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JAGUAR MINING INC.

TECHNICAL REPORT ON THE CAETÉ MINING COMPLEX, MINAS GERAIS STATE, BRAZIL

NI 43-101 Report

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1 SUMMARY

EXECUTIVE SUMMARY

Roscoe Postle Associates Inc. (RPA) was retained by Jaguar Mining Inc. (Jaguar) to assist in the preparation and audit of the Mineral Resource and Mineral Reserve estimates for the Caeté Mining Complex, including the Roça Grande and Pilar mines, located in Minas Gerais, Brazil. The purpose of this report is to support disclosure of the updated Mineral Resources and Mineral Reserves. This Technical Report conforms to NI 43-101 Standards of Disclosure for Mineral Projects. RPA has visited the Caeté Mining Complex several times, with the most recent site visit on December 11, 2018.

Jaguar is a Canadian-listed junior gold mining, development, and exploration company operating in Brazil with three gold mining complexes. Jaguar's principal operating assets are located in a greenstone belt in the state of Minas Gerais, Brazil. The common shares of Jaguar are currently listed on the TSX Exchange under the symbol JAG.

The Caeté Mining Complex is operated by Mineração Serras do Oeste (MSOL), a wholly-owned subsidiary of Jaguar. The Caeté Mining Complex includes the Roça Grande and Pilar mines and a processing plant with a nominal capacity of 2,050 tonnes per day (tpd), with separate tailings disposal areas for both fine flotation tailings and carbon-in-pulp (CIP) tailings. Electrical power supply is provided through the national power grid. The Caeté processing plant is located at the Roça Grande Mine.

The Roça Grande Mine produced at a rate of approximately 200 tpd up to Q1 in 2018, when it was placed on a care and maintenance basis. The Pilar Mine has a multi-year trend of increasing production, with 2018 at an average rate of approximately 1,100 tpd, peaking at 1,500 tpd towards the end of the year and into 2019.

Tables 1-1 and 1-2 summarize the Mineral Resource and Mineral Reserve estimates for the Caeté Mining Complex as of December 31, 2018. Canadian Institute of Mining, Metallurgy and Petroleum (CIM) for Mineral Resources and Mineral Reserves dated May 10, 2014 (CIM (2014) definitions) were followed for Mineral Resources and Mineral Reserves. No Mineral Reserves are currently estimated for the Roça Grande Mine.

TABLE 1-1 SUMMARY OF MINERAL RESOURCES - DECEMBER 31, 2018

Jaguar Mining Inc. – Caeté Mining Complex

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Roça Grande Mine:			
Measured	188	2.14	13
Indicated	889	2.91	83
Sub-total M&I	**1,077**	**2.77**	**96**
Inferred	1,759	3.48	197
Pilar Mine:			
Measured	3,079	4.40	435
Indicated	1,855	3.87	231
Sub-total M&I	**4,934**	**4.20**	**666**
Inferred	1,385	3.61	161
Total, Caeté Mining Complex:			
Measured	3,267	4.26	448
Indicated	2,744	3.56	314
Sub-total M&I	**6,011**	**3.94**	**762**
Inferred	3,144	3.54	358

Notes:

1. CIM (2014) definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au for the Roça Grande Mine and 1.81 g/t Au for the Pilar Mine.
3. Mineral Resources are estimated using a long-term gold price of US$1,400 per ounce for the Roça Grande Mine and US$1,500 per ounce for the Pilar Mine.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reais: 1 US Dollar for the Roça Grande Mine and 3.7 Brazilian Reais: 1 US Dollar for the Pilar Mine.
5. Mineral Resources for the Roça Grande Mine are prepared by depletion of the 2015 grade-block model by the excavation volumes and production as of December 31, 2018.
6. A minimum mining width of two metres was used.
7. Gold grades are estimated using inverse distance cubed interpolation for the Roça Grande Mine and by ordinary kriging for the Pilar Mine.
8. No Mineral Reserves are currently estimated at the Roça Grande Mine. Mineral Resources are inclusive of Mineral Reserves for the Pilar Mine.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

TABLE 1-2 SUMMARY OF PILAR MINERAL RESERVES – DECEMBER 31, 2018
Jaguar Mining Inc. – Caeté Mining Complex

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Proven	1,176	3.79	143
Probable	608	3.47	68
Total	**1,784**	**3.68**	**211**

Notes:
1. CIM (2014) definitions were followed for Mineral Reserves.
2. Mineral Reserves are estimated at a cut-off grade of 1.90 g/t Au.
3. Mineral Reserves are estimated using an average long-term gold price of US$1,300 per ounce and an exchange rate of 3.7 Brazilian Reais: 1 US Dollar.
4. A minimum mining width of two metres was used.
5. Numbers may not add due to rounding.

RPA is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other factors that could materially affect the Mineral Resource and Mineral Reserve estimates.

CONCLUSIONS

MSOL has been successful in increasing Mineral Resources and replacing depleted Mineral Reserves on a year-over-year basis. The Life of Mine Plan (LOMP) for the Caeté Mining Complex forecasts 3.4 years of production at an average of approximately 55,000 ounces of gold per year. The plant has capacity to process more ore, should it become available.

Conclusions by area are discussed in more detail below.

GEOLOGY AND MINERAL RESOURCES

- In RPA's opinion, the Roca Grande and Pilar Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and the estimates comply with CIM (2014) definitions.

Roça Grande Mine

- At a cut-off grade of 1.46 g/t Au, the Measured and Indicated Mineral Resources at the Roça Grande Mine total 1.08 million tonnes, at a grade of 2.77 g/t Au, containing 96,000 ounces of gold. In addition, Inferred Mineral Resources total 1.76 million tonnes, at a grade of 3.48 g/t Au, containing 197,000 ounces of gold.

- The mineralization at the Roça Grade Mine consists of a number of thin, moderately dipping tabular bodies. These tabular bodies are grouped into five Orebodies (RG01, RG02, RG03, RG06, and RG07).

- The main production of the mine has been from the RG01 and RG07 Orebodies, although a small amount of gold was produced by means of open pit mining from the RG03 and RG06 Orebodies. The RG01, RG02, RG03, and RG06 Orebodies are strataform to stratabound mineralized portions of a banded iron formation (BIF) assemblage which dip moderately to the southeast. The RG07 Orebody is comprised mostly of a quartz vein which is hosted by a BIF.

- The updated Mineral Resource estimate for the Roça Grande Mine was prepared based on drilling and channel sample data using a data cut-off date of June 30, 2015. The wireframe models of the mineralization remained unchanged from 2015. The wireframe models of the excavated volumes for the Roça Grande Mine were constructed using the information available as of December 31, 2018.

Pilar Mine

- At a cut-off grade of 1.81 g/t Au, the Measured and Indicated Mineral Resources at the Pilar Mine total 4.93 million tonnes, at a grade of 4.20 g/t Au, containing 666,000 ounces of gold. In addition, Inferred Mineral Resources total 1.39 million tonnes, at a grade of 3.61 g/t Au, containing 161,000 ounces of gold.

- The mineralization at the Pilar Mine comprises a number of sub-parallel, quartz-rich mineralized lenses which have an average strike in the upper levels of the mine of 015°, and dip steeply to the east with an average dip of 65°. The available drill hole information suggests that the strike of the mineralized zones becomes more northerly and the dip of the mineralized zones may begin to flatten to approximately 45° below the 120 m elevation. Three of the mineralized zones (BA, BF, and BF II) have been identified by drill hole and channel sample data to be isoclinally folded, with fold axes that plunge at approximately -40° to the southwest (approximately azimuth 210° to 225°). Many of the remaining mineralized zones (LFW, LPA, LHW, and the Torre Orebodies) are interpreted to be more tabular in overall form. The LPA zone resides in the axial plane of the folded BF zone and thus provides evidence for multiple ages of gold mineralization.

- Examination of the three-dimensional relationship of the Torre Orebody to the modelled outline of the BIF units shows that the overall dip of this mineralization gradually decreases with depth. This occurs with a change in the host rocks of this zone from the BIF to the enclosing chlorite schist units, such that an increased level of vigilance will be required of the core logging geologists to recognize and correctly sample potentially economic mineralization that is located by host rocks other than the BIF.

- The diamond drilling program carried out in 2018 was successful in outlining significant gold grades across mineable widths along the down-plunge continuations of the BA, BF, and BF II Orebodies, below the current active mining areas. The results from these drill holes have been incorporated into the updated block model. This drilling program, along with the normal-course mapping and sampling activities carried out by the mine geologists, has discovered a small, new mineralized zone (BF III).

- As a result of the additional information collected from the recently completed drilling programs, along with production information collected from detailed mapping and sampling programs, the level of understanding of the relationship of the mineralized zones to the host stratigraphy and structure is increasing.

- Reconciliation studies carried out for the 2018 production period clearly demonstrate that the sampling and assaying protocols, along with the block model estimation work flow, are producing reliable predictions of the tonnage and grade received at the processing plant.

- In RPA's opinion, the observed reconciliation variances in the data can be ascribed to four factors:

  - Inaccuracies in the Cavity Monitoring System (CMS) shapes,
  - Inaccurate estimates of the block model tonnages and grades due to the use of incomplete CMS shapes of all excavations for the year's production,
  - The discovery of additional ore during the development process that was not captured by the block model, and
  - Overall block model predicted grades being too high due to slightly optimistic channel sample capping values.

- Additional Mineral Resources are present that reside beyond the Mineral Reserve outlines as a result of the lower cut-off grade used for reporting of Mineral Resources. These are located as remnants above Level 12 (the limit of the current development) or as additional mineralized areas peripheral to the Mineral Reserve outlines in areas located below the current development. Three-dimensional resource polygons were prepared to aid in the estimation and reporting of the Mineral Resources to ensure that the requirement for spatial continuity was met. These resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.

MINING AND MINERAL RESERVES

Roça Grande Mine

- The Roça Grande Mine is presently on care and maintenance. Mineral Reserves are not currently estimated at the mine.

Pilar Mine

- The Pilar Mine is a well-run and professional operation currently producing at 1,500 tpd.

- The Pilar Mineral Reserve estimates were prepared in a professional and diligent manner by qualified professionals and the estimates comply with CIM (2014) definitions.

- At a cut-off grade of 1.90 g/t Au, the Proven and Probable Mineral Reserves at the Pilar Mine comprise 1.78 million tonnes at an average grade of 3.68 g/t Au containing 211,000 ounces of gold.

- Total dilution included in reserves averages approximately 25%, which is in agreement with results for 2018 mining.

- The LOMP for Pilar Mine forecasts 3.4 years of production, at a rate of 1,500 tpd. Gold production is forecast to average 55,000 ounces per year.

- The LOMP cash flow model confirms the economic viability of the Mineral Reserves, at a gold price of US$1,250/oz and an exchange rate of US$1.00=BRL3.70.

PROCESSING

- The processing circuit unit operations are reasonable to recover gold and provide for adequate tailings treatment for cyanide destruction. Operations have improved over time, resulting in higher recoveries, however, full capacity has not been tested due to lack of plant feed.

ENVIRONMENT AND PERMITTING

- RPA is not aware of any environmental liabilities on the property. Jaguar has all required permits to conduct the proposed work on the property. RPA is not aware of any other significant factors and risks that may affect access, title, or the right or ability to perform the proposed work on the property.

LIFE OF MINE PLAN

- The current LOMP leaves capacity for processing more material, should it become available, or conversely, to explore cost saving measures at the plant such as weekend shutdowns at the mill.

- At the current production rate of 1,500 tpd, the mine is approaching the maximum output for continuing at depth. In order to further increase production, a different haulage system would be required. Alternatively, other sustainable sources of ore would be required at the site in order to increase production.

- RPA reviewed capital and operating cost estimates prepared by Jaguar, and found them to be reasonable.

RECOMMENDATIONS

RPA's recommendations by area are summarized below.

GEOLOGY AND MINERAL RESOURCES

Geological Data

- Review surveying practices to ensure that all drill hole collars are accurately located prior to entry into the final drill hole database.

- Review CMS quality control procedures.

- Continue preparation and updating of the written procedures for such tasks as the collection of geological and sampling information, database management, and administration, and preparation of Mineral Resource estimates.

- Carry out a program of re-sampling any unsampled intervals within the mineralized wireframe boundaries, as the availability of drill core permits.

- Update the drill hole sampling protocols to ensure that full sampling coverage is obtained for all mineralized zones as part of the normal-course logging and sampling procedures. Preparation of current drill hole plans and sections by the logging geologist in either physical or digital format that show the location of the current drill

hole relative to the remainder of the drilling information will greatly assist in achieving this goal.

- Amend the data management protocols to include the secured archiving of all digital information that was used to prepare any Mineral Resource or Mineral Reserve estimates on the Jaguar server(s). Primary copies of all digital files could be archived in secured folders on the servers at each of the mine sites, while duplicate copies of all digital files could also be stored in secured folders on the Jaguar Corporate server located in Belo Horizonte.

- Carry out all remedial actions that are available and appropriate to correct the erroneous or suspected erroneous information for those excluded drill holes that are located in the as-yet unmined portions of the Pilar Mine. For those drill holes that remain, RPA recommends that they be removed from the active database into a database that is dedicated specifically for these records.

Assay Laboratory

- The certificate number for each assay batch should be included in the Jaguar internal database (the BDI database).

- The central BDI database should be updated to store drill core recovery, channel sample recovery, and sample tracking (lost sample) information. This will assist in deciding how to address null values in future resource estimates.

- The Quality Assurance/Quality Control (QA/QC) program should be amended to include the channel samples.

- At present, the pulverizers are cleaned with compressed air and a polyester fibre brush after each sample. As a minimum, the pulverizers should be cleaned with a wire brush. No special protocols are in place to clean the pulverizers after passing a sample of known high gold grade. The pulverizers should be cleaned with silica sand after processing each known high grade sample.

