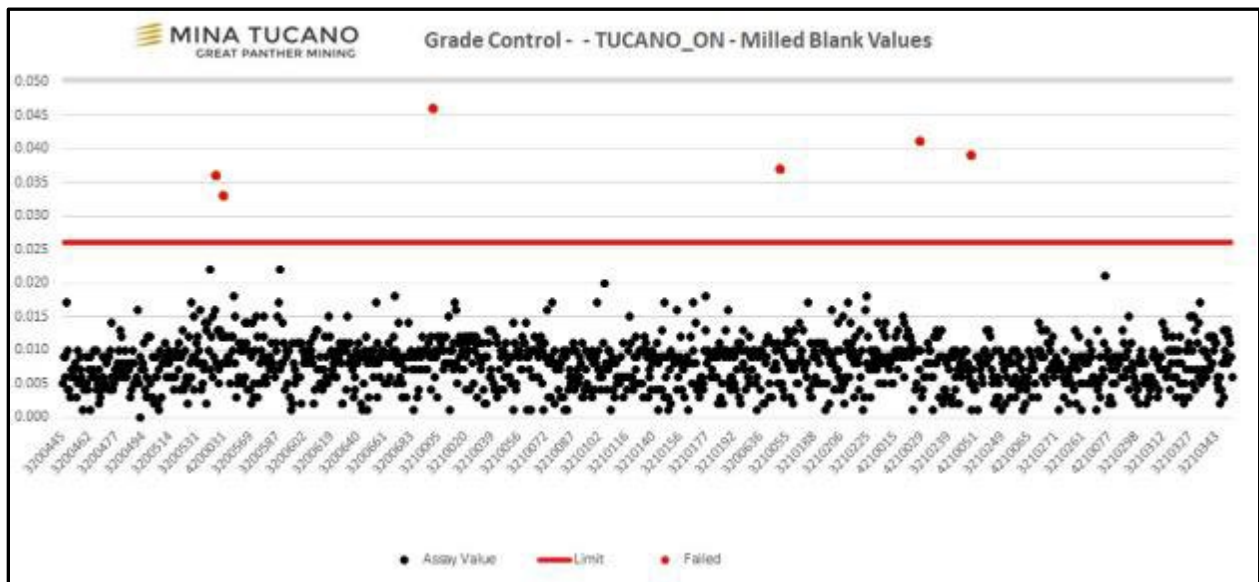


Figure 11-6: Blank sample Results - Tucano laboratory

### 11.6.3.3 Duplicates

Two types of duplicate samples are employed in the QA/QC program. The laboratory duplicate is a second split of the pulverized sample and indicates the precision resulting from the sample preparation and

analysis process. Figure 11-7 and Figure 11-8 graphically illustrate good correlation (precision) observed between laboratory duplicate pairs.

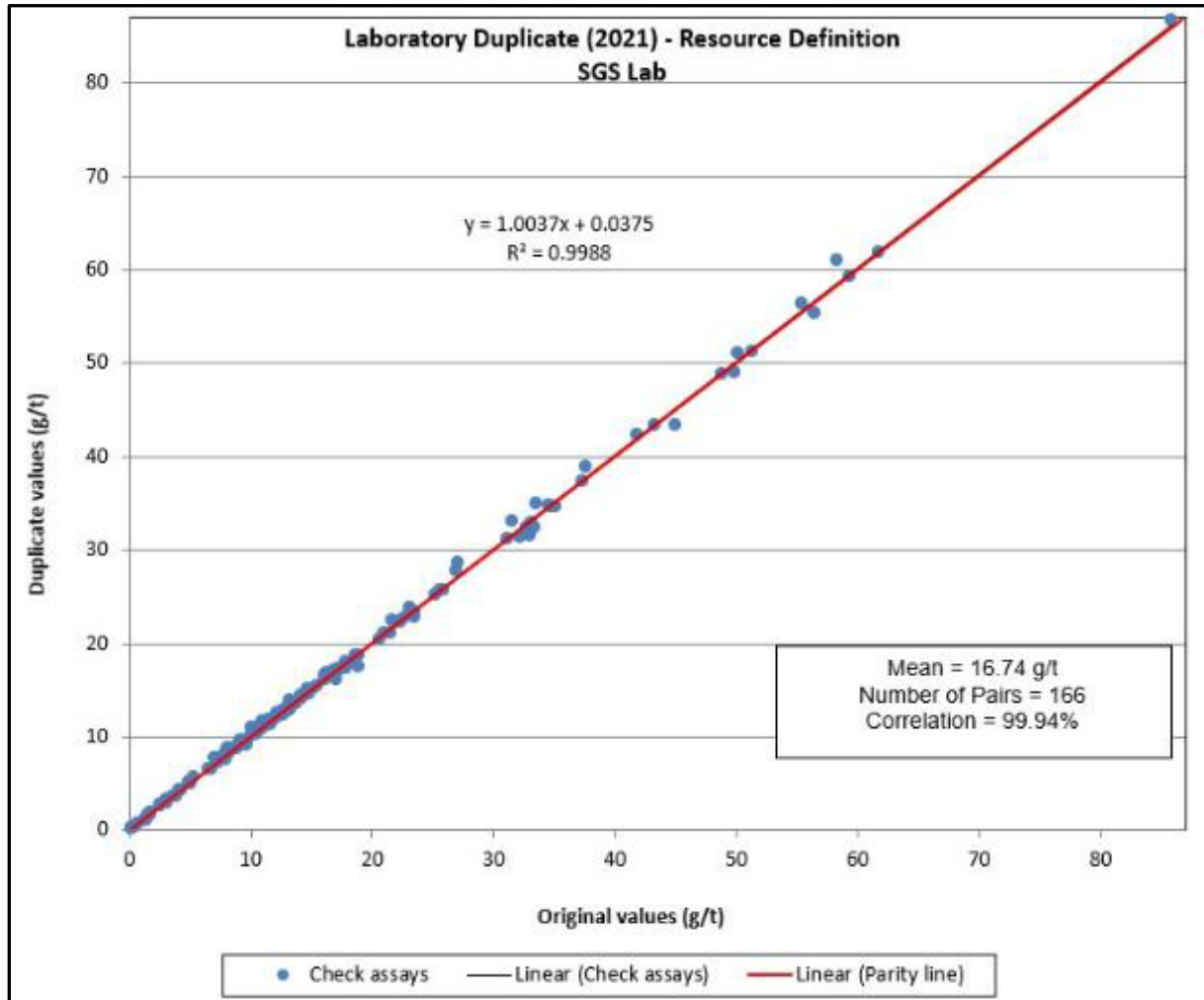


Figure 11-7: Laboratory Duplicate Samples – SGS Geosol Laboratory

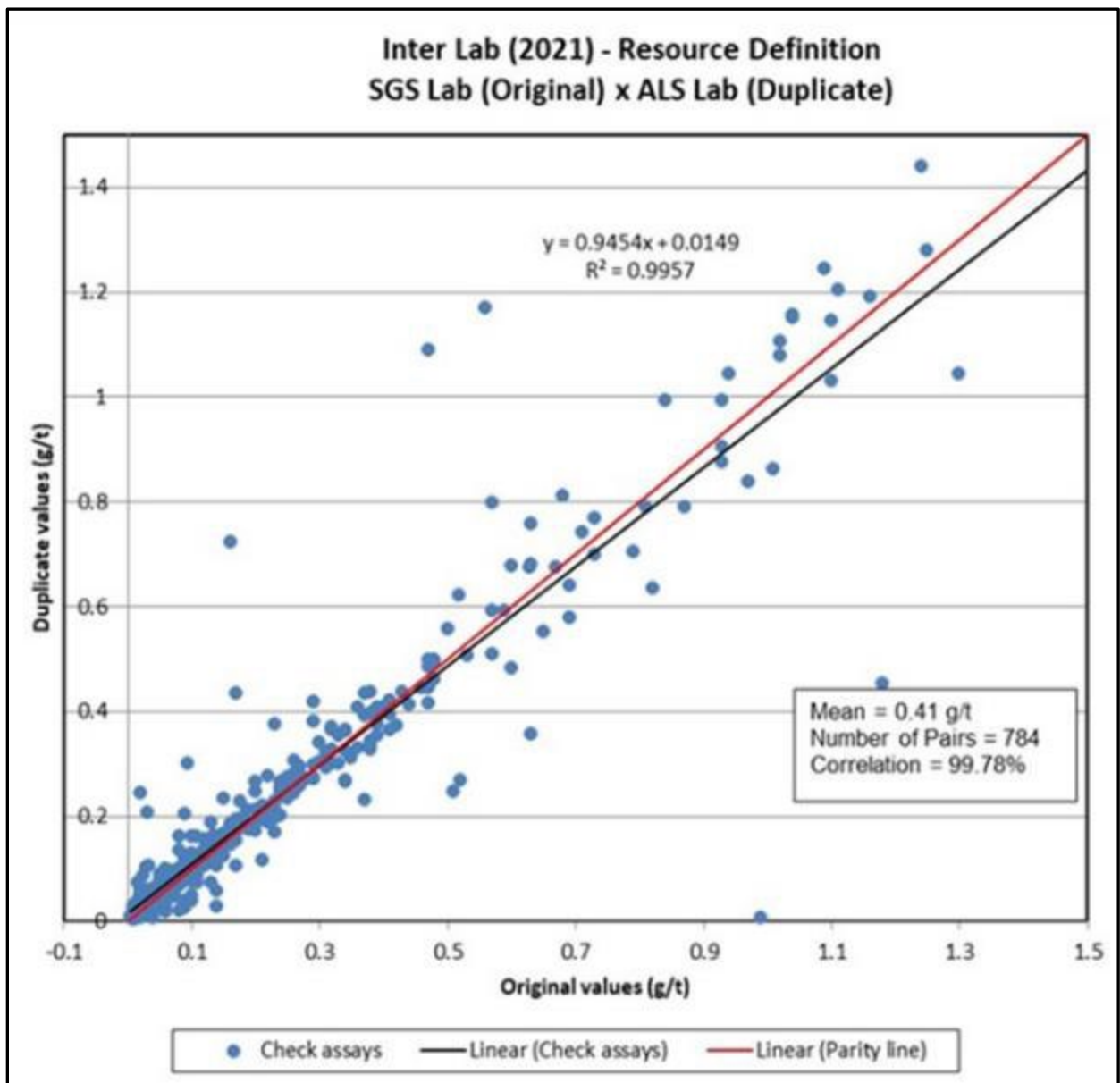


Figure 11-8: Laboratory Duplicate samples – Tucano Laboratory

The second is a field duplicate, which involves taking a second sample in the field (RC, RAB) or of core. In the case of core, the core is cut into two equal halves along the long axis for sampling with each sample undergoing its own sample preparation and analysis procedure. This sample indicates the natural variability in the mineralization within the core. Figure 11-9 indicates acceptable levels of variability in Field Duplicates.

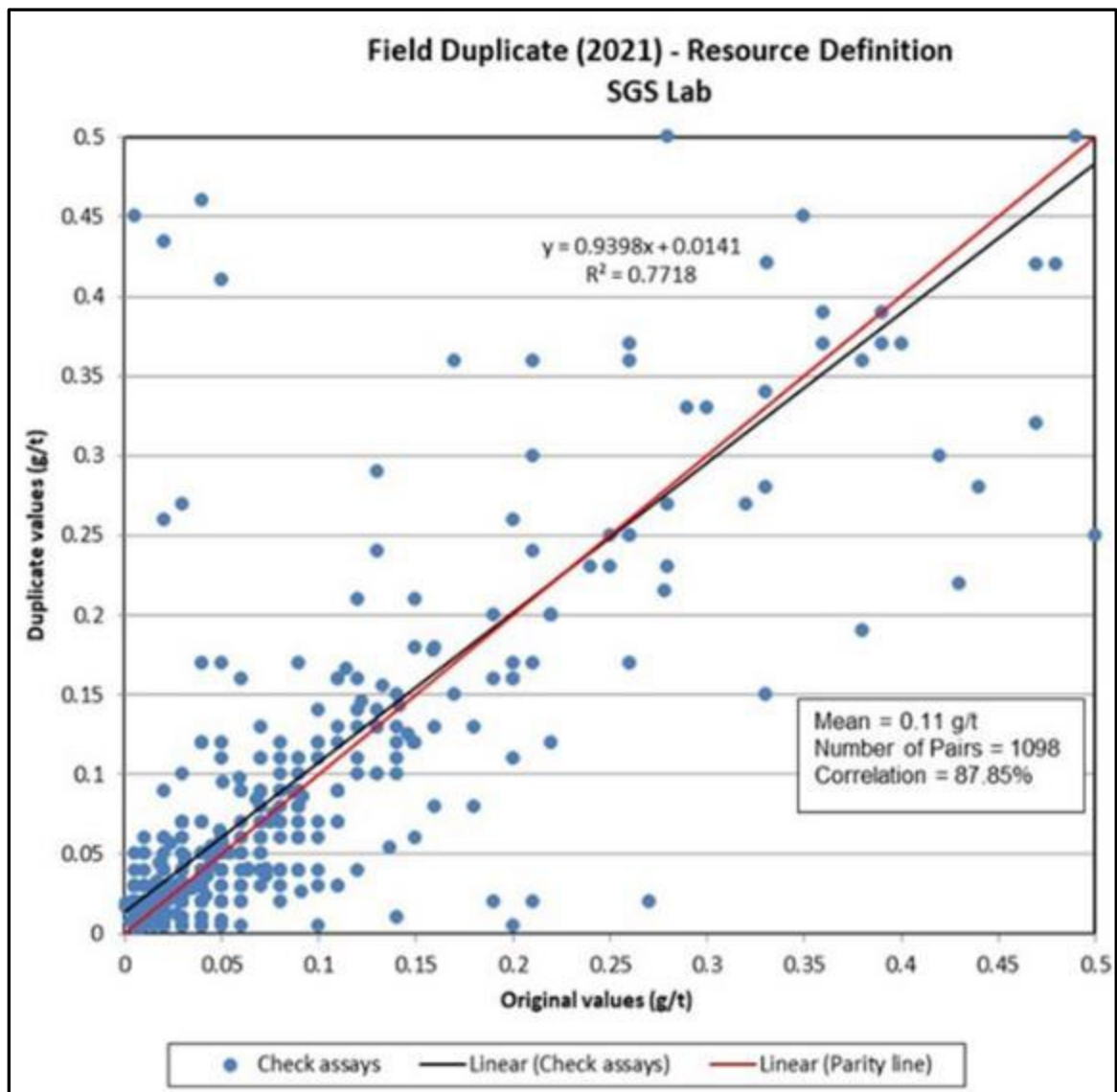


Figure 11-9: Field Duplicate Samples - SGS Geosol Laboratory

## 11.7 DATABASES

Prior to Beadell's acquisition of the Tucano mine data was stored in a Minesight Torque database. In early 2016 the database was migrated to a Datashed database. In 2019, the Beadell datasets were organized, validated, and migrated to Great Panther's acQuire database.

All drilling information is stored in acQuire which has been structured to facilitate and routinely validate data entry / upload, has built-in QA/QC procedures and sophisticated search filters. Uploading data to,

editing data in or database structure changes to acQuire are restricted to key data management staff. A large portion of acQuire is dedicated to legacy drilling datasets now related to areas above the current mining surface or mineralization that has been mined-out.

Drill logs including structural, density and geotechnical data are captured manually and then re-typed into forms or spreadsheets for entry in acQuire. Assay data is received in digital format and uploaded to acQuire. In addition to data entry validation routines developed within acQuire, geologists are responsible for validating data uploaded to the database through visually plotting the data to verify for inconsistencies. The QP responsible for MRMR estimation also performs an annual internal audit of the database prior to the estimation process.

Backups of the database are programmed by the IT department and are routinely made on a weekly and monthly basis.

## **11.8 SAMPLE SECURITY**

Grade control samples are collected and securely sealed in the field and transported directly to the ROM sample preparation facility at Tucano where the integrity of the bags and sample labels are verified. After processing the sample assay aliquot is delivered to the assay laboratory. Oversize and excess pulp samples are temporarily stored on-site for a period of 3 months before being discarded.

All exploration and resource definition samples, except drill core, are collected and securely sealed in the field and transported direct to the Tucano exploration sample preparation facility where the integrity of the sample bags and sample labels are verified. Samples are prepared producing approximately 400 g of -#105 pulverized pulp sample which is split into two 100 – 200 g samples. These are labelled and separated for despatch to the Tucano Laboratory and SGS Geosol Laboratory respectively. The oversize and remaining pulp material is stored on site in a storage area adjoining the sample preparation facility. Sample batches for the Tucano Laboratory are delivered directly to the on-site Laboratory facility.

Samples sent to an independent external laboratory are securely sealed, packaged and stored onsite until a sample batch is completed. Sample boxes are sealed and transported by truck to the Macapá air freight shipping point using contracted vehicles. The samples are air freighted to Belo Horizonte and delivered to the Laboratory, where the integrity of the sample packing and numbering system are confirmed against sample submission forms sent with the samples to the laboratory. The laboratory emails a confirmation that the samples were received, and provides a job number for tracking purposes.

In the case of drill core the procedure outlined in 11.1.5 are followed resulting in a bag of core sample that is delivered by the exploration staff directly to the Tucano exploration sample preparation facility. The samples then follow the same procedure as outlined above.

## **11.9 QP COMMENTS ON “ITEM 11: SAMPLE PREPARATION, ANALYSES, AND SECURITY”**

In the opinion of the QP:

- Sample collection, preparation, analysis and security for RC and core drill programs are in line with industry-standard methods for gold deposits;
- Drill programs included insertion of blank, duplicate, and certified reference material samples;
- QA/QC methods are practiced during density measurement programs, which are industry-leading practices;
- QA/QC program results do not indicate any significant issues with the analytical programs (refer to discussion in Section 12);
- Data is subject to validation, which includes checks on surveys, collar co-ordinates, lithology data, and assay data. The checks are appropriate, and consistent with industry standards (refer to discussion in Section 12);
- All core and RC chips have been catalogued and stored in designated areas.

The QP is of the opinion that the quality of the gold analytical data is sufficiently reliable to support Mineral Resource estimation without limitations on Mineral Resource confidence categories.

## **12. DATA VERIFICATION**

### **12.1 INTERNAL DATA VERIFICATION**

Data verification completed by Great Panther includes a review of the methods and practices used to generate the resource database. This includes but was not limited to the drilling, sampling, analysis, and data entry processes. The verification included a review of the QA/QC methods and results, standard database validation tests, and several site visits. The review of the QA/QC program and results are presented in Section 11.

The Qualified Person selected a number of drill holes to verify the described methods and practices by performing the following reviews:

- Visiting the core handling facility and a review of drill core collection, markup, logging, sampling, storage and security practices. No issues were found.
- Review of core logs for several drill holes during site visits. No issues were found.
- Visits to and review of procedures at the Tucano sample preparation facility, the Tucano fire-assay laboratory and the Certified SGS Geochemistry laboratory in Belo Horizonte. No issues were identified.
- Reviewing the drill hole traces in three-dimensional (3-D), level plan, and vertical sections. No unreasonable geometries were found.
- Querying the database for missing or repeated data, unique headers, duplicate holes, and gaps or overlapping intervals. Ensuring that the total depth recorded in each drill hole database table was consistent. No issues were identified.
- Accuracy of geological interpretations and grade interpretations on section and plan, and in geological models. No unreasonable geometries were found.

### **12.2 EXTERNAL DATA VERIFICATION**

Over the Project life, a number of external data verification programs were undertaken by third-party consultants. These included:

- Maxwell Geoservices Ltd (Maxwell): conducted data verification and QA/QC checks on behalf of Beadell from 2012 to 2017.
- AMC Consultants: conducted data verification during compilation of the 2018 Technical Report.
- Roscoe Postle Associates (“RPA”): conducted data verification during compilation of the 2019 Technical Report.
- Roscoe Postle Associates: conducted estimations and data verification of the TAP AB resource model for the 2020 Technical Report.

The Maxwell reports did not indicate significant precision or bias issues. A significant portion of the mineralized material evaluated has been mined out.

AMC reviewed the available QA/QC data, primarily derived from the Maxwell reports and noted that:

- Standards: some standards were used on a limited number of occasions and results are not statistically significant given the paucity of data. There is evidence of standard mislabelling or swaps. AMC concluded that despite these issues, there was no systemic bias in the database to make the grade estimates inaccurate.
- Duplicates: duplicates were found to be within acceptable limits.
- Blanks: no comment was made on blank performance.
- Insertion rates: insertion rates of standards was considered acceptable; however a comment was made that there was a strongly varying ratio of standards and duplicates to drill samples, and that a more systemic QC program was warranted.

AMC staff conducted a site visit in July 2015, and during that visit inspected various open pit exposures, reviewed selected core and RC chips, and inspected aircore, RC and core drilling, sampling and logging. No significant issues with these areas was noted.

AMC staff performed a software check on the data export from the Beadell database for issues such as overlapping intervals, sampling beyond hole depth prior to resource estimation.

RPA completed the following in 2019:

- Compared information contained within the assay tables of the digital databases against the assays presented in the original laboratory certificates.
- Compared lithological information contained within the drill logs against the information contained within the digital databases.
- Compared drill hole collar locations with the digital models of the topographic surfaces and excavation models.
- Visually inspected down hole survey data.

RPA found no material issues that would impact resource estimates.

RPA staff visited the operations in 2019. No significant issues were noted as a result of the site visits.

RPA completed the following in 2020 for the TAP AB deposits:

- Compared information contained within the assay tables of the digital databases against the assays presented in the original laboratory certificates.
- Compared digital lithological information contained within the drill logs against the information contained within the digital lithology models.
- Compared drill hole collar locations with the digital models of the topographic surfaces and excavation models.

RPA found no material issues that would impact resource estimates.

### **12.3 QP COMMENTS ON “ITEM 12: DATA VERIFICATION”**

The checks performed by Great Panther staff, including the continuous QA/QC checks conducted by the database administrator and Project geologists on the assay data and geological data are in line with industry standards for data verification. These checks have identified no material issues in the data that were not resolved through reference to the Laboratory Certificates or re-analysis of samples, before entry into the Project database.

The 2018 to 2020 technical reports (refer to Section 2.7) included a review of data verification. No material issues with the data or the Project database were identified at that time.

As part of multiple site visits during 2020 and 2021, the QPs have personally verified data supporting the estimates (refer to Section 12.3).

As a result of the data verification, the QPs conclude that the Project data and database are acceptable for use in Mineral Resource and Mineral Reserve estimation and can be used to support mine planning.

## **13. MINERAL PROCESSING AND METALLURGICAL TESTING**

### **13.1 INTRODUCTION**

Initial metallurgical testing was undertaken in the period 1998–2010 resulting in a heap leach processing configuration. In 2010 Beadell acquired the project and carried out a definitive Feasibility Study completed in May 2011, resulting in the base for the current mining and carbon-in-leach (“CIL”) processing flowsheet. The new plant, commissioned in 2011 was a conventional single-stage 7 MW semi-autogenous (SAG) mill and CIL circuit, designed to treat 3.1 Mt/a of oxide material.

The Tucano CIL gold processing plant was designed by Ausenco as was the expansion treat fresh/sulphide ore. The expansion programme included the installation of a secondary ball mill and a pre-leach tank and tailings thickener and increased throughput capacity to 3.6 million tonnes per annum treating 100% of the much harder sulphide ore type.

Key features of these flowsheet changes are as follows:

- An additional 6 MW ball mill to increase original Ausenco design capacity to 3.6 million tonnes/annum and potentially obtain a finer product size of 80% < 75 µm at a higher proportion of sulphide ore to increase cyanide leach gold recovery and kinetics. Completed in September 2018.
- A pre-leach thickener to allow effective operation of the hydrocyclones which in turn provides higher leach feed pulp % solids. Completed in September 2018.
- Additional leach residence time by adding one additional pre-leach tank to allow for the higher proposed plant capacity. Completed November 2018.
- Oxygen addition to CIL as proposed by Ausenco. Completed April 2019.
- Lead nitrate addition to CIL as proposed by Ausenco. Completed November 2018.

### **13.2 METALLURGICAL TESTWORK**

#### **13.2.1 TESTWORK**

Over the Project history, metallurgical testwork was completed as follows:

- Original heap leach: MPBA/New Gold; consultants Ausenco and Ammtec Limited (Ammtec).
- Initial and upgraded mill designs, debottlenecking: Beadell; consultants Ausenco, SGS Geosol, Testwork Process Development Ltd.; Ray Walton Consulting Inc. (Ray Walton), MPH Minerals Consultancy Ltd. (MPH Minerals), SRK Consulting Inc., and Outotec.

Testwork completed in support of the original Beadell mill design included mineralogy, comminution, determination of grind size and cyanidation conditions, gravity response, variability leach testwork, tailings characterization, oxygen uptake, carbon kinetics, slurry viscosity, lime demand, and cyanide destruction.

Beadell's later work initially focused on remediating low gold recoveries and coarse grind sizes that were impacting the plant in 2016 by comparing plant actual to plant design performance. This resulted in recommendations to expand the plant through additional grinding power, installing a pre-leach thickening step, increasing the residence time, and changing reagents at the CIL step. Testwork included bottle rolls on sulphide material. Results of the sulphide tests were variable, and not in line with expectations, so additional tests were recommended.

In 2017, SGS Geosol undertook bottle roll testing on a new set of composites from the TAP AB and Urucum deposit areas. This resulted in recommendations to change the leach residence time, as a residence time of 24 hours and a grind size of P80 75 µm was optimum given the plant grind capability.

## **13.2.2 RESULTS**

### **13.2.2.1 2011**

The initial mill testwork results, used for plant design in the 2011 Beadell feasibility study, included:

- The oxide and sulphide ores had very dissimilar physical and comminution characteristics;
- The oxide ore had a very low competency and low-to-average hardness, whereas the sulphide ores were competent to very competent and average to above average hardness. Co-processing of these ores was best suited to a SAG mill. A single-stage SAG mill was recommended for the first few years, when a high-oxide low-sulphide blend was planned. A ball mill was to be added around Year 4 when the sulphide content of the blend was expected to rise;
- Gravity test work in the laboratory showed a high recovery (35% to 56%) of gold by centrifugal gravity concentration and intensive cyanidation of gravity concentrate. However, the overall gold recovery, including leaching of gravity tails, showed no recovery improvement in recovery over a whole ore leach. Therefore, no gravity circuit was included in the plant design;
- Mineralization was free-milling and are not preg-robbing. Material was amenable to gold extraction by conventional CIP cyanidation. As a group, the oxide ores responded in a similar manner to each other, giving very high recoveries (typically >95%) at a grind size of P80 75 µm, with moderate reagent consumptions of 0.55 kg/t NaCN and 5.5 kg/t lime (60% CaO). Despite the ores showing no preg-robbing characteristics, CIL was selected because it was the lowest capital cost. The original elution circuit inherited by Beadell from New Gold's heap leach operation was retained to minimise capital costs;
- The sulphide ores had high recoveries, but typically 3% lower than oxide ores, at a grind size of P80 75 µm, and moderate reagent consumptions of 0.49 kg/t NaCN and 0.57 kg/t lime (60% CaO);
- The spent ore samples stockpiled from the previous heap leach operation had a recovery of 87% at a grind size of P80 75 µm, the low-grade ore stockpiled during the previous heap leach operation exhibited a recovery of 93.5% at a grind size of P80 75 µm;

- Oxygen addition increased the leaching kinetics, primarily for the sulphide ores. The use of oxygen was recommended for the high sulphide ore blends planned for the fourth year of operation;
- Lead nitrate addition at 100 g/t appeared to increase the kinetics of gold leaching for Tap AB oxide material, such that extractions previously achieved at 48 hours were achieved at between 12–24 hours;
- The planned Tucano ore blends both have thickener specific settling rates of 1.2 t/m<sup>2</sup>. The high sulphide blend requires 5–7.5 g/t of flocculant, and should achieve thickener underflow solids concentration of 60% to 62% solids. By comparison, the high oxide blend would require twice as much flocculant and would be expected to achieve a thickener underflow solids concentration of 50% to 52% solids;
- The air/SO<sub>2</sub> cyanide destruction process could be used to reduce cyanide in CIL tailings slurry to <3 ppm weakly acid dissociable cyanide (CN<sub>WAD</sub>) and <25 ppm total cyanide (CN<sub>TOTAL</sub>).

#### **13.2.2.2 2016**

The 2016 Beadell feasibility study to support a plant expansion included findings related to individual pieces of equipment in the study.

Mill sizing calculations by RWC and SRK supported the installation of a 6 MW ball mill. This was based on optimization with some “drift” of the respective SAG and ball mill power draws, a better fit of the ball mill to the 6.5 MW SAG mill, and ensuring the treatment rate could be maintained if harder sulphide material was mined. The ball mill could also potentially obtain a finer product size of 80% < 75 µm at a higher proportion of sulphide ore to increase cyanide leach gold recovery and kinetics.

Testwork by Outotec indicated that installation of a pre-leach thickener would:

- Allow the cyclones to be operated at a lower percentage of solids and thus, classify more effectively at the optimum grind size of 75 µm;
- Provide a slurry at a higher percentage of solids to the new leach tank and CIL process, and hence maintain adequate residence times.

The thickener selected was 28 m in diameter.

The reviews indicated that an additional leach tank would be required to allow the 24 hr residency time. A 15 x 15 m leach tank was selected to be installed ahead of the CIP circuit.

Reviews noted that the benefits of lead nitrate addition would be shorter leach times and reduced cyanide consumptions, particularly on the oxide ores. A design dosage figure of 150 g/t was selected.

Oxygen addition would significantly increase gold recovery kinetics; this had been recommended in the original plant design when treating sulphide materials; however, air, not oxygen was being used. A plant capacity of 7.5 t/d of oxygen was selected, i.e., approximately 0.75 kg of oxygen per tonne of slurry.

## **13.3 PLANT PERFORMANCE**

### **13.3.1 PLANT THROUGHPUT**

The average plant throughput from 2016 to 2018 was 3.6M tonnes containing only an average of 17% sulphide ore in the blend.

The Tucano Gold Mine commissioned a new oxygen plant in April 2019 which allows the processing of higher amounts of sulphide ore in the blend, which averaged 77% of sulphide ore from May 2019 to July 2021. The increased amount of sulphide ore did not affect metallurgical recoveries, in fact, they increased, and lower plant throughput due the harder ore in higher proportions in the feed blend.

### **13.3.2 METALLURGICAL RECOVERIES AND OXYGEN**

Plant recoveries are defined by pre and post April 2019 when the new oxygen plant was installed and dissolved oxygen (“DO”) in the pulp in leach tank one was increased to more than 15ppm DO as originally recommended by Ausenco for sulphide ore types. The average gold recovery pre oxygen plant was around 88%. The average recovery increased to 92% with oxygen supply.

The supply of oxygen in the leaching process increases gold recovery kinetics by the increased dissolved oxygen levels. 78% of gold is in solution in tank 1 already, which will vastly improve carbon adsorption kinetics and reduce soluble loss and reliance on downstream tanks for further gold dissolution.

### **13.3.3 CYANIDE CONSUMPTION**

The main reason for the higher cyanide consumption is the presence of Pyrrhotite and other Fe bearing minerals which solubilise on contact with water. Fe<sup>2+</sup> ions consume Cyanide and it is therefore important that Fe<sup>2+</sup> ions are oxidised to Fe<sup>3+</sup> ions since Fe<sup>3+</sup> ions do not consume cyanide. The addition of higher levels of oxygen has clearly significantly increased gold recovery but cyanide consumption rates have remained high.

Plant instrumentation has been improved and consequently, the cyanide consumption rates have been trending down under normal conditions (i.e. not excessive pyrrhotite). However, further research and development work is planned to ascertain the optimum plant set up.

### **13.3.4 DELETERIOUS ELEMENTS**

The Company rarely received penalties associated with the refining of the gold from the Tucano mine. The principal risk for a deleterious element in the doré comes from the presence of copper in localized veins within the mine. When necessary, this is managed through blending.

## **14. MINERAL RESOURCE ESTIMATES**

### **14.1 INTRODUCTION**

Mineral Resources are reported for the URE, Urucum, TAP C, TAP AB and Duckhead deposits, assuming open pit mining methods. For deeper portions of the TAP AB, URN, URCN & URCS deposits, Mineral Resources are estimated assuming underground mining methods. Mineral Resources are also estimated for stockpiled materials.

Database close-out dates for the estimates are provided in Section 10 in Table 10-2. The effective date for drilling data was July 31, 2021.