- All gold grades are determined by fire assay (FA)–atomic absorption (AA). The AA unit is currently calibrated to direct-read gold values up to 3.3 g/t. Any samples containing gold values in excess of this are analyzed by diluting the solute. High grade samples should be determined using a gravimetric method.

- The assay laboratory automatically re-assays all samples containing gold grades greater than 30 g/t Au, and the average of the re-assays are reported to the sites. All sample results should be reported to the site, without averaging.

- The threshold of 30 g/t Au is high. Re-assay thresholds of 10 g/t Au to 15 g/t Au are commonly used in other gold operations.

- The results from assays of all aliquots should be reported by the laboratory and recorded in the drill hole database. The current database structure will require slight modification to allow for recording of all assay results for a given sample. The final assay for the sample will then be the average of all of the assay results.

Mineral Resources

- Structural mapping information should be integrated with isopach maps of the carbonate iron formation at the Roça Grande Mine and trend analyses of the gold distribution to identify any primary controls on the distribution of the BIF-hosted gold mineralization.

- Preparation of a detailed geological model for the Roça Grande Mine will aid in understanding the controls on the distribution of the gold mineralization.

- Preparation of a three-dimensional model of the major regional fault encountered in the Vale railroad tunnel using all available data will greatly assist in development of exploitation strategies for the Mineral Resources contained within the RG02 Orebody at the Roça Grande Mine.

- Continuation of the detailed geological, alteration, and structural mapping program at the Pilar Mine is warranted. This information will assist in furthering the understanding of the detailed relationships between the host rocks and timing of the various episodes of mineralization and faulting.

- The cut-off grade strategy used for preparation of the mineralization wireframes should be amended to better reflect the potentially economic in-situ gold grades. As a minimum, the mineralization wireframes should be created using a cut-off grade closer to the reporting cut-off grade. By adoption of this strategy, it is anticipated that a lower number of below cut-off grade composite samples will be used in estimation of the block gold grades.

- Collection of detailed density measurements of the mineralization at the Pilar Mine should continue especially for those zones having a low number of density values.

- Wireframe models of the major lithological units should be prepared as aides in coding the density values to the block model.

- The use of a dynamic anisotropy method should be considered for estimation of gold grades into the model.

- In-fill drilling on the RG01 Orebody along the down-plunge projection of the encouraging drilling results is warranted.

- In-fill drilling of the mineralization found below Level 11 at the Pilar Mine is warranted. The goal of this drilling program is to increase the confidence in the distribution of the mineralization and to assist in the preparation of mine development and production schedules.

- Additional work that will provide further detailed information of the gold distribution in the area of the new mineralized zone, BFIII, is warranted and justified.

- A detailed geological review of the controls on the mineralization contained within the SW Orebody at the Pilar Mine should be carried out to aid in selecting high priority areas for future exploration programs.

- The reconciliation procedures should be expanded to evaluate the accuracy of the long-term block model, with and without the channel data, to begin to gauge the optimal drill hole spacing required for preparing Mineral Resource estimates.

- In the events where no CMS model is available for a given excavation volume, the design shape for the excavations in question (suitably modified for the estimated amount of overbreak) should be used as a proxy when preparing the reconciliation reports.

- A detailed evaluation of those Mineral Resources contained within the area of the current mine workings as possible additional feed sources at both the Pilar and Roça Grande mines is warranted.

MINING AND MINERAL RESERVES

- Efforts to reduce dilution should continue with cable bolts and stope pillars, and measurements using CMS should be used to analyze dilution by mining type. Measured results should be used to choose inputs to the reserve estimation process.

- The plans and implementations put in place by the rock mechanics engineers should continue. The implementation of stope pillars, cable bolt designs, and regular maintenance of the main infrastructure should continue.

LIFE OF MINE PLAN

- Review alternative feed sources to utilize unused capacity at the process plant. This is in progress regarding remnant mining in the upper levels, which has increased the Mineral Reserves.

- Review alternatives for the plant operating schedule.

- Continue efforts to exploit the opportunities in the upper areas of the mine to increase the LOMP. There are additional Mineral Resources in the old workings that can potentially be mined at reduced haulage distances. A detailed mining plan and costing is required.

- Consider undertaking studies to explore the opportunities of an open pit at Pilar. There are Mineral Resources close to surface that may potentially be mined using surface mining methods.

TECHNICAL SUMMARY

PROPERTY DESCRIPTION AND LOCATION

The Caeté Mining Complex is located to the east of Belo Horizonte, the capital city of the state of Minas Gerais. The Roça Grande and Pilar mines are located in the municipalities of Caeté and Santa Bárbara, respectively, in the state of Minas Gerais, Brazil. Caeté (35,000 inhabitants) and Santa Bárbara (30,000 inhabitants) are comparably sized towns, located 55

km and 110 km, respectively, from Belo Horizonte. The two towns have good urban infrastructure, including banks, hospitals, schools, and commercial businesses.

The Pilar ore is transported to the plant by trucks using paved and dirt public roads totalling 45 km.

Belo Horizonte is the capital and also the largest city of the state, with a population in excess of four million. It is the major centre for the Brazilian mining industry. A large commercial airport with domestic and international flights services Belo Horizonte, which hosts several state and federal government agencies and private businesses that provide services to the mining industry.

Jaguar maintains a corporate office in Belo Horizonte.

LAND TENURE

The land tenure package for the Caeté Mining Complex comprises 28 mining leases and exploration concessions granted by the National Mining Agency (Agência Nacional de Mineração (ANM), and four surface rights holdings. The mining leases and exploration concessions cover an area totalling 20,023 ha. The surface rights holdings comprise nine separate agreements that cover a total area of 751.17 ha.

Mining leases are renewable annually and have no set expiry date. Each year Jaguar is required to provide information to ANM summarizing mine production statistics.

Jaguar is obligated to pay a royalty equivalent to 1% of net sales to ANM. In addition, one royalty payment (0.5% of gross profits) and three lump sum annual rental payments are associated with the Caeté Mining Complex.

RPA is not aware of any environmental liabilities on the property. Jaguar has all required permits to conduct the proposed work on the property. RPA is not aware of any other significant factors and risks that may affect access, title, or the right or ability to perform the proposed work on the property.

EXISTING INFRASTRUCTURE

The Caeté Mining Complex includes a nominal 2,050 tpd processing plant with separate tailings disposal areas for both fine flotation tailings and CIP tailings. The electrical power supply is provided through the national power grid. The process plant is located at the Roça Grande Mine at an elevation of approximately 1,250 MASL.

An administration complex is located at the entrance to the plant site and includes offices, conference rooms, cafeteria, maintenance shops, compressors (mine and mill), a dry, a first aid station, warehouse, backfill preparation, and a water treatment plant, which is located near the process plant. The assay laboratory and process testing laboratory are also located near the process plant. The Roça Grande Mine is accessed by an adit that is located approximately 800 m to the southwest of the plant at an elevation of approximately 1,100 MASL. Trailers located at the mine adit provide local storage and office space. The explosives and blasting accessories warehouses are located 3.5 km away from the mine area, in compliance with the regulations set forth by the Brazilian Army.

The surface infrastructure at the Pilar Mine is limited to shops, offices, cafeteria, first aid, and warehouse facilities. The mine is accessed by an adit that is located at an elevation of approximately 750 MASL.

HISTORY

Initial exploration activities carried out by Vale between 1973 and 1993 in the Roça Grande Mine area consisted of regional geological, geochemical, and geophysical surveys, along with excavation of a number of exploration trenches and diamond drilling to evaluate the gold mineralization found in the area. Vale also carried out geological mapping, geological interpretation, and exploration and in-fill drilling at the Pilar deposit.

In December 2003, Jaguar acquired the Santa Bárbara property, which includes the Pilar mineral concessions, from Vale. In November 2005, Jaguar entered into a mutual exploration and option agreement with Vale that resulted in final transfer of the Roça Grande concessions to Jaguar in December 2010 and August 2011.

Jaguar initiated exploration activities at Pilar in 2006 and initially contemplated building a processing plant on site, however, the acquisition of the Roça Grande concessions created an

opportunity to develop an expanded project, with greater plant capacity to receive ore from several mineral properties.

In December 2008, Jaguar began transporting ore by truck from the Pilar Mine to the Paciência Plant to supplement the ore being supplied from Paciência Santa Isabel Mine.

In 2007, Jaguar completed a scoping study of the Caeté Project, received the Implementation Licence, and secured the power contract for the start-up. A feasibility study was completed in 2008, and by the end of the third quarter, Jaguar initiated construction for the milling and treatment circuits. After a hiatus due to the 2008/2009 disturbance in global markets, construction resumed and the Caeté processing plant was commissioned in June 2010. The first gold pour was conducted in August 2010 and commercial production was declared in October 2010.

From 2010 to December 31, 2018, gold production from the Caeté processing plant totalled approximately 380,000 ounces from 4.4 million tonnes of feed at an average recovery of 88%.

GEOLOGY AND MINERALIZATION

REGIONAL GEOLOGY

The Roça Grande and Pilar deposits are located in the eastern part of the Iron Quadrangle. Gold has been produced from numerous deposits, primarily in the northern and southeastern parts of the Iron Quadrangle, most hosted by Archean or Early Proterozoic BIFs contained within greenstone belt supracrustal sequences.

In the Brumal region, outcrops belonging to the granitic gneiss basement of the Nova Lima and Quebra subgroups of the Rio das Velhas Supergroup occur. The granitic gneiss basement is comprised of leucocratic and homogeneous gneisses and migmatites, making up a complex of an initial tonalitic composition intruded by Archean-aged rocks of granitic composition. The Rio das Velhas Supergroup is regionally represented by schists of the Nova Lima Group and meta-ultramafic rocks of the Quebra Group including serpentinites, talc schists, and meta-basalts. The rocks of the Nova Lima Group have been folded and sheared along a northeast-southwest regional trend.

Iron formations occur as the only meta-sediments in layers with thicknesses up to 10 m. The Nova Lima Group can be subdivided into two units: a unit consisting of talc chlorites and

intercalations of iron formation, fuchsite schist, quartz sericite schist, and carbonaceous phyllite; and a unit hosting sulphidized gold bearing iron formation and quartz sericite schists.

ROÇA GRANDE DEPOSIT

The Roça Grande Mine is located in the upper unit of the Nova Lima Group. The dominant rock types found in the mine are a mixed assemblage of meta-volcanoclastics and meta-tuffs. These are represented by quartz sericite and chlorite schists with variable amounts of carbonate facies BIF, oxide-facie BIF, meta-cherts, and graphitic schists. The iron formations, chert units, and graphitic schist units are intimately inter-bedded with each other, such that they form an assemblage of chemical and clastic sedimentary units.

Two important BIF horizons are present at the Roça Grande Mine, the North Structure (Structure 1) which hosts the RG01 mineralized body and the South Structure (Structure 2) hosts the RG02, RG03, and RG06 mineralized bodies. The RG07 mineralized body is located immediately in the hanging wall of Structure 1 and is hosted mostly by a quartz vein. The bedding is well defined by the carbonate-facies iron formation and chert found in the BIF horizons, with an overall strike of azimuth 70º to 80º, and dipping approximately 30º to 35º south.

At Roça Grande, gold mineralization is most commonly associated with BIF horizons. In RG01, RG02, RG03, and RG06 mineralized bodies, the gold mineralization is developed roughly parallel to the primary bedding and is related to centimetre-scale bands of massive to disseminated pyrrhotite and arsenopyrite. In many cases, better gold values are located along the hangingwall contact of the iron formation sequence and are hosted by carbonate-facies iron formation. The grades generally decrease towards the footwall where the iron formation becomes more silica-rich.

In the RG07 mineralized body, gold is found to be hosted in quartz veins that are contained within a sericite (chlorite) schist associated with an east-west oriented shear zone.

PILAR DEPOSIT

The Pilar deposit is hosted by the basal units of the Nova Lima Group. The rocks in the region of the mine are comprised of tholeiitic basalts and komatiite flows of the Ouro Fino and Morro Vermelho Units, along with their intrusive equivalents. To the west, these basal units are in fault contact with mica-quartz schists, chlorite-quartz schists, chlorite-sericite schists, and

chemical and clastic sedimentary rocks of the Santa Quitéria Unit. The chemical sedimentary rocks include chert and BIF. To the east, the units are in fault contact with migmatites and granitic gneisses of the Bação Complex that form the basement sequence.

On the mine property, all rock units strike in a northeasterly direction. The regional strike of the units changes to a southeasterly direction to the south of the mine property. Regional mapping has found that the foliations mostly dip steeply to the southeast. The regional-scale thrust faults also strike in a northeasterly direction and dip steeply to the southeast on the mine property.

On the property scale, at least three different orientations of faults are recognized. The earliest fault is the northeasterly-striking regional-scale thrust fault that forms the contact between the Santa Quitéria Unit and the Ouro Fino and Morro Vermelho Units. This thrust fault cross-cuts and terminates a more northerly set of faults that have a strike of approximately 020° and dip steeply to the east. The third set of faults are oriented in an east-west orientation and have subvertical dips. The displacement along these faults has been observed in underground exposures to be in the order of one to two metres.

The host rocks of the mine have been affected by at least one period of folding. Structural mapping on the property has shown that the orientation of the fold axes dip approximately 45° to the southeast (azimuth 135°).

The mineralization at the Pilar Mine is hosted by a number of the host rock units including the BIFs along with mafic schists and talc-chlorite schists. Gold mineralization is associated with sulphide mineralization consisting of arsenopyrite and pyrrhotite. Quartz veins and veinlets can also be present, however, the presence of quartz is not a prerequisite for higher gold values. The sulphide minerals occur mostly as disseminations in the host rock, however, semi-massive to massive concentrations are seen locally over a few tens of centimetres. The majority of the gold mineralization is hosted within folded and faulted carbonate facies iron formations. Quartz veins are typically less than one metre in width.