Geology logs and assay results from all exploration and grade control diamond drilling and Reverse Circulation (“RC”) drilling programs were used in the construction of three-dimensional (“3D”) models of weathering, resistance, lithology and mineralization. Rotary air blast (“RAB”) drilling may be used for drill testing surficial colluvium or highly weathered material. In this Technical Report this is restricted to the fringes of the TAP C deposit.

To reflect operational parameters, the Mineral Resource block models use selective mining unit (SMU) sizes of:

- Urucum, TAP C and TAP AB open pits: parent blocks of 3 x 5 x 4 m;
- URE open pit: parent block of 5 x 3 x 2 m;
- URN underground: parent block of 8 x 20 x 20 m; sub-blocks at 1 x 5 x 2.5 m;
- URCS & URCN underground: parent blocks of 9 x 20 x 8 m; sub-blocks at 1.125 x 5 x 2 m;
- Duckhead open pit: parent blocks of 5 x 10 x 2 m; sub-blocks at 0.625 x 2.5 x 1 m.

Resource Estimation modelling was conducted using the industry standard, commercial softwares; Leapfrog, MineSight or Surpac for geologic modelling and generation of mineralization wireframes, Isatis for geostatistical evaluation and variography and Datamine for block modelling and resource estimation.

### **14.2 EXPLORATORY DATA ANALYSIS**

Statistical analysis was conducted on individual wireframes, (orebodies), by deposit and could include descriptive statistics, histograms, probability plots, declustering analysis and grade distribution maps. All orebodies had hard boundaries for estimation purposes.

- 3 wireframes were defined for the URE deposit. (Figure 14-1)
- 70 wireframes for the Urucum open pit trend. (Figure 14-2).
- 24 mineralized wireframes for the URN underground deposit (Figure 14-3).
- 38 wireframes for TAP C. (Figure 14-4).

- 66 mineralized wireframes for TAP AB (Figure 14-5).
- 24 mineralized wireframes for the Duckhead deposit (Figure 14-6).

## 14.3 GEOLOGICAL MODELS

### 14.3.1 URUCUM EAST

No mining activities have been conducted at URE. The topography surface is the natural surface.

A weathering surface defining the base of oxidation and a rock strength surface defining the base of low resistance (non-blasting material) were interpreted from drill core.

The lithology model is developed from geologic logging of drill core.

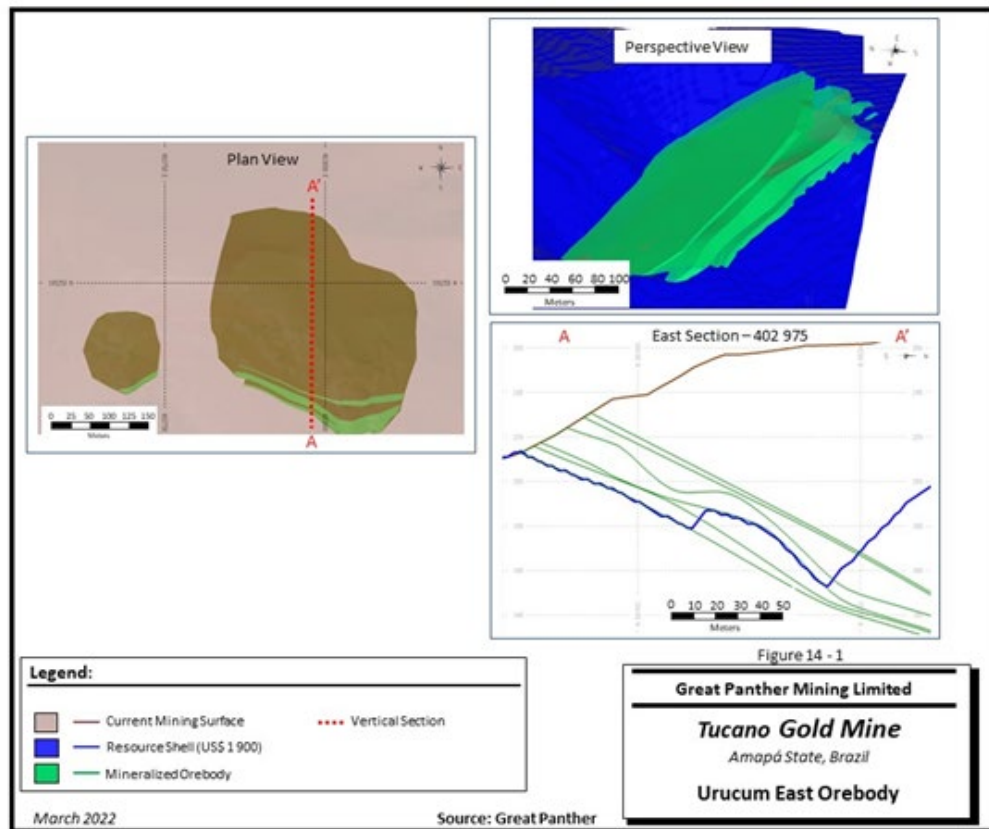


Figure 14-1: Urucum East Orebody

A 0.3 g/t Au cut-off grade was used for defining open pit mineralization wireframes, allowing for minor dilution intercepts to be included for continuity. Open pit wireframes had a minimum 3 m mineralization thickness.

### 14.3.2 URUCUM

The topographic surface used to constrain the estimation was that of July 31<sup>st</sup>, 2021.

A weathering surface defining the base of oxidation and a rock strength surface defining the base of low resistance (non-blasting material) were interpreted from drill core.

The lithology model is developed from geologic logging of drill core.

Both 0.3 g/t Au and 0.5 g/t Au lower limits are used to limit mineralization wireframes, allowing for minor dilution intercepts to be included for continuity. Open pit wireframes have a 3 m minimum mineralization thickness.

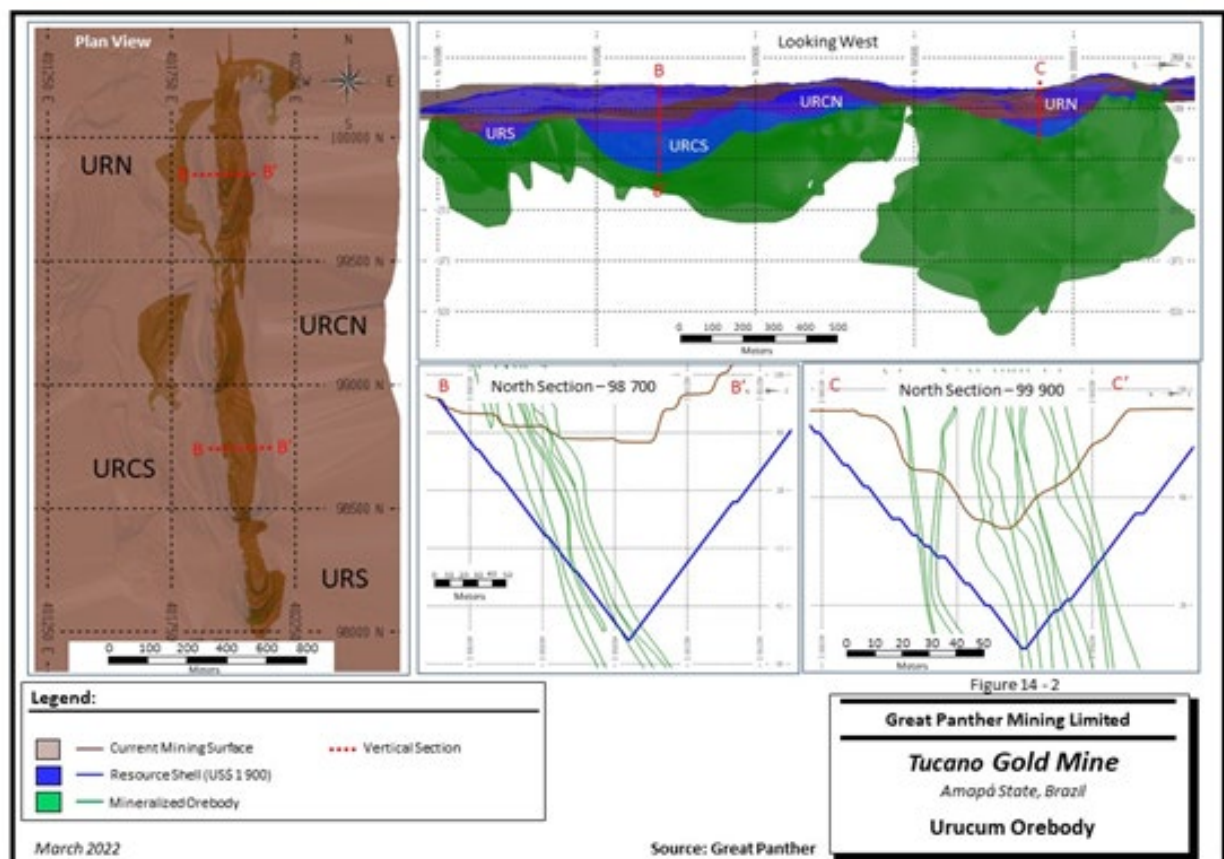


Figure 14-2: Urucum Open Pit Deposit

The wireframe model used for Mineral Resource estimation is +0.3g/t Au for Urucum (URN, URCS, URS pits) while for URCN the model with +0.5 g/t Au was selected. The wireframe at +0.5 g/t Au for URCN is selected due a concentration of higher grades (+2.0 g/t) in some portions of the deposit.

#### 14.3.2.1 Urucum North, Urucum Central Underground

The underground portion of the Urucum model was subdivided into URN and URC, with a geographic divisor at 99,400 mN.

Stopes were modelled beneath a constraining crown pillar for definition of mineral resources.

For the underground a minimum 1.6 g/t Au is used for resources. For URN Underground no minimum thickness was used for modelling of the underground wireframes, and narrow (<1 m) very high grade intervals were included. As a guide a minimum grade \* true thickness of 6 g\*m was used as a guide for inclusion.

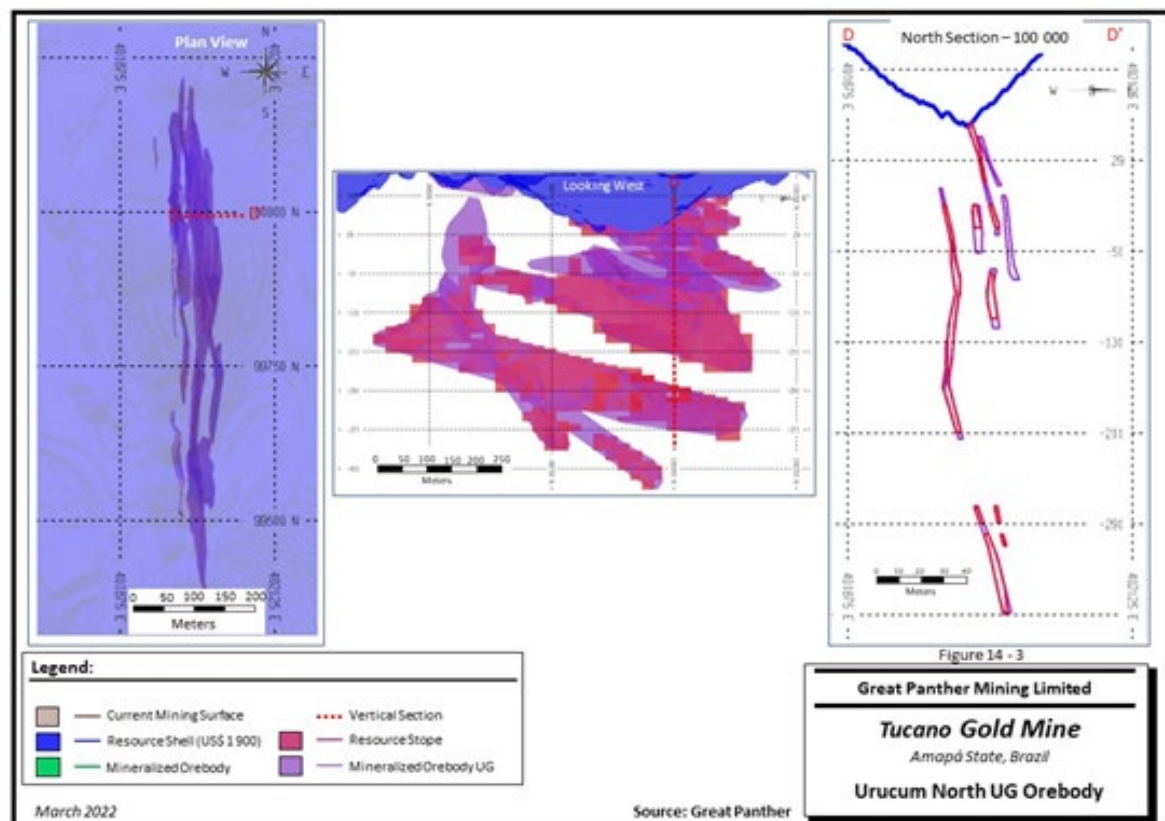


Figure 14-3: Urucum North Underground Deposit

### 14.3.3 TAP C

The topographic surface used to constrain the estimation was that of July 31st, 2021. This corresponds to the topography as of June 2018 when mining was suspended at TAP C.

A weathering surface defining the base of oxidation and a rock strength surface defining the base of low resistance (non-blasting material) were interpreted from drill core.

The lithology model is developed from geologic logging of drill core.

A +0.3 g/t Au grade wireframe was used for defining open pit mineralization, allowing for minor dilution intercepts to be included for continuity. Open pit wireframes have a minimum 3 m mineralization thickness.

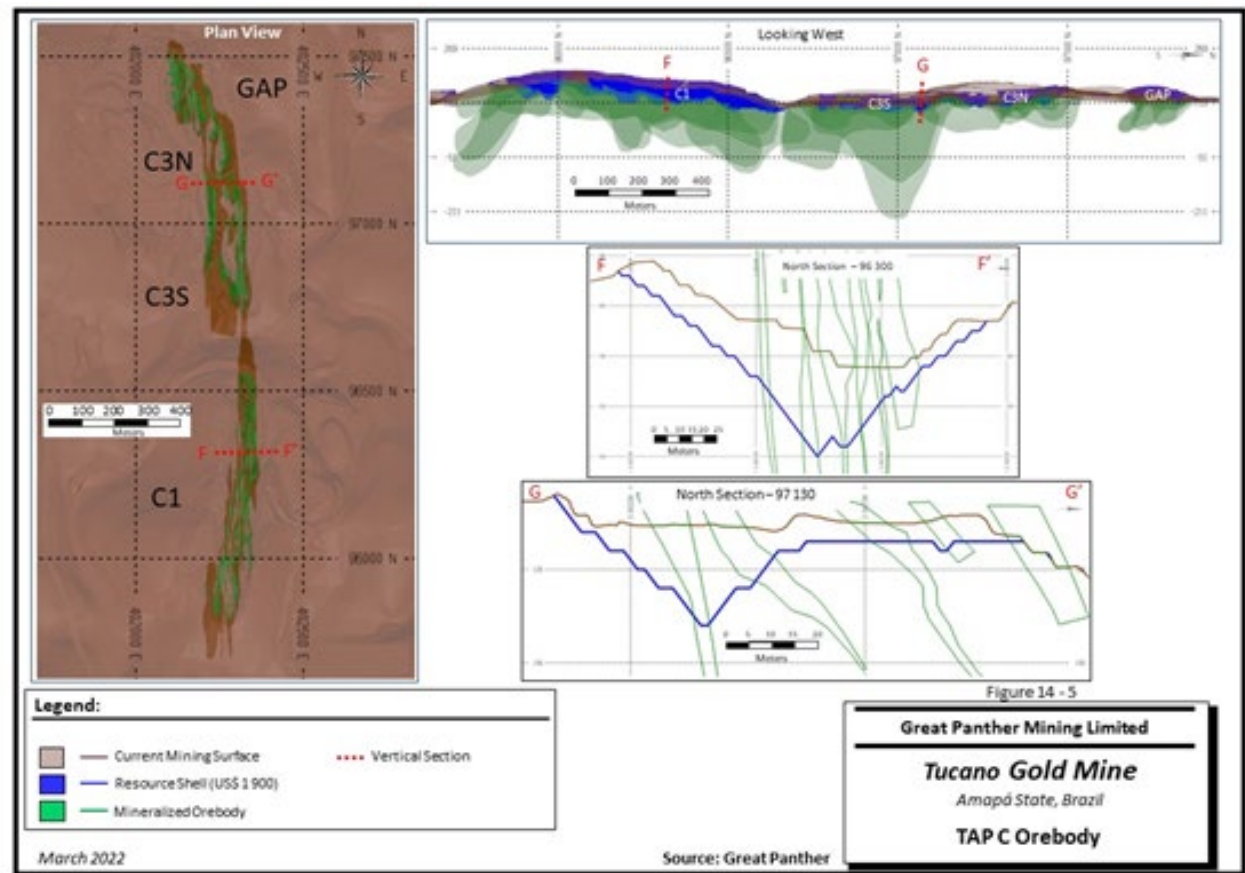


Figure 14-4: TAP C Open Pit Deposit

#### 14.3.4 TAP AB

Primary topographic surfaces and the cut and fill surface topographies as of April 30th, 2019 were used to generate updated in situ and backfill domains. The topographic surface used to constrain the orebody was that of July 31st, 2021.

A weathering surface defining the base of oxidation and a rock strength surface defining the base of low resistance (non-blasting material) were interpreted from drill core. Weathering depths in the mine sequence can extend to over 250 m depth.

The lithology model is developed from geologic logging of drill core.

A 0.3 g/t Au cut-off grade was used for defining mineralization wireframes, allowing for minor dilution intercepts to be included for continuity. Wireframes had a 3 m mineralization thickness minimum.

Structural trend surfaces were generated that followed the principal veins. These surfaces were used as planes of preferred grade continuity trends to prepare a set of grade shells at various cut-off grades.

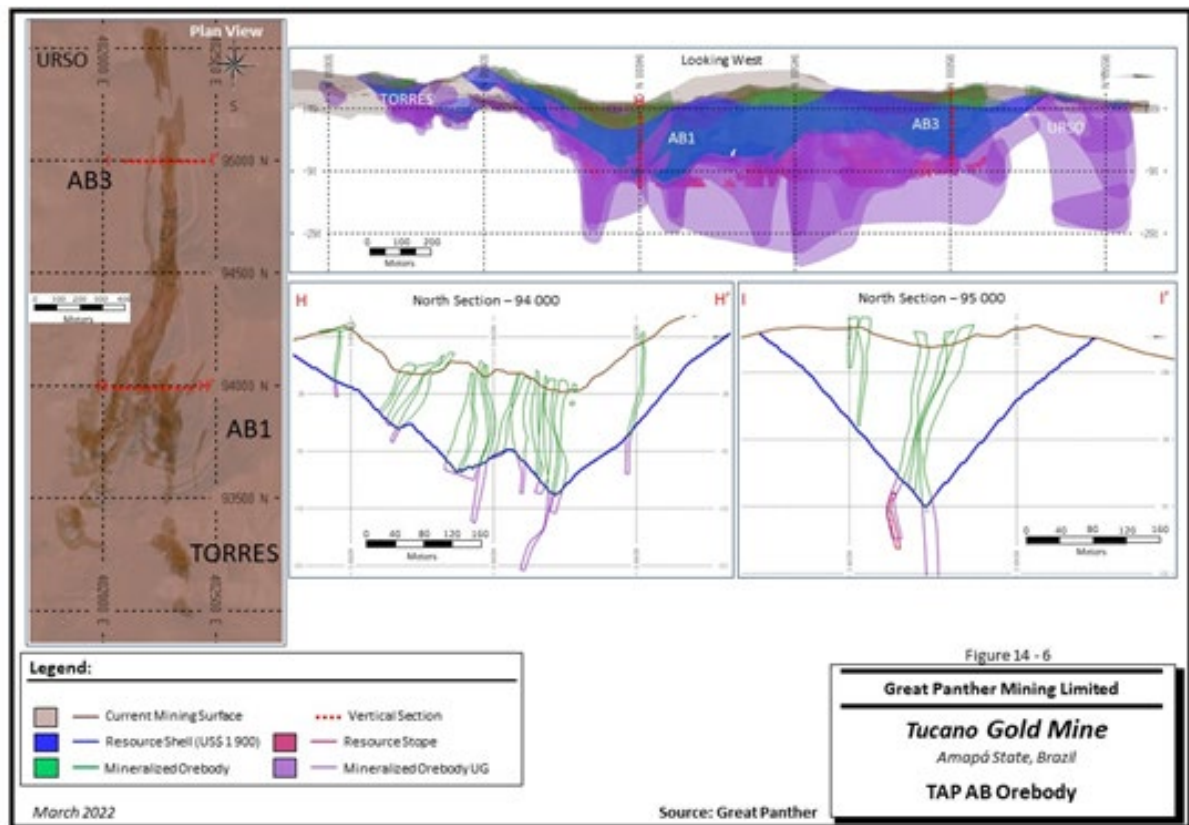


Figure 14-5: TAP AB Open Pit Deposit

### 14.3.5 DUCKHEAD

Mining activity at Duckhead was suspended in December 2016 so the topographic surface used for mine depletion is that of December 31st, 2016.

A weathering surface defining the base of oxidation was interpreted using drill holes.

Lithologies modelled included a main BIF unit with internal carbonates, schists and amphibolites.

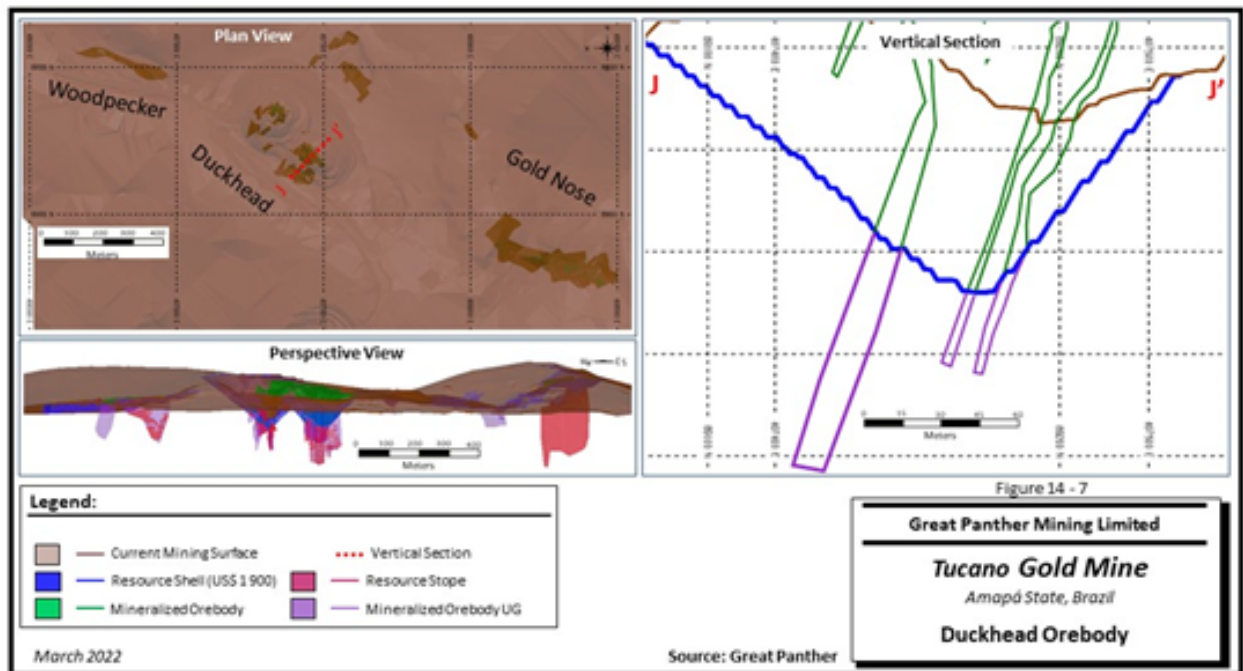


Figure 14-6: Duckhead Open Pit Deposit

### 14.4 DENSITY ASSIGNMENT

Core is routinely measured for bulk density, with the bulk density of the oxide measured immediately after drilling to determine the wet bulk density prior to drying, and the subsequent dry bulk density. The method of density measurement used was the Jolly Method (also known as the Archimedes method).

Figure 14-7 shows the average of densities separated by deposit.

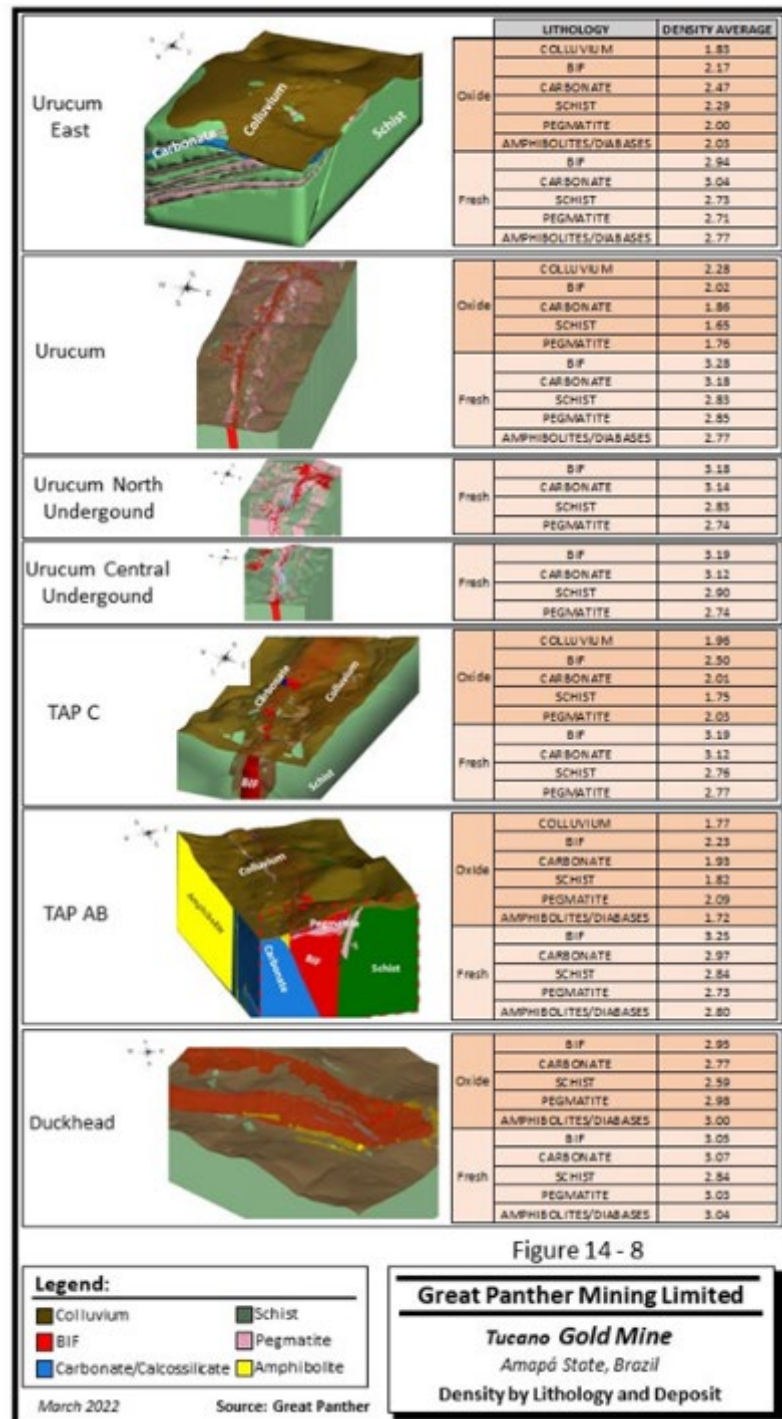


Figure 14-7: Average of Density Separated by Deposit

A total of 2,278 bulk density measurements were available for the URE deposit. Density measurements were assigned a lithology and weathering intensity. Average oxide bulk densities ranged from 1.83 in colluvium to 2.47 in carbonate. Fresh rock average bulk densities ranged from 2.71 in pegmatite to 3.04 in carbonate.

There are 45,394 recorded values for the various lithological and weathering units in the Urucum deposit used in the resource estimation. Average oxide bulk densities range from 1.65 in schist to 2.28 in colluvium. Fresh rock densities separated by lithology were interpolated into the block model using Inverse Distance ("IQD2"). Average densities range from 2.77 in pegmatite to 3.28 in BIF.

For the URN underground deposit, bulk density measurements were assigned a lithology and interpolated into the block model using the nearest-neighbor ("NN") method. A total of 20,059 samples, most within fresh rock, were available for estimation. Average fresh rock density values ranged 2.74 in pegmatite to 3.18 in BIF.

For the URC underground deposit, bulk density measurements were assigned to a lithological unit and interpolated into the block model using the nearest-neighbor (NN) method. A total of 37,993 samples, most within fresh rock, were available for estimation. Average fresh rock density values ranged 2.74 in pegmatite to 3.19 in BIF.

There are 12,676 recorded values for the various lithological and weathering units in the TAP C deposit. Average oxide bulk densities ranged from 1.75 in schist to 2.50 in BIF. Fresh rock separated by lithological unit had been interpolated into the block model using IQD2 and average fresh rock densities ranged from 2.76 in pegmatite to 3.19 in BIF.

For the TAP AB deposit there are 38 258 recorded values for the various lithological and weathering units. Average oxide bulk densities ranged from 1.72 in amphibolites to 2.23 in BIF. Fresh rock average bulk densities ranged from 2.73 in pegmatite to 3.25 in carbonate.

There are 10,350 bulk density measurements available for the Duckhead deposit. Bulk density measurements were assigned to a lithological unit and interpolated into the block model using the NN method. Average oxide bulk densities ranged from 2.59 in schist to 3.00 in amphibolite. Fresh rock average bulk densities ranged from 2.84 in schist to 3.07 in carbonate.

## **14.5 GRADE CAPPING/OUTLIER RESTRICTIONS**

Assays were capped prior to compositing and grade estimation, based on the exploratory data analysis. In some instances, a restricted search distance was implemented for higher-grade samples, such that samples above a certain grade threshold were capped at a lower level if located further than half the length of the search ellipse used in the first pass. The outlier restriction levels were set separately for each domain.

Grade capping applied to the URE deposit was established analyzing the log-normal probability plot and was set to 6 g/t Au.

Grade capping applied to the open pit portion of the Urucum deposit was established analyzing log-normal probability plot and was set to 12 g/t Au.

Grade capping for the underground portion of the Urucum deposit was established within the 98th and 100th percentile of the grade distribution curve. For domains with <100 composite samples, no grade capping was applied. In such domains with uncapped composites, the influence of high-grade samples was controlled by applying more restrictive ranges during grade interpolations. Grade capping ranges from 3 to 40 g/t depending on the ore lode.

A grade cap for the open pit portion of the TAP C deposit was established analyzing log-normal probability plot and was set to 15 g/t Au.

Grade capping applied to the open pit portion of the TAP AB deposit was established analyzing log-normal probability plot and was select 12 g/t Au.

Grade caps were applied to the Duckhead assay data. For domains with <100 composite samples, no grade capping was applied. Caps ranged from 3 to 900 g/t depending on the domain. Nested grade shells were used to limit smearing and restrict the influence of high-grade gold values during estimation at the Duckhead deposit. These ranged from 0.3 g/t Au in the low-grade envelope, to 50 g/t Au in the higher-grade core area.

## **14.6 COMPOSITES**

Samples within the mineralized wireframes were composited to 2 m intervals for the open pit models. This length was considered appropriate, as the majority of samples are 1 m long.

The URN underground data were composited on 1 m intervals. The URC underground data were composited on 2 m intervals.

## **14.7 VARIOGRAPHY**

Variography was completed for all the deposits.

## **14.8 ESTIMATION/INTERPOLATION METHODS**

URE deposit used ordinary kriging with Dynamic Anisotropy. ("OKDA"). The search criteria was completed in three passes (Table 14-1), using parent cells, hard boundaries, and 2 m capped composites.

Table 14-1: Search Criteria, Urucum East

Pass	Description	Value
1	Search radius (m)	30 x 30 x 20
	Maximum samples/hole*	3
	Minimum samples	8
	Maximum samples	14
2	Search radius (m)	60 x 60 x 40
	Maximum samples/hole*	3
	Minimum samples	7
	Maximum samples	14
3	Search radius (m)	400 x 300 x 300
	Maximum samples/hole*	3
	Minimum samples	3
	Maximum samples	14

\* 2 meters composite

Estimation at Urucum for the open pit portion used OKDA, the first pass represents 50% of variogram parameter. The search criteria are set out in Table 14-2, using parent cells, hard boundaries, and 2 m capped composites. A late phase pegmatite, barren of gold, cuts mineralization in places. A wireframe of the pegmatite has been modeled to reduce estimated grades proportionally.

Table 14-2: Search Criteria, Urucum Open Pit

Pass	Description	Value
1	Search radius (m)	25 x 25 x 10
	Maximum samples/hole*	3
	Minimum samples	10
	Maximum samples	14
2	Search radius (m)	50 x 50 x 20
	Maximum samples/hole*	3
	Minimum samples	8
	Maximum samples	14
3	Search radius (m)	400 x 300 x 300
	Maximum samples/hole*	3
	Minimum samples	3
	Maximum samples	14

\* 2 meters composite

Estimation for the underground portion of the URN deposit was completed in three passes (Table 14-3) by ordinary kriging ("OK"), using parent cells, hard boundaries, and 1 m capped composites. Both NN and OK methods were used. An outlier restriction radius of 20 m was used.

For the underground portion of URC an estimate by OK was conducted in three passes (Table 14-4), using parent cells, hard boundaries, and 2 m capped composites.

**Table 14-3: Search Criteria, Urucum North Underground**

Pass	Description	Value
1	Search radius (m)	130 x 120 x 25
	Maximum samples/hole*	12
	Optimum nb samples per octant	3
	nb of consecutive empty octants	3
	Outlier restriction	yes
2	Search radius (m)	130 x 120 x 25
	Maximum samples/hole*	12
	Optimum nb samples per octant	3
	nb of consecutive empty octants	7
	Outlier restriction	yes
3	Search radius (m)	500 x 500 x 100
	Maximum samples/hole*	4
	Optimum nb samples per octant	no restriction
	nb of consecutive empty octants	no restriction
	Outlier restriction	yes

\* 1 meter composite

**Table 14-4: Search Criteria, Urucum Central Underground**

Pass	Description	Value
1	Search radius (m)	35 x 30 x 15
	Maximum samples/hole*	4
	Minimum samples	12
	Maximum samples	32
2	Search radius (m)	70 x 60 x 30
	Maximum samples/hole*	4
	Minimum samples	8
	Maximum samples	32
3	Search radius (m)	500 x 500 x 100
	Maximum samples/hole*	4
	Minimum samples	1
	Maximum samples	32

\* 2 meters composite

Estimation for the TAP C deposit was completed in three passes (Table 14-5), the first pass represents 50% of variogram parameter. Estimates used OKDA, parent cells, hard boundaries and 2 m capped composites.

Table 14-5: Search Criteria, TAP C

Pass	Description	Value
1	Search radius (m)	30 x 30 x 20
	Maximum samples/hole*	3
	Minimum samples	8
	Maximum samples	14
2	Search radius (m)	60 x 60 x 40
	Maximum samples/hole*	3
	Minimum samples	7
	Maximum samples	14
3	Search radius (m)	400 x 300 x 300
	Maximum samples/hole*	3
	Minimum samples	3
	Maximum samples	14

\* 2 meters composite

Estimation for the TAP AB deposit was completed with three passes (Table 14-6), the first pass represents 75% of variogram parameter. Estimates used OKDA, parent cells, hard boundaries and 2 m capped composites.

Table 14-6: Search Criteria, TAP AB

Pass	Description	Value
1	Search radius (m)	30 x 30 x 10
	Maximum samples/hole*	3
	Minimum samples	10
	Maximum samples	14
2	Search radius (m)	60 x 60 x 20
	Maximum samples/hole*	3
	Minimum samples	8
	Maximum samples	14
3	Search radius (m)	400 x 300 x 300
	Maximum samples/hole*	3
	Minimum samples	3
	Maximum samples	14

\* 2 meters composite

Gold grades were estimated for the Duckhead deposit in three consecutive OK passes (Table 14-7) using the parent cells, hard boundaries and 2 m composites. An outlier restriction based on nested grade shells was used.

Table 14-7: Search Criteria, Duckhead

Pass	Description	Value
1	Search radius (m)	30 x 50 x 15
	Maximum samples/hole*	3
	Minimum samples	9
	Maximum samples	32
	Outlier restriction	yes
2	Search radius (m)	60 x 100 x 20
	Maximum samples/hole*	3
	Minimum samples	7
	Maximum samples	32
	Outlier restriction	yes
3	Search radius (m)	1 000 x 1 000 x 100
	Maximum samples/hole*	3
	Minimum samples	1
	Maximum samples	32
	Outlier restriction	yes

\* 2 meters composite

## 14.9 BLOCK MODEL VALIDATION

Validation for all the models included visual comparisons, statistical comparisons, comparison of the volumes of the wireframe models to the block model volume results, swath plots, and comparison of block and composite grades in blocks containing composites. Check estimates using OKDA, OK, NN and ID<sup>2</sup> estimation methods were used to validate the OKDA estimate for all deposits except Urucum Underground (North and Central) and Duckhead. For these deposits for check estimates using OK, NN and ID<sup>2</sup> estimation methods were used to validate the OK. The following are observations made by each deposit.

### 14.9.1 URUCUM EAST OPEN PIT

The following were noted:

- Grade continuity was reasonable and visual inspection confirmed that block grades were reasonably consistent with local drill hole assay and composite grades and that there was no significant bias apparent;

- There was no significant bias between the resource block grades and the assay composites in swath plots;
- There was a 1.33% difference between the volume of the mineralized domain models and the block model volume results, which is acceptable;
- The block model is a reasonable representation of the tonnages and grades of the mineralized zones for the open pit model.

#### **14.9.2 URUCUM OPEN PIT**

Results showed:

- In visual inspection, general agreement is present between the distribution of the estimated gold grades and drill hole intercept grades, for those portions within the US\$1,900/oz Mineral Resource pit surface, differences are present at the local scale due to the complexity of the mineralization;
- There is a 1.97% difference between the volume of the mineralized domain models and the block model volume results, which is acceptable;
- For URN, URCS and URS the block model reported were modeled with +0.3 g/t Au wireframe and for URCN with +0.5 g/t Au wireframe;
- Examination of swath plots suggested good agreement between the estimated grades and the informing samples for those portions of the block model containing a high density of drilling and sampling information. Higher variances were observed in areas where the density of sample information is reduced. A degree of smoothing was also observed.

#### **14.9.3 URUCUM NORTH / URUCUM CENTRAL UNDERGROUND**

The following were noted:

- Grade continuity was reasonable and block grades were reasonably consistent with local drill hole assay and composite grades. There was no significant bias apparent;
- Trend plots showed no significant bias between the resource block grades and the assay composites;
- The block model is a reasonable representation of the tonnages and grades of the mineralized zones for the underground model.

#### **14.9.4 TAP C OPEN PIT**

Validation indicated:

- Estimated block grades reflected the local composite values and trends displayed by the estimated grades followed the intended path;

- There was a 0.41% difference between the volume of the mineralized domain models and the block model volume results, which is acceptable;
- Visual comparisons of the estimated block grades with the drill hole assays showed a similar overall general correlation between the estimated grades and informing samples;
- Higher and lower grade swaths follow the local trend of the lenses, mirroring the domain contour.

#### **14.9.5 TAP AB OPEN PIT**

Validation indicated:

Estimated block grades reflected the local composite values and trends displayed by the estimated grades followed the intended path;

- There was a 0.33% difference between the volume of the mineralized domain models and the block model volume results, which is acceptable;
- Visual comparisons of the estimated block grades with the drill hole assays showed a similar overall general correlation between the estimated grades and informing samples.

#### **14.9.6 DUCKHEAD OPEN PIT**

The following were noted:

- Grade continuity was reasonable and visual inspection confirmed that block grades were reasonably consistent with local drill hole assay and composite grades and that there was no significant bias apparent;
- The block model is a reasonable representation of the tonnages and grades of the mineralized zones for the open pit model.

### **14.10 CLASSIFICATION OF MINERAL RESOURCES**

Mineral Resources are classified into Measured, Indicated and Inferred categories based on the Canadian Institute of Mining, Metallurgy and Petroleum guideline (CIM, 2014). A range of criteria was used in determining an appropriate Mineral Resource classification, including:

- Drilling density and orientation
- Confidence in geological knowledge
- Variogram models attributes

Due principally to data density and mineralization characteristics each deposit resulted in slight variations in the classification parameters. Below are the classification characteristics.

For the open pit mining portion of the URE deposit the classification strategy was as follows:

- Indicated: Estimated by at least 3 drillholes, maximum distance of 40 m
- Inferred: all blocks out to the maximum search

For the open pit portion of the Urucum deposit, the classification strategy was as follows:

- Measured: Estimated by at least 4 drill holes, maximum distance of 25 m
- Indicated: Estimated by at least 3 drillholes, maximum distance of 50 m
- Inferred: all blocks out to the maximum search

Resources for the URN underground portion of the Urucum deposit, the classification strategy was as follows:

- Measured: A slope of regression  $>0.7$
- Indicated: slope of regression between 0.4 to 0.7
- Inferred: slope of regression lower than 0.4
- After visual inspection of model, some manual adjustments were made in classification, where appropriate

Resources for the URC underground deposit were classified based on the confidence in geological knowledge, drilling density and orientation and the variogram model attributes and estimation statistics such as slope of regression. The classification strategy was as follows:

- Measured: Estimated by at least 3 drill holes, maximum distance of 35 m
- Indicated: Estimated by at least 2 drillholes, maximum distance of 70 m
- Inferred: all blocks out to the maximum search

For the TAP C deposit, the classification strategy was as follows:

- Measured: Estimated by at least 4 drill holes, maximum distance of 30 m
- Indicated: Estimated by at least 3 drillholes, maximum distance of 60 m
- Inferred: all blocks out to the maximum search

For the TAP AB deposit, the classification strategy was as follows:

- Indicated: Estimated by at least 3 drillholes, maximum distance of 60 m
- Inferred: all blocks out to the maximum search

The Duckhead deposit considered amenable to open pit mining methods was classified as Indicated, and blocks under the conceptual pit shell were classified as Inferred. the classification strategy was as follows:

- Indicated: Estimated by at least 2 drillholes, maximum distance of 50 m
- Inferred: all blocks out to the maximum search

- After visual inspection of model, some manual adjustments were made in classification, where appropriate

## 14.11 REASONABLE PROSPECTS OF EVENTUAL ECONOMIC EXTRACTION

For each of the open pit deposits, a preliminary economic pit shell was generated using the Lerchs-Grossmann (“LG”) optimization method as a constraint in the estimate of the Mineral Resource potentially amenable to open pit mining methods.

For Mineral Resources potentially amenable to underground mining methods an assumption of sublevel stoping was used. All resources below the LG pit and above the calculated underground cut-off had been reported as inferred underground resource.

### 14.11.1 URUCUM EAST OPEN PIT

The input parameters are presented in Table 14-8.

Table 14-8: Pit Shell Inputs, Urucum East

Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1 900.00
Exchange Rate	R\$/US\$	5.00
Mining Cost	Units	Value
- Oxide	US\$/t	2.15
- Fresh Rock	US\$/t	2.68
Processing Cost	Units	Value
- Oxide	US\$/t	11.42
- Fresh Rock	US\$/t	13.91
General and Administration Cost	US\$/t	6.04
Gold Recovery		88%
Pit Discard Cut-off Grade	Units	Value
- Oxide	g/t Au	0.30
- Fresh Rock	g/t Au	0.40
Overall wall slope Angle		
- Oxide		37°
- Fresh Rock		49°

### 14.11.2 URUCUM OPEN PIT

The input parameters are presented in Table 14-9.

Resources were depleted using a topographic surface as at end of July 31, 2021.

### 14.11.3 URUCUM NORTH, URUCUM CENTRAL UNDERGROUND

Mineral resources potentially amenable to underground mining methods (sublevel stope methodology) use the assumptions presents in Table 14-10, mining widths and design consideration are discussed in the chapter 15. For Urucum Central Underground, all resources bellow the open pit design and above the underground cut-off are reported as an inferred underground resource.

Table 14-9: Pit Shell Inputs, Urucum

Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1 900.00
Exchange Rate	R\$/US\$	5.00
<b>Mining Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	2.15
- Fresh Rock	US\$/t	2.68
<b>Processing Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	11.42
- Fresh Rock	US\$/t	13.91
<b>General and Administration Cost</b>	<b>US\$/t</b>	<b>6.04</b>
Gold Recovery		88%
<b>Pit Discard Cut-off Grade</b>	<b>Units</b>	<b>Value</b>
- Oxide	g/t Au	0.30
- Fresh Rock	g/t Au	0.40
<b>Overall wall slope Angle</b>		
- Oxide		38° - 40°
- Fresh Rock		49° - 52°

Table 14-10: Urucum North and Central Underground Parameters.

Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1 250.00
Exchange Rate	R\$/US\$	5.00
<b>Mining Cost</b>	<b>Units</b>	<b>Value</b>
- Fresh Rock	US\$/t	50.00
<b>Processing Cost</b>	<b>Units</b>	<b>Value</b>
- Fresh Rock	US\$/t	25.00
<b>General and Administration Cost</b>	<b>US\$/t</b>	<b>10.00</b>
Gold Recovery		93%
<b>UG Cut-off Grade</b>	<b>Units</b>	<b>Value</b>

- Oxide	g/t Au	2.10
- Fresh Rock	g/t Au	1.60

#### 14.11.4 TAP C OPEN PIT

The input parameters are presented in Table 14-11.

The last mining activity on this deposit was June, 2018 so this surface was used for defining backfill and the topographic surface for mine depletion.

Table 14-11: Pit Shell Inputs, TAP C

Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1 900.00
Exchange Rate	R\$/US\$	5.00
<b>Mining Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	2.15
- Fresh Rock	US\$/t	2.68
<b>Processing Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	11.42
- Fresh Rock	US\$/t	13.91
<b>General and Administration Cost</b>	<b>US\$/t</b>	<b>6.04</b>
Gold Recovery		88%
<b>Pit Discard Cut-off Grade</b>	<b>Units</b>	<b>Value</b>
- Oxide	g/t Au	0.30
- Fresh Rock	g/t Au	0.40
<b>Overall wall slope Angle</b>		
- Oxide		36° - 39°
- Fresh Rock		47° - 52°

#### 14.11.5 TAP AB

The input parameters are presented in Table 14-12. Selected cut-off grades were 0.3 g/t Au for oxide material and 0.4 g/t Au for fresh rock. Open pit Mineral Resources were depleted using a topographic surface as of July 31, 2021.

Mineral resources potentially amenable to underground mining methods (sublevel stoping methodology), are report assuming similar mining parameters as used at URN underground deposit. Input parameters are summarized in Table 14-13.

Table 14-12: Pit Shell Inputs, TAP AB

Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1 900.00
Exchange Rate	R\$/US\$	5.00
<b>Mining Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	2.15
- Fresh Rock	US\$/t	2.68
<b>Processing Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	11.42
- Fresh Rock	US\$/t	13.91
<b>General and Administration Cost</b>	<b>US\$/t</b>	<b>6.04</b>
Gold Recovery		88%
<b>Pit Discard Cut-off Grade</b>	<b>Units</b>	<b>Value</b>
- Oxide	g/t Au	0.30
- Fresh Rock	g/t Au	0.40
<b>Overall wall slope Angle</b>		
- Oxide		36° - 38°
- Fresh Rock		47° - 51°

Table 14-13: Mineable Shape Inputs, TAP AB

Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1 900.00
Exchange Rate	R\$/US\$	5.00
<b>Mining Cost</b>	<b>Units</b>	<b>Value</b>
- Fresh Rock	US\$/t	50.00
<b>Processing Cost</b>	<b>Units</b>	<b>Value</b>
- Fresh Rock	US\$/t	13.91
<b>General and Administration Cost</b>	<b>US\$/t</b>	<b>6.04</b>
Gold Recovery		93%
<b>UG Cut-off Grade</b>	<b>Units</b>	<b>Value</b>
- Oxide	g/t Au	2.10
- Fresh Rock	g/t Au	1.60

#### 14.11.6 DUCKHEAD

The input parameters are presented in Table 14-14.

Mineral resources potentially amenable to underground mining methods use the assumptions of sublevel stoping. All resources bellow the open pit design and above the underground cut-off are reported as an inferred underground resource.

Table 14-14: Pit Shell Inputs, Duckhead

Parameter	Units	Value
Gold Price (Base Case)	US\$/oz Au	1 900.00
Exchange Rate	R\$/US\$	5.00
<b>Mining Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	2.15
- Fresh Rock	US\$/t	2.68
<b>Processing Cost</b>	<b>Units</b>	<b>Value</b>
- Oxide	US\$/t	11.42
- Fresh Rock	US\$/t	13.91
<b>General and Administration Cost</b>	<b>US\$/t</b>	<b>6.04</b>
Gold Recovery		88%
<b>Pit Discard Cut-off Grade</b>	<b>Units</b>	<b>Value</b>
- Oxide	g/t Au	0.30
- Fresh Rock	g/t Au	0.40
<b>Overall wall slope Angle</b>		
- Oxide		38°
- Fresh Rock		50°

## 14.12 STOCKPILES

The reported stockpiles are a ensemble of stockpiles that are separated by grade quality (marginal to very high grade), type (oxide or fresh) and location. This combination a proper and more accurate control of the stockpiles.

Stockpiles are surveyed monthly and reconciled based on ore production. In July 31<sup>st</sup>, 2021, the total was 1.57 MTon with 0.48 g/t Au, as reported in Table 14-15.

## 14.13 MINERAL RESOURCE STATEMENT

Measured and Indicated Mineral Resources are reported inclusive of those Measured and Indicated Mineral Resources that were converted to Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Mineral Resources estimates have an effective date of July 31, 2021.

The Qualified Person for the Mineral Resource estimate is Carlos Henrique Barbosa Pires, *FAusIMM (CP)* a full-time Great Panther employee, who is qualified person as defined by NI 43-101. The Mineral Resource estimates are tabulated in Table 14-15.

Table 14-15: Mineral Resource Estimates

Deposit	Category	Mining Scenario	Cut-off Grade (g/t Au)	Oxidation	Tonnage (kt)	Grade (g/t Au)	Contained Metal (koz Au)
Urucum East	Indicated	Open Pit	0.3	Oxide	715	1.43	33
			0.4	Fresh	318	1.31	13
	<i>Subtotal Indicated</i>	<i>Open Pit</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>1 033</i>	<i>1.39</i>	<i>46</i>
	Inferred	Open Pit	0.3	Oxide	152	0.68	3
			0.4	Fresh	16	1.14	1
	Inferred	Underground	2.1	Oxide	1	2.41	0
			1.6	Fresh	371	2.09	25
	<i>Sub-total Inferred</i>	<i>OP and UG</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>541</i>	<i>1.66</i>	<i>29</i>
Urucum	Measured	Open Pit	0.3	Oxide	215	0.88	6
			0.4	Fresh	2 306	1.54	114
	Indicated	Open Pit	0.3	Oxide	78	0.97	2
			0.4	Fresh	1 925	1.46	91
	<i>Sub-total M&amp;I</i>	<i>Open Pit</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>4 524</i>	<i>1.47</i>	<i>214</i>
	Inferred	Open Pit	0.3	Oxide	1	1.21	0
			0.4	Fresh	354	1.50	17
	<i>Sub-total Inferred</i>	<i>Open Pit</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>354</i>	<i>1.50</i>	<i>17</i>
Urucum North Underground	Indicated	Underground	1.6	Fresh	2 369	4.51	343
	<i>Subtotal Indicated</i>	<i>Underground</i>	<i>1.6</i>	<i>Fresh</i>	<i>2 723</i>	<i>4.12</i>	<i>360</i>
	Inferred	Underground	1.6	Fresh	3 458	2.83	315
	<i>Sub-total Inferred</i>	<i>Underground</i>	<i>1.6</i>	<i>Fresh</i>	<i>3 458</i>	<i>2.83</i>	<i>315</i>
Urucum Central Underground	Inferred	Underground	1.6	Fresh	852	2.61	71
	<i>Sub-total Inferred</i>	<i>Underground</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>852</i>	<i>2.61</i>	<i>71</i>
TAP C	Measured	Open Pit	0.3	Oxide	2 814	0.93	84
			0.4	Fresh	317	1.22	12
	Indicated	Open Pit	0.3	Oxide	730	0.91	21
			0.4	Fresh	129	1.33	6
	<i>Sub-total M&amp;I</i>	<i>Open Pit</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>3 990</i>	<i>0.96</i>	<i>124</i>
	Inferred	Open Pit	0.3	Oxide	179	1.22	7
			0.4	Fresh	9	0.90	0
	<i>Sub-total Inferred</i>	<i>Open Pit</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>188</i>	<i>1.21</i>	<i>7</i>
TAP AB	Indicated	Open Pit	0.3	Oxide	7 419	1.09	261
			0.4	Fresh	6 822	1.12	245
		Underground	1.6	Fresh	124	2.47	10
			<i>variable</i>	<i>Oxide and Fresh</i>	<i>14 365</i>	<i>1.12</i>	<i>515</i>
	Inferred	Open Pit	0.3	Oxide	212	0.95	6
			0.4	Fresh	488	0.84	13
		Underground	2.1	Oxide	4	3.39	0
			1.6	Fresh	68	2.15	5
	<i>Sub-total Inferred</i>	<i>OP and UG</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>772</i>	<i>1.00</i>	<i>25</i>
Duckhead	Indicated	Open Pit	0.3	Oxide	312	2.04	20
	Indicated	Open Pit	0.4	Fresh	414	1.41	19
	<i>Subtotal Indicated</i>	<i>Open Pit</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>726</i>	<i>1.68</i>	<i>39</i>
	Inferred	Open Pit	0.3	Oxide	46	1.40	2
			0.4	Fresh	18	3.40	2
		Underground	2.1	Oxide	46	3.01	4
			1.6	Fresh	506	2.74	45
	<i>Sub-total Inferred</i>	<i>Underground</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<i>615</i>	<i>2.68</i>	<i>53</i>
Stockpile	Measured	Open pit		0.5	79	0.85	2
		Spent ore		0.5	37	0.70	1
		Rom expansion		0.5	299	0.63	6
		Marginal ore		0.3	985	0.42	13
	<i>Sub-total Measured</i>		<i>variable</i>	<i>Oxide and Fresh</i>	<i>1 400</i>	<i>0.50</i>	<i>22</i>
<b>Totals</b>	<b>Measured</b>	<b>OP and UG</b>	<b>variable</b>	<b>Oxide and Fresh</b>	<b>7 051</b>	<b>1.06</b>	<b>240</b>
	<b>Indicated</b>	<b>OP and UG</b>	<b>variable</b>	<b>Oxide and Fresh</b>	<b>21 355</b>	<b>1.55</b>	<b>1 064</b>
	<b>Measured and Indicated</b>	<b>OP and UG</b>	<b>variable</b>	<b>Oxide and Fresh</b>	<b>28 407</b>	<b>1.43</b>	<b>1 303</b>

	<i>Inferred</i>	<i>OP and UG</i>	<i>variable</i>	<i>Oxide and Fresh</i>	<b>6 782</b>	<b>2.37</b>	<b>518</b>
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Notes to accompany Mineral Resource table:

1. Mineral Resources were classified using the 2014 CIM Definition Standards.
2. Mineral Resources are inclusive of Mineral Reserves.
3. Since the prior MRMR estimates, new drilling results are available for the TAP AB, TAP C, and Urucum open pit resources.
4. Mineral Resources are estimated at various cut-off grades depending on mining method, mineralization style and haulage distances.
5. Mineralization wireframes were generated at 0.3g/t Au for open pit resources except for URCN where a 0.5g/t wireframe was used. Underground resources were calculated within a 1.6g/t Au wireframe. The minimum wireframe width is three metres.
6. Mineral Resources are estimated using a long-term gold price of US\$1900/oz and a US\$:BR\$ exchange rate of 1:5.
7. The Company's Mineral Resource estimates were prepared by Mr. Carlos Henrique Barbosa Pires, FAUIMM (CP), a full-time Tucano employee and a Qualified Persons as defined by NI 43-101.
8. Numbers may not add due to rounding.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Mineral resources are subject to infill drilling, permitting, mine planning, mining dilution and recovery losses, among other things, to be converted into mineral reserves. Due to the uncertainty associated with inferred mineral resources, it cannot be assumed that all or any part of an inferred mineral resource will ever be upgraded to indicated or measured mineral resources, including, as a result of continued exploration.

## 14.14 FACTORS THAT MAY AFFECT THE MINERAL RESOURCE ESTIMATE

Factors that may affect the Mineral Resource estimates include:

- Metal price and exchange rate assumptions;
- Changes to the assumptions used to generate the gold grade cut-off grade;
- Changes to geological and mineralization geometry, geological and grade continuity assumptions;
- Changes to density and domain assignments;
- Changes to geotechnical, mining and metallurgical recovery assumptions;
- Change to the input and design parameter assumptions that constrain the conceptual pit and Mineral Resource estimates;
- Changes to the input and design parameter assumptions that pertain to the conceptual mineable shapes constraining the estimates;
- Assumptions as to the continued ability to access the site, retain mineral and surface rights titles, maintain environment and other regulatory permits, and maintain the social license to operate.

## 14.15 QP COMMENTS ON "ITEM 14: MINERAL RESOURCE ESTIMATES"

The QP notes the following:

- The QP is of the opinion that Mineral Resources were estimated using industry-accepted practices, and conform to the 2014 CIM Definition Standards;

- There are no other environmental, legal, title, taxation, socioeconomic, marketing, political or other relevant factors known to the QP that would materially affect the estimation of Mineral Resources that are not discussed in this Report;
- There is upside potential for the estimates if mineralization that is currently classified as Inferred can be upgraded to higher-confidence Mineral Resource categories

## 15. MINERAL RESERVE ESTIMATES

### 15.1 SUMMARY

The Mineral Reserve estimate for the Tucano Project conforms to the 2014 CIM Definitions Standards as incorporated under NI 43-101. To convert Mineral Resources to Mineral Reserves, The Tucano Technical Services Team applied modifying factors of dilution and mineral extraction to only the Measured and Indicated categories of the Mineral Resource. Inferred Resources are not included in the Mineral Reserves. The Mine consists of both open pit and underground Mineral Resources for which Mineral Reserves have been independently estimated.

The Mineral Reserve statement was prepared by Mr. Felipe Fernandes (Great Panther Mining's Open Pit Lead) in collaboration with Prominas Brasil and the Tucano Technical Services Department. The Reserve Statement was reviewed and approved by Mr. Fernando A Cornejo (Great Panther Mining's Chief Operating Officer), and it is presented in Table 15-1. The estimate is based on the July 31, 2021 resource block models as described in Section 14. This Mineral Reserve estimate includes open pit mining in Urucum, Tap AB, TAP C, URE, and Duckhead and underground mining in the Urucum deposit.

Table 15-1: Mineral Reserve Estimate with effective date of July 31, 2021.

Location/area	Proven			Probable			Total Proven and Probable		
	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)	Tonnes (000s)	Gold grade (g/t)	Contained gold (000s oz)
Open pit	2,495	1.4	112	7,4371	1.08	259	9,932	1.16	372
Underground	189	3.78	23	1,976	4.17	265	2,164	4.13	288
Stockpile	1,400	0.5	22	0	0	0	1,400	0.5	22
Total	4,084	1.2	158	9,413	1.73	524	13,496	1.57	682

Notes:

- Mineral Reserves were classified using the 2014 CIM Definition Standards.
- Mineral Reserve estimation includes mine depletion through to July 31, 2021 and drills results through to July 31, 2021. The effective date of the Mineral Reserve estimate is July 31, 2021.
- Open pit Mineral Reserves are estimated within designed pits above discard cut-off grades that vary from 0.40 g/t Au to 0.45, g/t Au for oxide ore and 0.46 g/t Au to 0.50 g/t Au for fresh ore.
- The cut-off grades are based on an average long-term gold price of US\$1,650/oz Au and operating costs sourced from the current operations and mining contracts at an US\$/Brazilian exchange rate of 1:5.0.
- Mineral Reserves incorporate estimates of dilution and mineral losses.
- Underground Mineral Reserves were estimated using an incremental cut-off grade of 2.4 g/t Au. The cut-off grades are based on a gold price of US\$1,250/oz Au and operating costs sourced from the operations and mining contracts at an US\$/Brazilian exchange rate of 1:3.8.

7. A minimum mining width of 15 metres was used for open pit Mineral Reserves and 3 metres was used for underground Mineral Reserves.
8. The Mineral Reserve estimate includes surface stockpiles.
9. Average metallurgical process recovery is 91.5%.
10. Numbers may not add due to rounding.

The base case financial analysis shows that the Tucano life-of-mine plan (LOM) founded on the Mineral Reserve estimates in Table 15-1 provide positive cash flows throughout the mine's operating life, confirming that the Mineral Reserves are economically mineable and that economic extraction can be justified.

The Qualified Person and the associated supporting experts are not aware of any mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

## **15.2 OPEN PIT MINERAL RESERVES**

The open pit Mineral Reserves were estimated using industry standard mine planning software, the July 31, 2021, Mineral Resource estimate and topography surface, and mine design parameters described in this Technical Report. The optimized pit shells were used as a guide for the detailed mine design that include pit ramps. The oxide and fresh Mineral Reserve estimates are founded on the whole block mining.

### **15.2.1 DILUTION AND EXTRACTION**

Numerous sources of dilution are considered and account for; internal dilution due to resource model block regularization; external dilution resulting from geological/geometric contacts; and operational dilution that accounts for production factors and schedule demands.

For mine planning purposes, all resource models containing selective mining units (SMU) that are considered inadequate for open pit mining operations were re-blocked to a minimum practical size sub-block that can be excavated by mining equipment currently employed on site. Blocks were included if the total dilution inherited due to SMU regularization was above the resource cut-off grade 0.3 g/t Au for Oxides and 0.4 g/t/ Au for Fresh Rock

External (contact) dilution has been estimated utilizing all regularized models. (block size 3 m x 5 m x 4 m). External edge dilution is based on a bench by bench analysis of the dilution skin around the grouped resource blocks above CoG. The dilution skin was created by extruding the contour line for the grade shell created by grouping all blocks above CoG. The width of the dilution skin was defined as 0.5 m and 0.4 m based on the loading units used during vein excavation (i.e., 6.5 m<sup>3</sup> and 5.0 m<sup>3</sup> hydraulic excavators). The total volume of the block grade shell plus dilution skin was considered the diluted volume and the percentual increase from original grade shell volume is the external dilution. Isolated groups of up to three ore blocks completely surrounded with waste are considered ore loss.

Table 15-2 summarizes the dilution and mineral extraction modifying factors used for Mineral Resource to Mineral Reserve conversion.

**Table 15-2: Dilution and Mineral Extraction Estimates**

Great Panther Mining Limited – Tucano Gold Mine			
Area	Mineralized Zone	Dilution (%)	Extraction (%)
Tap AB	Fresh Rock	4%	12%
all pits	Oxide Rock	11%	0%
Urucum	Fresh Rock	0%	0%
North	Oxide Rock	5%	17%
Urucum	Fresh Rock	0%	0%
Central S	Oxide Rock	0%	0%
Tap C	Fresh Rock	4%	14%
C1	Oxide Rock	12%	22%
Duck Head	Fresh Rock	4%	10%
all pits	Oxide Rock	6%	16%
Urucum East	Fresh Rock	1%	6%
all pits	Oxide Rock	6%	14%

### 15.2.2 CUT-OFF GRADE

In order to determine if material within the open pit should be sent to the mill for processing or to the waste rock dump, a marginal cut-off grade has been calculated. The marginal cut-off grade, which is referred to as the “Open Pit Discard Cut-off” in the CIM Estimation of Mineral Resource and Mineral Reserves Best Practice Guidelines, differs from the break even cut-off grade since mining costs are excluded from the calculation. The reason for excluding the mining costs is that material already defined to be within the limits of the open pit must be mined regardless of if it is classified as ore or waste, in order to access the bench below. Mining costs are included in the marginal cut-off grade calculation if there is an incremental cost for mining ore relative to mining waste. This may reflect cost such as grade control drilling, extra ore haulage distance or ore re-handle costs.

The marginal cut-off grade was calculated for each block individually based on its Fresh Rock/Transitional/Oxide state and distance to the plant. The marginal cut-off grades are derived based on a gold price of US\$1,650/oz Au for all open pit deposits. Operating costs sourced from the current operations (May 2020 to April 2021, reflecting normal operational conditions prior to the slope failure at URCS) and mining contracts at a US\$/R\$ exchange rate of 1:5.0. The average estimated marginal cut off grades inside the selected Pit Designs are summarized in Table 15-3 for all open pit deposits. A distinction between material types was made (oxide/fresh) in order to capture the variation in mining and processing costs.