MINERAL RESOURCES

ROÇA GRANDE

The block model for the Roça Grande Mine is based on drilling and channel sample data using a data cut-off date of June 30, 2015. The database comprises 649 drill holes and 6,517

channel samples. The estimate was generated from a block model constrained by three-dimensional (3D) wireframe models that were constructed using a minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A two metre minimum width criterion was subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of three gram-metres. The gold grades are estimated using the inverse distance cubed interpolation (ID^3) algorithm. A capping value of 30 g/t Au was applied for the RG01 and RG06 Orebodies while a capping value of 50 g/t Au was applied for the RG02, RG03, and RG07 Orebodies. The wireframe models of the mineralization and excavated material for the Roça Grande Mine were constructed using the excavation information as of December 31, 2018.

The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with these orebodies.

The Mineral Resource reports were prepared by creating clipping polygons that were used to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, were located completely within the boundaries of Jaguar's mineral rights holdings at the Roça Grande Mine, possessed a grade times thickness product of at least three gram-metres, and were not located in mined out areas. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off.

PILAR

The updated block model for the Pilar Mine is based on drilling and channel sample data using a data cut-off date of December 31, 2018. The database comprises 1,658 drill holes and 20,698 channel samples. The estimate was generated from a block model constrained by 3D wireframe models that were constructed using a minimum width of two metres. The gold grades are estimated using the ordinary kriging (OK) and ID^3 estimation algorithms. Various capping values were applied to each of the different Orebodies, ranging from 60 g/t Au for the BA Orebody to 20 g/t Au for the LHW Orebody. The wireframe models of the mineralization

and excavated material for the Pilar Mine were constructed using the excavation information as of December 31, 2018.

The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with this deposit.

MINERAL RESERVES

Table 1-2 summarizes the Mineral Reserves for Pilar Mine as of December 31, 2018 based on a gold price of US$1,300/oz. A break-even cut-off grade of 1.90 g/t Au was used to report the Mineral Reserves for the Pilar Mine. While small-scale mining of Mineral Resources continues at Roça Grade Mine, Mineral Reserves are not currently estimated.

Dilution was applied to the designed stopes as planned dilution (portions of the stopes that project outside the resource wireframes) and unplanned dilution (a factor to account for overbreak). Internal and external dilution estimates average approximately 25%.

Extraction (mining recovery) is assumed to be 100%. Although some losses are encountered during blasting and mucking, they are minimal, and reconciliation to mill results indicates that high dilution/high extraction assumptions are in good agreement.

RPA is not aware of any mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

It is RPA's opinion that the Pilar Mineral Reserve estimates were prepared in a professional and diligent manner and that the estimates comply with CIM (2014) definitions.

MINING METHODS

At the Pilar Mine, gold mineralization is contained within a shear zone with an average 50^{o} to 60^{o} dip. The mineralization is structurally complex due to intense folding and displacements (up to one metre) due to local faulting. This results in direction changes and pinching and swelling of the vein over relatively short distances.

There are two mining methods in use. The cut and fill method is utilized in the narrower sections of the deposit, whereas the longhole method is used in the thicker areas. The current LOMP includes longhole mining for a majority of the Mineral Reserves. The 2018 production rates averaged approximately 1,100 tpd. Recently, the mine has increased from three to four eight-hour shifts per day and the production rate has increased to 1,500 tpd.

The mine is accessed from a five metre by five metre primary decline located in the footwall of the deposit. The portal is located at an elevation of 760 MASL. The mine is divided into levels with Level 01 established at an elevation of 690 m. Starting at this point, the level spacing is 75 m vertical, i.e., Level 02 is at an elevation of 615 m, Level 03 at an elevation of 540 m, etc. A three-metre thick sill pillar is left between levels. Sublevels have also been excavated from the main ramp at 15 m vertical intervals to provide for intermediate access to the mining panels. The decline has reached Level 12.

Longhole mining is carried out on a longitudinal retreat sequence, towards a central access. Stopes are 50 m in length and separated by three metre to five metre wide pillars, depending on the thickness of the zone. When the mining of each longhole stope has been completed, the excavation is filled using a combination of development waste and hydraulically placed cemented classified flotation tailings. Once the cement is allowed to set, the next stope in the sequence is drained of excess water and can be mined. The sequence continues until the entire sublevel is mined. Mining then proceeds upward to the next sublevel and the sequence is repeated until the sill pillar is reached. Stopes are mined from several individual levels simultaneously in order to provide the required number of active workplaces needed to meet production targets.

The mine is highly mechanized. Development and mining activities are accomplished with a fleet of two, two-boom, and two one boom electric-hydraulic jumbos. Longhole drilling is completed with three Sandvik production drills. Five 6 yd^3 Load-Haul-Dump (LHD) units are used for mucking. Four 10t Sandvik LH410 LHD units are used for mucking. A fleet of four Volvo A30 articulated trucks and one Iveco 25 t truck and are used to haul broken rock to surface.

LIFE OF MINE PLAN

Stope and development designs, and production scheduling were carried out using Deswik mine design software, and depleted for stopes mined out as of December 31, 2018.

The production schedule covers a mine life of 3.4 years based on current Mineral Reserves, and is summarized in Table 1-3.

TABLE 1-3 LOMP PRODUCTION SCHEDULE
Jaguar Mining Inc. – Caeté Mining Complex

Item	Units	2019	2020	2021	2022	Total
Total Mill Feed	Tonnes (000)	546	538	478	221	1,784
	g/t Au	3.48	3.53	3.97	3.95	3.68
	Ounces (000)	61	61	61	28	211
Recovery	%	90%	90%	90%	90%	90%
Gold Produced	Ounces (000)	55	55	55	25	207

There is capacity for processing more material, up to 2,050 tpd, should it become available, or conversely, to explore cost saving measures at the plant such as batch processing.

Production rates in the LOMP are forecast to be 1,500 tpd. The increase of production is based on adding a fourth shift to the work day and adding haulage equipment to move the ore to surface. The mining sequence provides two active stopes per sublevel, with simultaneous access to multiple sublevels. The current production of 1,500 tpd has been demonstrated to be achievable in the short-term and, in RPA's opinion, this rate can be maintained over the LOMP time period.

As mining advances at depth, the Mine will approach its maximum output due to truck haulage cycle times and ventilation limitations. In order to increase production, alternative workplaces (such as remnant mining or new orebodies) or material handling changes (such as a winze) will be required.

MINERAL PROCESSING

The Caeté processing plant has a design capacity of 720,000 tonnes per year (tpa) of run-of-mine (ROM) ore. In 2018, the plant processed feed from the Pilar and Roça Grande mines. Over the past three years of operation, the Caeté processing plant operated at approximately 60% of its design capacity. This was mainly due to mine feed issues. Absent those issues, tailing filtration capacity would limit the plant to 720,000 tpa.

The overall gold recovery achieved in 2018 was 89%.

The process flowsheet consists primarily of the following unit steps:

- Crushing
- Grinding
- Gravity Gold Recovery
- Flotation
- Leaching and CIP
- Gold Recovery
- Detoxification
- Tailings Disposal

In RPA's opinion, the processing circuit unit operations are reasonable to recover gold and provide for adequate tailings treatment for cyanide destruction. Operations have improved over time, resulting in higher recoveries, however, full capacity has not been tested due to lack of plant feed.

ENVIRONMENTAL, PERMITTING AND SOCIAL CONSIDERATIONS

Jaguar has all required permits to conduct the proposed work on the property.

Jaguar maintains good relationship with local communities participating in many social development projects.

As of December 31, 2018, Jaguar has maintained progressive rehabilitation and reclamation provisions of US$7.2 million for the Roça Grande Mine and the process plant and the Pilar Mine which represent the undiscounted, uninflated future payments for the expected rehabilitation costs.

CAPITAL AND OPERATING COST ESTIMATES

The capital cost estimate for the Caeté Mining Complex were prepared by Jaguar and includes primary access development, mine equipment replacement, plant equipment replacement, sustaining capital, tailings dam expansion, and mine closure. Table 1-4 summarizes the capital costs.

TABLE 1-4 CAPITAL COSTS
Jaguar Mining Inc. – Caeté Mining Complex

Description	Unit	2019	2020	2021	2022+	Total
Mining	US$000	5,541	2,468			8,009
Plant	US$000	1,555	1,555	1,555	1,555	6,218
Sustaining	US$000	4,398	2,881	3,012	3,391	13,683
Closure	US$000	537	1,934	1,942	2,792	7,206
Total	**US$000**	**12,031**	**8,838**	**6,509**	**7,738**	**35,116**

Operating cost estimates for the Caeté Mining Complex were prepared by Jaguar and include mining, processing, and general and administration (G&A) expenses. Table 1-5 summarizes the operating costs.

TABLE 1-5 OPERATING COSTS
Jaguar Mining Inc. – Caeté Mining Complex

Description	Units	2019	2020	2021	2022	Total
Mining	US$/t milled	29.43	29.43	29.43	29.43	29.43
Secondary Development	US$/t milled	12.23	12.23	12.23	12.23	12.23
Contractor	US$/t milled	7.10	7.10	7.10	7.10	7.10
Processing	US$/t milled	30.83	30.83	30.83	30.83	30.83
G&A	US$/t milled	3.47	2.83	2.88	3.24	3.10
Total	**US$/t milled**	**83.06**	**82.42**	**82.47**	**82.83**	**82.69**

2 INTRODUCTION

Roscoe Postle Associates Inc. (RPA) was retained by Jaguar Mining Inc. (Jaguar) to assist in preparation and audit of the Mineral Reserve and Mineral Resource estimates for the Caeté Mining Complex, including the Roça Grande and Pilar mines, located in Minas Gerais, Brazil. The purpose of this report is to support disclosure of the Mineral Reserves and Mineral Resources as of December 31, 2018. This Technical Report conforms to NI 43-101 Standards of Disclosure for Mineral Projects.

Jaguar is a Canadian-listed junior gold mining, development, and exploration company operating in Brazil with three gold mining complexes. The company's principal operating assets are located in a greenstone belt in the state of Minas Gerais, Brazil. The common shares of Jaguar are currently listed on the TSX Exchange under the symbol JAG.

The Caeté Mining Complex is operated by Mineração Serras do Oeste (MSOL), a wholly-owned subsidiary of Jaguar. The Caeté Mining Complex includes the Roça Grande and Pilar mines, a processing plant with a nominal capacity of 2,050 tonnes per day (tpd), with separate tailings disposal areas for both fine flotation tailings and carbon-in-pulp (CIP) tailings. Electrical power supply is provided through the national power grid. The Caeté processing plant is located at the Roça Grande Mine.

The Roça Grande Mine produced at a rate of approximately 200 tpd up to Q1 in 2018, when it was placed on a care and maintenance basis. The Pilar Mine has a multi-year trend of increasing production, with 2018 at an average rate of approximately 1,100 tpd, peaking at 1,500 tpd towards the end of the year and into 2019.

SOURCES OF INFORMATION

A site visit to the Pilar Mine was carried out by Mr. Jeff Sepp, P.Eng., RPA Senior Mining Engineer, on December 10, 2018. Mr. Sepp was accompanied by Mr. Jon Hill, Exploration & Geology Expert Advisor, and by Mr. Helbert Taylor Vieira, Resources and Reserves Manager, of Jaguar. RPA had previously visited the two mines in November 2014 and again in 2017.

A summary of the Jaguar staff and its consultants, other than the named authors of this Technical Report who contributed to the preparation of the Mineral Resource and Mineral Reserve estimates for the Pilar and Roça Grande mines, is presented below.

Name	Position	Company
Benjamin Guenther	Chief Executive Officer	Jaguar
Kevin Weston	VP - Operations	Jaguar
Hashim Ahmed	Chief Financial Officer	Jaguar
Jonathan Victor Hill	Exploration & Geology – Expert Advisor	Jaguar
Jean-Marc Lopez	Technical Advisor to the Board	Jaguar
Eric Duarte	General Manager	Jaguar
Elias de Oliveira Andrade	Technical Service Manager	Jaguar
Helbert Taylor Vieira	Resources and Reserves Manager	Jaguar
Armando José Massucato	Exploration Manager	Jaguar
Tiago Pedro de Souza	Geology Coordinator	Jaguar
Hugo Leonardo de Avila Gomes	Resource Geologist	Jaguar
André Moura de Alcântara	Geotechnical Geologist	Jaguar
Igor Saraiva	Mine Planning Coordinator	Jaguar
Anderson José Gonçalves	Mine Planning Engineer	Jaguar
Carolina Cardoso Takano	Mine Planning Engineer	Jaguar
Wálmiron Emanuel Tette	Mine Planning Technician	Jaguar
Samuel Faria de Souza Ameno	Mine Planning Technician	Jaguar
Rogerio de Lima Lopes	Operational Mine Manager	Jaguar
Aloma Cruz Tente	Mine Geologist	Jaguar
Jussara de Fátima Toffoli	Mine Geologist	Jaguar
Fabrício Gonçalves Barcelos	Database Geology Technician	Jaguar
Alessandra Gracietti Teixeira	Database Technician	Jaguar
Nigel Wesley Oliveira Fernandes	GIS Technician	Jaguar
Mauro França Correia	Geology Technician	Jaguar
Jose Fernando Vinaud	Mineral Rights Technician	Jaguar
Edson Cassemiro	Metallurgical Plant Manager	Jaguar
Marco Antonio Fernandez P.Silva	Environment manager	Jaguar
Ana Thereza Nápoles Balbi	Institutional Relationship	Jaguar
Rayssa Garcia de Sousa	Environment Coordinator	Jaguar
Daniel Pires de Oliveira	Environment analyst	Jaguar
Francisco Bittencourt Oliveira	Senior Mining Engineer	MCB Serviços e Mineração
Sérgio Sartori	Senior Mining Engineer	MCB Serviços e Mineração
Bruno Tomaselli	Senior Mining Engineer	MCB Serviços e Mineração

Mr. Sepp, P.Eng., RPA Senior Mining Engineer, Mr. Reno Pressacco, M.Sc.(A), RPA Principal Geologist, and Mr. Avakash Patel, P.Eng, RPA Vice President, Metallurgy and Principal Metallurgist, are the Qualified Persons for this Technical Report. Mr. Sepp prepared Sections

15, 16, 18 to 22, and 24. Mr. Pressacco prepared Sections 4 to 12, 14, and 23. Mr. Patel prepared Sections 13 and 17. All authors share responsibility for Sections 1, 2, 3, 25, 26, and 27 of this Technical Report.