**Table 15-3: Marginal Grade Estimates for Open Pits**

Great Panther Mining Limited – Tucano Gold Mine								
Parameters	Units	URN	URCS	Tap AB1	Tap AB3	Tap C1	DH	URE
<b>Revenue</b>								
Gold Price	US\$/Oz Au	1,650	1,651	1,652	1,653	1,654	1,655	1,656
Exgange Rate	US\$/R\$	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Gold Payable	%	99.95%	99.95%	99.95%	99.95%	99.95%	99.95%	99.95%
Refining Carges	R\$/Oz Au	120.46	120.46	120.46	120.46	120.46	120.46	120.46
Royalties	%	2.85%	2.85%	2.85%	2.85%	2.85%	2.85%	2.85%
Avg Process Recovery	%	88%	88%	88%	88%	88%	88%	88%
Net Revenue	R\$/Oz Au	6,943	6,943	6,943	6,943	6,943	6,943	6,943
<b>Operating Cost</b>								
Grade Control	R\$/t	3.78	3.78	3.78	3.78	3.78	3.78	3.78
Extra Ore Haulage, Oxide	R\$/t	2.51	2.15	-0.87	-0.61	1.07	8.68	2.36
Extra Ore Haulage, Fresh	R\$/t	1.50	-1.01	-0.63	-0.91	0.02	6.11	3.40
Crusher Feed	R\$/t	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Processing, Oxide	R\$/t	57.08	57.08	57.08	57.08	57.08	57.08	57.08
Processing, Fresh	R\$/t	69.57	69.57	69.57	69.57	69.57	69.57	69.57
G&A	R\$/t	30.20	30.20	30.20	30.20	30.20	30.20	30.20
<b>Break Even CoG, Oxide</b>	<b>g/t Au</b>	<b>0.47</b>	<b>0.47</b>	<b>0.46</b>	<b>0.46</b>	<b>0.46</b>	<b>0.50</b>	<b>0.46</b>
<b>Break Even CoG, Fresh</b>	<b>g/t Au</b>	<b>0.53</b>	<b>0.52</b>	<b>0.53</b>	<b>0.52</b>	<b>0.53</b>	<b>0.56</b>	<b>0.54</b>
<b>Marginal CoG, Oxide</b>	<b>g/t Au</b>	<b>0.42</b>	<b>0.42</b>	<b>0.41</b>	<b>0.41</b>	<b>0.42</b>	<b>0.45</b>	<b>0.42</b>
<b>Marginal CoG, Fresh</b>	<b>g/t Au</b>	<b>0.48</b>	<b>0.46</b>	<b>0.47</b>	<b>0.46</b>	<b>0.47</b>	<b>0.50</b>	<b>0.48</b>

### 15.2.3 OPEN PIT OPTIMIZATION PARAMETERS

A series of nested LG (Whittle) pit shells were generated by varying the gold price (revenue factor) from US\$1,250/oz Au to US\$2,050/oz Au using \$100/oz Au increments. These indicate the operating margin based on the mathematical LG pit shells. The results are analyzed to select the pit shell to guide the ultimate pit design. Pit optimization results by pit are summarized in Table 15-4.

Mine pits were developed using the US\$1,650 LG pit shell as a reference, except in the cases of URN and TAP AB3 where the US\$1650 LG pit shell did not provide sufficient space for the ramp and pit design to achieve the ultimate pushback. In these two cases the ultimate pit shell was designed at US\$1,650/oz Au within the \$1,850/oz Au LG pit shell. Table 15-5.

Table 15-4: Pit Optimization Results

Pit Shell	Gold Price (US\$/oz)	ROM (M T)	Au (g/t Au)	Gold (K oz)	Strip Ratio	Value (M R\$)
AB1	P1250	1.20	1.16	45	5.0	131
	P1350	2.69	1.05	91	6.0	193
	P1450	3.72	1.04	125	6.8	226
	P1550	4.04	1.04	135	6.9	232
	<b>P1650</b>	<b>4.42</b>	<b>1.03</b>	<b>146</b>	<b>7.1</b>	<b>234</b>
	P1750	4.88	1.02	161	7.5	231
	P1850	6.23	1.02	204	8.6	200
	P1950	6.68	1.02	218	8.9	185
	P2050	6.95	1.01	226	9.0	173
AB3	P1250	0.60	1.43	28	8.9	69
	P1350	0.67	1.41	31	9.0	73
	P1450	0.77	1.38	34	9.0	77
	P1550	0.81	1.37	36	9.1	78
	P1650	0.89	1.33	38	9.1	79
	P1750	0.99	1.30	41	9.3	78
	<b>P1850</b>	<b>1.38</b>	<b>1.25</b>	<b>55</b>	<b>11.1</b>	<b>68</b>
	P1950	1.48	1.23	59	11.4	64
	P2050	1.58	1.21	62	11.5	59
URN	P1250	0.21	1.04	7	2.0	22
	P1350	0.30	0.99	10	2.4	26
	P1450	0.47	0.96	14	3.1	30
	P1550	0.63	0.92	19	3.3	33
	P1650	0.73	0.90	21	3.4	33
	P1750	0.81	0.89	23	3.5	33
	<b>P1850</b>	<b>1.03</b>	<b>0.88</b>	<b>29</b>	<b>4.3</b>	<b>29</b>
	P1950	1.08	0.87	30	4.4	28
	P2050	1.13	0.87	32	4.5	25
URCS	P1250	1.66	1.55	83	2.7	341
	P1350	1.73	1.53	85	2.8	344
	P1450	1.83	1.50	89	3.0	348
	P1550	2.01	1.46	94	3.3	351
	P1650	2.11	1.44	98	3.5	350
	P1750	2.49	1.42	114	5.2	348
	P1850	2.57	1.41	117	5.4	345
	P1950	2.68	1.41	121	5.8	340
	P2050	2.75	1.40	124	6.1	335
Tap C1	P1250	0.29	1.15	11	2.8	39
	P1350	0.34	1.10	12	2.9	41
	P1450	0.44	1.05	15	3.6	43
	P1550	0.48	1.03	16	3.7	44
	<b>P1650</b>	<b>0.52</b>	<b>1.00</b>	<b>17</b>	<b>3.7</b>	<b>44</b>

	P1750	0.62	0.96	19	4.0	43
	P1850	0.67	0.93	20	4.1	43
	P1950	0.73	0.91	21	4.4	41
	P2050	0.78	0.90	23	4.6	39
Duck Head	P1250	0.21	2.86	19	15.9	117
	P1350	0.25	2.65	21	15.3	120
	P1450	0.27	2.51	22	14.6	120
	P1550	0.36	2.19	25	13.7	123
	<b>P1650</b>	<b>0.41</b>	<b>2.05</b>	<b>27</b>	<b>13.3</b>	<b>123</b>
	P1750	0.45	1.93	28	12.5	123
	P1850	0.48	1.88	29	12.5	122
	P1950	0.51	1.83	30	12.6	121
URE	P2050	0.68	1.62	35	12.4	113
	P1250	0.31	1.33	13	7.9	38
	P1350	0.32	1.32	14	8.0	39
	P1450	0.34	1.30	14	7.9	40
	P1550	0.35	1.29	15	8.0	40
	<b>P1650</b>	<b>0.38</b>	<b>1.26</b>	<b>15</b>	<b>8.0</b>	<b>40</b>
	P1750	0.40	1.24	16	8.1	40
	P1850	0.48	1.25	19	10.4	37
	P1950	0.55	1.21	22	10.9	34
	P2050	0.57	1.20	22	10.9	34

Pit Shell selected using the July 31, 2021 topography.

All pit values are reported with the base price (US\$ 1,650/oz Au)

**Table 15-5: LG Pit Shell Selection Criteria**

Deposit Pit	LR Shell MRMR2021 (US\$/oz)	LR Shell MRMR2020 (US\$/oz)	Justification
<b>TAP AB</b>			
AB1	<b>1650</b>	1500	Reserves Base Price
AB3	<b>1850</b>	1600	Base Shell (1,650 US\$/oz) resulted in very narrow mining spaces. Economic models indicate extra stripping associated with the larger pit shell (1,850 US\$/oz) is offset by extra gold production. The result is a better operational design that may be mined faster, with increased flexibility.
<b>TAP C</b>			
C1	<b>1650</b>	Not in MRMR	Reserves Base Price
<b>URU</b>			

URCS	1650	1750	Reserves Base Price
URN	1850	1500	Base Shell (1,650 US\$/oz) is very narrow and could not be engineered into an operational design. The pit shell design at 1,850US\$/oz yields a positive economic result. The URN pit is important in scheduling 2022 production.
URE			
URE	1650	1500	Reserves Base Price
Duckhead			
DH	1650	1500	Reserves Base Price

## 15.3 UNDERGROUND MINERAL RESERVES

Underground mineral reserves are based on the 2019 Technical Report prepared by RPA and have not been modified. Great Panther is currently completing an extensive drilling plan as part of ongoing technical studies with the objective of producing a technical report in the fourth quarter of 2022. This Section is an extract from the 2019 Technical Report prepared by RPA.

The underground Mineral Reserves were estimated through the use of mine planning software, using the Mineral Resource estimate, and mine design parameters described in this Technical Report.

### 15.3.1 CUT-OFF CRITERIA

Underground Mineral Reserves were estimated using an incremental cut-off grade of 2.4 g/t Au. The basis for this COG is presented in Table 15-5.

Table 15-6: Underground Cut-Off Grade Parameters

Great Panther Mining Tucano Gold Mine		
Item	Unit	Value
Production Rate	tpd	1,500
Gold Price	US\$/oz	1,250
Recovery	%	93%
Dore Payable	%	99.95%
FX	\$R/US\$	3.8
Refining Cost	\$R/oz	77.78
Royalties	%	3.14%
Ore Value	US\$/g	35.55
Operating Costs		

Mining	US\$/t	50
Milling	US\$/t	25
G&A	US\$/t	10
Total	US\$/t	85
COG	g/t Au	2.4

RPA notes that the incremental costs do not include any development costs or contractor equipment leasing costs.

### 15.3.2 MSO ESTIMATES

The following criteria were utilized for the MSO stope shapes in determining the mining inventories:

- The typical stope height is 20 m (i.e., same as the sublevel interval), although some stopes near the upper resource boundaries are 10 m or 15 m in height.
- Stope lengths for Up-hole Retreat are 50 m, whereas Avoca stopes are continuous without pillars.
- CoG of 2.4 g/t Au.
- Planned dilution consists of 0.5 m footwall plus 0.5 m hanging wall.
- Minimum mining width of 2.0 m (plus 1.0 m of dilution).
- Minimum pillar distance between parallel lodes 10.0 m.
- Isolated stopes requiring excessive development were not included.

The MSO parameters are summarized in Table 15-6.

**Table 15-7: MSO Parameters**

Great Panther Mining Limited – Tucano Gold Mine

Item	Unit	Value
Cut-off grade for MSO stope shapes (before dilution added)	g/t Au	1.6
Minimum mining width	m	2
Dilution skin width – total	m	1
Stope height 1	m	20
Stope height 2 from base	m	15
Stope height 3 from base	m	10
Stope increment - strike length	m	25
Minimum transverse pillar width	m	10
Include inventory within pit “reserve” pit design *	Flag (1/0)	yes
Conduct stope-adjacency smoothing	Flag (y/n)	no

Reference X start for stope shape grid & extent	Easting   m	401880   200
Reference Y start for stope shape grid & extent	Northing   m	99310   1075
Reference Z start for stope shape grid & extent	Elevation   m	-590   800
Maximum weathered rock inside stope shape	WEATH=5000 %	10
Block model: "urucum_ug_resources2015_v17"	Version   date	ugv17d #  8Oct2015

### 15.3.3 MINING RECOVERY FACTORS

The following ore losses were applied to the stope tonnes after the MSO stope shapes were generated (after subtracting the ore development tonnes):

- Up-hole Retreat mining areas (mining in a down-dip direction)
- 6 m rib pillar every 50 m equivalent to 12% ore loss.
- 2% ore loss for difficult to muck ore at the bottom of stopes.
- Total ore loss = 14%.

Avoca stoping areas (mining in an up-dip direction)

- 2% ore loss for difficult to muck ore at the bottom of stopes.

Sill pillar recovery

- Ore loss = 35% due to mining below unconsolidated rockfill.

Ore development recovery

- Recovery of development ore has been assumed to be 100% (Note: development dilution is captured in the development wireframes when assessed by Mine24D).

## 15.4 COMPARISON TO PREVIOUS ESTIMATES

A comparison to the previous September 31, 2020 Mineral Reserve estimates is provided in Table 15-7 below:

Table 15-8: Comparison of Current and Previous Mineral Reserve Estimate

Great Panther Mining Limited – Tucano Gold Mine			
Reserve Estimate	Tonnes (000 t)	Grade (g/t Au)	Ounces (000 Oz)
September 30, 2020	9,758	2.00	629
Depletion	1,503	1.10	53
Depleted 2020 MR	8,255	2.16	576

July 31, 2021	13,496	1.57	682
Difference	5,241	-0.59	106
% Difference	63%	-27%	18%

The Mineral Reserve estimate in the 2021 MRMR Estimation represents a 106,000 (18%) increase in gold ounces compared to the Mineral Reserve estimate in the 2020 Technical Report, as the 63% increase in ore tonnes is partly offset by a 27% reduction in average gold grades.

The increase is primarily due to an increase in the underlying Mineral Resources mass while with more conservative grades, as well as a decrease in cut-off grades resulted from a higher gold price.

## **16. MINING METHODS**

### **16.1 OVERVIEW**

The mining method for the Tucano open pit operations is via conventional open pit mining. Since 2015, the contractor, U&M Mineração e Construção S.A. (U&M), has supplied contract mining equipment and labour. In 2022, Great Panther engaged a new open pit mining contractor, Minax: Transportes e Construções Ltda (“Minax”) to initially operate in parallel with the existing contractor that is scheduled to cease activities at the end of year. Mobilization of the new mining contractor has already begun and will continue into mid-2022. The new contractor is a Brazilian company using a new mining fleet, which will contribute to an improvement in overall mine performance. In addition to earthmoving responsibilities for both waste and ore, the contractors are responsible for production drilling, pre-shear drilling, pit dewatering, ore re-handle, crusher feed, maintenance and supervision of their fleet of equipment.

The mining method for the underground operations assumes the use of up-hole retreat or longitudinal retreat, longhole open stoping (Avoca) methods, with the operations strategy based on the use of a mining contractor, using contract mining equipment and labour.

### **16.2 OPEN PIT**

Seven pits will be mined in the current LOM plan:

- TAP AB1;
- TAP AB3;
- TAP C1;
- URN;
- URCS;
- Duckhead (“DH”);
- URE.

All pits, except URE have been previously mined.

#### **16.2.1 GEOTECHNICAL CONSIDERATIONS**

Geotechnical sectors were defined by pit and material. (fresh/oxide) Mineralization, bedding and foliation are generally sub-vertical. The overall pit slopes and pit ramp parameters used in open pit designs are provided in Table 16-1 based on the studies by O’Brien (2016) and Navarro (2019).

The specific slope angles for individual pits are determined in conjunction with the overall geotechnical recommendations, and expected haulage ramp layout, ramp width, and the projected number of ramps in the pit wall.

**Table 16-1: Geotechnical Design Recommendations**

Great Panther Mining Limited – Tucano Gold Mine				
Material	Bench Face Angle (°)	Bench Height (m)	Berm Width (m)	Inter-Ramp Angle (°)
Oxide	70	4	3	41.9
Fresh	75	24	10	55.6

In 2021 gold production was impacted during the year primarily due to geotechnical issues resulting from pit wall stability in the "URCS" open pit and additional remediation work needed to ensure safety for workers.

Great Panther announced in May 2021 that wall movements were detected in the west wall of the south-central portion of the URCS open pit, resulting in the temporary halting of mining activities in the pit. Mining activities were resumed in July. On October 18, 2021, the Company reported that Tucano's geotechnical committee had advised that additional remediation work be completed in the URCS open pit to improve stability as increased movement in the west wall had been detected. As safety and the wellbeing of workers is the Company's primary concern, mining of ore from URCS was temporarily suspended. The additional pushback necessary to fully restart mining in URCS is suspended to mid-2022 following the rainy season so that it can be completed in a safe and cost-effective manner. Most of the remaining gold production from the URCS pit is planned for 2023.

Mineral Reserves and Mineral Resources for the URCS open pit have been included in their entirety. Mineral Reserves included in this Technical Report are based on a US\$1,650 per ounce pit-shell with an additional 8.5 million tonne pushback in the west wall. New drilling field investigations performed in February and March 2022 under SRK Consulting's guidance has assisted the Company's efforts on correctly identifying a low angle slip surface causing movement in the west wall. SRK's recommendations for slope design parameters have been incorporated into the new pit design and used for fine tuning the URCS pushback. The Company anticipates that the value in the pit will support these further adjustments in the pushback design.

## **16.2.2 HYDROGEOLOGICAL CONSIDERATIONS**

Dewatering of the pits, particularly the deeper Urucum and TAP AB pits, involves pumping from sumps and water collection/diversion ditches on the pit bottom or strategic locations at intermediate elevations on the pit highwalls.

Hydrogeologic studies have been initiated on the URN underground project to compliment the development studies.

### 16.2.3 OPEN PIT DESIGNS

Mine design criteria were based on a conventional surface mine operation using the equipment fleet discussed in Section 16.2.8.

The ultimate pit designs shown in Figure 16-1 to Figure 16-7 incorporated pit slope geotechnical parameters (bench face angle, inter ramp angles, and berm widths) for the oxide and fresh rock and pit sectors, included haulage ramps, and took into account minimum mining widths based on the open pit mining equipment selected.

For the LOM pit designs the ramp parameters, Table 16-2, were adapted to reflect the new Minax mining contractor fleet. Haulage ramps were designed at 12 m width for 30 m<sup>3</sup> class trucks and two-way traffic. For the final four benches in the bottom of the final pit design, the haul road was narrowed to a width of 10 m, suitable for single-lane traffic. The maximum ramp gradient is 10%. All roads required a cap of crushed rock to facilitate all-season use.

Pits were designed with 4 m operating bench heights. For pits with catch benches at 12 m intervals and increased to 6 m wide (previously 4 m) to assist maintenance. It may be possible in some higher elevation areas to mine waste rock on 8 m or 12 m high benches, which is more cost effective and may facilitate higher pit sinking rates in terms of vertical metres per year. To maximize ore selectivity and minimize dilution ore will be delineated and mined on 4 m benches.

**Table 16-2: Pit Slope and Ramp Parameters**

Great Panther Mining – Tucano Gold Mine				
Item	Parameter	Units	Oxide	Fresh Rock
Pit slope	Bench height	m	4	4
	Bench face angle	degrees	70	80
	Berm vertical interval	m	8	12
	Berm width	m	6	6
	Inter-ramp slope angle	degrees	41.9	55.9
Pit ramp parameters	Maximum ramp gradient	percent	10	10
	Two-way ramp width	m	12	12
	Single lane ramp width (near-pit bottom)	m	10	10

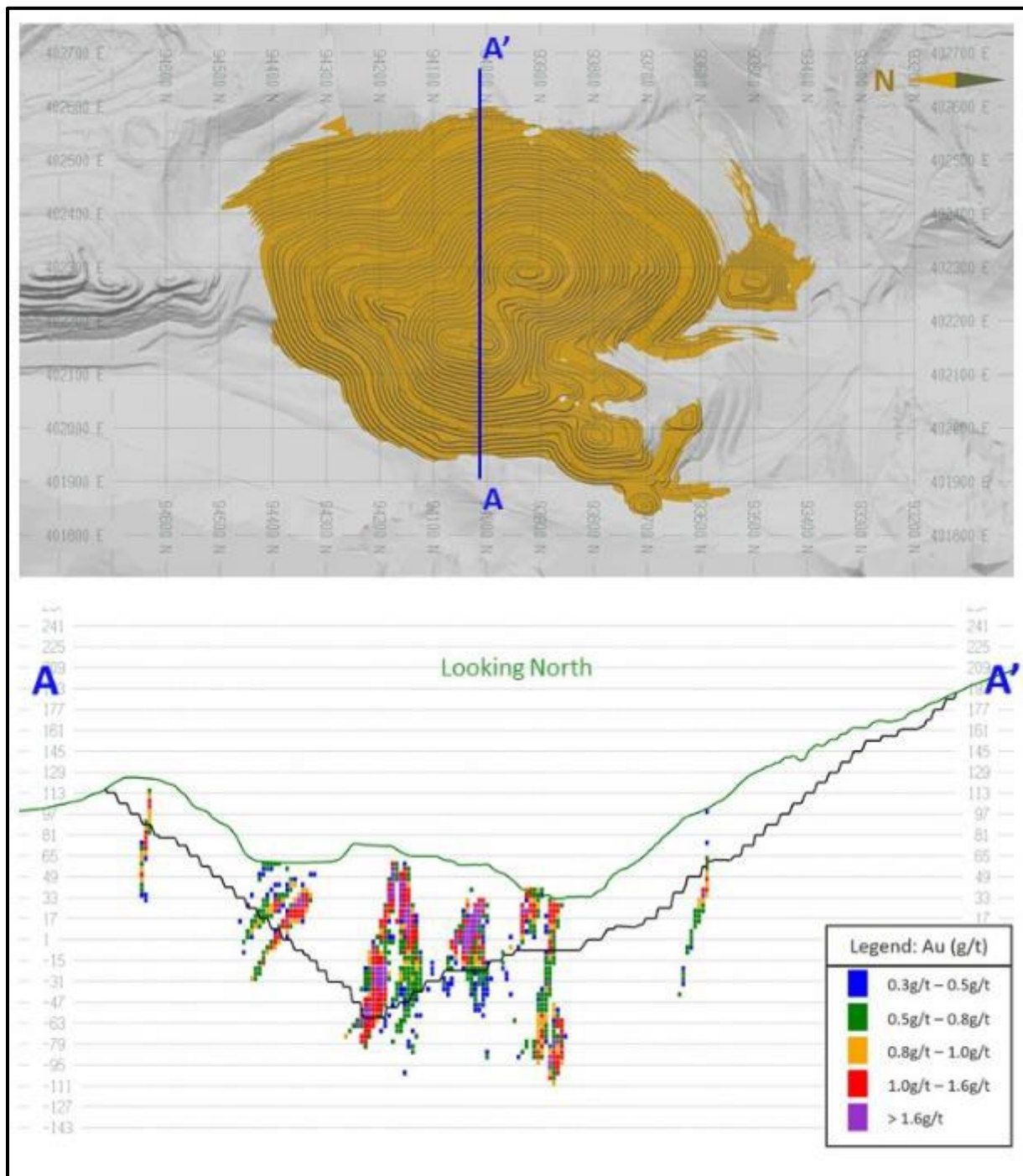


Figure 16-1: Ultimate Pit Layout, TAP AB1

Note: Figure prepared by Great Panther, 2021.

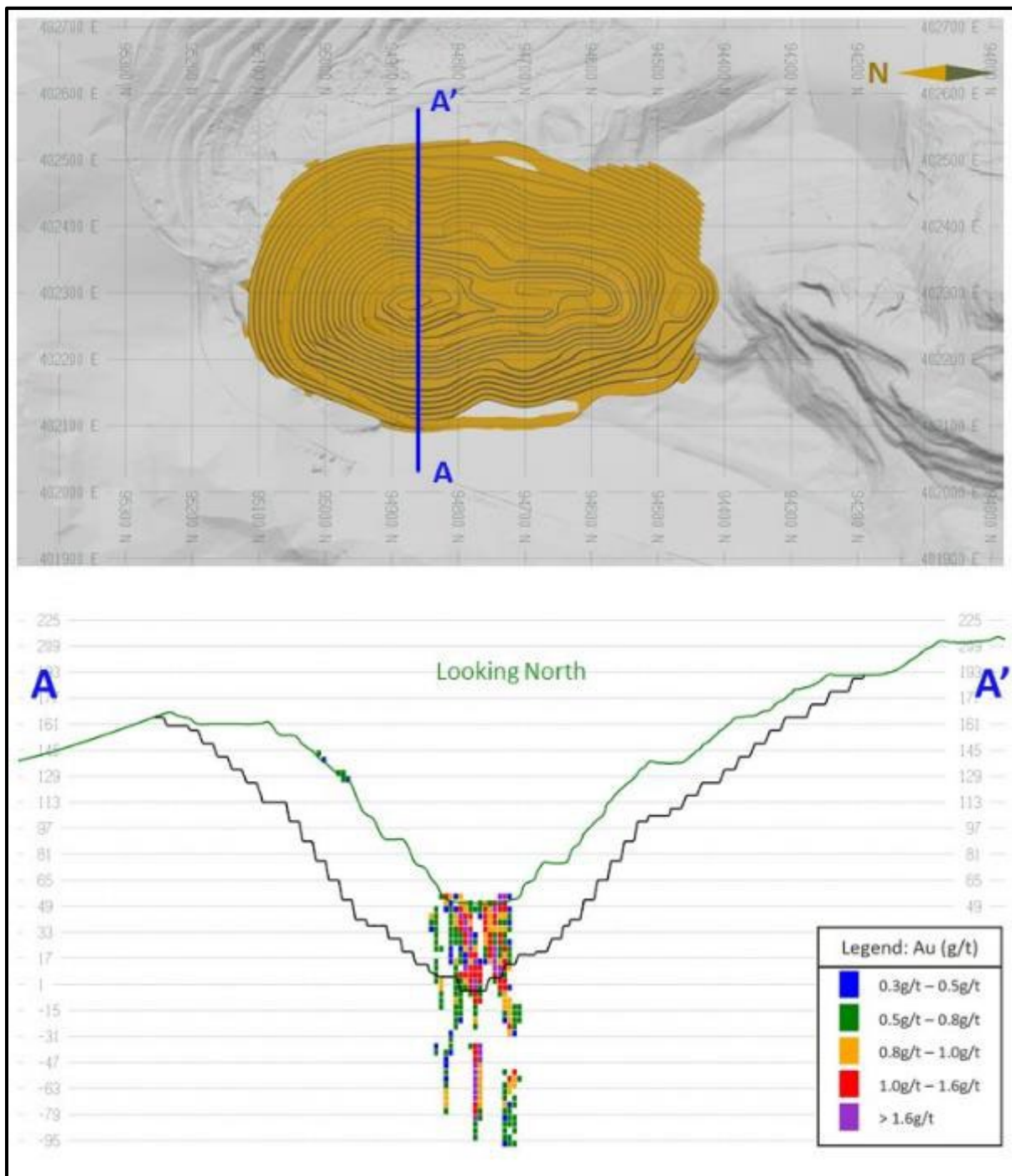


Figure 16-2: Ultimate Pit Layout, TAP AB3

Note: Figure prepared by Great Panther, 2021.

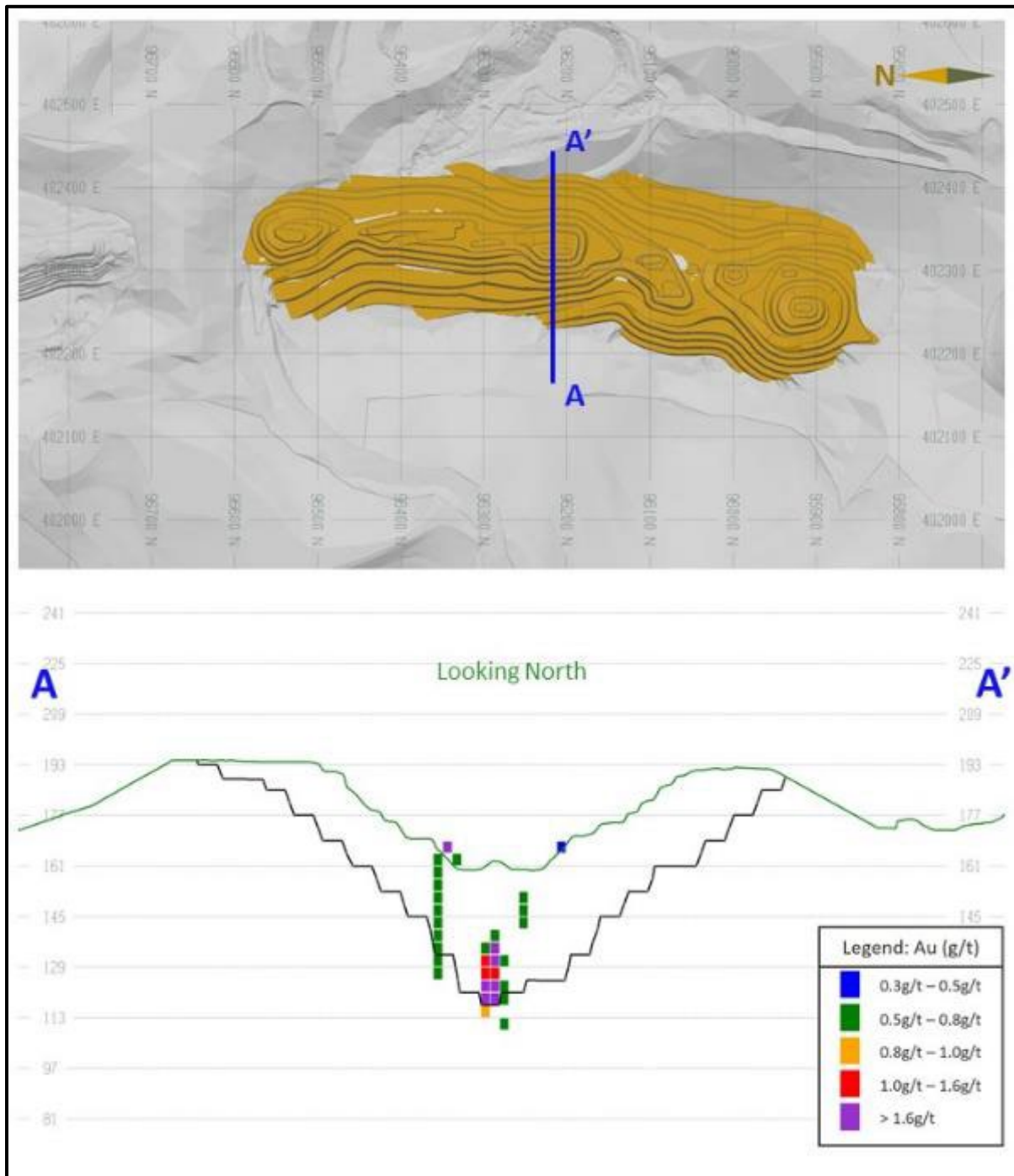


Figure 16-3: Ultimate Pit Layout, TAP C1

Note: Figure prepared by Great Panther, 2021.