The documentation reviewed, and other sources of information, are listed at the end of this report in Section 27 References.

LIST OF ABBREVIATIONS

Units of measurement used in this report conform to the metric system. All currency in this report is US dollars (US$) unless otherwise noted.

a	annum
A	ampere
bbl	barrels
btu	British thermal units
°C	degree Celsius
C$	Canadian dollars
cal	calorie
cfm	cubic feet per minute
cm	centimetre
cm^2	square centimetre
d	day
dia	diameter
dmt	dry metric tonne
dwt	dead-weight ton
°F	degree Fahrenheit
ft	foot
ft^2	square foot
ft^3	cubic foot
ft/s	foot per second
g	gram
G	giga (billion)
Gal	Imperial gallon
g/L	gram per litre
Gpm	Imperial gallons per minute
g/t	gram per tonne
gr/ft^3	grain per cubic foot
gr/m^3	grain per cubic metre
ha	hectare
hp	horsepower
hr	hour
Hz	hertz
in.	inch
in^2	square inch
J	joule
k	kilo (thousand)
kcal	kilocalorie
kg	kilogram
km	kilometre
km^2	square kilometre
km/h	kilometre per hour
kPa	kilopascal
kVA	kilovolt-amperes
kW	kilowatt
kWh	kilowatt-hour
L	litre
lb	pound
L/s	litres per second
m	metre
M	mega (million); molar
m^2	square metre
m^3	cubic metre
µ	micron
MASL	metres above sea level
µg	microgram
m^3/h	cubic metres per hour
mi	mile
min	minute
µm	micrometre
mm	millimetre
mph	miles per hour
MVA	megavolt-amperes
MW	megawatt
MWh	megawatt-hour
oz	Troy ounce (31.1035g)
oz/st, opt	ounce per short ton
ppb	part per billion
ppm	part per million
psia	pound per square inch absolute
Psig	pound per square inch gauge
R$ or BRL	Brazilian Real
RL	relative elevation
s	second
st	short ton
stpa	short ton per year
stpd	short ton per day
t	metric tonne
tpa	metric tonne per year
tpd	metric tonne per day
US$	United States dollar
USg	United States gallon
USgpm	US gallon per minute
V	volt
W	watt
wmt	wet metric tonne
wt%	weight percent
yd^3	cubic yard
yr	year

3 RELIANCE ON OTHER EXPERTS

This report has been prepared by RPA for Jaguar. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to RPA at the time of preparation of this report, and
- Assumptions, conditions, and qualifications as set forth in this report.

For the purpose of this report, RPA has relied on ownership information provided by Jaguar. RPA has not researched property title or mineral rights for the Roça Grande and Pilar mining operations and expresses no opinion as to the ownership status of the property.

RPA has relied on Jaguar for guidance on applicable taxes, royalties, and other government levies or interests, applicable to revenue or income from the Roça Grande and Pilar mining operations.

Except for the purposes legislated under provincial securities laws, any use of this report by any third party is at that party's sole risk.

4 PROPERTY DESCRIPTION AND LOCATION

The Roça Grande and Pilar mines form the Caeté Mining Complex, located to the east of Belo Horizonte, the capital city of the state of Minas Gerais (Figures 4-1 and 4-2). Both mines share the same milling complex and are reported together in this Technical Report. The Caeté processing plant is located at the Roça Grande Mine where ore produced by the Pilar Mine is processed. The Roça Grande Mine was placed on care and maintenance in Q1 2018. The Roça Grande and Pilar mines are located in the municipalities of Caeté and Santa Bárbara, respectively, in the state of Minas Gerais, Brazil. Caeté (35,000 inhabitants) and Santa Bárbara (30,000 inhabitants) are comparably sized towns, located 55 km and 110 km, respectively, from Belo Horizonte. The two towns have good urban infrastructure, including banks, hospitals, schools, and commercial businesses.

From Caeté, the main access to the plant site and to the Roça Grande Mine is by a seven kilometre public dirt road that links Caeté to the town of Barão de Cocais. The Roça Grande Mine has geographic coordinates of 19°57’ S latitude and 43°38’ W longitude.

The Pilar ore is transported to the Caeté processing plant by trucks using paved and dirt public roads totalling 45 km. The Pilar Mine has geographic coordinates of 19°58’4.43” S latitude and 43°28’ 25.70” W longitude.

Belo Horizonte is the capital and also the largest city of the state, with a population in excess of four million. It is the major centre for the Brazilian mining industry. A large commercial airport with domestic and international flights services Belo Horizonte, which hosts several state and federal government agencies and private businesses that provide services to the mining industry.

Jaguar maintains a corporate office in Belo Horizonte.

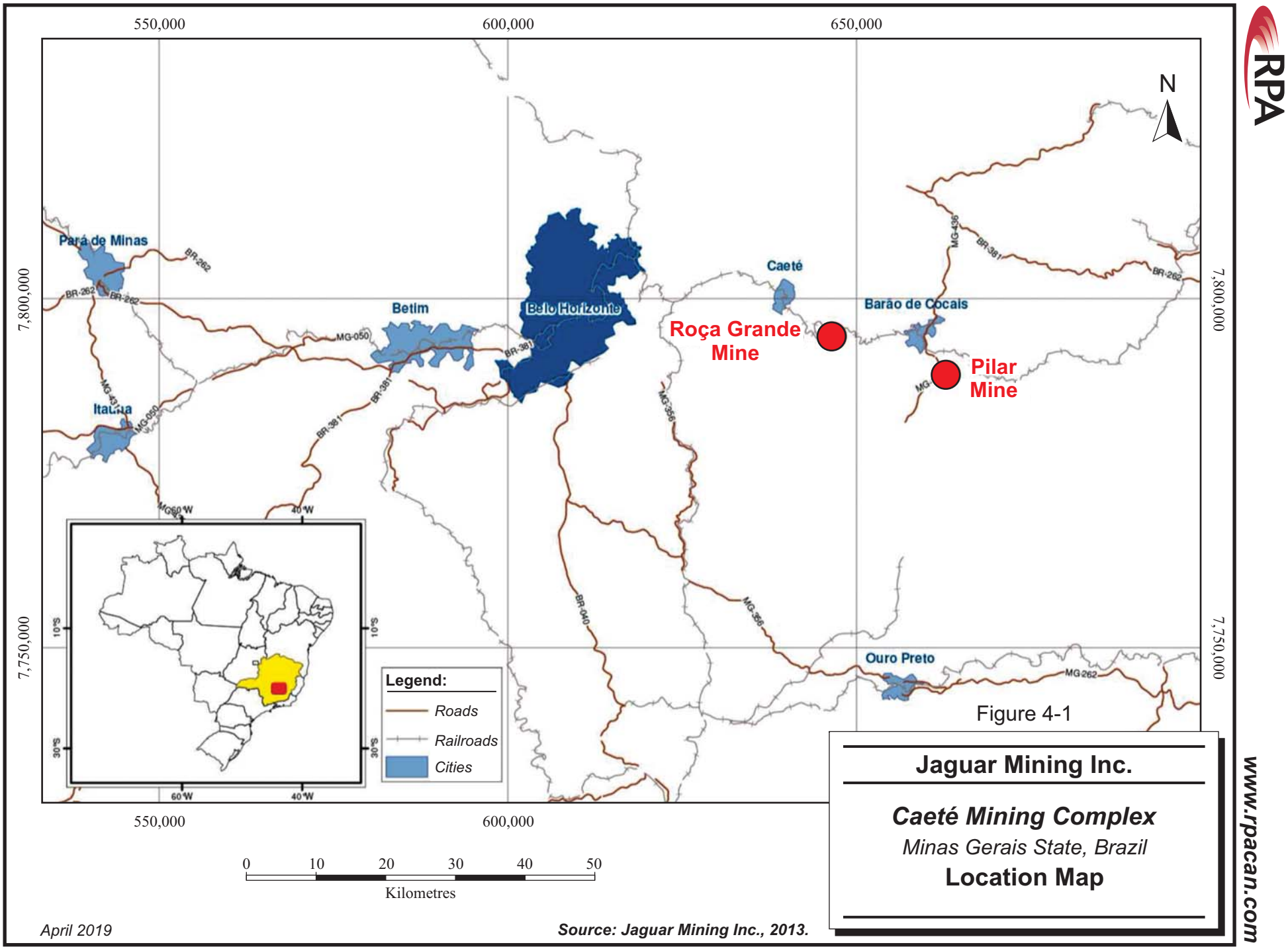

Figure 4-1

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Location Map

April 2019

Source: Jaguar Mining Inc., 2013.

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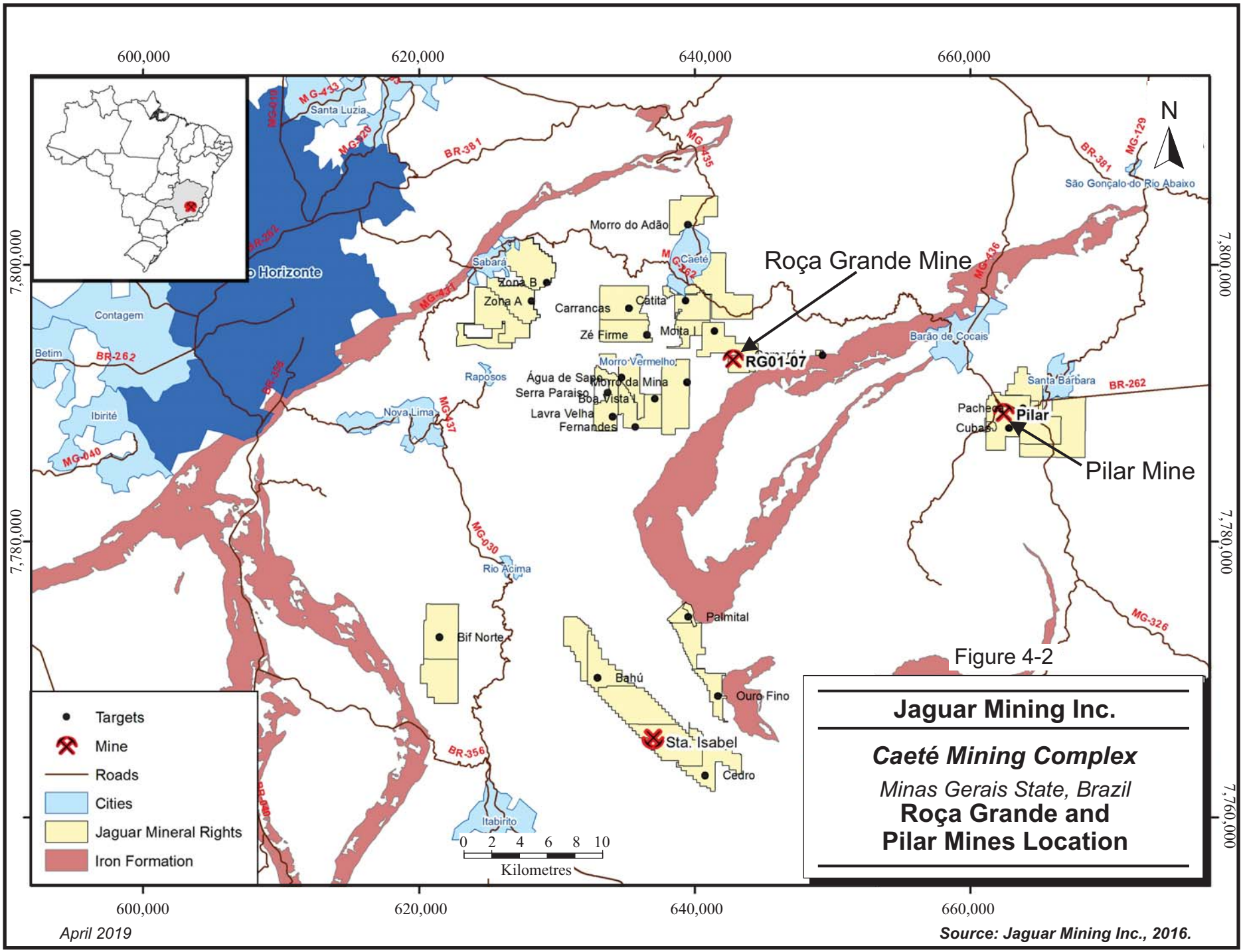


Figure 4-2

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Roça Grande and Pilar Mines Location

April 2019

Source: Jaguar Mining Inc., 2016.

MINERAL TENURE AND SURFACE RIGHTS

The land tenure package for the Caeté Mining Complex comprises 28 mining leases and exploration concessions granted by the Agência Nacional de Mineração (ANM), and four surface rights holdings (Figures 4-3 and 4-4). The mining leases and exploration concessions cover an area totalling 20,023 ha (Table 4-1). The surface rights holdings comprise nine separate agreements that cover a total area of 751.17 ha (Table 4-2).

TABLE 4-1 SUMMARY OF MINERAL RIGHTS HOLDINGS
Jaguar Mining Inc. – Caeté Mining Complex

ANM Tenement	Target	Area (ha)	Licence No.	Licence Published in	Licence Renewal Date	Status
			Pilar:			
830.187/2004	Cubas	600	3867	05/05/2004	05/03/2007	Exploration Licence Renewal Application
830.463/1983	Pilar	961.66	206	17/08/2005		Mining Concession
831.878/2013	Pilarzinho	35.33	13494	30/08/2018		Renewal Application
830.402/2016	Pilar	1,237.98	2578	17/03/2016	16/01/2019	Exploration Licence
831.233/2017	Pilar	1,227.97				Exploration Application
Sub-total, Pilar		**4,062.94**				
			Caeté Complex:			
430.001/1935	Zona A	1,000.01	229	24/07/1996		Mining Concession
430.002/1935	Zona B	654.41	236	25/07/1996		Mining Concession
807.482/1976	Boa Vista	675.18	322	21/10/2009		Mining Concession
830.037/2015	Camará 1	8.15				Exploration Application
830.038/2015	Camará 2	12.72				Exploration Application
830.807/2017	Fazenda Gerisa	1,000				Mining Concession Application
830.935/1979	Morro do Adão	728.38	933	19/07/1990		Mining Concession Application
830.938/1979	Catita	521.7	264	03/09/2009		Mining Concession
830.940/1979	Juca Vieira	285.32	246	22/07/1993		Mining Concession
831.056/2010	RG 3	706.03				Mining Concession Application
831.057/2010	RG 1,2,5,6 and 7	193.08	105	28/03/1996		Mining Concession Application
831.196/2008	Fazenda dos Cristais	106.93				Exploration Application
831.282/2002	Arr.Velho de Santana	884.7	6047	12/05/2006		Exploration Licence Renewal (Positive Final Report filed)
831.371/2003	Morro Vermelho	583.42	1433	05/06/2008		Exploration Licence Renewal (Positive Final Report filed)
831.580/2018	Fazenda dos Cristais	313.76				Exploration Application
831.817/2003	Córrego Brandão	1,583.69	8078	06/12/2016		Exploration Licence Renewal Application
832.022/2018	Florália	1,618.45				Exploration Application
832.023/2018	Florália	1,500.51				Exploration Application
832.098/2018	Bahú	1,283.87				Exploration Application
832.230/2003	Fazenda Cristais	339.99	9512	06/12/2016		Exploration Licence Renewal Application
832.152/2002	Fazenda Furnas do	600.24	8782	26/04/2006		Mining Concession Application

ANM Tenement	Target	Area (ha)	Licence No.	Licence Published in	Licence Renewal Date	Status
834.126/2007	Cotão Carrancas	808.95	127	19/03/2013		Exploration License Renewal
834.409/2007	Água de Sapo	550.61	147	19/03/2013		Exploration License Renewal (Positive Report filed)
830.807/2017	Morro da Mina	1.00				Mining Concession Application
Sub-total, Caeté		**15,960**				
Total, Pilar & Caeté		**14,199.52**				

TABLE 4-2 SUMMARY OF SURFACE RIGHTS HOLDINGS
Jaguar Mining Inc. – Caeté Mining Complex

Fazenda	Area (ha)	Registry No.	Orebody or Utility		20% Area Forest Legal Reserve
Velha/Navantinho Peixoto	140.00	Pending	Moita II	Inactive	Legal reserve area of 28.52 ha
Trindade	184.78	2920	Camará II	Inactive	Legal reserve area of 71.43 ha
Roça Grande	41.65	13171	Moita I Dam	Inactive	Legal reserve area of 9.23 ha
Roça Grande	177.71	13172	RG01, RG07 and RG05	Active	Not Available
Gongo Soco	64.00	8854	RG02, RG03 and RG06	Active	Not Available
Serra Luis Soares	9.38	13170	Processing Plant	Active	Not Available
Serra Luis Soares	99.47	12734	RG02W, Processing Plant and Waste Dump	Active	Not Available
Santa Rita	23.55	11379	Catita I	Inactive	The legal reserve area of 4,29 ha
Serra Luis Soares/Saint Gobain	10.63	17033	Mechanic Workshop	Active	Not Available
Total	**751.17**				

Mining leases are renewable annually and have no set expiry date. Each year Jaguar is required to provide information to ANM summarizing mine production statistics. Exploration concessions are granted for a period of three years. Once a company has applied for an exploration concession, the applicant holds a priority right to the concession area as long as there is no previous ownership. The owner of the concession can apply to have the exploration concession renewed for one-time extension for a period of two or three years. Renewal is at the sole discretion of ANM. Granted exploration concessions are published in the Official Gazette of the Republic (OGR), which lists individual concessions and their change in status. The exploration concession grants the owner the sub-surface mineral rights. Surface rights can be applied for if the land is not owned by a third party.

The owner of an exploration concession is guaranteed, by law, access to perform exploration field work, provided adequate compensation is paid to third party landowners and the owner accepts all environmental liabilities resulting from the exploration work. The exploration permits are subject to annual fees based on its size.

The location of the mineralized wireframes in relation to the property boundaries for the Roça Grande Mine and the Pilar Mine are shown in Figures 4-5 and 4-6, respectively.

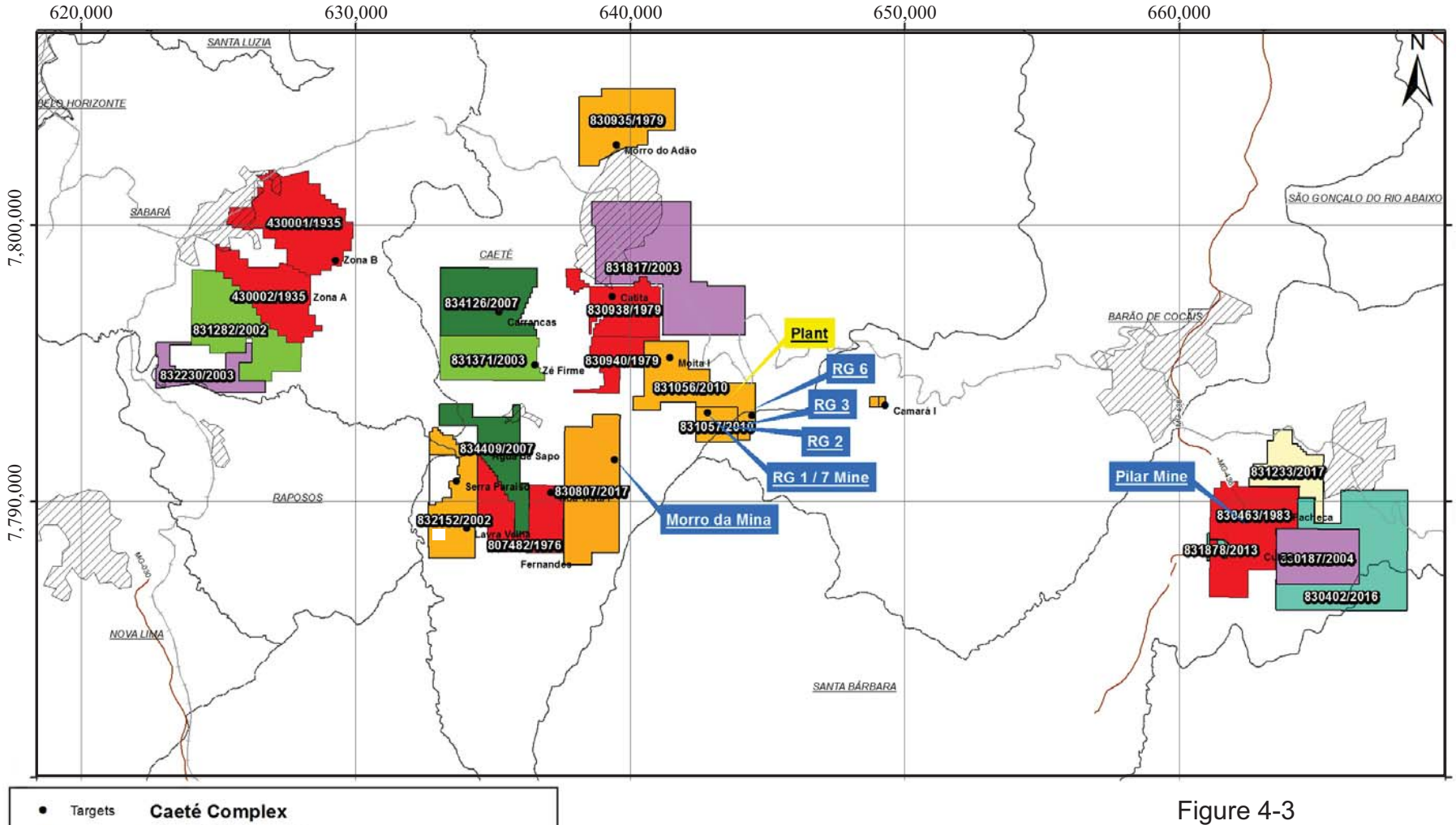


Figure 4-3

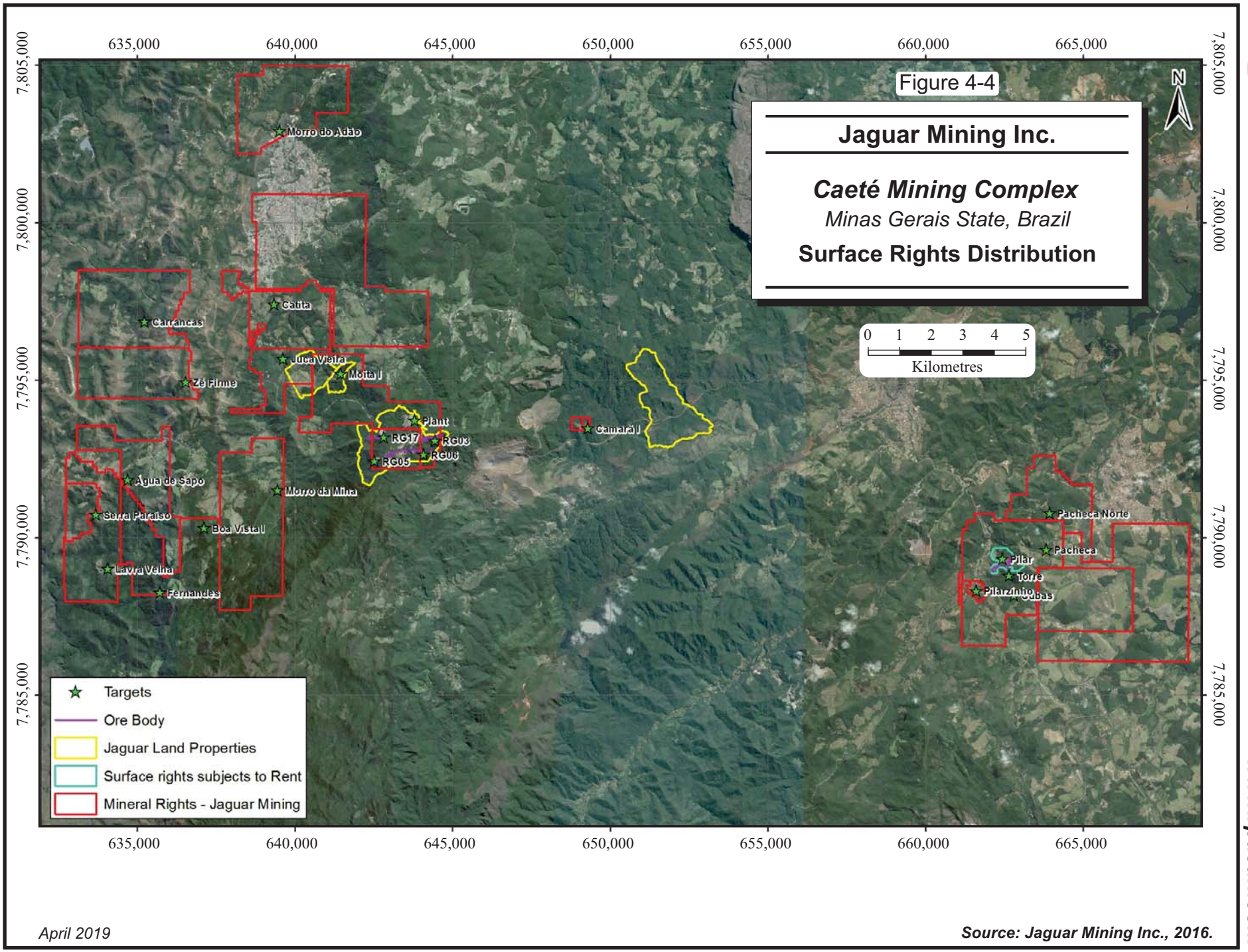
Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Mineral Rights Distribution

Source: Jaguar Mining Inc, 2016.



April 2019

Source: Jaguar Mining Inc., 2016.