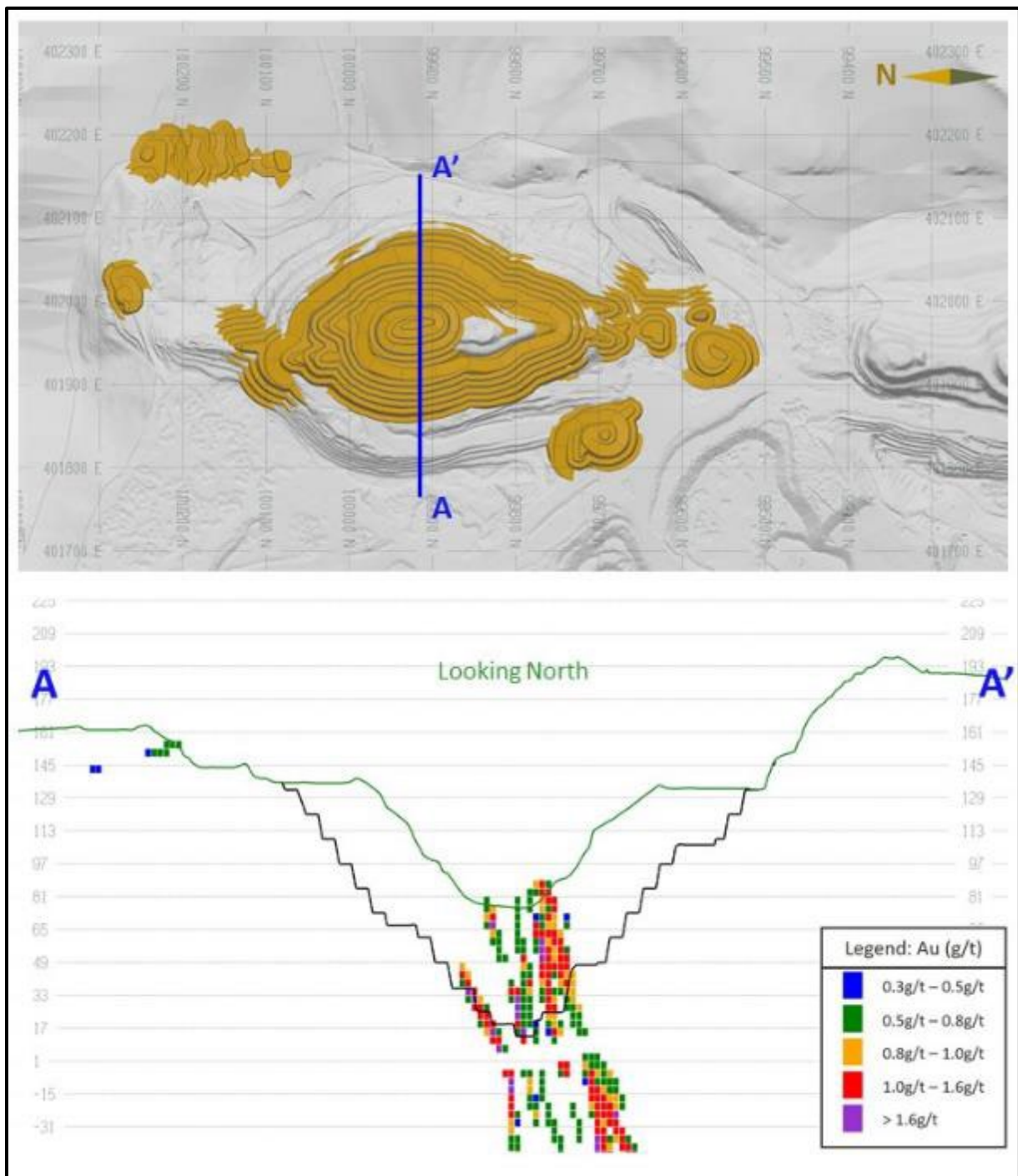


Figure 16-4: Ultimate Pit Layout, Urucum North

Note: Figure prepared by Great Panther, 2021.

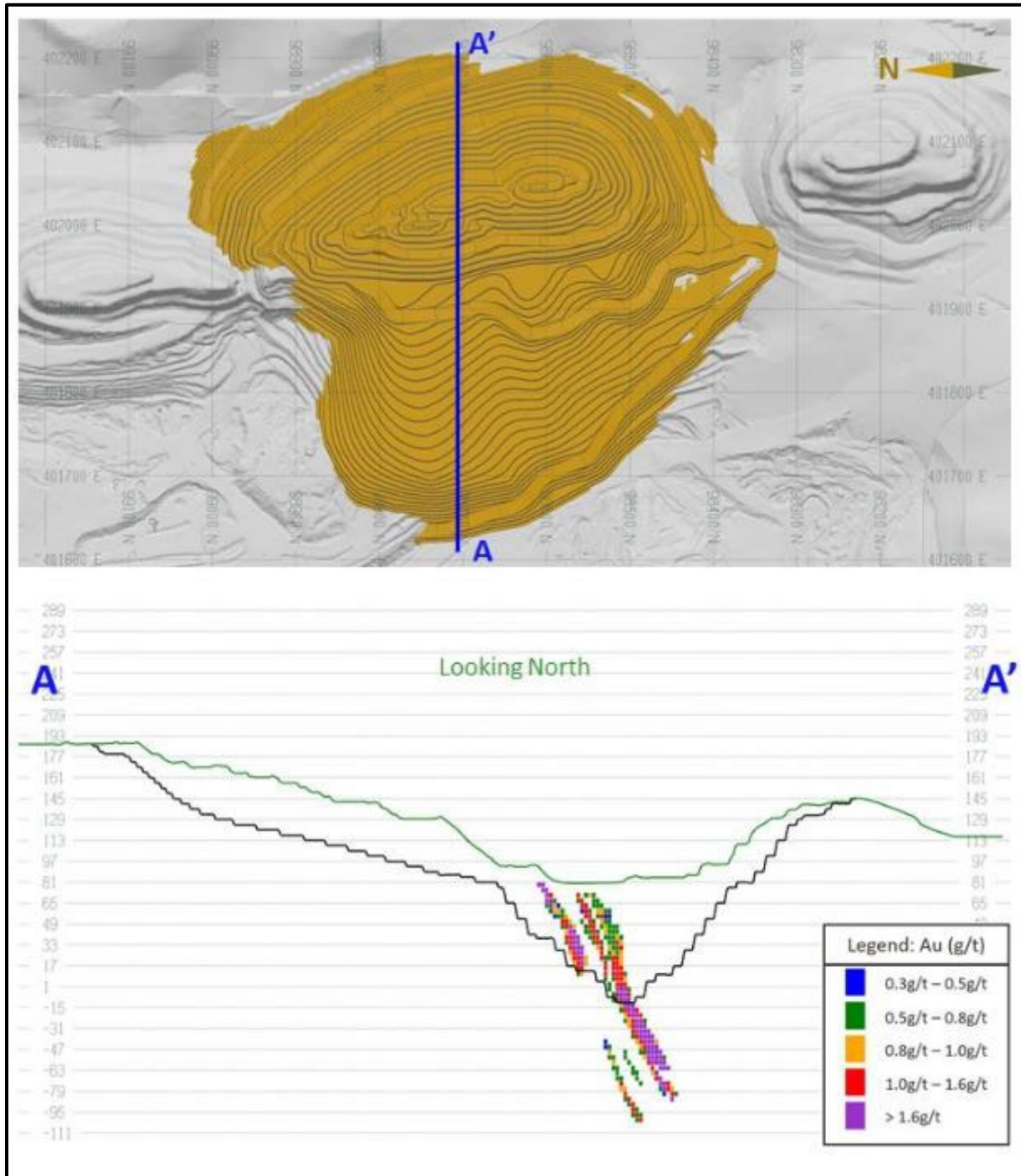


Figure 16-5: Ultimate Pit Layout, Urucum Central South

Note: Figure prepared by Great Panther, 2021.

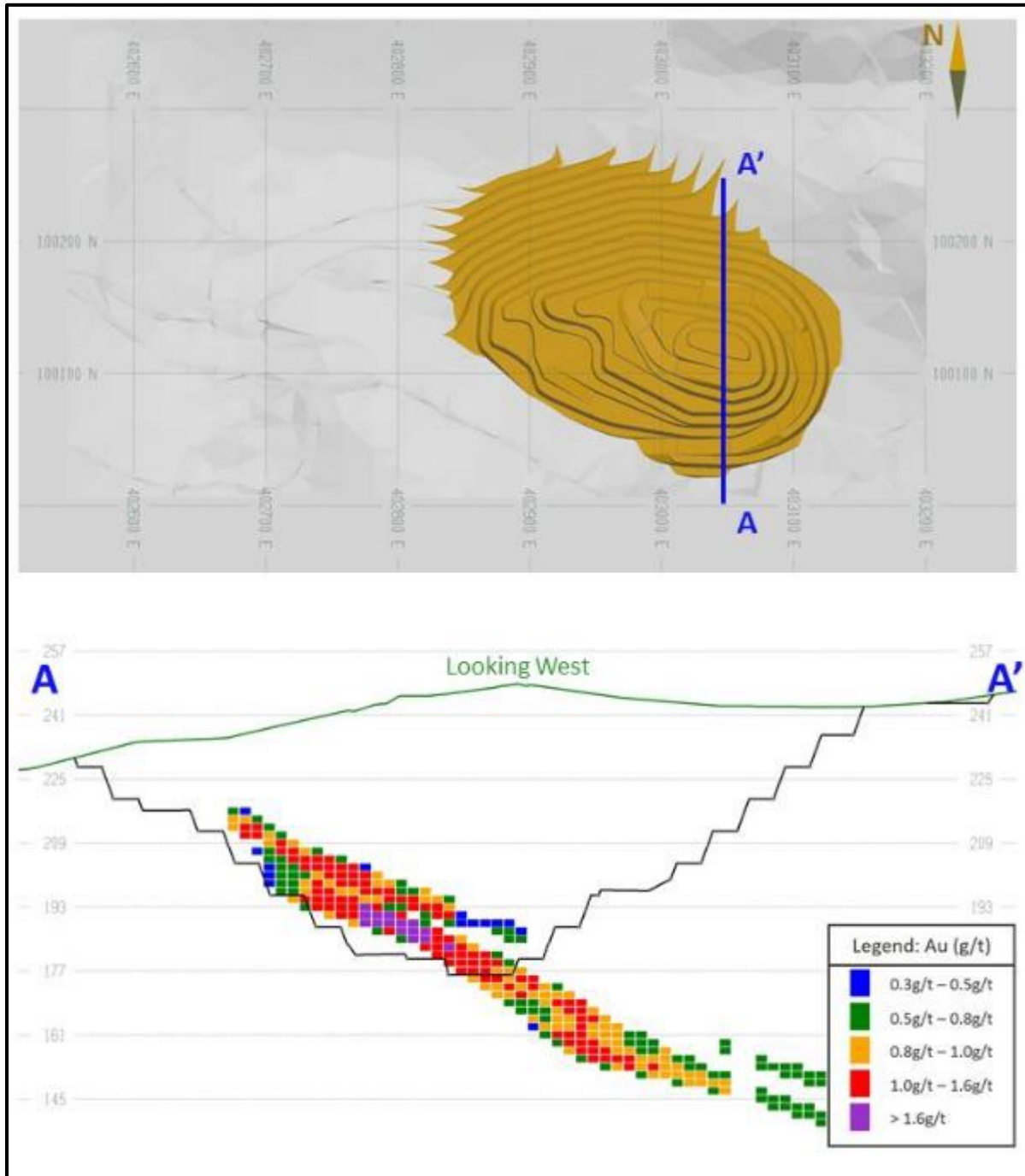


Figure 16-6: Ultimate Pit Layout, Urucum East

Note: Figure prepared by Great Panther, 2021.

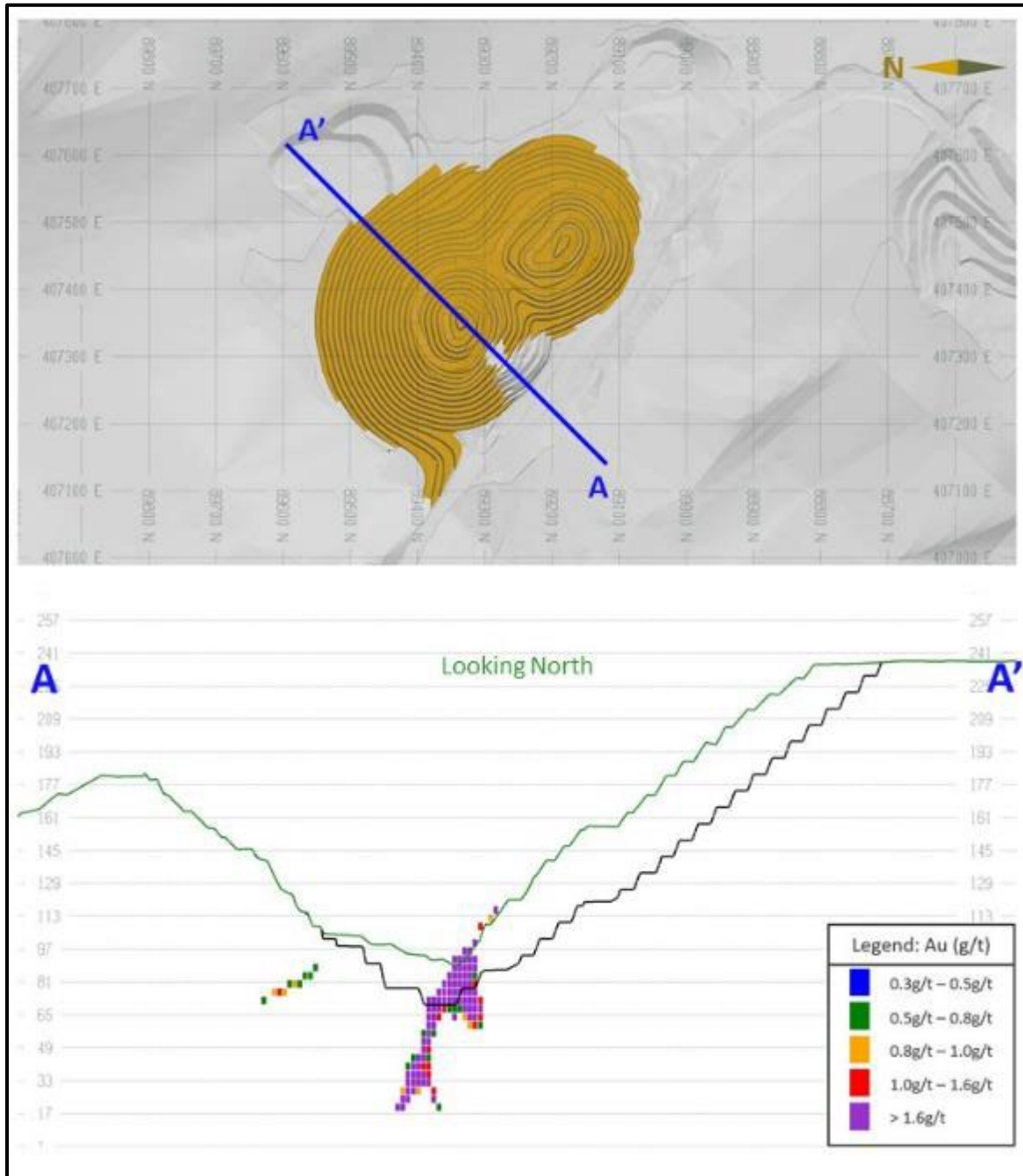


Figure 16-7: Ultimate Pit Layout, Duckhead

Note: Figure prepared by Great Panther, 2021.

#### **16.2.4 MINE OPERATIONS**

The mining operations are based on the use of hydraulic excavators and a haul truck fleet engaged in conventional open pit mining techniques. Excavated material is loaded to trucks and hauled to either the ROM, ore stockpiles, or the waste rock storage facility (WRSF).

Excavation of oxide material does not require drilling and blasting. For fresh rock, waste rock is typically drilled on 8 m high benches using 140 mm diameter drill holes, and a drill pattern of 4.4 x 5.0 m spacing and blasted at a powder factor of 0.78 kg/m<sup>3</sup>. Mineralized rock is typically blasted on 8 m benches using smaller drill holes (102 mm diameter) using a tighter drill pattern of 2.3 x 2.8 m spacing with a higher powder of 1.20 kg/m<sup>3</sup>. Due to groundwater inflow at the oxide/transition contact, water-resistant emulsion explosive is used. Final pit walls, as well as the temporary pit walls during the phasing are pre-split. Ore and waste are fired together. For wide zones of fresh mineralization, the ore can be blasted separately to minimize contact dilution.

Ore sent to the ROM is stockpiled in defined areas and separated as either oxide or fresh, within various cut-off grade categories, to facilitate later blending to achieve the desired oxide/fresh rock proportion and grade required by the plant.

The open pit was scheduled to operate 365 days per year, 24 hours per day. The U&M and Minax work schedule assumed four crews working three 8-hr shifts.

#### **16.2.5 PRODUCTION SCHEDULE**

A quarterly pit production schedule was generated with the objective of meeting a target ore processing rate of a nominal 10,000 t/d at an average 96% annual plant availability. Table 16-3. The LOM mining rate averaged approximately 59,320 t/d. The maximum mining rate averages 124,000 t/d due to extensive stripping in the third quarter of 2022. The current open pit reserves have a remaining three-year mine life, to 2025.

ROM quantities were based on whole block mining and total 10.6 Mt grading 1.08 g/t Au with a strip ratio averaging 8.8:1. Oxide material makes up 62% of the total open pit ore tonnage in the LOM plan, and 68% of the total waste tonnage that will be mined.

Plant feed scheduled consisted of the ROM from the pit and from the stockpiles. The pit ROM production was projected to be direct feed to the crusher, complemented with the ROM re-handled on an as-needs basis.

The LOM pit ore and waste production and plant feed schedule are summarized in Figure 16-8 and Figure 16-9 respectively.

### **16.2.6 GRADE CONTROL AND PRODUCTION MONITORING**

Grade control is carried using RC drilling on a 10 m by 6 m grid with sampling on 1 m intervals generally to 24 m to 60 m depth depending on access and production needs. Nominally holes

Table 16-3: Tucano LOM Open Pit Production Schedule

Period	un	Total	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4	2025 Q1	2025 Q2	2025 Q3
<b>Open Pit Mining</b>																			
ROM - Oxide	kt	5310	27	106	147	341	950	677	62	84	285	466	468	674	177	436	241	142	27
ROM - Fresh	kt	4622	95	223	126	269	575	23	116	621	593	470	387	191	244	307	205	147	29
Open Pit ROM Total	kt	9932	122	329	273	610	1525	700	178	705	878	936	855	865	421	744	446	289	56
<b>Stockpile Inventory</b>																			
ROM - Oxide	kt	587	0	0	23	1	29	245	201	0	38	2	29	0	3	18	0	0	0
ROM - Fresh	kt	99	0	0	0	0	16	21	29	0	17	0	1	0	0	14	0	0	0
Stockpile ROM Total	kt	686	0	0	24	1	45	266	230	0	55	2	30	0	3	32	0	0	0
<b>Total ROM, Pit + Stockpile</b>																			
ROM - Oxide	kt	5898	27	106	170	342	979	922	263	84	322	467	497	674	180	454	241	142	27
ROM - Fresh	kt	4720	95	223	127	269	591	44	144	621	610	470	388	191	244	321	205	147	29
Total ROM, Pit + Stockpile	kt	10618	122	329	297	611	1570	966	408	705	932	938	885	865	424	775	446	289	56
Au Grade	g/t	1.14	1.03	1.24	0.84	0.90	1.00	1.04	0.87	1.23	1.28	1.25	1.05	1.00	1.11	1.30	1.33	1.62	5.00
Contained Au	koz	389	4	13	8	18	51	32	11	28	38	38	30	28	15	32	19	15	9
ROM - Oxide Portion	%	56%	22%	32%	57%	56%	62%	95%	65%	12%	35%	50%	56%	78%	42%	59%	54%	49%	48%
Waste – Oxide Rock	kt	54,953	1,209	3,489	3,709	5,804	7,594	4,806	2,111	1,730	3,748	4,500	3,274	3,155	4,268	3,562	1,425	500	69
Waste - Fresh Rock	kt	32,937	1,562	1,866	1,566	2,176	2,154	1,647	3,818	3,944	2,706	1,841	1,350	1,789	2,464	2,243	925	778	108
Waste - Total	kt	87,890	2,770	5,355	5,274	7,980	9,749	6,454	5,928	5,674	6,455	6,341	4,624	4,943	6,732	5,806	2,350	1,278	177
Saprolite Portion	%	63%	44%	65%	70%	73%	78%	74%	36%	30%	58%	71%	71%	64%	63%	61%	61%	39%	39%
Strip Ratio	W/O	8.8	22.6	16.3	19.3	13.1	6.4	9.2	33.3	8	7.4	6.8	5.4	5.7	16	7.8	5.3	4.4	3.2
Total Moved - Oxide	kt	60,851	1,236	3,595	3,879	6,146	8,573	5,728	2,374	1,814	4,071	4,968	3,772	3,829	4,447	4,016	1,665	642	96
Total Moved - Fresh	kt	37,657	1,657	2,089	1,692	2,446	2,745	1,692	3,962	4,565	3,317	2,311	1,738	1,980	2,708	2,565	1,130	925	137
Grand Total Moved	kt	98,508	2,893	5,684	5,571	8,591	11,318	7,420	6,336	6,379	7,387	7,279	5,509	5,808	7,156	6,581	2,796	1,567	233
Oxide portion	%	62%	43%	63%	70%	72%	76%	77%	37%	28%	55%	68%	68%	66%	62%	61%	60%	41%	41%
Open pit mining rate	ktpd	65	47	62	62	94	123	78	68	70	80	79	60	64	78	71	31	17	3
<b>Plant Feed</b>																			
Plant Feed from Pit	kt	9,932	115	301	309	539	890	893	692	676	907	900	891	860	426	744	446	289	56
Plant Feed from Stockpile	kt	1,400	492	609	299	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant Feed - Oxide	kt	6,710	514	694	472	295	490	770	475	76	292	432	503	669	182	436	241	142	27
Plant Feed - Fresh	kt	4,622	93	216	135	244	400	123	217	600	615	469	388	191	244	307	205	147	29
Total Plant Feed	kt	11,332	607	910	607	539	890	893	692	676	907	900	891	860	426	744	446	289	56
Au Grade	g/t	1.08	0.60	0.77	0.66	0.95	1.32	1.02	0.60	1.26	1.30	1.28	1.04	1.00	1.11	1.33	1.33	1.62	5.00
Oxide Feed Portion	%	59%	85%	76%	78%	55%	55%	86%	69%	11%	32%	48%	56%	78%	43%	59%	54%	49%	48%
Nominal Rate per Cal Day	tpd	7,446	9,956	9,892	6,750	5,918	9,674	9,702	7,691	7,424	9,858	9,784	9,789	9,450	4,634	8,083	4,956	3,177	606
Plant Availability	%	75%	100%	99%	68%	59%	97%	97%	77%	74%	99%	98%	98%	95%	46%	81%	50%	32%	6%



Feed Rate, Plant Avail 92%	tpd	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
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are drilled at an angle of 60 degrees. The resultant samples are assayed at the Tucana mine sample preparation facility and analyzed in the Tucano fire assay laboratory. Industry standard quality control procedures involving, reference, blank and duplicate samples are employed.

On receipt and modelling of the grade control assay data, preliminary mineralization outline plans are generated for each active mining bench. In the pit the ore zones are marked out on the bench and contacts verified with the observed geology. Based on the definition of ore and waste zones a blast drillhole grid is programed and carried out using percussion drills drilling vertical holes to 8m depth. After blasting the degree of heave is evaluated and the contacts of the ore zones redefined on the bench. A technician is appointed to oversee each mining area as the mining contractor operates to remove the ore. A centralized dispatch system is employed to control and register the destination of all truckloads of ore or waste from the bench.

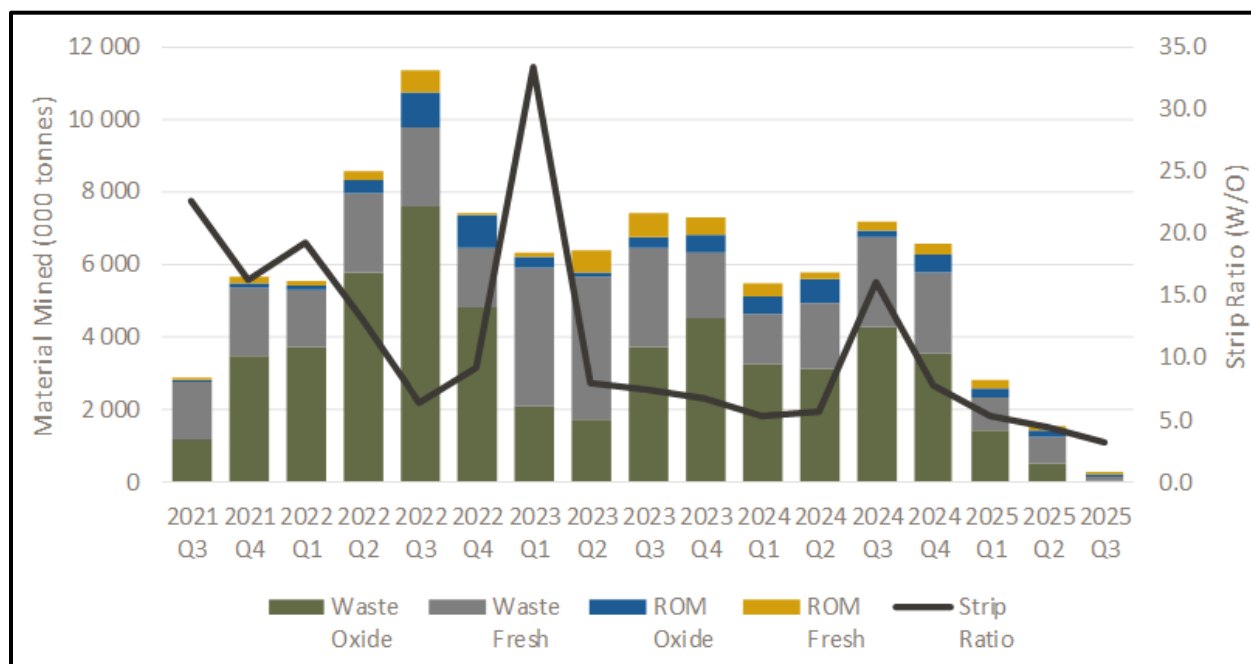


Figure 16-8: LOM Material Mined by Type

Note: Figure prepared by Great Panther, 2021.

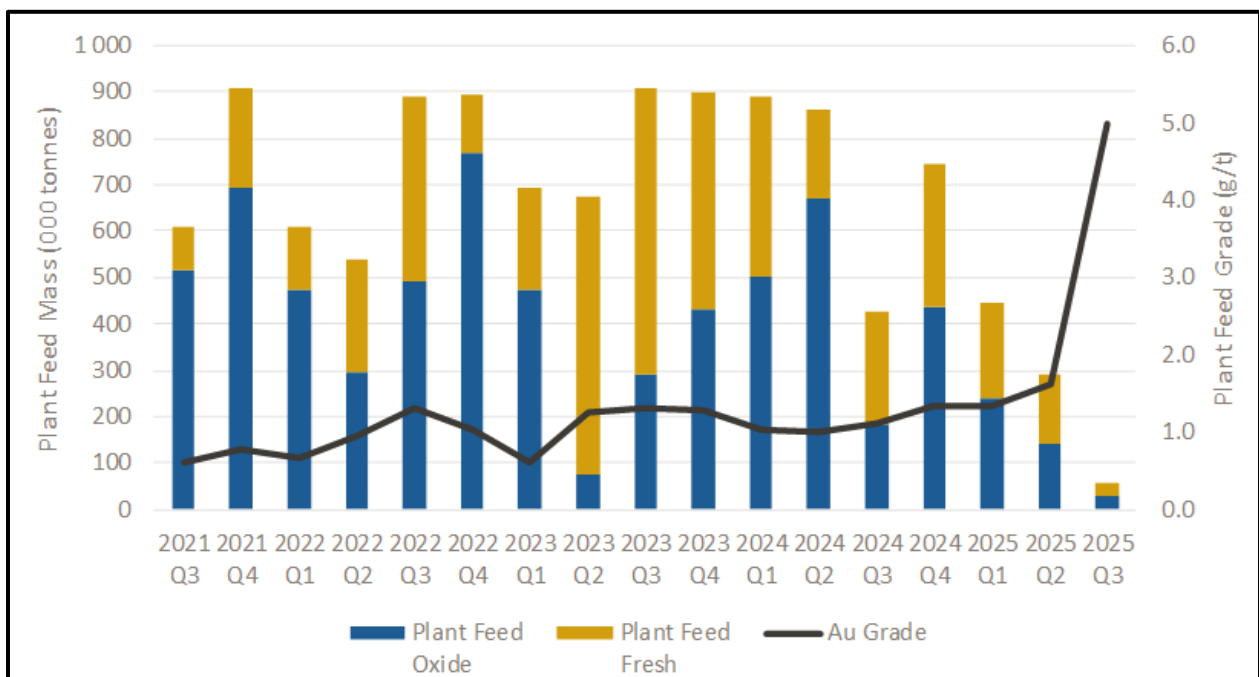


Figure 16-9: LOM Plant Feed Material by Type

Note: Figure prepared by Great Panther, 2021.

## 16.2.7 CONTRACTOR RESPONSIBILITIES

The contractor is responsible for providing the necessary equipment and manpower to meet the LOM production requirements. Minax contract rates were used for the LOM plan. In addition to earthmoving responsibilities for both waste and ore, the contractors are responsible for production drilling, pre-shear drilling, pit dewatering, ore re-handle, crusher feed, and maintenance and supervision of their fleet of equipment. During 2022, the two mining contractor operational areas are geographically distinct. From 2023, Minax will be the sole mining contractor.

## 16.2.8 EQUIPMENT

U&M operate at TAP AB which is a large open pit undergoing a major pushback. The primary ore and waste loading equipment are 6.5 m<sup>3</sup> and 15 m<sup>3</sup> excavators supported by 4.2 m<sup>3</sup> wheel loaders used for in-pit loading and ore loading at the crusher. Haulage equipment consists of 36-t, 90-t, and 136-t truck fleets.

For planning of the open pit LOM, key equipment requirements will be supplied by Minax and are summarized in Table 16-4. Primary ore and waste loading equipment are 4.5 m<sup>3</sup> excavators supported by 6 m<sup>3</sup> wheel loaders utilized for in pit loading and ore loading at the crusher. Haulage equipment is

comprised of a feet of 30 m<sup>3</sup> trucks. This equipment is supported by light vehicles, support units, lighting plants, pumps etc.

**Table 16-4: Mining Fleet**

Minax Mining Fleet			U&M Mining Fleet		
Great Panther Mining Limited – Tucano Gold Mine			Great Panther Mining Limited – Tucano Gold Mine		
Manufacturer	Model	Units	Manufacturer	Model	Units
Scania	Heavy Tipper Truck 10x4/8x4	50	Sandvik	Drill, Panther 1500i, DX 680	9
Volvo	Articulated Truck A30G	12	Hitachi	Excavator, EX-1200	5
Volvo	Excavator EC750D	12	Hitachi	Excavator, EX-2500	4
Volvo	Excavator EC380D	1	Hyundai	Excavator, HX-220	6
Caterpillar	Dozer D8	5	Caterpillar	Loader, 980	5
Caterpillar	Dozer D6	5	Caterpillar	Truck, 740	10
Caterpillar	Grader 140K	5	Caterpillar	Truck, 777	22
Caterpillar	Loader 966	2	Komatsu	Truck, 730 E	6
Caterpillar	Loader 980	2	Caterpillar	Dozer, D9	5
Caterpillar	Road Roller CP54B	2	Caterpillar	Dozer, D6	1
Sandvik	Driller DP1500	5	Caterpillar	Grader, 16H, 14M	5
Sandvik	Driller DX800	3	Mercedes	Truck, 8x4	15
	Water Truck 20,000 L	4	Case	Rock Breaker	3
	Fuel Truck	3		Road Roller	1
	Rock Breaker	2	Mercedes, Volvo	Water trucks	4
	Long Reach Excavator	1		Fuel Truck	5
	Munck Truck	2			
	Floater	1			
Caterpillar	Backhole Loader 416F	1			

## 16.3 UNDERGROUND

The underground mining operations will be located beneath the URN open pit. Underground mining methods are based on the 2019 Technical Report prepared by RPA and have not been modified. In Q4 2020, Tucano initiated a drilling program to support technical studies. The 19,000 m drilling program was completed in the first quarter of 2022. The drilling will support underground mine development studies scheduled for conclusion at the end of 2022.

### **16.3.1 GEOTECHNICAL CONSIDERATIONS**

The base of weathering is relatively shallow and is expected to have minimal impact on underground mining operations. Deeper weathering may be present along major faults and on the contacts of pegmatite dykes. Weathering will be a factor for establishing the portal location and the upper sections of ventilation raises.

Barton's rock quality index (Q), the modified Q value (Q'), and Bieniawski's rock mass rating (RMR) classifications were used to estimate the stable spans for stopes and development, and ground control requirements. Data analysis indicated that there was little difference in rock mass condition between the hanging wall and backs of the stopes or between different locations within the orebody. The same rock mass classification was used for each zone and location.

An unsupported span of 50 m with a 20 m sublevel interval (i.e., 24 m floor to roof) should remain stable for three weeks, provided there are no abnormal conditions. The maximum strike distance that can be left open will be satisfied with at 50 m spacing of the rib pillars.

The crown pillar design assumes depends on the width of the stope beneath it. The minimum height to width ratio should be 3:1. The actual height can be optimized by controlling the profile of the pillar's base and by using ground control systems (e.g., cable bolts and shotcrete).

Sill pillars required a 2:1 minimum height to width ratio and were not allowed to be <10 m in height. It may be necessary to increase the sill-pillar height to maintain this 2:1 ratio in places where stacked lenses occur, or in wider parts of the orebody.

Rib pillars between adjacent open stopes were designed to be at least 5 m high and had a minimum height to width ratio of 1:1. Pillars between lenses, where stacked lenses exist, had a minimum height of 10 m. The extraction sequence was recommended to advance from the hanging wall to the footwall where there were stacked lenses. Alternatively, small rib pillars could be left in the ore to reduce the chances of inter-lens pillar failure.

Ground control requirements should be light as ground conditions are expected to be good. Additional support may be needed where excavations cross pegmatite contacts as well as major fault zones. Additional support will be required in zones where poor ground conditions are encountered.

### **16.3.2 HYDROGEOLOGICAL CONSIDERATIONS**

Minimal groundwater inflows are expected in the underground mine. Possible sources of groundwater could be major cross-cutting faults as well as the contact areas between the pegmatites and the country rock. Dewatering infrastructure requirements are outlined in Section 16.3.

### **16.3.3 MINING METHOD SELECTION**

Mining is planned to use:

- Up-hole retreat: a top-down mining method in which the ore is drilled and blasted with up-holes and mining retreats to a centrally positioned crosscut on each sublevel. Backfilling the mined-out void can be delayed by leaving rib pillars to support the sidewalls. In most cases, the large mined-out void will eventually be backfilled with uncemented rockfill to maintain regional ground stability;
- Avoca: a bottom-up mining method that is suitable for steeply-dipping vein-type orebodies. The orebody is mined from bottom to top in horizons, similar to cut-and-fill and sublevel open stoping. A bench is established at each end of the stope, which retreats along strike toward the centre of the stope. The mined-out part of the stope is progressively backfilled with rockfill such that the waste muck pile advances just behind the retreating bench face.

To maximize production rates, the orebody was divided into blocks separated by sill pillars allowing production to proceed from multiple mining fronts. The sill pillars will be partially recovered after the stopes above and below them have been mined out and backfilled. The typical sill-pillar height will be 15.5 m, considering a 20 m sublevel interval. Alternatively, thinner sill pillars (e.g., 6–10 m) could be left without making any attempt to recover them.

#### **16.3.4 DESIGN ASSUMPTIONS AND DESIGN CRITERIA**

The mine layout is provided in Figure 16-10, and is based on the following criteria:

- Twin declines accessing the north and south parts of the deposit;
- Portal situated on the north side of the URN open pit;
- North and south exhaust ventilation raises;
- 20 m sublevel interval;
- Stopes accessed by a footwall drive and crosscuts on every sublevel;
- Decline development initiates in Year 1;
- Mine plan targets Measured, Indicated and Inferred Mineral Resources down to RL 500 m (750 m below surface).

#### **16.3.5 MINE OPERATIONS**

Approximately 2.1 Mt of ore at an average grade of 4.1 g/t Au will be mined and processed over the 6.5 mine life. An evaluation of the planned production rate and scheduling indicates that the deposit supports 450,000–500,000 t/a. Production rates will vary from year to year depending on the number of production fronts available in different areas of the mine.



Table 16-5: Underground Production Schedule

Area	Units	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Total
Stoping	Tonnes (kt)	28	289	396	445	370	387	111	2,027
	Grade (g/t Au)	3.2	3.2	4.3	5	4.4	3.5	3.8	4.1
	Contained metal (koz Au)	2.9	30	55.3	72.1	52.2	44.1	13.5	270.1
Ore development	Tonnes (kt)	1.4	10.3	8.7	33.5	21.1	27.6	4.8	107.5
	Grade (g/t Au)	2.7	2.8	3	5.2	3.3	2.8	3.7	3.7
	Contained metal (koz Au)	0.1	0.9	0.8	5.6	2.3	2.5	0.6	12.8
Total production	Tonnes (kt)	30	299	405	479	391	415	116	2,134
	Grade (g/t Au)	3.2	3.2	4.3	5	4.3	3.5	3.8	4.1
	Contained metal (koz Au)	5.6	32.8	58.3	77.2	55.5	46.9	17.2	282.9
Ore development	Metres (m)	26	177	158	549	357	481	83	1,832
<i>Waste Development</i>									
Horizontal	Tonnes (kt)	218	303	326	322	313	309	147	1,938
Eq metres	m	3,452	4,805	4,797	4,810	4,797	4,797	2,128	29,584
Vertical	Tonnes (kt)	5.9	9.4	6.5	6.9	5.1	6.3	2.9	43.2
Eq metres	Metres (m)	97	157	103	101	78	96	43	675

### 16.3.7 VENTILATION

Ventilation will be a pull-type (exhausting) system (Figure 16-11).

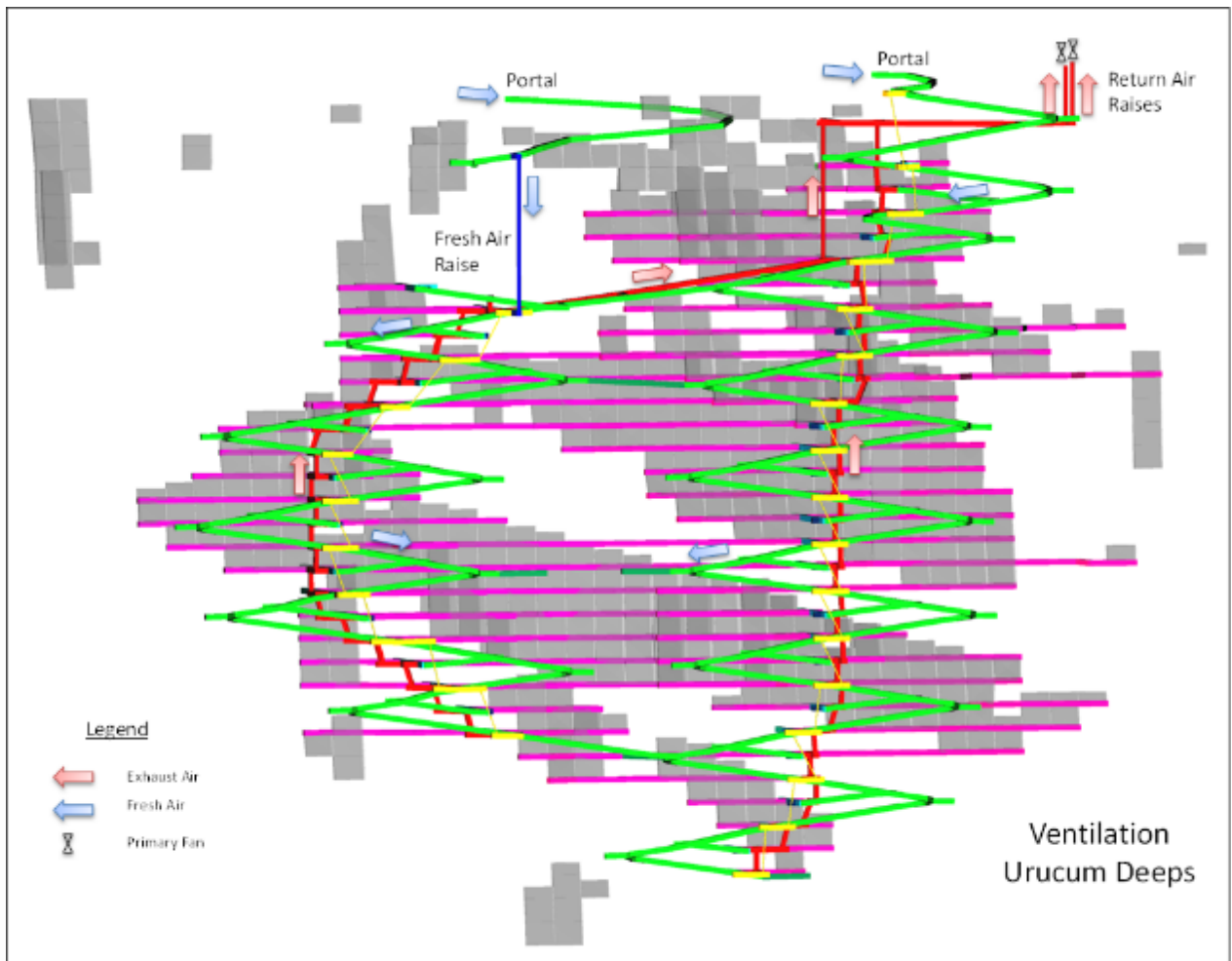


Figure 16-11: Schematic, Primary Ventilation System

Note: Figure prepared by Great Panther, 2021.

Fresh air will enter the mine through the portal and main decline. It will split between the north and south declines that extend to the mine's lower levels. Fresh air also enters via an access drive from the open pit, thereby lightening the volume flowing through the declines and ensuring that the air velocity in the declines is manageable.

Two primary return air raises will be developed at the northern end of the mine, each with an exhaust fan installed at its collar. Two exhausting fans will provide a degree of redundancy in the ventilation system. Internal return raises will be developed while driving the two declines. A return air transfer drift will convey exhaust air from the southern internal return raises to the northern primary raises.

Auxiliary ventilation on the levels will be provided by auxiliary vent fans and vent ducting, using the declines as the fresh-air source. The vitiated air will be exhausted via a return air raise that connects to the access drive of each level.

The ventilation system, as designed, will provide 350 m<sup>3</sup>/s of fresh air to the underground operation.

### **16.3.8 UNDERGROUND INFRASTRUCTURE FACILITIES**

#### **16.3.8.1 Surface**

The underground mine would use some of the existing infrastructure built for the open pit operations such as the explosives magazines and warehouse.

Additional surface infrastructure will include the following:

- Two 560 kW radial fans for ventilation;
- Mine dry change rooms;
- Lamp room (200 lamp capacity);
- Office facilities (technical services, operations control, electrical and mechanical engineering, and management and supervision);
- Surface workshop (10 t bridge crane, offices for maintenance supervision, toilets and wash basins, workshop area, fuel station, equipment washing area)
- Mine rescue centre (first aid room, mine rescue and training room).

#### **16.3.8.2 Underground**

Dewatering infrastructure will consist of a series of sumps along the declines, spaced at an 80 m vertical interval, and each one will have a submersible pump. The water will be pumped from sump to sump and finally discharged into the dewatering system in the open pit. Intermediate sumps, spaced at a 20 m vertical interval, will drain water to the main sumps via drain-holes.

Industrial water is already available at the site of the underground-mine project as a result of the existing services for the open pit and processing operations. Water usage is expected to peak at around 7.6 L/s during Stage 1 when the production rate attains 500 kt/a. The water will be delivered underground via 4" diameter steel pipe installed in the back of each decline.

Two portable electric compressors will supply compressed air to the mine.

The mine's emergency egresses will be developed as raises extending from sublevel to sublevel and equipped with regulation-compliant ladderways. The mine will have four portable 12-person refuge chambers that will be used during the mine's development before the escapeway system is established. They will continue to be used once the mine is in production in situations where a second means of egress cannot be provided.

Medium voltage electrical power (e.g., 4,160 v) will be supplied to the underground mine via the two declines, using separate feeder circuits connected to the site's main substation. Each feeder will continue down its respective decline.

The mine will have a leaky feeder system for communications. Two-way radios will be mounted on every piece of mobile equipment and provided at strategic locations.

Underground service bays will be provided for the daily maintenance of the jumbos and production rigs. Most of the maintenance for the mobile equipment fleet, however, will be carried out at the existing maintenance shop on surface.

### 16.3.9 BLASTING AND EXPLOSIVES

The existing explosive magazines and warehouse facilities will be used for the underground project.

### 16.3.10 MINING EQUIPMENT

The key equipment required to support underground operations is provided in Table 16-6.

Table 16-6: Underground Equipment

Equipment
Epiroc Boomer 282 Two boom development jumbos
Simba H1354 production drills
Volvo A35 underground haulage truck
Ten-tonne tramming capacity load-haul-dump vehicles
Epiroc Boltec M ground support rig
A Scaletec UV 2 or a Normet Scaler 2000 mobile mechanized scaler
Mobile rockbreaker
Telehandler for installing services and transporting materials
Caterpillar 12H Grader
Charmec explosives charger
Four-wheel drive pickup trucks and jeeps for technical staff and supervisors

## 16.4 QP COMMENTS ON “ITEM 16: MINING METHODS”

The LOM plan envisages open pit mining to 2025, with underground mining being implemented in parallel. Results of technical studies to support a production decision for the underground project are expected for the fourth quarter of 2022.

Open pit mining is well established with mine planning, liberation of mining areas and blasting supervised by the Company while the mining operations are conducted by a contractor. The contract mining operator is being changed to increase equipment availability and adapt the fleet to the current mining conditions.

In 2021 the western wall of URCS suffered stability issues leading to the suspension of mining activities in the URCS pit. Subsequent studies by consultants, indicate that the instability was generated due to a number of factors including waste rock storage over a structure, unseasonal rainfall and destabilisation of the toe of a low angle structure. This situation is limited to the URCS pit and has not affected production from other pits. A pushback will be implemented after the rainy season. The Company believes this action plan will permit the recover of the gold reserves at URCS.

Underground mining methods are conventional proven methods. The indications of excellent ground conditions support the implementation of these mining methods. The Company is carrying out more advanced geotechnical, hydrogeology and mine planning studies on the basis of the recent drilling programs completed at URN. This may result in improved definition of the mining methods.

Mine designs and equipment are conventional to the industry.

## **17. RECOVERY METHODS**

### **17.1 INTRODUCTION**

The Tucano Gold Mine flowsheet consists of a primary jaw crusher feeding a SAG mill/ball mill (SAB) grinding circuit. The ground ore is thickened prior to being treated in a “hybrid” CIL plant consisting of a new single pre-leach tank followed by the original six-tank CIL and carbon elution circuit, followed by detoxification of tailings.

The design is currently based upon mining and processing of 3.4 Mt/a of ore and treating a blend of ore which is predominantly (90%) of the harder sulphide ore type.

The Tucano Gold Mine Expansion Project which included a new ball mill, pre-leach thickener, additional single leach tank and oxygen plant was completed in November 2018. An additional oxygen plant was installed and commissioned in April 2019 to further increase dissolved Oxygen (DO) levels and this equipment was designed to treat 3.6 Mtpa.

### **17.2 PROCESS FLOW SHEET**

A simplified process flowsheet is included as Figure 17-1.

### **17.3 PLANT DESIGN**

#### **17.3.1 CRUSHING AND STOCKPILING**

Ore is delivered to a ROM pad where oxide and sulphide ores are stockpiled separately depending on specified grade ranges. The ores are fed to the crusher hopper by means of a front-end loader to achieve the daily planned grade and sulphide/oxide blend.

A vibrating grizzly allows the finer, sticky oxide ore to bypass the crusher. Crushing is achieved using a 1400 mm x 1200 mm single toggle METSO C-150 jaw crusher with a closed side setting (CSS) of 125 mm. In addition to the jaw crusher, a separate spent ore feeder is located in the emergency stockpile area to facilitate the feeding of spent ore direct to the SAG mill. A surge bin with 30 min residence time and a diversion chute to an emergency stockpile feeder is located halfway between the crusher and the SAG mill.

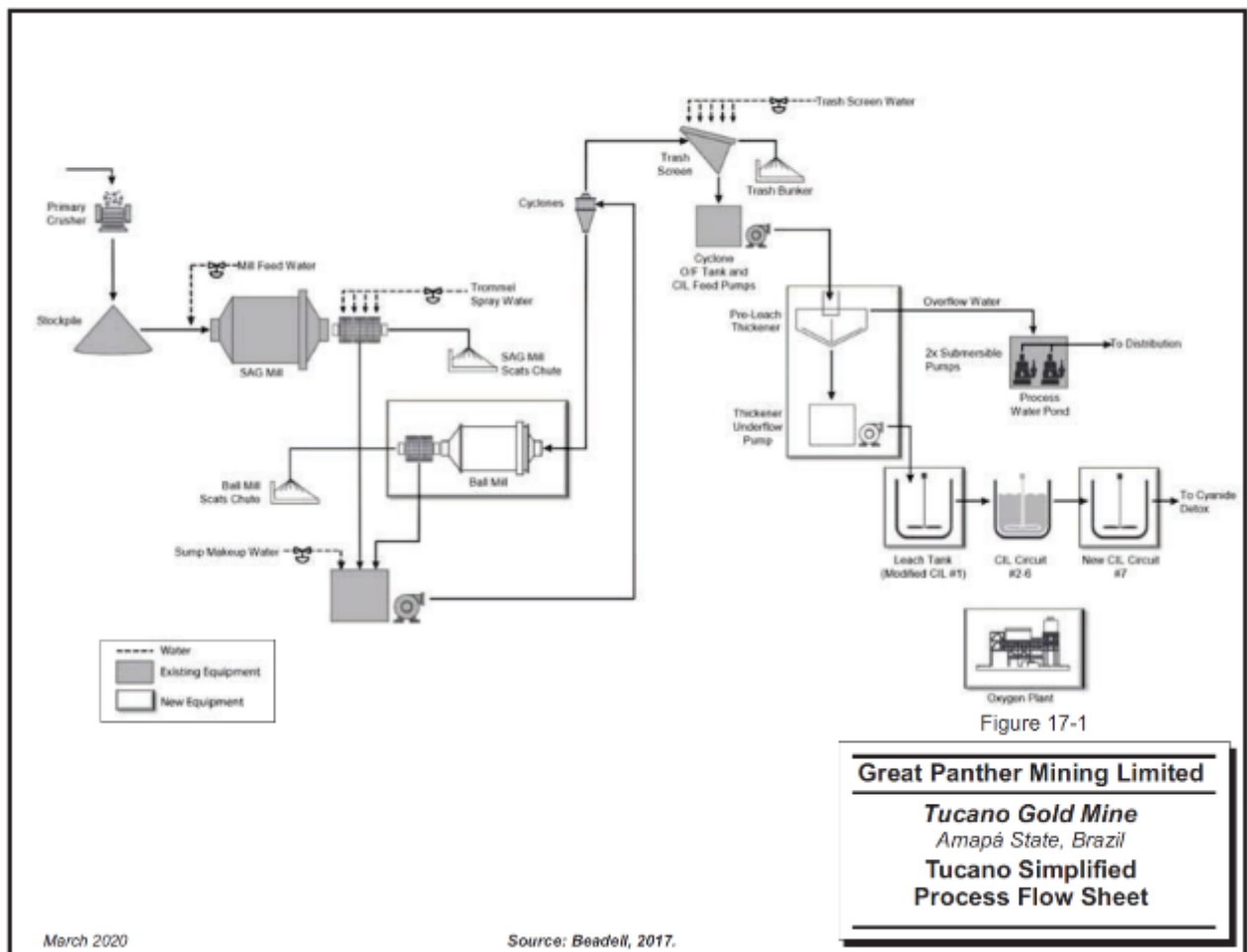


Figure 17-1: Tucano Mineral Process Flowsheet

Note: Figure prepared by Great Panther, 2021.

### 17.3.2 MILLING, CLASSIFICATION AND PRE-LEACH THICKENING

Grinding is achieved with an Outotec SAG mill with a 7 MW single-pinion TECO drive, a diameter of 7.32 m and an effective grinding length (EGL) of 7.95 m in open circuit followed by an Outotec Ball mill fitted with a 6 MW motor. The ball mill operates in closed circuit with a battery of 10 hydro cyclones with a product size which is currently 80% < 75 µm. The plant has two Weir 490 HP cyclone feed pumps at the discharge of the ball mill and the cyclones have an apex of 210 mm with a 5 in. vortex.

The addition of the ball mill in 2018 allowed the mill feed tonnage to be maintained at 3.4 Mt/a on the harder sulphide ore types, while also reducing the hydro-cyclone overflow P80 size. Hydro-cyclone overflow from the grinding circuit is screened to remove trash (i.e., wood chips, plastic, etc.) and is then

pumped to a 28 m diameter Outotec pre-leach thickener. The pre-leach thickener overflow is recycled as process water and recycled to the grinding circuit. The pre-leach thickener underflow is then pumped to a pre-leach tank. The introduction of the pre-leach tank enhanced the gold adsorption kinetics of carbon and maintains a leach residence time of 24 hr at the planned 450 t/hr (i.e., 3.6 Mt/a) process capacity.

### **17.3.3 HYBRID CIL**

The Hybrid CIL circuit consists of one 2,650 m<sup>3</sup> pre-leach tank followed by six 2,650 m<sup>3</sup> (live volume) CIL tanks. There are two objectives in operating the pre-leach tank:

- Ensure that the majority of gold is in solution before coming into contact with the carbon, as this significantly increases the carbon adsorption kinetics;
- Blowing oxygen into this first tank to ensure that the dissolved oxygen levels are >15 ppm.

All seven tanks operate in series. Launderers connect the tanks to allow slurry to flow by gravity through the tank train. All tanks are fitted with bypass launders to allow any tank to be removed from service for agitator or screen maintenance.

Each tank is fitted with a 110 kW mechanical agitator to ensure uniform mixing. Oxygen is currently maintained in the pre-leach Tank 1 at > 15 ppm via a dedicated pulp recycle system and oxygen injection system and the remaining oxygen is added to CIL Tanks 2, 3, and 4. Air is supplied to CIL Tanks 5, 6, and 7.

Each CIL tank is fitted with a single 12 m<sup>2</sup> mechanically swept, wedge-wire inter-tank screen to retain carbon. The style of inter-tank screen selected is known as a “pump screen”, which allows each of the CIL tanks to be installed at the same elevation, in contrast to the stepped arrangement used for conventional cascade CIP plants. This arrangement simplified the civil engineering requirements of the CIL area. Barren carbon enters the adsorption circuit at the last tank, CIL Tank 6, and is advanced counter-currently to the slurry flow by moving slurry and carbon from CIL Tank 6 to CIL Tank 5 using recessed impeller carbon-transfer pumps. The inter-stage screen in CIL Tank 5 retains the carbon and the slurry flows by gravity back to CIL Tank 6. This counter-current process is repeated until the carbon reaches CIL Tank 1. A single recessed-impeller pump is used to transfer slurry to a loaded-carbon recovery screen. The carbon reporting as screen oversize flows to the carbon transfer column and the screen undersize returns to CIL Tank 1.

The elution circuit is the same elution circuit that was originally designed for the New Gold heap leach operation. The loaded carbon is washed with process water in the carbon transfer column to remove slimes prior to the elution circuit. An eductor, using raw water, transfers the washed carbon to the existing desorption circuit. Barren carbon returning to the adsorption circuit from the carbon regeneration kiln is screened over a vibrating screen to remove fine carbon which is then collected and stockpiled for processing off site. The sized and regenerated carbon reports directly to CIL Tank 6.

Sodium cyanide solution is metered into Leach Tank No. 1 and the design allows for additional cyanide to be metered to other tanks as required. Final pH adjustments are made by the addition of lime to the CIL Tank 1 feed box from a lime slurry ring main system. Tailings slurry from the last CIL tank flows to the vibrating carbon safety screen to recover any carbon that may be present due to damage, wear, or

incorrect installation of the final stage inter-stage screen. Carbon recovered on the screen is delivered to a bulk bag for re-use. Tailings discharging from the carbon safety screen underflow are transferred via gravity to the cyanide detoxification circuit. The leach and adsorption area has three spillage pumps, which deliver any spillage in the area back to the process. Maintenance of the seven hybrid CIL tanks and agitators is achieved using an overhead crane.

#### **17.3.4 TAILINGS**

Tailings are deposited in the tailings dam located at the north of the plant. The use of the East Pond involves pumping the tailings approximately 6.5km and 5.7km for return water. An air/SO<sub>2</sub> cyanide destruction circuit, using sodium metabisulfite (SMBS), lime slurry, and copper sulphate, consists of two tanks in series with a total residence time of 60 min. The circuit lowers the cyanide concentration of the tailings before discharge to the West Pond TSF.

The detoxified tailings will leave the circuit at approximately 36% solids. Water is recovered from the TSF and pumped back to the process plant for consumption or neutralization and discharge. Natural degradation and dilution in the dam reduce the cyanide level further in the return water to a concentration of approximately 10 ppm total cyanide. The majority of this return water is re-used in the process plant.

As the site water balance is positive, a portion of plant water needs to be discharged to the environment, in this case the 'Jornal' Creek.

#### **17.3.5 ELUTION**

The existing Zadra pressure elution circuit and gold room was constructed as part of the original heap leach operation and the CIL plant was configured to use these facilities.

The elution columns are primed with a solution of 0.1% cyanide and 1% caustic soda that is prepared in the electrowinning solution tank. This solution is recirculated through the elution columns at 135°C to promote the elution of gold ions that are adsorbed in the micro pores of the loaded carbon. The heating of the recirculating solution is provided by a 720kW electrical elution heater. The current elution circuit is sized to treat 4.8 t of carbon per day. The elution circuit is currently treating 3 - 4 strips (14.4–19.2 t/d) specifically to minimise gold inventory in circuit. The management of carbon in the circuit requires an optimisation study to evaluate the quantity of gold in inventory and soluble gold loss versus long term elution costs.

#### **17.3.6 CARBON REGENERATION**

Once the acid wash cycle is complete, the carbon is fed to the kiln feed hopper, where the carbon is screw-fed to the kiln dewatering screen, to dewater the carbon to 50% w/w solids. The undersize flow from the kiln dewatering screen is transferred and collected by the acid wash area sump pump. The kiln dewatering screen oversize reports to the kiln feed hopper. Carbon is withdrawn from the kiln feed hopper by a screw feeder and fed to the carbon regeneration kiln.

Carbon regeneration is achieved at a temperature of 700°C. After regeneration, the barren carbon is discharged into the carbon quench tank to reduce the temperature of the carbon to room temperature. The barren carbon is then transferred back to the CIL circuit.

The carbon regeneration kiln acquired from the previous heap leach operation has been extensively refurbished.

### **17.3.7 ELECTROWINNING AND GOLD RECOVERY**

The solution leaving the elution columns passes through two heat exchangers, arranged in series, to reduce the solution temperature to the electrowinning feed tank. The solution flows from the electrowinning feed tank through a bank of four electrowinning cells, where the gold in the solution is deposited on the cathodes within the cells. The barren solution leaves the electrowinning cells and returns to the electrowinning solution tank. This solution is then pumped back through the elution heater to the elution columns. The solution is recirculated through this closed circuit for 12 hr to 15hr, until the deposition of gold onto the cathodes is complete. At the end of the elution cycle, the carbon is transferred to the acid wash column. The barren eluate solution is pumped from the electrowinning solution tank back to the CIL circuit.

The acid wash cycle consists of a six-hour acid wash, in which 15% hydrochloric acid (HCl) is recirculated through the column, followed by a two-hour water wash. The HCl is delivered to the acid wash column by a dedicated acid wash HCl tank and pump set located in the desorption area.

A 15% HCl solution is prepared by diluting 33% HCl from the main acid storage tank with clean water. Wash water is added to the acid wash tank from the main water supply.

The gold room was retained from the previous heap leach operation existing operation and consists of a bank of four electrowinning cells. During the electrowinning process, gold is deposited on the stainless-steel wool cathodes in the cells. Following electrowinning, the sludge containing the gold is dislodged from the cathodes using a high-pressure water spray. The sludge is dried in a drying oven before being combined with fluxes and smelted in a furnace.

There are two operating furnaces, both gas-fired furnaces. In smelting, the doré metal and slag separate in the furnace, the molten slag is transferred to slag pots and the doré metal is cast into bars. Doré bars are cleaned, weighed, stamped, sampled, and then stored in a safe contained within a strong room before dispatch.

## **17.4 ENERGY, WATER, AND PROCESS MATERIALS REQUIREMENTS**

### **17.4.1 ENERGY**

The plant requires 17 MW when treating fresh rock ore, and about 15.5 MW when the mill feed is 30% oxide, 70% fresh rock. The line and backup power supply is discussed in Section 18.8.

### **17.4.2 WATER**

Process water is sourced from the TSF, raw water is sourced from William Creek, and potable water is sourced from treated raw water (see discussion in Section 18.7).

### **17.4.3 PROCESS CONSUMABLES**

The major process materials required include:

- Quicklime (CaO) for pH control;
- Sodium cyanide (NaCN) for gold dissolution and desorption;
- Lead nitrate ( $\text{Pb}(\text{NO}_3)_2$ ) for enhancing gold dissolution;
- Sodium hydroxide (caustic soda; NaOH) for carbon acid washing neutralisation and desorption.
- Hydrochloric acid (HCl) for carbon acid washing;
- Sodium metabisulphite (SMBS) for cyanide destruction;
- Copper sulphate pentahydrate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) for cyanide destruction;
- Flocculant for thickening;
- Anti-scalant to minimise scaling in the process water distribution, reclaim water distribution, fresh water distribution, gland water distribution, and elution circuit;
- Fluxes for smelting;
- Low- and high-pressure air services;
- Oxygen;
- Steel balls for SAG and ball mill grinding media.

## **18. PROJECT INFRASTRUCTURE**

### **18.1 INTRODUCTION**

The Tucano Gold Mine site is located approximately 185 km from Macapá, the capital of Amapá State, on the northern coast of Brazil.

Macapá and the Santana port, approximately 10 km to the southwest of Macapá, are located on the northern bank of the North Canal of the Amazon River. The Santana port can accommodate relatively large ships, as it was built for bulk material handling and has been in use until recently to handle iron ore from the Zamin property, adjacent to the Tucano Gold Mine site, to the southeast.

Macapá is 330 km northwest from Belém, the capital of the state of Pará, on the southern bank of the South Canal of the Amazon River. Belém has approximately 1.5 million inhabitants and has a fairly well-developed industry. It is well connected to the industrial regions in Brazil's southeast and the main hub for the northeast Amazonia region.

An infrastructure location plan is provided as Figure 18-1. Surface infrastructure to support open pit operations is in place, and includes:

- Open pits;
- Waste rock storage facilities.;
- Tailings storage facilities;
- Processing facilities: grinding and CIL facilities, plant administration buildings, plant workshop area, power supply and distribution, sample preparation and assay laboratory, storage area for plant supplies and consumables, and reagent preparation facilities;
- Mine facilities: heavy mining vehicle and light vehicle workshops, warehouse storage facilities, tire shop, refuelling, and washing bays, mine planning, administrative, and messing facilities, and mine control and dispatch room;
- Central administration building and medical facility;
- Geology, survey, mining engineering, supply, environment, and safety offices;
- Mine and exploration sample preparation facilities. Core and sample storage facilities;
- Security office and security gate;
- Nursery;
- Explosives magazine and accessories storage;
- Water management facilities: stormwater and water storage dams, diversions, culverts and purification plant;
- U&M facilities: covered workshop area and stores warehouse;

Geosol Drilling facilities: workshop and storage sea container.