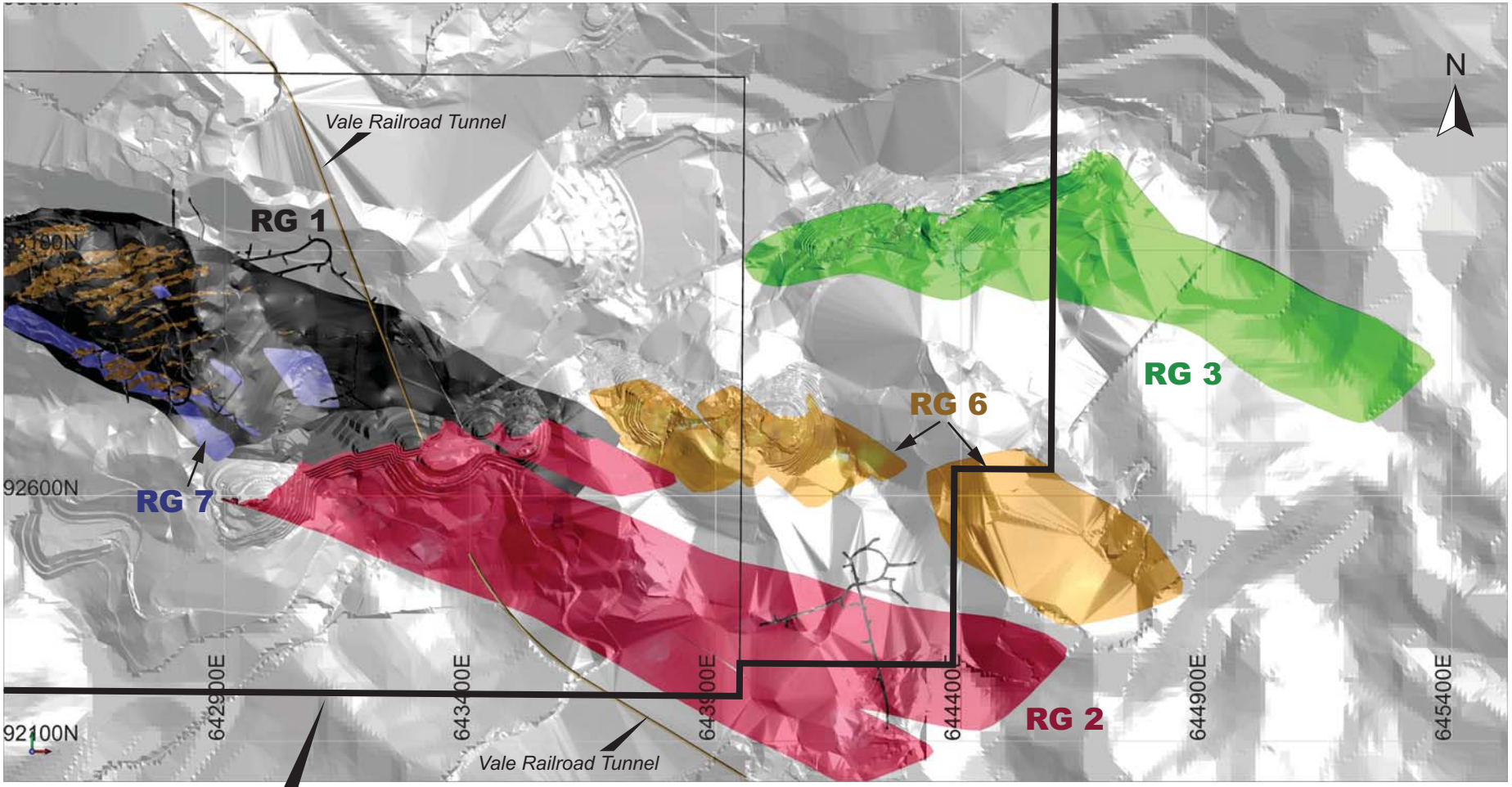


Figure 4-5

Jaguar Mining Inc.

Caeté Mining Complex
Minas Gerais State, Brazil
Location of Mineralized Wireframes, Roça Grande Mine

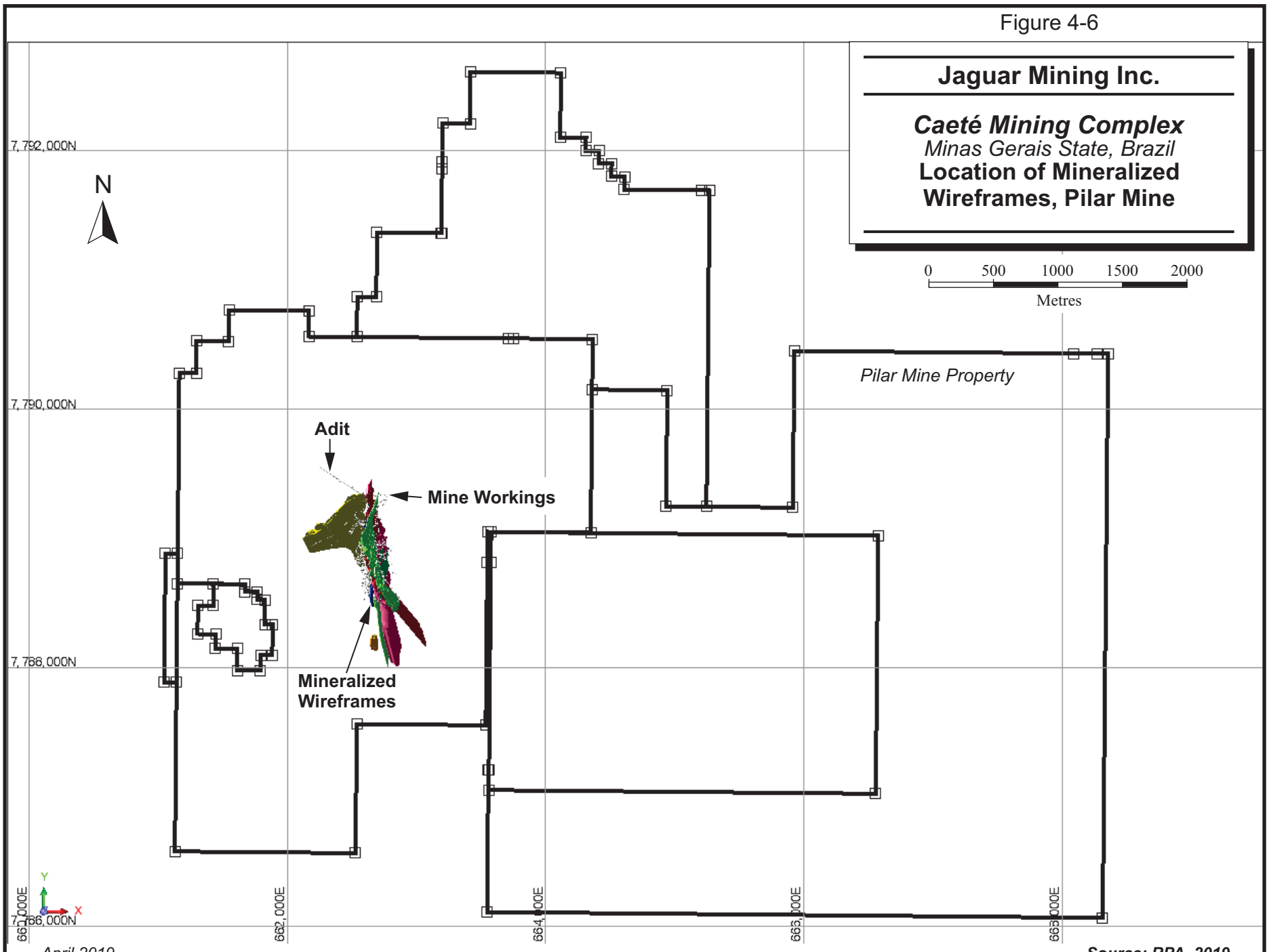
April 2019

Source: RPA, 2019.

Figure 4-6

Jaguar Mining Inc.

Caeté Mining Complex
Minas Gerais State, Brazil
Location of Mineralized Wireframes, Pilar Mine



April 2019

Source: RPA, 2019.

ROYALTIES AND OTHER ENCUMBRANCES

Jaguar must pay a royalty equivalent to 1% of net sales to ANM. In addition, one royalty payment and three lump sum annual rental payments are associated with the Caeté Mining Complex (Table 4-3).

TABLE 4-3 SUMMARY OF ROYALTIES AND RENTS, 2018
Jaguar Mining Inc. – Caeté Mining Complex

Owner	Royalty	Orebody or Utility	Payments (BRL)
Royalties:			
Carlos Marcelani	0.5% of Production Gross Profits (Concession 830.463/1983)	Pilar office, Mechanic Shop, BA, BF, BFII and SW orebodies	1,404,208

RPA is not aware of any environmental liabilities on the property. Jaguar has all required permits to conduct the proposed work on the property. RPA is not aware of any other significant factors and risks that may affect access, title, or the right or ability to perform the proposed work program on the property.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

ACCESSIBILITY

The Caeté Mining Complex can be accessed via the federal highway BR 381 and state paved roads. The distance from Belo Horizonte to the town of Caeté is 110 km along paved roads and eight kilometres from Caeté to the Roça Grande Mine site by dirt road. Access to the Pilar Mine is provided by a paved highway from both Belo Horizonte (93 km) and Santa Bárbara (seven kilometres). A partially paved, 45 km secondary road is used to transport Pilar run-of-mine (ROM) ore to the processing plant that is located at the Roça Grande Mine.

CLIMATE

The Caeté Mining Complex lies at an elevation of approximately 1,000 MASL. The terrain in the area is rugged in many places, with numerous rolling hills incised by deep gullies along drainage channels. The relief in the area is approximately 400 m. Farming and ranching activities are carried out in approximately 50% of the region.

Annual rainfall in area of the Roça Grande and Pilar mines averages between 1,300 mm and 2,300 mm, 84% of which falls during the rainy season between October and March. Most of the precipitation falls in the months of December and January. The surface winds have a generally low average speed (less than one metre per second), and are predominantly from the south and southeast.

The annual average temperature is slightly above 20ºC. Air humidity does not exceed 90%, even during the summer months. The annual average evaporation is approximately 934 mm. The climate is suitable for year-round operations.

LOCAL RESOURCES

Belo Horizonte is one of the world's mining capitals with a regional population in the range of four million people. Automobile manufacturing and mining services dominate the economy. General Electric has a major locomotive plant which produces engines for all of South America

and Africa. Mining activities in Belo Horizonte and the surrounding area have been carried out in a relatively consistent manner for over 300 years.

This mining region has historically produced significant quantities of gold and iron from open pit and large-scale underground mining operations operated by AngloGold Ashanti, Vale, Companhia Siderúrgica Nacional (CSN), and Eldorado Gold Corp. Belo Horizonte is a well-developed urban metropolis and has substantial infrastructure including two airports, an extensive network of paved highways, a fully developed and reliable power grid, and ready access to process and potable water.

Caeté is a town of approximately 35,000 people. The town has good urban infrastructure, including banks, hospitals, schools, and commercial businesses. The local economy is based on agriculture and iron mining. Manpower, energy, and water are readily available. The Caeté Mining Complex is supplied by electric power from the Brazilian national grid, but back-up generator power is also available at the mine sites.

INFRASTRUCTURE

The Caeté Mining Complex includes a nominal 2,050 tpd processing plant with separate tailings disposal areas for both fine flotation tailings and CIP tailings. Electrical power supply is provided through the national power grid. The process plant is located at the Roça Grande Mine at an elevation of approximately 1,250 MASL.

An administration complex is located at the entrance to the plant site, with such ancillary buildings as offices, conference rooms, cafeteria, maintenance shops, compressors (mine and mill), a dry, a first aid station, warehouse, backfill preparation, and a water treatment plant, which is located near the process plant. The assay laboratory and process testing laboratory are also located near the process plant. The Roça Grande Mine is accessed by an adit that is located approximately 800 m to the southwest of the plant at an elevation of approximately 1,100 MASL. Trailers located at the mine adit provide local storage and office space. The explosives and blasting accessories warehouses are located 3.5 km away from the mine area, in compliance with the regulations set forth by the Brazilian Army.

The surface infrastructure at the Pilar Mine is limited to shops, offices, cafeteria, first aid, and warehouse facilities. The mine is accessed by an adit that is located at an elevation of approximately 750 MASL.

A railroad tunnel measuring approximately seven metres wide by six metres high traverses the Roça Grande Mine area at approximately 1,050 MASL. The tunnel is owned and operated by Vale and intersects the mineralized wireframe of the RG02 lens at an elevation of approximately 1,055 MASL.

RPA noted that the Caeté Mining Complex was well-run and organized, provided a safe environment for the mine workforce, and had well-maintained maintenance and equipment facilities. The facilities are of a size and quality capable of supporting the forecasted production rates.

6 HISTORY

PRIOR OWNERSHIP

In December 2003, Jaguar acquired the Santa Bárbara property, which includes the Pilar mineral concessions, from Vale. In November 2005, Jaguar entered into a mutual exploration and option agreement with Vale with respect to six concessions, known as the Roça Grande concessions, located on 9,500 acres of highly prospective gold properties along 25 km of a key geological trend in the Iron Quadrangle. The contract between Jaguar and Vale provided Jaguar with the exclusive right over a 28 month period beginning November 28, 2005 to explore and conduct feasibility studies and to acquire gold mining rights in the Vale properties if the studies supported economical mining operations. The contract granted corresponding rights for Vale to explore the Jaguar property for iron and acquire mineral rights in the property during a three-year period. In November 2007, Jaguar notified Vale of its intent to exercise the option to acquire all six Roça Grande concessions. The final transfers of the Roça Grande concessions to Jaguar were concluded in December 2010 and August 2011 (Jaguar 2015b). In November 2014, four of the six Roça Grande concessions acquired from Vale were returned to Vale by amending the original contract.

EXPLORATION AND DEVELOPMENT HISTORY

Initial exploration activities carried out by Vale in the Roça Grande Mine area consisted of regional geological, geochemical, and geophysical surveys, along with excavation of a number of exploration trenches and diamond drilling to evaluate the gold mineralization found in the area. In total, 4,746 stream sediment samples were collected and 4,350 m of trenches were excavated during the 1973 to 1993 period.

Vale carried out geological mapping, geological interpretation, and exploration and in-fill drilling at the Pilar deposit. Eldorado Gold Corp. executed a small drilling campaign to evaluate the deposit from 2002 to 2003 (Machado, 2010).

Soil sampling programs have been carried out throughout the various claim blocks within the Caeté Mining Complex. A summary of the soil samples collected by the various mining companies is presented in Table 6-1.

TABLE 6-1 CAETÉ MINING COMPLEX SOIL SAMPLES BY MINING COMPANY
Jaguar Mining Inc. – Caeté Mining Complex

Company	Total
MMV (Anglo)	1,270
DOCEGEO (Vale)	7,899
WMC (Western Mining Co.)	2,674
Jaguar Mining	10,472
Grand Total	**22,315**

Jaguar initiated exploration activities at Pilar in 2006 and initially contemplated building a sulphide plant on site, however, the acquisition of the Roça Grande concessions created an opportunity to develop an expanded project, with greater plant capacity to receive ore from several mineral properties.

In 2007, Jaguar completed a scoping study of the Caeté Project, received the Implementation Licence, secured the power contract for the start-up, and commissioned TechnoMine to prepare a NI 43-101 Technical Report on the Caeté Project mineral resources, which was completed during the year.