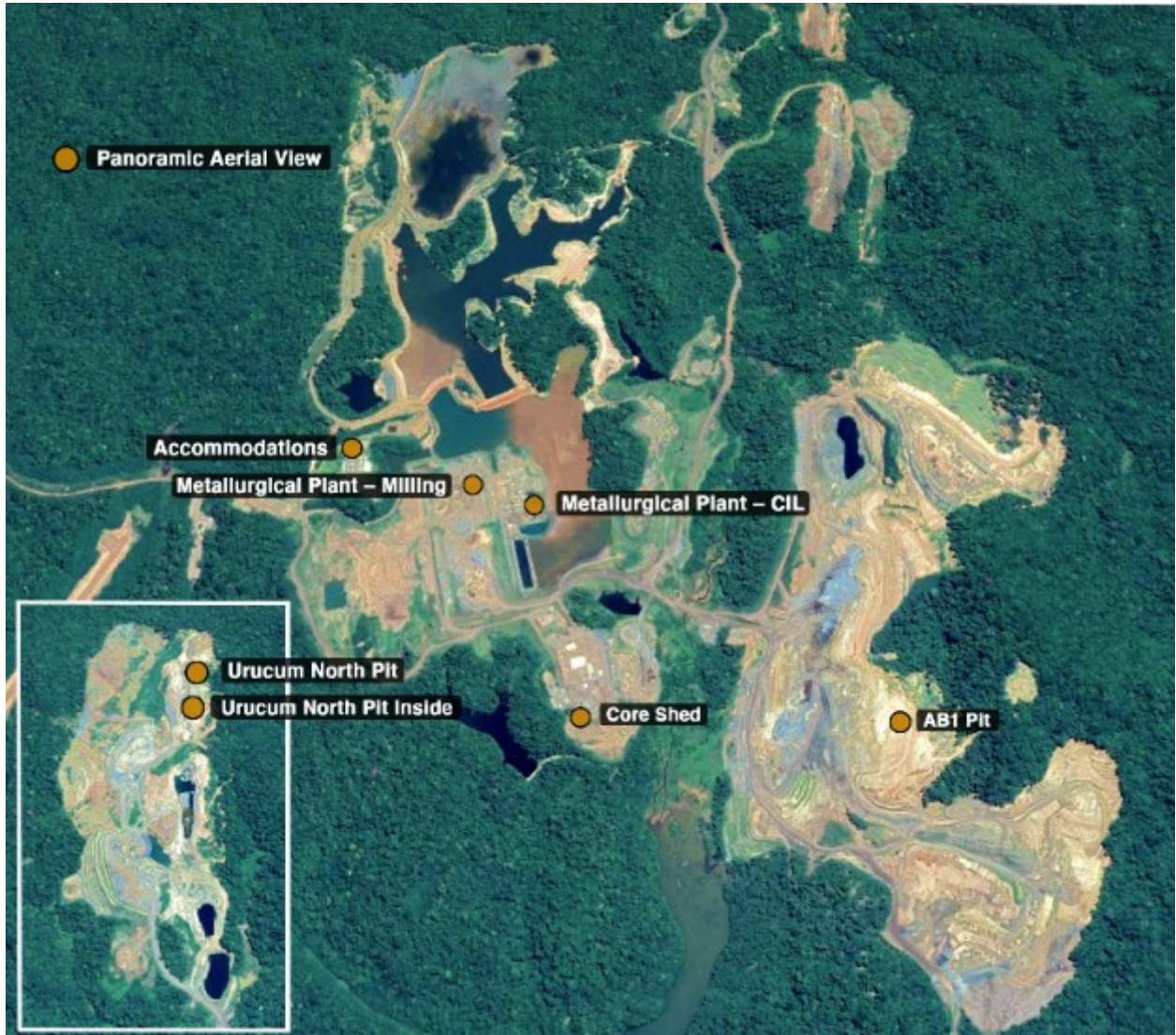


Figure 18-1: Tucano Mine Surface Infrastructure Layout Plan

Note: Figure prepared by Great Panther, 2021

Infrastructure that will be required to support the underground mining operations includes:

- Two 560 kW radial fans for ventilation;
- Mine dry change rooms;
- Lamp room (200 lamp capacity);

- Office facilities (technical services, operations control, electrical and mechanical engineering, and management and supervision);
- Surface workshop (10 t bridge crane, offices for maintenance supervision, toilets and wash basins, workshop area, fuel station, equipment washing area. Mine rescue centre (first aid room, mine rescue and training room);
- Declines;
- Ventilation system;
- Dewatering system;
- Portable electric compressors.

The surface infrastructure was included in the layout in Figure 18-1, and the locations of the declines and ventilation system were shown in Figure 16-10 and Figure 16-11.

## **18.2 ROAD AND LOGISTICS**

Access to the Project is described in Section 5.1.

Diesel for the operation of the mining fleet and for power generation is the main bulk material transported by road to the operations.

## **18.3 STOCKPILES**

Where possible ore is transported directly to the plant however several stockpile areas are designated for use when required. Where possible these are closed stockpiles, being separate piles from individual trucks and are temporary in nature with the main objective of facilitating ore type and grade blending. Once blended open stockpiles are generated close to the crusher hopper for low grade, medium grade, high grade and very high-grade ore.

## **18.4 WASTE ROCK STORAGE FACILITIES (“WRSF”)**

The WRSFs are located as close as practicable to the open pits to minimize haul distances and haul truck cycle time for each pit phase, considering the pit waste disposal requirements, access road and facility layout, and geotechnical parameters (Figure 18-2 and Figure 18-3). A portion of the waste rock from the pit is used for the tailings dam embankment construction.

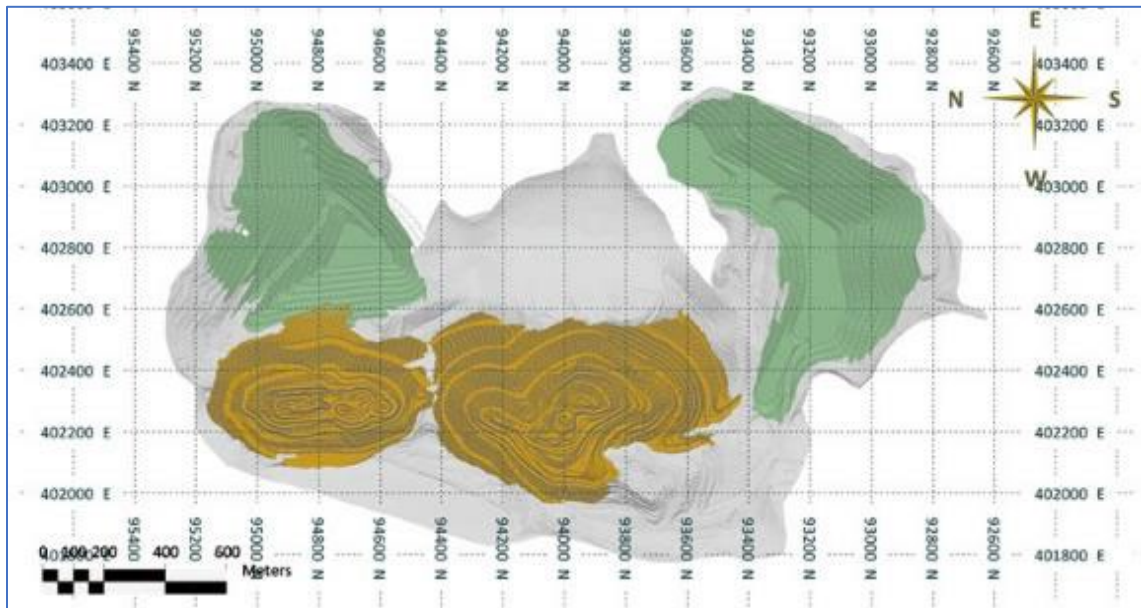


Figure 18-2: WRSF Layout, TAP AB

Note: Figure prepared by Great Panther, 2021. Orange demarcates the open pits and green shows the WRSFs.

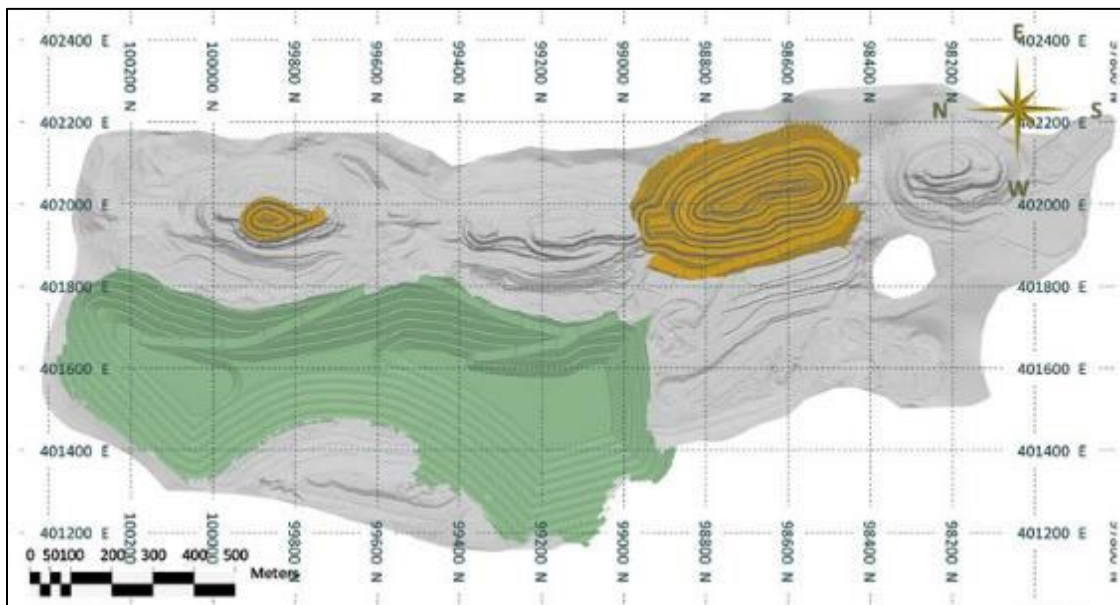


Figure 18-3: WRSF Layout, Urucum

Note: Figure prepared by Great Panther, 2021. Orange demarcates the open pits and green shows the WRSFs.

The WRSF design parameters include:

- Overall dump slope angle of 2.5H:1V or 22°;
- A haulage ramp that is 25 m wide at a 10% gradient;
- A placement swell factor of 1.30 for both oxide rock and broken fresh rock.

The WRSFs are constructed in a bottom-up configuration consisting of 10 m vertical lifts. The designed capacities of the WRSFs have sufficient capacity to accept the entire waste rock volume that will be mined from the open pits.

The WRSFs slope parameters consist of 10 m high lifts with re-shaped 29° face angles, separated by 7 m wide berms, appropriately graded to control water flow. The resultant slope inclination is 22°. Observations and spot measurement of face angles on some as-built dump face angles indicates ranges from 35–38°. These constructions are interim WRSFs that will be re-shaped in the future.

## **18.5 TAILINGS STORAGE FACILITIES (“TSF”)**

The TSF system originally consist of three installations: TAP D (inactive since 2014), North Mill Pond (NMP) with a little remnant capacity and, finally, East Dam, current in operation of tailings disposal. The NMP TSF received a Licence to Operate, valid from November 2015 to November 2021 (six years). In October 2020 the East Dam received its operating licence, valid to 2026

The TSF Performance Management involves a continuous inspection of the TSF structure and monitoring of instruments disposed along the dikes and within the reservoir area. Water monitoring includes pluviometry stations monitored daily and limnimetric measurements to verify the level of the supernatant of the reservoirs. The water table and pore pressure of dikes (embankments) are monitored by INA and piezometers. Monitoring for movement on embankments is controlled by topographic landmarks and/or prisms. During routine inspections key indicators such as anormal seepage, excess humidity on downstream slopes or high turbidity of the water downstream of embankments are immediately diagnosed and treated.

### **18.5.1 EAST DAM, PHASE 1 AND 2**

Currently tailings are being stored in the East Dam Phase 1 TSF facility which is licensed to operate up to elevation 137 m. The construction was completed in November 2020. In October 2020, the operating Licence for Phase 1 (LO Nº. 0035/2020) was issued by SEMA and is valid for the period from October 2020 to October 2026 (six years). The TSF commenced operation in February 2021.

Construction of Phase 2 of the East Dam, up to level 145m is currently underway after receiving an ASV and construction Licence from the environmental authorities. The total combined storage capacity of the East Dam at RL 137 and RL145 is 9.6 Mm<sup>3</sup> which is equivalent to 29 months of operational life at a 3.5 Mt/a throughput rate.

### **18.5.2 FUTURE STORAGE CAPACITY**

Great Panther will extend the tailings storage capacity by commissioning a new TSF. In 2021, a trade-off study between the South Mill Pond (SMP) and West Pond Phase 2 (WPP2) areas was carried out and WPP2 was selected as the most suitable for the Tailings Strategy Plan. Currently, the WPP2 studies are concentrated on geotechnical studies for execution of detailed engineering. Below is an executive summary of WPP2 project:

- Total capacity of 30.84 Mm<sup>3</sup>.of tailings
- Reservoir formed by 10 dikes composed by compacted clay soil, transition (geotextile / sand) and rockfill
- Reservoir total area of 1.7 km<sup>2</sup>
- Around 2 Mm<sup>3</sup> of clay soil/rock material moved
- Maximum dike height of 37,5m
- 8yrs life considering current tailings disposal rate (7.500m<sup>3</sup>/day)

The Figure 18-6 and Figure 18-7 present WPP2 plan view of the reservoir area after 8 yrs disposal and a typical cross section of the embankment, respectively.



Figure 18-4: Overview of TAP D, NMP, WPP1 and East Dam tailings facilities

Note: Figure prepared by Great Panther, 2021.



Figure 18-5: East Dam extension. (EL. 145 m)

Note: Figure prepared by Great Panther, 2021.



Figure 18-6: WPP at 8 years

Note: Figure prepared by Great Panther, 2021.

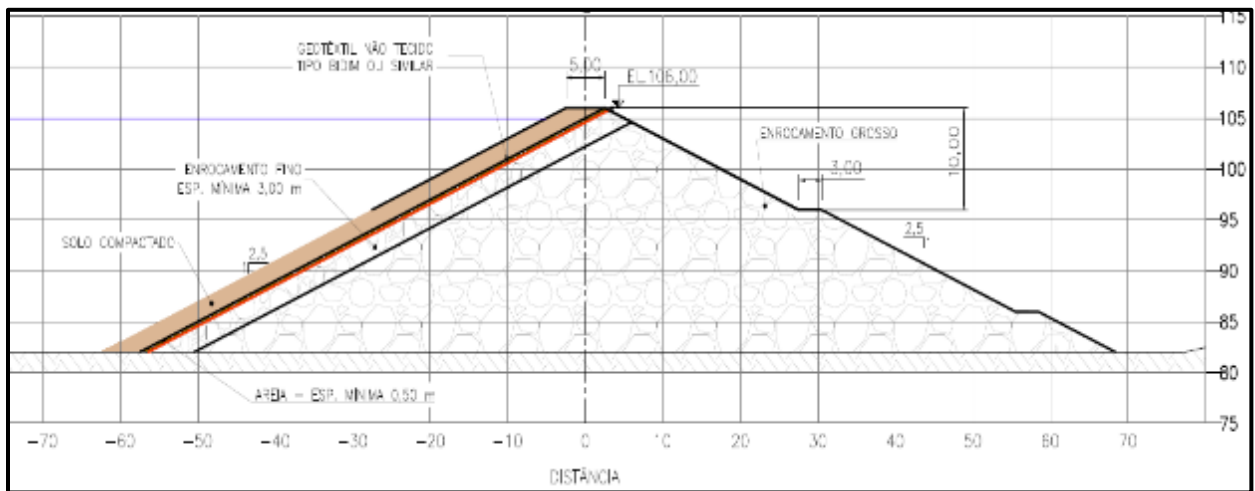


Figure 18-7: Typical Cross-Section of WPP Embankment

#### 18.5.2.1 Permitting of the TSF

TSFs in Brazil require an Operation License issued by SEMA. During the construction phase an Implementation License and deforestation permit (ASV) are required.

The current operating TSFs have been granted operations licences.

- East dam: License 0223/2015 valid from November 2015 to November 2021 (six years), The Phase 1 extension was approved on 27/08/2021 under “Licença de Instalação” nº007/2021 for a period of 5 years.
- The integrated NMP and WPP1 are permitted (Ofício 868/2017 by the Instituto de Meio Ambiente and Regulation Territorial, within the same operational licence.
- The East dam extension phase II, requires two deforestation permits. (ASV) which were granted by the State’s Environmental Secretary.

#### 18.5.2.2 Tailings Federal law

After the Effective Date of this technical report, the Brazilian Mining Authority (“ANM”) emitted a resolution n 95/2022 on February 22, 2022 defining timing and parameters related to the Federal Law nº. 14.066 of September 30, 2020, which treats the requirements for the implementation of new tailings storage facilities. Great Panther is evaluating the impact of these changes on future TSF projects at Tucano, including future potential extensions beyond elevation 145m of the East dam, along with options for future TSFs.

### **18.5.3 CONCLUSIONS**

There are three Tailing Storage Facilities in Tucano Gold Mine, TAP D (inactive since 2014), North Mill Pond (NMP) with remnant capacity and, finally, East Dam, current in operation of tailings disposal. The east storage capacity once the dam is raised to elevation 145m will be 9.5Mm<sup>3</sup> which is equivalent to 29 months of operational life.

Additional storage capacity should be implemented through the construction of a new TSF. This storage facility could provide 30.8 Mm<sup>3</sup> additional capacity.

Great Panther is evaluating the impact of the new Federal Law on future TSF projects at Tucano, including future potential extensions beyond elevation 145m of the East dam, along with options for future TSFs.

### **18.6 WATER MANAGEMENT**

Raw water is sourced from William Creek, and sent to a water collection dam, and pumped to a lined raw water dam, from where it is sent to either the plant raw water tanks for consumption in the plant or to a potable water treatment facility.

Raw water is consumed at an average rate as of 180 m<sup>3</sup>/hr, while existing permits allow for up to 450 m<sup>3</sup>/hr of consumption. About 100 m<sup>3</sup>/hr is directly used to cool the milling equipment. Part of this water evaporates, and the balance is diverted back to the river. The remaining 80 m<sup>3</sup>/hr of water flow, after primary treatment, is used at a rate of 72 m<sup>3</sup>/hr for washing and industrial purposes. The remaining 8 m<sup>3</sup>/hr of water flow are further treated to obtain potable water.

A potable water treatment plant filters and chlorinates the raw water to produce drinking water, which is stored in two potable water tanks.

Process water consists of recycled and other waste streams used in the process, including return water from the TSF. The plant consumes 900 m<sup>3</sup>/hr of process water (100 m<sup>3</sup>/hr are used in the SAG mill feed, 750 m<sup>3</sup>/hr are used at the mill discharge, and an additional 50 m<sup>3</sup>/hr is used for the preparation of reagents). Process water is stored and sourced from a dedicated process water dam. Overflow from the process water dam flows by gravity to the detoxification pond for cyanide destruction prior to discharge to the environment.

### **18.7 CAMPS AND ACCOMMODATION**

Personnel living in Amapá account for approximately 80% of the workforce. Most of the workforce live in towns near the mine site with transport to Serra do Navio and Pedra Branca do Amapari provided by Great Panther daily. Personnel from Macapá also have transport provided by buses on a weekly basis.

Managers and professional staff either commute from the state capital Macapá, or from other cities in Brazil on a fly-in-fly-out basis.

There is a 142-person accommodation camp located to the east of the old leach pads, near the access road to the site.

## **18.8 POWER AND ELECTRICAL**

The Tucano Gold Mine power requirements are provided by two sources:

- 69 kVA, 20 MVA power line established by the “Companhia Electrica do Amapá, which was privatised in November 2021 and is now controlled by Grupo Equatorial Energia (“CEA Equatorial”);
- 12 MW continuous rated Aggreko diesel-powered generation system.

The CEA Equatorial line capacity is currently limited to 20 MVA due to CEA Equatorial distribution transformer limitations of 138 kVA to 69 kVA. A progressive strategy for the upgrade of the power line and transformers of the CEA Equatorial line from 1.8 MW to 11.7 MW is planned. The 70 km long 69 kVA transmission line from the Coaracy Nunes facilities to the Mine has a capacity of 10 MW. A 30 MVA transformer from 138 kVA to 69 kVA to support the expansion of the capacity of the CEA Equatorial line is being evaluated by the new controlling group. This would increase reliability of the service.

## **19. MARKET STUDIES AND CONTRACTS**

### **19.1 MARKET STUDIES**

No market studies are currently relevant as Tucano is an operating mine producing a readily saleable commodity in the form of doré. The doré bars contain approximately 76% gold and 15% silver, the remainder being copper, iron, and other minor metals. Silver credits are received from the refineries. Penalties can be applied in the refining contracts for any impurities; however, these are rare occurrences, and the penalties have not been excessive.

Approximately 70% of the doré is shipped to Asahi Refining Canada (Asahi) in Brampton, Canada and 30% to Metalor Technologies SA (Metalor) in Neuchâtel, Switzerland. The current refining contract with Asahi is valid until the end of December 2021. The refining contract with Metalor is managed through Samsung C&T U.K and is valid until the end of December 2021. In 2022 100% of doré is shipped to Asahi under a contract valid until March 2023.

Brinks – Segurança e Transporte de Valores Ltda (Brinks) is the designated company to transport the doré from the Tucano Gold Mine to the refining facilities. The title change for each shipment occurs typically at the Brampton refinery with Asahi, and Sao Paulo airport for Samsung (Metalor).

The terms and conditions of refining and transportation agreements are considered to be within industry norms. There is some variation depending on the number of ounces per shipment, so an average was used for the economic analysis that supports the Mineral Reserves.

### **19.2 COMMODITY PRICE AND EXCHANGE RATE PROJECTIONS**

Commodity prices used in Mineral Resource and Mineral Reserve estimates are set by Great Panther's corporate office. They are based on consultation with financial and investment institutions and are general consensus of the Company on the short and long-term gold price and exchange rates.

The current gold price provided for Mineral Reserve estimation is \$1,650/oz, and \$1,900/oz for the long-term Mineral Resource estimation.

Exchange rate assumptions used in the economic analysis that supports the Mineral Reserves is BR\$5.00:US\$1.00.

### **19.3 CONTRACTS**

Major contracts include the following:

- Mining 'load and haul': U&M Mineração e Construção S.A. ("U&M") and, Transportes E Construcoes LTDA ("MINAX");
- Mining additional equipment support: F.J dos Santos Service EPP (rockbreaker);
- RC drilling: Geosedna Perfurações Especiais S.A.;

- Diamond drilling: Geosol - Geologia e Sondagens S.A.;
- Fuel supply: Ipiranga Produtos de Petróleo S.A.;
- Power generators: Aggreko Energia Locação de Geradores Ltda.;
- Contract security staff: Segurpro Vigilancia Patrimonial S.A.;
- Catering: JC Refeições Amapari Ltda.;
- Offsite laboratory: SGS Geosol Laboratórios Ltda.;
- Personnel transport: Costa Lima e Souza Empreendimentos Ltda & Raimundo Palmerin de Souza EPP;
- Refining: Asahi and Metalor;
- Refining carbon fines: Umicore.

The various contracts were awarded following a competitive bidding process, prices are within the industry range and comparable to other operations in Brazil. Contracts are negotiated and renewed as needed.

## **20. ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT**

### **20.1 BASELINE AND SUPPORTING STUDIES**

A complete environmental study, permitting, and social/community impact assessment was completed by SRK Consultores do Brasil Ltda (SRK Brazil) in 2011 to satisfy the SEMA requirements for obtaining an Operating Licence for the mining operation including a SAG mill/CIL process plant.

In 2011, SRK Brazil also produced an Environmental Control Plan (PCA) to implement environmental and social controls. The PCA covered the environmental aspects of mining, monitoring and management plans, and provided guidance on implementing various programs in the local communities.

A total of 110 nationally protected species were recorded in the region of the Tucano Operations. Of these protected species, 100 were bird species, including three species with protected habitats, seven were mammalian species, and three were plant species. The operations region also hosts five new plant species and seven other plants of interest (rare or endemic). There are two rare and endemic fish species, which were found in first- and second-order creeks.

In the region of the Tucano Operations, specifically in the municipalities of Pedra Branca do Amapari, Serra do Navio, and Porto Grande, there are 68 identified archaeological sites, most of which are associated with historical and pre-colonial sites.

### **20.2 ENVIRONMENTAL CONSIDERATIONS/MONITORING PROGRAMS**

Great Panther has a number of monitoring or rehabilitation programs in place.

Groundwater and surface water monitoring is performed through daily field checks of monitoring activities and sample collection for chemical analysis at Great Panther facilities. The underground and surface water-monitoring system consists of 29 points:

- 11 points with piezometers.
- 11 surface water monitoring points (river).
- 7 points in the maintenance and fuel station areas to monitor the separation the water and oil in liquid waste capture tanks.

Monthly, quarterly, and semi-annual sample collections are performed, with samples sent to certified external laboratories, and reported as required to the applicable regulatory authorities.

Fauna monitoring programs are conducted by a third-party, Ambiex Industria Comercio e Servicos Ltda., consist of:

- Logging the occurrences of species of mammals, amphibians, reptiles, birds, and fish within the extended operational area of influence;

- Obtaining data on faunal communities;
- Detection and evaluation any interference that could affect faunal communities;
- Development, and continuous improvement of controls and management to mitigate impacts on faunal communities.

Rehabilitation programs include the implementation of a re-vegetation sub-program to rehabilitate degraded areas. An on-site nursery is used to retain genetic material from disturbed plant species for use in planting and re-seeding in conjunction with future rehabilitation and closure activities.

Great Panther periodically submits air quality monitoring reports to regulatory authorities and is regularly audited. Key areas monitored include the exhaust fumes from the generator sets used to generate power, and exhaust fumes from diesel-powered heavy equipment. The concentrations of NO, NO<sub>2</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>, and SO<sub>2</sub> show satisfactory indices below the reference limits of the equipment. Monitoring of total suspended particles indicates that these are highest during periods of low rainfall but are well below the acceptable maximum limits.

Noise is routinely monitored and shows levels below 70 dBA. On site, the compulsory use of individual hearing protection is enforced in areas with operating heavy equipment.

Sedimentation is controlled by collecting water run-off and directing it through planned and monitored surface drainage systems and internal drainage systems (in the case of the WRSFs and open pits), thus allowing for the reduction of solid material suspension before release into existing waterways, primarily William Creek.

In November 2021, Tucano received three Notices of Infraction for an alleged release of cyanide caused by a leak in a reclaimed water pipe at the Tucano mine site. The Company has filed its defence applying for the cancellation of the infraction notices issued by the State Department of the Environment ("SEMA") in connection with SEMA's investigation of a fish mortality event in the Areia and Silvestre Creeks (the "Event"). Preliminary water quality assaying and fish toxicology results, point to the absence of a causal link between the activities of the Tucano mine and the Event. The Company has been working collaboratively with authorities, providing access to all necessary information. Furthermore, the Company reinforces its commitment to the local community and the state of Amapá and has supported the local authorities in their assistance efforts.

## **20.3 CLOSURE PLAN**

Mineral Engenharia e Meio Ambiente Ltda (MEMA), a third-party consultant reviewed and updated the operations closure plan in December 2020 with the inclusion of the Duckhead mine and an update of costs. Closure assumes equipment and facilities dismantling, degraded areas reclamation, and environmental monitoring during (active phase) and after closure (passive phase).

The document complies with NBR 13030 norms regarding rehabilitation and vegetation of areas degraded by mining activities using recovery and revegetation techniques described in the Brazilian Institute of the Environment and Renewable Natural Resources Mining Regulatory Norms (MRN), 19, 20 and 21.

The estimated closure cost is BR\$87.7 million, which approximately equates to US\$17.3 million. The closure plan costs assume a minor contributor from the sale of scrap metal, at BR\$2.4 million (US\$0.6 million).

## **20.4 PERMITTING**

All licences required for the operation of Tucano Gold Mine, mill, processing plant and constructed TSFs (including the East Dam RL 137 m) have been obtained or applications for renewals have been filed. Further permitting will be required with the expansion of existing TSFs as described in Section 18.

The Tucano Mine Operational Licence that was granted on November 8, 2011 is valid until November 9, 2021. The application for renewal was submitted on March 24, 2021 and has been approved by the technical and legal sectors of SEMA. It is currently awaiting the signature of the President of SEMA.

Great Panther expects to receive and maintain all licensing requirements to support production during the LOM plan.

The underground mine is an extension of the current mining operation; however it will require a separate Operating License. This will be applied for after receiving approval of simplified environmental impact report from the environmental authority. (SEMA)

## **20.5 CONSIDERATIONS OF SOCIAL AND COMMUNITY IMPACTS**

An area of approximately 4,000 km<sup>2</sup> is socially affected by the Tucano Operations, and that area includes portions of the municipalities of Serra do Navio and Pedra Branca do Amapari. Tucano employs approximately 1671 people, including direct employees and contractors, and almost 80% are from local communities and towns.

Tucano's social performance team actively engages with the local communities to create and maintain mutually beneficial relationships founded on understanding and optimizing the operation's benefits for local and regional development. The team implements broad stakeholder engagement and social investment programs that focus on three main areas: socio-economic development, public health and safety, and education.

Additionally as part of the Operation Licence requirements, Great Panther annually contributes capital to the Social and Environmental Compensation Funds of the local municipalities of Pedra Branca and Serra do Navio. A council formed by representatives of the communities, City Hall, City Council, and the Company, reviews and evaluates programs to be executed under these agreements, in their respective communities that are subsequently implemented by working collaboratively with local stakeholders.

Examples of social programs recently executed include:

- Family farming: Improving the quality of agricultural products and skills in rural communities;
- Education: supporting local schools to strengthen access to quality education and complement formal education for children and youth in the region;

- Emergency preparedness training: prioritizing the local communities' safety in the operations' areas of influence, seeking to improve community preparedness and emergency prevention initiatives;
- COVID-19: assisting local communities with educational and monitoring programs to minimize the impact of the spread of the virus .

## 21. CAPITAL AND OPERATING COSTS

### 21.1 INTRODUCTION

Capital and operating cost estimates are based on the LOM Plan as of July 31, 2021 which is based on mining and processing existing Mineral Reserves from open pit, underground, and stockpile sources.

The LOM plan assumes contractor-operated open pit mining operations until the third quarter of 2025, and a seven-year underground mine life, also operated by contractors. Processing operations finish in 2029.

Tucano is an operating mine; operating and capital costs are primarily based on actual operating and capital costs.

### 21.2 CAPITAL COST ESTIMATES

#### 21.2.1 OPEN PIT

The open pit capital costs reflect those costs required to maintain the operations during the LOM plan. The total capital costs estimated for the open pit and tailings dam operations totals US\$11.2 million. The cost includes TSF expansion for both open pit and underground processing, power line upgrade, and contractor shop, plant and environmental improvements (Table 21-1).

Table 21-1: Open Pit Capital Costs for LOM

Great Panther Mining Limited – Tucano Gold Mine						
Area	Unit	Total	Y1	Y2	Y3	Y4
Tailings dam expansions	US\$ 000	7,796	4,512	3,284		
Plant improvements	US\$ 000	600	400	200		
Mine Improvements	US\$ 000	967	717	250		
Environmental improvements	US\$ 000	343	173	170		
Power line	US\$ 000	550	250	200	100	
Others	US\$ 000	950	500	250	200	
Total open pit capital cost	US\$ 000	11,206	6,552	4,354	300	

#### 21.2.2 UNDERGROUND

Underground capital costs are estimated as shown in Table 21-2.

Capital lateral development is expected to cost approximately US\$25.3 million over the LOM. This cost excludes material handling costs, power, and diesel costs which have been allocated to operating costs.

The underground infrastructure capital cost estimate is US\$12.01 million. Costs are based on supplier quotations and unit rates from past experience with similar projects. The underground infrastructure costs largely consist of electrical reticulation, ventilation, and dewatering system costs. They do not include mobile equipment capital costs which are included within rates for contractor development and production mining.

**Table 21-2: Underground Capital Cost Estimates**

Area	Unit	Total	Y1	Y2	Y3	Y4	Y5	Y6
Underground lateral development	US\$ 000	<b>25,290</b>	1,990	6,280	6,280	6,270	4,280	190
Underground infrastructure	US\$ 000	<b>12,010</b>	2,730	3,670	3,350	2,170	90	—
Surface infrastructure	US\$ 000	<b>13,030</b>	7,080	3,820	1,010	770	350	—
<b>Total</b>	<b>US\$ 000</b>	<b>50,330</b>	<b>11,800</b>	<b>13,770</b>	<b>10,640</b>	<b>9,210</b>	<b>4,720</b>	<b>190</b>

### 21.2.3 CLOSURE

As described in Section 20.3, closure costs are estimated at US\$17.3 million.

### 21.2.4 CAPITAL COST SUMMARY

The capital cost for the LOM totals US\$62 million, consisting of US\$11.2 million in capital for the open pits and US\$50.3 million in capital for the planned underground.

## 21.3 OPERATING COST ESTIMATES

LOM operating cost estimates include on-site and off-site costs:

- On-site: mining, process plant operating and maintenance, and G&A costs;
- Off-site: doré bullion transport and refining charges, and royalties.

### 21.3.1 OPEN PIT

#### 21.3.1.1 Mining Costs

Open pit operating costs are summarized in Table 21-3 and average US\$2.81/t moved. Costs are sourced from actual 2020/2021 operating costs and the unit mining costs defined in mining contracts. These costs include those of operating the equipment, the labour associated with operating the mine, the cost for explosives and diesel, as well as pit dewatering, road maintenance, and other activities. Key mine operating cost parameters include:

- Continuous 24 hour per day mining operation for 365 days per year.

- Fixed unit contract costs for oxide and fresh ore mining, that include production drilling, blasting, loading, hauling, de-watering, contractor required ancillary equipment and extra works, mine geology, and grade control drilling. These fixed costs are contingent on ore type and haulage distance and vary from US\$1.87–US\$3.16/m<sup>3</sup> for oxide ore and US\$4.77–US\$7.71/m<sup>3</sup> for fresh ore;
- Fixed unit cost of US\$0.85/t for oxide waste rock and US\$1.19/t for fresh waste rock mining that includes production drilling, blasting (where required), loading, hauling, de-watering and contractor ancillary equipment and extra works;
- Fixed mining cost of US\$0.19/m<sup>3</sup> for pre-split drilling (applicable to fresh rock only);
- Fixed crusher feed cost of US\$0.43/t;
- Contractor labour costs are included in unit mining costs;
- Owner labour costs are included in mining and processing costs;
- Mine operating cost estimates are based on a US\$/R\$ exchange rate of 1:4.79;
- No VAT or import duties are included in mining costs.