In 2008, expansion plans at the Caeté Project continued as TechnoMine completed a feasibility study. By the end of the third quarter in 2008, all necessary permits and licences for the construction and commissioning phase of the Caeté Project had been received and Jaguar initiated civil works for the milling and treatment circuits.

In November 2008, due to the decline in gold prices, the financial markets and worldwide equity values, including the gold sector, Jaguar temporarily suspended development of the Caeté Project pending an assessment of market conditions and the availability of capital to move the project forward. Consistent with the decision to suspend the development of the Caeté Project, underground work at the Roça Grande Mine was temporarily suspended; however, development at the Pilar Mine continued.

In December 2008, Jaguar began transporting ore by truck from the Pilar Mine to the Paciência Plant to supplement the ore being supplied from Paciência Santa Isabel Mine.

In March 2009, Jaguar completed an $86.3 million equity offering, the proceeds of which were primarily used to restart development and construction at Caeté. During 2009 and part of 2010, Jaguar focussed on the implementation and construction of the Caeté Project.

The Caeté processing plant was commissioned in June 2010. The first gold pour was conducted in August 2010 and commercial production was declared in October 2010. Capital expenditures for the Caeté Project totalled US$127 million (Jaguar 2015b).

At the Roça Grande Mine, mining activities focussed on the RG01 deposit. The principal access to the mine is provided by an adit and ramp system that has been developed to the 925 m elevation, approximately 175 m below the elevation of the adit collar. A cross-cut to the south was begun from the 1,070 m elevation to provide access to the RG02 deposit but was abandoned when it encountered poor ground conditions.

The principal access to the Pilar Mine is provided by an adit and ramp system that has been developed to the 0 m elevation, approximately 750 m below the elevation of the adit collar. Gold mineralization is contained within a number of separate zones, however, the bulk of the production is being derived from the BA, BF, and BF II zones.

PAST PRODUCTION

A small amount of gold was produced by DOCEGEO from the Roça Grande deposits (RG02, 03, 04, 05, and 06) during the 1996 to 2000 period. In total, approximately 1.02 Mt of material at an average grade of 2.2 g/t Au was mined by open pit mining methods and processed by heap leaching. A total of approximately 66,800 oz of gold was recovered (Machado, 2010).

Since 2010, the Caeté Mining Complex has processed material from various local deposits including Roça Grande, Pilar, and Rio de Peixe. Since 2010, the Roça Grande Mine has recovered approximately 894,000 oz of gold. The Roça Grande Mine was put on a care and maintenance basis in Q1 2018.

Initial production from the Pilar Mine was processed at the Paciência Mining Complex during the 2008 to 2010 period. After 2010, the ore from the Pilar Mine was processed at the Caeté processing facility. Since 2008, the Pilar Mine has recovered approximately 390,000 oz of gold.

Production for the Caeté Mining Complex is summarized in Table 6-2.

TABLE 6-2 CAETÉ MINING COMPLEX PRODUCTION

Jaguar Mining Inc. – Caeté Mining Complex

	Pilar Production		Roça Grande Production		Caeté Plant Production			
Year	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au	Recovery	Ounces Produced
2008	7,000	5.43						
2009	163,000	4.39						
2010	291,000	3.73	58,000	2.48	290,000	2.71	76%	19,304
2011	453,000	3.55	204,000	2.35	674,000	2.90	87%	54,783
2012	426,000	3.36	208,000	3.30	627,000	2.98	88%	52,913
2013	450,000	3.23	156,000	2.81	613,000	2.95	88%	51,424
2014	391,000	2.85	172,000	2.39	596,000	2.57	90%	44,251
2015	308,000	3.32	159,000	2.29	469,000	2.92	90%	39,687
2016	296,000	3.35	89,000	2.16	380,000	3.02	90%	33,351
2017	335,000	3.80	69,000	2.51	406,000	3.27	90%	38,685
2018	353,400	4.24	11,700	2.69	377,000	3.81	89%	41,788
Total	**3,473,000**	**3.52**	**1,126,000**	**2.59**	**4,432,000**	**2.99**	**88%**	**376,186**

Note:
1. From 2008 to 2011, some of Pilar ore was processed at Paciência.
2. From 2010 to 2012, open pit oxide ore from Roça Grande was mined and processed.

7 GEOLOGICAL SETTING AND MINERALIZATION

REGIONAL GEOLOGY

The Roça Grande and Pilar deposits are located in the eastern part of the Iron Quadrangle, which had been the largest and most important mineral province in Brazil for centuries until the early 1980s, when the Carajás mineral province, in the state of Pará, attained equal status. Many commodities are mined in the Iron Quadrangle, the most important being gold, iron, manganese, bauxite, imperial topaz, and limestone. The Iron Quadrangle was the principal region for the Brazilian hard rock gold mining until 1983 and accounted for approximately 40% of Brazil's total gold production. Gold was produced from numerous deposits, primarily in the northern and southeastern parts of the Iron Quadrangle, most hosted by Archean or Early Proterozoic banded iron formations (BIF) contained within greenstone belt supracrustal sequences.

In the Brumal region, outcrops belonging to the granitic gneiss basement of the Nova Lima and Quebra subgroups of the Rio das Velhas Supergroup occur. The granitic gneiss basement is comprised of leucocratic and homogeneous gneisses and migmatites, making up a complex of an initial tonalitic composition intruded by Archean-aged rocks of granitic composition. The upper contact of the sequence is discordant and tectonically induced by reverse faulting. The Rio das Velhas Supergroup is regionally represented by schists of the Nova Lima Group and meta-ultramafic rocks of the Quebra Group including serpentinites, talc schists, and meta-basalts (Figure 7-1). The rocks of the Nova Lima Group have been folded and sheared along a northeast-southwest regional trend.

Iron formations occur as the only meta-sediments in layers with thicknesses up to 10 m. The Nova Lima Group can be subdivided into two units: a unit consisting of talc chlorites and intercalations of iron formation, fuchsite schist, quartz sericite schist, and carbonaceous phyllite; and a unit hosting sulphidized gold bearing iron formation and quartz sericite schists.

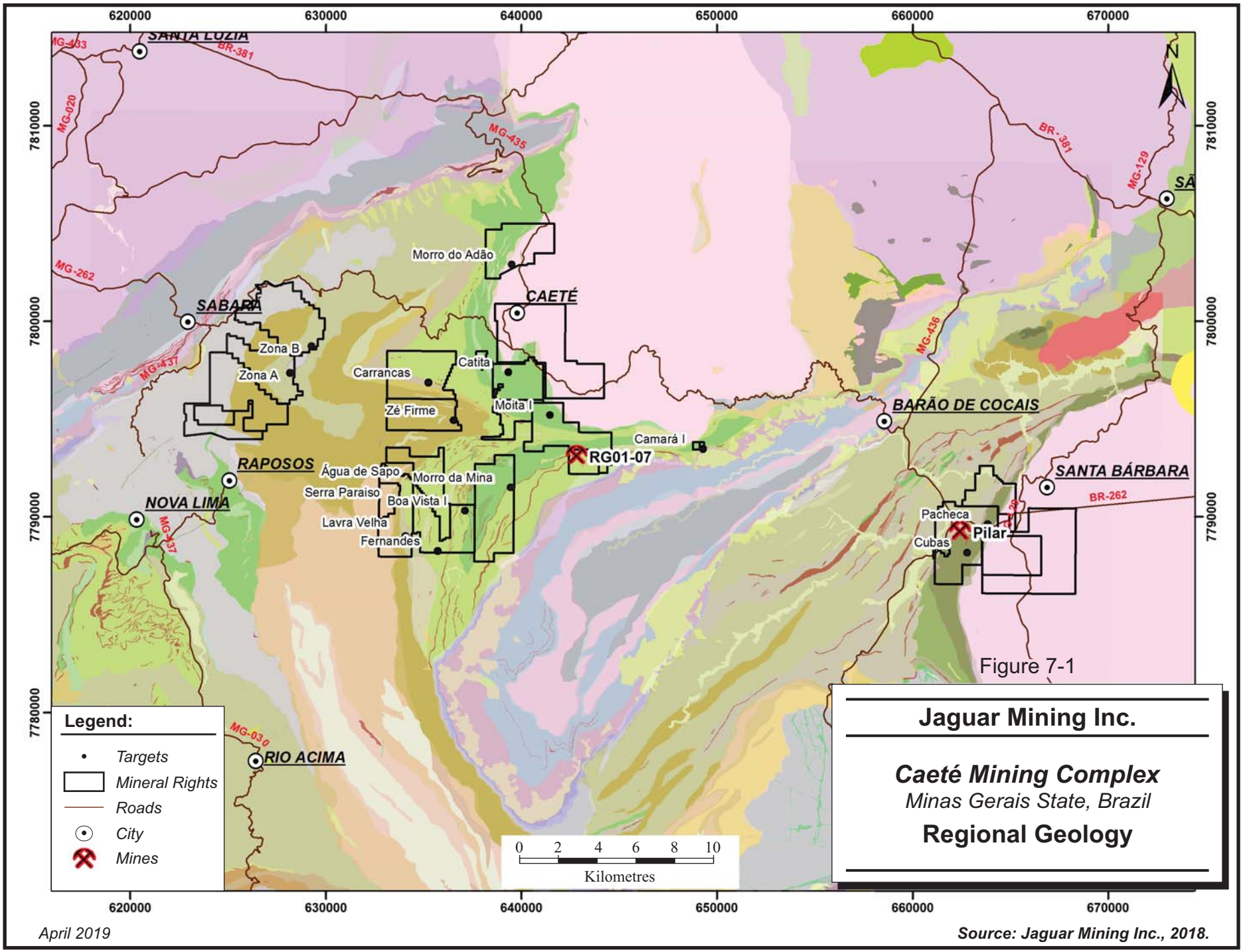


Figure 7-1

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Regional Geology

April 2019

Source: Jaguar Mining Inc., 2018.

PHANEROZOIC

Cenozoic

NEOGENO

Pleistocene-Holocene

N34al Alluvium: sand and gravel

N34co Colluvial deposits: Blocks, boulders and Pebbles of Quartzite and cango in alluvial soil

N23ca Canga: rock fragments cemented by limonite

N23co Colluvial deposits: Quartzite blocks, blocks and pebbles, itabirite and canga in alluvial soil

PALEOGENE

Eocene-Oligocene

E23sl Lake sediment: argillite, sandstone and lignite

PALEOGENE

Eca Canga: rock fragments cemented by limonite

PROTEROZOIC

PALEOPROTEROZOIC

RIACIANO

ITACOLOMI GROUP

PP2i Undivded - Quartzite with conglomerate and Phyllite lenses

PP2isa Santo Antônio Formation - Phyllite, quartzite, conglomerate and dolomite. Lenses of rock rich in iron or iron formation

PROTEROZOIC

PALEOPROTEROZOIC

MINES SUPER GROUP

RIACIANO

GROUP WILL KNOW

PP2ms Undivided - Chlorite-sericite shale, serictic quartzite, feldspar quartzite and metagravit

SIDERIAN

PIRACICABA GROUP

PP1mp Undivided - Phyllite, quartzite, ferruginous quartzite and quartz-sericite shale

PP1mpb Barreiro Formation - Graffite shale, schist mica and phyllite

PP1mpf Formation Fêcho do Funil - Phyllite, dolomitic phyllite, dolomite; quartzite and subordinate iron formation

PP1mpc Cercadinho Training - Ferruginous quartzite , quartzite, grit, quartz sericite shale, phyllite, sericita shale, talco xisto e grafita xisto

ITABIRA GROUP

PP1mi Undivided - Itabirito, phytotic and dolomitic itabirite; high-content, friable hematite (h)

PP1mig Gandarela Training - Dolomite, dolomite itabirite, limestone and phyllite Itabirito (it)

PP1mic Cauê Formation - Itabirito and dolomitic itabirite, with dolomite lenses. Compact and friable hematite (h)

CARAÇA GROUP

PP1mc Undivided- Quartzite, quartzite phyllite, Phyllite and conglomerate

PP1mcb Batatal Training- phyllite seriolitic, phyllite carbonaceous, finite quartzite lens and iron formation

PP1mcm Training Currency - Gray quartzite, grit and conglomerate, quartz-sericite shale with interspersed philite lenses; quartzite phyllite, quartz-mica shale and conglomerate

ARCHEAN

NEOARCHEAN - MESOARCHEAN

SRIO DAS VELHA SUPERGROUP

NEOARCHEAN

MACHINE GROUP

STRONG HOUSE FORMATION

A4mcc Capanema Unit - Sericite shale and sericite-quartz shale. (Association of Non-Marine Litofacies: alluvial-floating metasediments)

A4mce Unit Córrego do Engenho- Seritic quartzite of medium granulation and subordinate conglomerate quartzite. Association of non-marine lithofacies: alluvial-flown metasediments)

A4mcj Jaguara Unit- Medium-to-thick granular sericitic quartzite and grit; polymorphic metaconglomerate and quartz-mica suborporate shale. Preserved cross-sectional and cross-sectional stratification. (Association of Non-Marine Litofacies: alluvial-fluvial metastasis)

A4mcdc Unit Girl Owner, Fácies Córrego da Cidreira - Metaparaconglomerado polymic and quartzite (Association of Non-Marine Litofacies: alluvial-fluvial metasediments)

A4mcdv Unit Girl Owner, Fácies Córrego do Viana - Polycyclic metaconglomerate and serictic quartzite with gradient and cross-grooved and tangential cross stratification; Quartz mica subordinate shale. Polymorphic conglomerate (cg). (Association of non-marine lithofacies: alluvial-flown metasediments)

PALMITAL FORMATION

A4mprp Rio de Pedras Unit - Sericotic quartzite and quartz-sericite schist with small to medium cross stratification; shale carbonated subordinate. Quartzito seriolitic (qts). (Association of Litofacies Ressedimentada: proximal metaturbidites)

GROUP NOVA LIMA

A4mcp Stream Unit of Paina - Quartz-mica-chlorite shale, clorita shale, biotita-small feldspar shale; local ferrous formation. (Association of Litofacies Retentionation: target distal turbidites)