**Table 21-3: Open Pit Operating Cost Estimate**

Great Panther Mining - Tucano Gold Mine										
Area	Unit	LOM	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023	2024	2025
Mining (OP)	US\$/t moved	2.81	2.48	3.43	2.78	2.48	2.52	2.51	2.58	7.07
Mining (OP)	US\$/t feed	26.62	26.82	33.65	44.94	32.11	21.78	22.18	22.26	41.59
Processing	US\$/t feed	17.77	15.28	18.76	21.11	15.06	15.30	16.50	18.01	29.57
G&A	US\$/t feed	2.21	1.54	2.36	2.65	1.62	1.56	1.93	2.10	7.49
Total	US\$/t	46.6	43.64	54.77	68.70	48.79	38.64	40.61	42.37	78.65

### 21.3.1.2 Process Costs

Process plant operating costs are currently US\$17.77 (refer to Table 21-3). The Tucano plant treats a blend of sulphide and oxide ore and therefore separate costs are not determined. Blending takes into account key ore characteristics such as grade, hardness, sulphide content and sulphide type, amongst other criteria, to optimize feed for the plant.

### 21.3.1.3 General and Administrative Costs

The total unit G&A costs are US\$2.21/t of feed of which US\$1.18/t is considered to be fixed overhead costs.

#### **21.3.1.4 Off-Site Operating Cost**

Gold doré is shipped from the site to the refining company. The current transport costs are estimated at US\$4.37/oz Au and the refining treatment charges are US\$15.45/oz Au.

### **21.3.2 UNDERGROUND**

#### **21.3.2.1 Mining Costs**

LOM mining costs are estimated to be US\$50.00/t of ore milled and total operating costs, inclusive of processing and G&A, are estimated to be US\$75.80/t of ore milled.

The underground operations are assumed to use a contractor for all development and production throughout the LOM. Underground mobile equipment costs are included in the contractor rates for development and production mining. The estimate for the contractor-provided equipment includes the following (based on maximum requirements):

- 1 longhole production drill;
- 6 double-boom jumbos;
- Five 10 t LHDs;
- Five 32.5 t articulated trucks;
- 4 cable bolters and shotcrete machines;
- Ancillary equipment.

Operating cost assumptions for the LOM plan are provided in Table 21-4 by major area, and in Table 21-5 by year.

Table 21-4: Underground Operating Costs by Major Area

Department	Operating Cost (\$M)
Mine	160.70
Surface Handling	2.80
Process plant	39.10
G&A	13.10
<b>Total</b>	<b>161.80</b>

Table 21-5: Underground Operating Costs by Year

Year	Operating Cost (\$M)
Year 1	2.3
Year 2	22.7
Year 3	30.7
Year 4	36.3
Year 5	29.6
Year 6	31.4
Year 7	8.8
<b>Total</b>	<b>161.8</b>

## **22. ECONOMIC ANALYSIS**

Great Panther is using the provision for producing issuers, whereby producing issuers may exclude the information required under Item 22 for technical reports on properties currently in production.

## **23. ADJACENT PROPERTIES**

This section is not relevant to this Report.

## **24. OTHER RELEVANT DATA AND INFORMATION**

This section is not relevant to this Report.

## **25. INTERPRETATION AND CONCLUSIONS**

### **25.1 INTRODUCTION**

The QPs note the following interpretations and conclusions in their respective areas of expertise, based on the review of data available for this Report.

### **25.2 MINERAL TENURE, SURFACE RIGHTS, WATER RIGHTS, ROYALTIES AND AGREEMENTS**

Information provided by Great Panther and experts retained by Great Panther supports the interpretation that the granted mining concessions and exploration permits are valid.

Great Panther holds sufficient surface and water rights to support the LOM plan.

Royalties are payable to the federal government (CBPM), to the State of Amapá (TFRM), to the municipalities of Pedra Branca do Amapari and Serra do Navio, and to certain former tenure holders who were partners in Mineracao Vale dos Reis.

The Project is not subject to any other back-in rights payments, agreements or encumbrances.

To the extent known to the QP, there are no other significant factors and risks that may affect access, title, or the right or ability to support the LOM plan that have not been discussed in this Report.

### **25.3 GEOLOGY AND MINERALIZATION**

The deposits are considered to be examples of Proterozoic orogenic gold deposits with the mineralization at Tucano hosted by banded iron formations and flanking calc-silicate units.

The geological understanding of the settings, lithologies, and structural and alteration controls on mineralization in the different zones is sufficient to support estimation of Mineral Resources and Mineral Reserves. The geological knowledge of the area is also considered acceptable to reliably inform mine planning.

The mineralization style and setting are well understood and can support declaration of Mineral Resources and Mineral Reserves.

Tucano continues to extend the current open pit resources within the mine sequence. In parallel, exploration is drilling the underground potential beneath URN and is focussed on the discovery of new deposits, initially within a 20 km radius of the current mine plant and infrastructure.

Studies are underway to advance the URN underground project with an extensive drilling program executed during 2021. The drill data is being incorporated in mining studies with the objective of a decision on mine development in 2022.

High-grade zones similar to that of the plunging URN high-grade are indicated in the legacy drill data within the mine sequence. The continuity of these zones have not been evaluated at depth and therefore represent exploration opportunities.

An intensive regional exploration program including over 700-line kilometres of multi-element soil sampling was conducted in 2021. This covered high priority exploration corridors along favourable, structural settings and lithologies, interpreted in 2019 from the regional aerogeophysical surveys. These surveys cover approximately 2000 square kilometres of the Vila Nova greenstone belt centred on Tucano. The soil samples are being analysed and interpreted and targets will be prioritized for drilling in the second half of 2022.

## **25.4 EXPLORATION, DRILLING AND ANALYTICAL DATA COLLECTION IN SUPPORT OF MINERAL RESOURCE ESTIMATION**

The exploration programs completed to date are appropriate for the style of the deposits on the Project.

Sampling methods are acceptable for Mineral Resource and Mineral Reserve estimation.

Sample preparation, analysis and security are generally performed in accordance with industry-accepted standards.

The quantity and quality of the lithological, geotechnical, collar and down-hole survey data collected during the exploration and resource delineation drilling programs are sufficient to support Mineral Resource and Mineral Reserve estimation. The collected sample data adequately reflect deposit dimensions, true widths of mineralization, and the style of the deposits. Sampling is representative of the gold grades in the deposits, reflecting areas of higher and lower grades.

The QA/QC programs adequately address issues of precision, accuracy and contamination. Drilling program sampling procedures include the insertion of blanks, duplicates and Certified Reference Material. QA/QC submission rates meet industry-accepted standards.

The data verification programs concluded that the data collected from the Project adequately support the geological interpretations and constitute a database of sufficient quality to support the use of the data in Mineral Resource and Mineral Reserve estimation.

## **25.5 METALLURGICAL TESTWORK**

Tucano is an operating mine. Therefore, metallurgical testwork and associated analytical procedures were appropriate to the mineralization type, appropriate to establish the optimal processing routes, and were performed using samples that are typical of the mineralization styles within the operations area.

Samples selected for testing were representative of the various types and styles of mineralization. Samples were selected from a range of depths within the deposits. Sufficient samples were taken so that tests were performed on sufficient sample mass.

Recovery factors are supported by production data.

Average recoveries from the plant, are independent of deposit but vary considerably as a function of the average grade of the plant feed. Tests indicate average grade recoveries of; above 1.51g/t Au produce recoveries above 93%, between 0.81g/t to 1.50g/t Au at 91% and below 0.80g/t Au at 90% recovery. There is no significant difference between oxide and sulphide ore.

There are no significant deleterious elements.

## **25.6 MINERAL RESOURCE ESTIMATES**

Mineral Resources are reported using the 2014 CIM Definition Standards and assume open pit and underground mining methods.

Factors that may affect the Mineral Resource estimates include: metal price and exchange rate assumptions; changes to the assumptions used to generate the gold grade cut-off grade; changes in local interpretations of mineralization geometry and continuity of mineralized zones; changes to geological and mineralization shape and geological and grade continuity assumptions; density and domain assignments; changes to geotechnical, mining and metallurgical recovery assumptions; change to the input and design parameter assumptions that pertain to the conceptual pit constraining the estimates; and assumptions as to the continued ability to access the site, retain mineral and surface rights titles, maintain environment and other regulatory permits, and maintain the social license to operate.

There is upside potential for the estimates if mineralization that is currently classified as Inferred can be upgraded to higher-confidence Mineral Resource categories.

## **25.7 MINERAL RESERVE ESTIMATES**

Mineral Reserves are reported using the 2014 CIM Definition Standards and are based on open pit mining methods and underground mining methods.

Factors that may affect the Mineral Reserve estimates include: changes to the gold price assumptions; changes to pit slope and geotechnical assumptions; unforeseen dilution; changes to hydrogeological and pit dewatering assumptions; changes to inputs to capital and operating cost estimates; changes to operating cost assumptions used in the constraining pit shell; changes to pit designs from those currently envisaged; stockpiling assumptions as to the amount and grade of stockpile material; geotechnical assumptions used when evaluating the potential economics of URCS; changes to modifying factor assumptions, including environmental, permitting and social licence to operate.

There is upside potential for the estimates if mineralization that is currently classified as Mineral Resources potentially amenable to surface or underground mining methods can be converted to Mineral Reserves following appropriate technical and financial studies.

## **25.8 MINE PLAN**

The open pit mining operations use conventional open pit mining methods and equipment. Mining is conducted by a contractor.

The remaining open pit mine life is three and a half years, to the third quarter of 2025.

Proposed underground mining operations will use a combination of up-hole retreat and Avoca mining methods, both of which are conventional, and will use conventional equipment. Mining will be conducted by a contractor.

The proposed underground mine life is approximately seven years.

## **25.9 GOLD RECOVERY**

The process methods are conventional to the industry. The comminution and recovery processes are widely used in the industry with no significant elements of technological innovation.

The process plant flowsheet design was based on testwork results, previous study designs and industry standard practices.

The process facilities in use are appropriate to the mineralization styles.

The plant will produce variations in recovery due to the day-to-day changes in ore type or combinations of ore type being processed. These variations are expected to trend to the forecast recovery value for monthly or longer reporting periods.

## **25.10 INFRASTRUCTURE**

All of the infrastructure required to support open pit operations is in place.

Additional infrastructure will be required for the underground operations. This includes, on surface, ventilation fans, change rooms, lamp room, office facilities (technical services, operations control, electrical and mechanical engineering, and management and supervision), surface workshop (10 t bridge crane, offices for maintenance supervision, toilets and wash basins, workshop area, fuel station, equipment washing area, and a mine rescue centre (first aid room, mine rescue and training room). Infrastructure in the underground will include the mine portal, twin declines, ventilation and dewatering systems, emergency egresses, refuge chambers and compressed air.

Great Panther employees live in the surrounding communities, or are housed in the on-site camp for those from Macapá or in fly-in fly-out mode.

Two TSFs are planned to be constructed / extended. If constructed, there would be sufficient TSF capacity to store tailings until 2027 at a 3.5 Mt/a throughput rate. Great Panther is currently evaluating the impact of recent tailings Federal law changes on future TSF projects at Tucano, including future potential extensions beyond elevation 145m of the East dam, along with options.

Power requirements are provided by a power line via CEA Equatorial, the local supply authority, and an on-site Aggreko diesel-powered generation system.

## **25.11 ENVIRONMENTAL, PERMITTING AND SOCIAL CONSIDERATIONS**

A complete environmental study, permitting, and social/community impact assessment was prepared in support of the planned operations in 2011. In the same year a PCA was developed to cover the environmental aspects of mining, monitoring and management plans, and provided guidance on implementing various programs in the local communities.

All licences required for the operation of Tucano Gold Mine, mill, processing plant and constructed TSFs (including the East Dam RL 137 m) have been obtained or applications for renewals have been filed. Further permitting will be required for the additional TSFs.

Great Panther expects to both receive and maintain all licensing requirements to support production during the LOM plan.

On completion of technical studies the URN underground project will require approval of the mine plan by the mining authority and by the environmental authority. Preparation of the required documentation is underway.

Closure costs were updated in December 2020 and are estimated at US\$17.3 million.

As part of the Operation Licence requirements, Great Panther annually contributes capital to the Social and Environmental Compensation Funds of the local municipalities of Pedra Branca and Serra do Navio.

Great Panther actively engages with the local communities to create and maintain mutually beneficial relationships founded on understanding and optimizing the benefits the operations can have on regional development. Community relations personnel employed by Great Panther implement broad stakeholder engagement and social investment programs that focus on three main areas: socio-economic development, public health and safety, and education.

## **25.12 MARKETS AND CONTRACTS**

Doré from the mine is readily marketable, and contracts are in place for doré sales.

Commodity prices used in Mineral Resource and Mineral Reserve estimates are set by Great Panther corporate. They are based on consultation with financial and investment institutions and are general consensus by the Company on the short and long-term gold price and exchange rates.

The current gold price provided for Mineral Reserve estimation is \$1,650/oz, and \$1,900/oz for the long-term Mineral Resource estimation.

Exchange rate assumptions used in the economic analysis that supports the Mineral Reserves is BR\$5.00:US\$1.00.

Major contracts include contractor mining, equipment support, RC drilling, fuel supply, power generators, security, catering, assays, personnel transport, and refining. The various contracts were awarded

following a competitive bidding process, prices are within the industry range and comparable to other operations in Brazil. Contracts are negotiated and renewed as needed.

## **25.13 CAPITAL COST ESTIMATES**

Capital and operating cost estimates are based on the LOM plan as of July 31, 2021 which is based on mining and processing existing Mineral Reserves from open pit, underground, and stockpile sources.

The LOM plan assumes contractor-operated open pit mining operations until the third quarter of 2025, and a seven-year underground mine life, also operated by contractors.

Tucano is an operating mine; operating and capital costs are primarily based on actual operating and capital costs.

The total capital costs estimated for the open pit and tailings dam operations totals US\$11.2 million.

Capital lateral development for the underground operations is expected to cost approximately US\$25.3 million over the LOM.

The underground infrastructure capital cost estimate is US\$12.01 million.

## **25.14 OPERATING COST ESTIMATES**

Tucano's operating costs which include mine, plant and G&A for the remaining LOM are estimated over the remaining open pit mine life at US\$46.60 /t feed.

## **25.15 ECONOMIC ANALYSIS**

Great Panther is using the provision for producing issuers, whereby producing issuers may exclude the information required under Item 22 for technical reports on properties currently in production.

## **25.16 RISKS AND OPPORTUNITIES**

### **25.16.1 RISKS**

Permitting is a significant risk to scheduling. This can affect the timing of projects such as the TSF expansion or licensing of the URE open pit or the URN underground project, or in the regional exploration programs for opening access and detailed resource drilling of targets.

Geotechnical conditions are in general good and can be managed, however the mine sequence has been deeply weathered and structurally deformed. As the pits deepen and expand laterally the probability of encountering areas of poor stability increase. However, the company's awareness of these issues has increased and pre-emptive steps are built into general mining procedures.

In 2021 gold production was impacted during the year primarily due to geotechnical issues resulting from pit wall stability in the URCS open pit and additional remediation work needed to ensure safety for

workers. Resources and Reserves for URCS pit have been included in their entirety. Mineral Reserves estimates included in this Technical Report are based on a US\$1,650 per ounce pit-shell with an additional 8.5 million tonne pushback in the west wall. New drilling field investigations performed in February and March 2022 under SRK Consulting's guidance has assisted the Company's efforts on correctly identifying a low angle slip surface causing movement in the west wall. SRK's recommendations for West Wall upper slope design parameters and implementation recommendations have been incorporated into the new pit design and used for fine tuning the URCS pushback. The Company anticipates that the value in the pit will support these further adjustments in the pushback design.

After the Effective Date of this Technical Report, the Brazilian Mining Authority ("ANM") enacted resolution n 95/2022 on February 22, 2022 defining timing and parameters related to the Federal Law nº. 14.066 of September 30, 2020, which treats the requirements for the implementation of new tailings storage facilities. Great Panther is evaluating the impact of these changes on future tailing storage facilities at Tucano, including future potential extensions beyond elevation 145m of our current East dam.

## **25.16.2 OPPORTUNITIES**

The greatest opportunity at Tucano arises out of the limited exploration carried out by previous operators both within the mine sequence and more importantly within a 20-kilometer radius of the Tucano mine plant.

Shallow exploration drilling along the mine sequence continues to incrementally increases the Mineral Reserve base while deeper drilling beneath the URN pit has demonstrates the continuity of a high-grade mineralization zone. The combination of mapping high-grade zones within historic data from mined portions of the Urucum - TAP C trend, together with limited deeper drilling, indicates potential to encounter additional, plunging high-grade zones. These targets require testing.

In 2021, Great Panther carried out extensive (+700 line kilometers) multi-element soil sampling programs on the exploration tenement portfolio, over high potential exploration corridors defined in 2020. The soil program focused on high potential corridors within a 20 km radius of the Tucano plant. Results of this program are being received and interpreted. Prioritized exploration targets will be drill tested in the second half of 2022.

An economic analysis was performed in support of estimation of the Mineral Reserves; this indicated a positive cash flow using the assumptions detailed in this Report. Based on the economic analysis, Great Panther was able to increase the LOM of the open pit Mineral Reserves from the end of 2023 to the third quarter of 2025. In part the increase in Mineral Reserves is due to the increase in gold price from \$1500/oz Au (used in September 30, 2020) to \$1650/oz Au.

However the increase in Mineral Resources and Mineral Reserves is also due to additional drilling and a better understanding of mineralization. The main mineralization trend is well defined with excellent continuity, however the multiple, economically mineralized lenses within the zone are more erratic and less continuous.

As the pits become larger the presence of marginal ore in hanging wall and/or footwall zones that will lie within the wider pits, become increasingly important. This material has to be removed, but in contrast to

non-mineralized waste, it has economic value that offsets operational costs. Delineation of these zones led to a significant increase in mass, slight increase in overall ounces with a reduction in average grade. The higher-grade zones still exist but the amount of low-grade material included in the MRMR has reduced the overall average grade. Identification of the lower grade lenses or haloes will improve mine planning allowing pit designs to optimally extract mineralization.

The URN underground project is a focus of current studies with a major drilling program being completed and mine studies underway. The MRMR estimates for the underground project has not changed in this Technical Report but will be updated once studies are completed, scheduled for late 2022. At the end of 2020, the Company initiated drilling to test continuity of near surface high-grade gold zones for inclusion in the URN open pit design. As drilling progressed and continuity of the zones became more evident, deeper drilling to test high-grade mineralization within the underground mine model was carried out and became a focus in the second half of 2021. After the initial 8,000m program an additional 11,000m program was initiated, scheduled for completion in the second quarter of 2022. In parallel, additional technical studies and permitting programs are underway for the underground project. These studies are critical to developing a detailed schedule to include the URN underground high-grade zone in the LOM plan and demonstrate the potential and importance, of similar but poorly defined high-grade zones along the mine sequence.

### **25.16.3 FORWARD-LOOKING STATEMENTS**

This Technical Report contains forward-looking statements within the meaning of the United States Private Securities Litigation Reform Act of 1995 and forward-looking information within the meaning of Canadian securities laws (together, "forward-looking statements"). Such forward-looking statements may include, but are not limited to, statements regarding (i) the increase in the open pit mine life at Tucano, (ii) when and whether the Company will reach a decision to develop the underground mine at URN, (iii) the potential to increase resources within the mine sequence and near mine through exploration drilling, (iv) the Company's efforts to correctly identify the slip surface causing movement in the west wall of the UCS pit and, (v) the value in the UCS pit being able to support the pushback design of the UCS pit.

These forward-looking statements and information reflect the Company's current views with respect to future events and are necessarily based upon a number of assumptions that, while considered reasonable by the Company, are inherently subject to significant operational, business, economic and regulatory uncertainties and contingencies. These assumptions include: continued operations and exploration work, including plans to complete infill drilling at Tucano in 2022 without significant interruption due to COVID-19 or any other reason; the accuracy of the Company's geological modeling at Tucano and the assumptions upon which they are based, ore grades and recoveries; prices for gold, silver, and base metals remaining as estimated; currency exchange rates remaining as estimated; prices and inflation rates for energy inputs, labour, materials, supplies and services (including transportation); all necessary permits, licenses and regulatory approvals for the Company's operations and exploration work are received in a timely manner on favourable terms, including permitting for tailings dam construction in Tucano, Tucano will be able to continue to use cyanide in its operations; the Company will not be required to further impair Tucano as the current open pit mineral reserves are depleted through mining; the ability to procure equipment and operating supplies without interruption including the Company's ability to work with its

mining contractor in Tucano to resolve equipment availability issues, and that there are no material unanticipated variations in the cost of energy or supplies; operations not being disrupted by issues such as pit-wall failures or instability, mechanical failures, labour disturbances and workforce shortages, illegal occupations or mining, seismic events, and adverse weather conditions; the Company's ability to comply with environmental, health and safety laws; and the Company's ability to maintain its stock exchange listings. The foregoing list of assumptions is not exhaustive.

These forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause the actual results, performance or achievements expressed or implied by such forward-looking statements to be materially different. Such factors include, among others, risks and uncertainties relating to: the impact of COVID-19 on the Company's ability to operate and conduct exploration work, including drilling plans, as anticipated, and the risk of an unplanned partial or full shutdown of the Company's mines and processing plants, whether voluntary or imposed, which would adversely impact the Company's revenues, financial condition and ability to meet its production and cost guidance and fund its capital programs and repay its indebtedness; the inherent risk that estimates of Mineral Reserves and Resources may not be accurate and accordingly that mine production will not be as estimated or predicted; planned exploration activities, including plans for further exploration drilling and infill drilling may not result in the discovery of new Mineral Resources/definition of Mineral Resources and readers are cautioned that Mineral Resources that are not Mineral Reserves have no defined economic viability; there is no certainty that the Company will be able to define a mineral resource with infill drilling; open pit mining operations at Tucano have a limited established mine life and the Company may not be able to extend the mine life for Tucano open pit operations beyond 2025 as anticipated; gold, silver and base metal prices may decline or may be less than forecasted; fluctuations in currency exchange rates (including the U.S. dollar to Brazilian real exchange rate) may increase costs of operations; operational and physical risks inherent in mining operations (including pit wall collapses, tailings storage facility failures, environmental accidents and hazards, industrial accidents, equipment breakdown, unusual or unexpected geological or structural formations, cave-ins, flooding and severe weather) may result in unforeseen costs, shut downs, delays in production and drilling and exposure to liability; potential political and social risks involving Great Panther's operations in a foreign jurisdiction; the potential for unexpected costs and expenses or overruns; shortages in the ability to procure equipment and operating supplies without interruption including the inability of the Company to resolve equipment availability issues with its mining contractor; employee and contractor relations; relationships with, and claims by, local communities; the Company's ability to obtain all necessary permits, licenses and regulatory approvals in a timely manner on favourable terms; changes in laws, regulations and government practices in the jurisdictions in which the Company operates; legal restrictions related to mining; diminishing quantities or grades of mineral reserves as properties are mined operating or technical difficulties in mineral exploration, changes in project parameters as plans continue to be refined; the Company's inability to meet its production forecasts or to generate the anticipated cash flows from operations could result in the Company's inability to meet its scheduled debt payments when due or to meet financial covenants to which the Company is subject or to fund its exploration programs as planned; the Company's ability to raise additional financing to fund its operations, capital requirements or maturing debt obligations as required, the ability to maintain and renew agreements with local communities to support continued operations; ability to identify or complete acquisition opportunities or to complete acquisitions that are accretive to the Company; the

potential for incremental closure bond requirements with respect to the Company's Coricancha mine and whether such requirements would have a material and adverse effect on the company's liquidity and could require additional financing to be raised; the risk that the Company does not maintain its listing on the exchanges where it trades and that any delisting may have a material impact on the liquidity of its stock and its ability to raise capital; the potential for tailings storage facility permitting regulations in Brazil to negatively impact the Company's ability to maintain its existing tailings facilities without any modifications and to secure new tailings capacity at competitive costs or at all; and other risks and uncertainties, including those described in respect of Great Panther, in its most recent annual information form and material change reports filed with the Canadian Securities Administrators available at [www.sedar.com](http://www.sedar.com) and reports on Form 40-F and Form 6-K filed with the Securities and Exchange Commission and available at [www.sec.gov](http://www.sec.gov).

There is no assurance that these forward-looking statements will prove accurate or that actual results will not vary materially from these forward-looking statements. Although the Company has attempted to identify important factors that could cause actual results to differ materially, there may be other factors that cause results not to be as anticipated, estimated, described, or intended. Accordingly, readers are cautioned not to place undue reliance on forward looking statements. Forward-looking statements and information are designed to help readers understand management's current views of our near- and longer-term prospects and may not be appropriate for other purposes. The Company does not intend, nor does it assume any obligation to update or revise forward-looking statements or information, whether as a result of new information, changes in assumptions, future events or otherwise, except to the extent required by applicable law.

#### **25.16.4 INFORMATION CONCERNING ESTIMATES OF MINERAL RESOURCES**

The disclosure in this Technical Report and referred to herein was prepared in accordance with NI 43-101 which differs significantly from the requirements of the U.S. Securities and Exchange Commission (the "SEC"). The terms "measured mineral resource", "indicated mineral resource" and "inferred mineral resource" used in this press release are in reference to the mining terms defined in the 2014 CIM Definition Standards, which definitions have been adopted by NI 43-101. Accordingly, information contained in this Technical Report providing descriptions of mineral deposits in accordance with NI 43-101 may not be comparable to similar information made public by other U.S. companies subject to the United States federal securities laws and the rules and regulations thereunder.

Investors are cautioned not to assume that any part or all of mineral resources will ever be converted into reserves. Pursuant to the 2014 CIM Definition Standards, "inferred mineral resources" are that part of a mineral resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Such geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An inferred mineral resource has a lower level of confidence than that applying to an indicated mineral resource and must not be converted to a mineral reserve. However, it is reasonably expected that the majority of inferred mineral resources could be upgraded to indicated mineral resources with continued exploration. Under Canadian rules, estimates of inferred mineral resources may not form the basis of feasibility or pre-feasibility studies, except in rare cases. Investors are cautioned not to assume that all or any part of an inferred mineral resource is economically or legally mineable.

Disclosure of "contained ounces" in a resource is permitted disclosure under Canadian regulations; however, the SEC normally only permits issuers to report mineralization that does not constitute "reserves" by SEC standards as in place tonnage and grade without reference to unit measures.

Canadian standards, including the 2014 CIM Definition Standards and NI 43-101, differ significantly from standards in the SEC Industry Guide 7. Effective February 25, 2019, the SEC adopted new mining disclosure rules under subpart 1300 of Regulation S-K of the United States Securities Act of 1933, as amended (the "SEC Modernization Rules"), with compliance required for the first fiscal year beginning on or after January 1, 2021. The SEC Modernization Rules replace the historical property disclosure requirements included in SEC Industry Guide 7. As a result of the adoption of the SEC Modernization Rules, the SEC now recognizes estimates of "measured mineral resources", "indicated mineral resources" and "inferred mineral resources". Information regarding mineral resources contained or referenced in this Technical Report may not be comparable to similar information made public by companies that report according to U.S. standards. While the SEC Modernization Rules are purported to be "substantially similar" to the 2014 CIM Definition Standards, readers are cautioned that there are differences between the SEC Modernization Rules and the 2014 CIM Definitions Standards. Accordingly, there is no assurance any mineral resources that the Company may report as "measured mineral resources", "indicated mineral resources" and "inferred mineral resources" under NI 43-101 would be the same had the Company prepared the resource estimates under the standards adopted under the SEC Modernization Rules.

## **26. RECOMMENDATIONS**

### **26.1 GEOLOGY AND MINERAL RESOURCE**

Data generated by Great Panther supporting the 2021 MRMR Estimation meets industry standards for quality assurance and quality control. The 2021 MRMR Estimation is a snapshot of the Mineral Resource and Mineral Reserve as of the effective date of July 31, 2021. Out of the 2021 MRMR Estimation, the resource block model becomes the long-term model for mine planning and the initial starting point for the revised short-term block model which is updated with ongoing grade control, resource definition and exploration drilling.

The block model has a high level of confidence in areas of high-density, grade control drilling but the confidence and resource classification drop as drilling becomes more widely spaced in resource definition and exploration drilling. It is critical that all operational staff understand these limitations and that mine and exploration geology staff maintain the short-term model updated.

Areas for continued improvement in management of the short-term model are;

- in areas of interest, relogging of the key zones of previous / legacy drill holes, to ensure compatibility of logging.
- improved capture and correlation of bench mapping information.
- regular updating of mineralization and lithology / alteration wireframes
- constant verification of grade control drilling against the resource block model to understand variations and identify opportunities. (generally due to data density variations)
- identify areas of low data density that may represent opportunities with additional drilling.

All operational groups within Tucano are striving for constant improvement. It is important that there is good communication between the mining and plant areas to understand variations in mine and plant grades and tonnages to improve processes and performance.

The Tucano mine controls a tenement package that covers a 90 km portion of the poorly explored Vila Nova Greenstone Belt. The only deposit known in the Belt is the Tucano Mine which was discovered as the result of exploration in the late 1990's. Very little regional exploration has been carried out in the last 20 years and Great Panther recognizes that a modern, quality exploration program is overdue.

- In 2020, the Company's regional aerogeophysics was interpreted and prospective structural domains and prospective features identified.
- In 2021, the prospective structural corridors were followed-up with regional multi-element soil geochemistry. Over 700 line kilometers of sampling was completed with final results being received. Exploration targets will be interpreted and prioritized.

- In 2022, the Company should evaluate the use of Big Data and Artificial Intelligence systems in the evaluation of these large aerogeophysical and geochemical datasets.

## **26.2 MINING AND MINERAL RESERVES**

Geotechnical monitoring of open pit stability is imperative to follow best practices for both production and safety reasons. During 2021, Great Panther has taken steps to improve the monitoring process, including the implementation of radar scanning equipment and prioritization of geotechnical monitoring. Data collection, monitoring and data interpretation procedures are being addressed based on recommendations from specialist consultants, leading to an improved understanding of the causes, risks and mitigation alternatives.

## **26.3 UNDERGROUND MINING**

The drill programs initiated in 2021 will complement and guide studies, increasing the geotechnical and hydrogeological understanding of the URN underground deposit and consolidate the design basis for the underground project. In the 2019 Technical Report, RPA made the following recommendations which will be addressed as the studies on the underground project progress:

- Advance the Underground Project to the FS stage. Opportunity exists to stage the Project such that the second ramp is delayed until production from the first ramp proves successful and mining costs are better understood.
- Develop and operate the underground mine with contractors; this resolves any issues regarding supply of an experienced underground work force and allows for a reduction in upfront capital expenditure for mobile equipment.
- Consider using truck haulage for all material movement in the underground mine.
- Carry out further geotechnical analysis to facilitate design and the efficient recovery of pillars. Detailed geotechnical modelling is recommended during the FS stage. This will also assist with understanding of the potential dilution, particularly in the narrower veins.
- Complete further metallurgical test work particularly on the primary sulphide material that will be extracted from underground. There is a risk that unexpected changes to metallurgical performance and gold recovery may occur.
- Complete further environmental work during the FS stage to ensure that the underground operations do not present any issues in terms of environmental compliance. Any compliance issues could inadvertently delay the project or add additional unplanned costs to the project.
- Opportunities exist to reduce capital costs for the underground project through locally constructed surface change rooms and offices rather than rental and may be an inexpensive alternative. The use of less expensive Scania P420 trucks for underground haulage once the decline roadway (floor) has been prepared and graded is also an opportunity. These options should be evaluated during the FS.

## **26.4 MINERAL PROCESSING**

There are many factors that impact mineral processing at the Tucano Mine, these include variations in sulphide type and content, mineralization oxidation, mineralization hardness and the nature of the gold. These factors effect, blending requirements, grinding, and oxygen and cyanide consumption.

Significant improvements have been made in understanding the nature of these issues. Applying this knowledge and further studies to improving process control tools is an ongoing task.

In parallel efforts are required to introduce protocols to map the key characteristics within the Tucano deposits, to where possible, anticipate process control modifications or improve ore blending.

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