A4mfv Old Farm Unit- Chlorite-quartz feldspar shale, biotite-sericite-chlorite feldspar shale, biotita-moscovita shale, rocha calcis-silicática e metargilito carbonoso (metapsamites and metapelites with small gradational and cross stratification). (Association of Litofacies Staphylococci: metapsamitos and metapelites with small gradational and cross strati fication)

A4mcm Catarina Mendes Unit - Carbonate-quartz-feldspar-biotite-chlorite shale, sericite-biotite-chlorite-quartz shale, quartz-chlorite shale, calcissilictic rock, metaconglomerado e fm. ferrífera. Ferrous formation (ff). Grenada-staurolite schist in contact metaphoric aureole (ge). (Association of Litofacies Ressedimentada: metagrauvaca with cyclic and gradational stratification and plane-parallel and cross stratification)

A4mcs Site Stream Unit - Quartz-carbonate-mica-chlorite shale, quartz-mica shale, charcoal phyllite; fsubordinate ferrous formation. Ferrous formation (ff). Sericita-quarzto shale (sq). (Association of Litofacies Ressedimentada: metapelites and metapsamitos with gradational and cross-sectional esti trati fi cation)

A4mm Minda Unit - Plagioclase-chlorite-mica-quartz shale, sericite-quartz shale, quartz-chlorite-mica shale; shale and subordinate iron formation. (Association of Litofacies Ressedimentada: metapsamitos and metapelites with pre-served gradation stratification)

MESOARCHEAN

A3msq Santa Quitéria Unit - Mica-quartz shale, chlorite-quartz shale, sericite-chlorite shale, carbonic shale, iron formation and meta-chert. Ferrous formation (ff). (Classification of Sedimentary Litofacies)

A3mmv Morro Vermelho Unit - Teolitic and Komatic metabasalt, Iron formation and Metachert; piclastic and fissile-subordinate metavolcanic shale. Ferrous formation (ff). (Association of Vulcanosedimentary-chemical Litofacies)

A3mof Fine Gold Unit - Teolitic and Komatic metabasalt, metaperidotite and basic metatuph; acid metavulcanic, metachert, iron formation and subordinate carbonaceous shale. Ferrous formation (ff). (Association of Volcanic Milky-Ultramafic Litofacies)

MESOARCHEAN

BASE COMPLEX

A3b Mix, sediment or granite

IGNEOUS ROCKS OF UNKNOWN AGE

d Diabase Dykes

GEOLOGIC STRUCTURES

- Strike and Dip
- Foliated Bedding
- Inverted Layers
- Inverted bedding with sub-parallel foliation
- Layering/Compositional Banding
- Direction of Vertical Layers
- Direction of vertical schistosity
- Direction and diving of foliation
- Measured Dip Foliation, Phase 2
- Vertical Foliation, Phase 2
- Dip of Shale
- Dip of cleavage
- Dip of Crenulated cleavage or fracture, Phase 3
- Dip of Crenulated cleavage or fracture, Phase 4
- Direction of vertical Cleavage
- Plunge of Joints
- Junta measured Dip
- Vertical Jointing
- Direction of Lineaments
- Direction of Intersections and Lineaments
- Lineaments B
- Lineaments B, Phase 2
- Lineaments B, Phase 3
- Linear shearing of Minerals
- Linear shearing of Minerals, Phase 1
- Linear shearing of Minerals, Phase 2
- Pencil Structures
- Crenulation Axis
- Small Folds, with inducated folds

- Geologic Contact
- Inferred Contact
- Normal Fault
- Inferred Normal Fault
- Thrust Fault
- Inferred Thrust Fault
- Transverse Fault
- Normal Fault
- Inferred Normal Fault
- Axial Trace Anticline Normal
- Inferred Axial Trace Anticline Normal
- Axial Trace Sycline Normal
- Inferred Axial Trace Sycline Normal
- Inferred Axial Trace Anticline Inverted
- Inferred Axial Trace Sycline Inverted

Figure 7-1A

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Regional Geology Legend

April 2019

Source: Jaguar Mining Inc., 2015.

LOCAL AND PROPERTY GEOLOGY

ROÇA GRANDE DEPOSIT

The Roça Grande Mine is located in the upper unit of the Nova Lima Group. The dominant rock types found in the mine are a mixed assemblage of meta-volcanoclastics and meta-tuffs. These are represented by quartz sericite and chlorite schists with variable amounts of carbonate facies BIF, oxide-facie BIF, meta-cherts, and graphitic schists. The iron formations, chert units, and graphitic schist units are intimately inter-bedded with each other, such that they form an assemblage of chemical and clastic sedimentary units.

Two important BIF horizons are present at the Roça Grande Mine and they are separated by a central unit of sericitic phyllites and schists (Figure 7-2). The two BIF horizons are roughly parallel and are called Structures 1 and 2. In general, the southern BIF unit (Structure 2) is thicker than the northern BIF unit (Structure 1). The North Structure (Structure 1) hosts the RG01 mineralized body and the South Structure (Structure 2) hosts the RG02, RG03, and RG06 mineralized bodies (Figure 7-3). The RG07 mineralized body is located immediately in the hanging wall of Structure 1 and is hosted mostly by a quartz vein. The bedding is well defined by the carbonate-facies iron formation and chert found in the BIF horizons, with an overall strike of azimuth 70º to 80º, and dipping approximately 30º to 35º south (Figure 7-4).

At the mine scale, folding of the iron formation stratigraphy is generally absent. Local folding and faulting in the Structure 2 has been observed at the RG06 mineralized body where a 200 m to 300 m strike length of the stratigraphy has been folded.

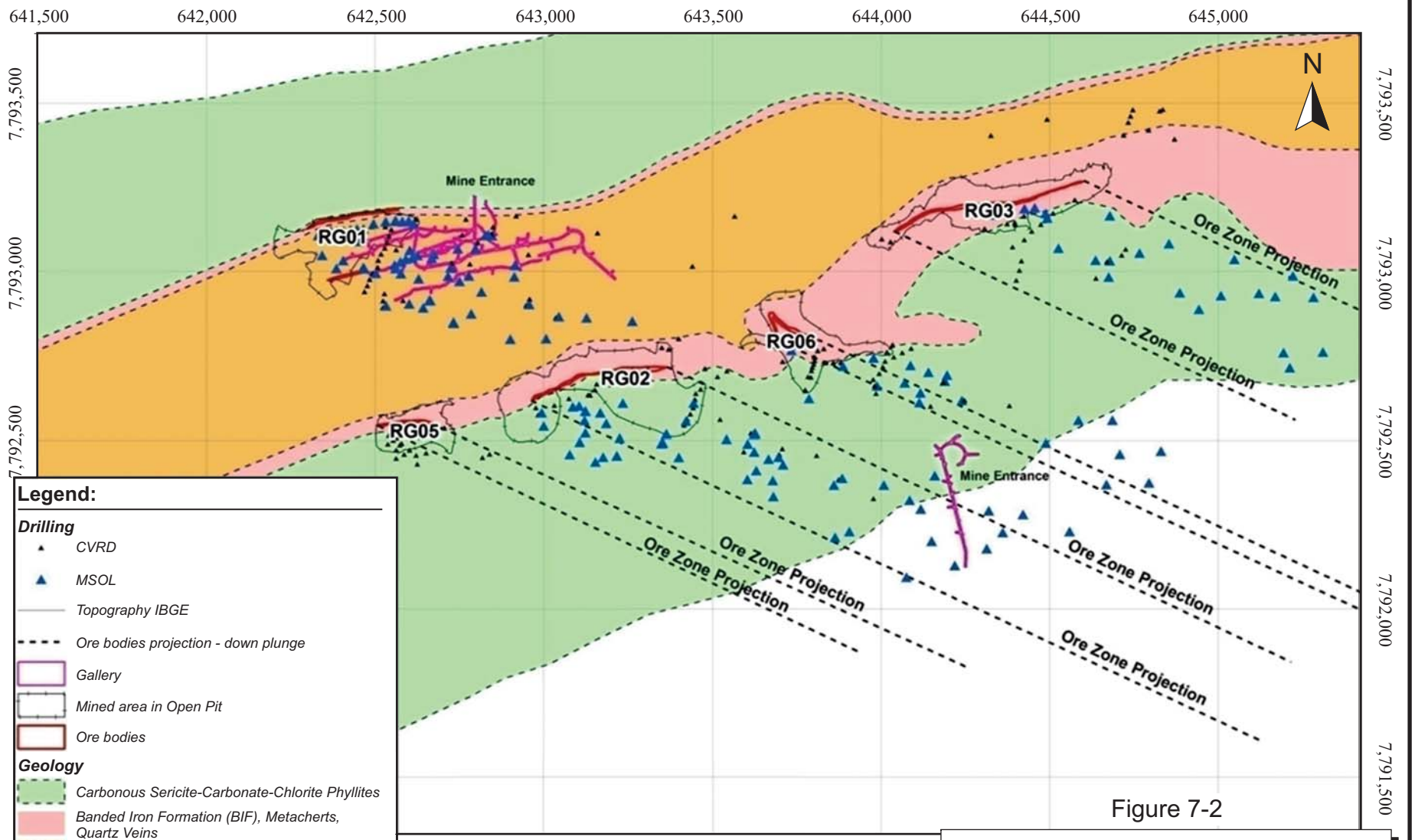


Figure 7-2

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Property Geology of the Roça Grande Mine

April 2019

Source: Jaguar Mining Inc., 2013.

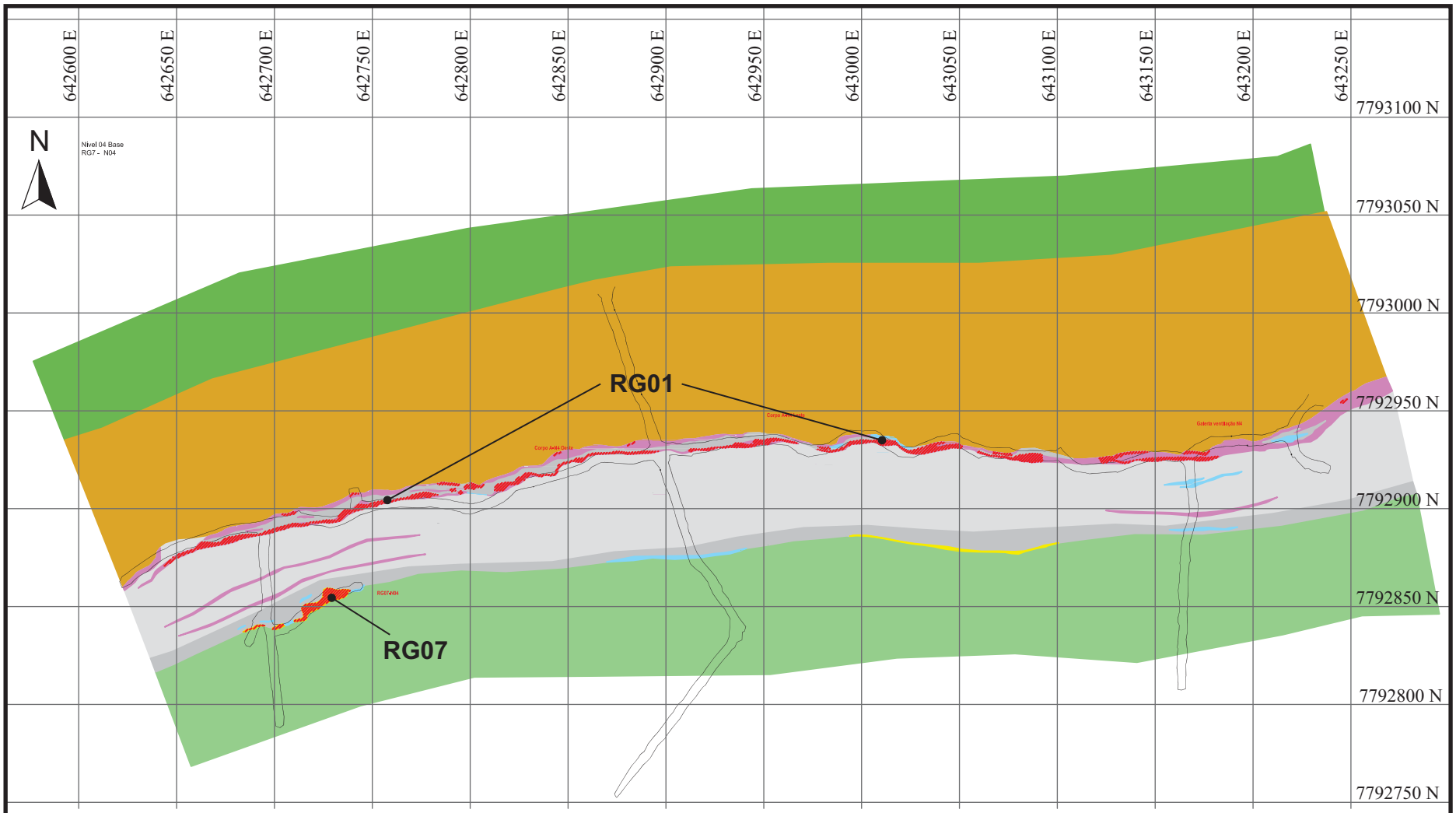


Figure 7-3

Legend:

- *Banded Iron Formation*
- *Graphitic Schist*
- *Carbonate quartz schist with sericite and carbon*
- *Carbonate quartz schist with sericite*
- *Carbonate quartz schist with sericite and clorite*
- *Carbonate clorite sericite quartz schist with volcanic quartz*
- *Quartz vein*
- *Smoky Quartz vein with free gold*
- *Ore Zone*

0 25 50 75 100
Metres

Jaguar Mining Inc.

Caeté Mining Complex
Minas Gerais State, Brazil
Level Plan, 4th Level
Roça Grande Mine

April 2019

Source: Jaguar Mining Inc., 2015.

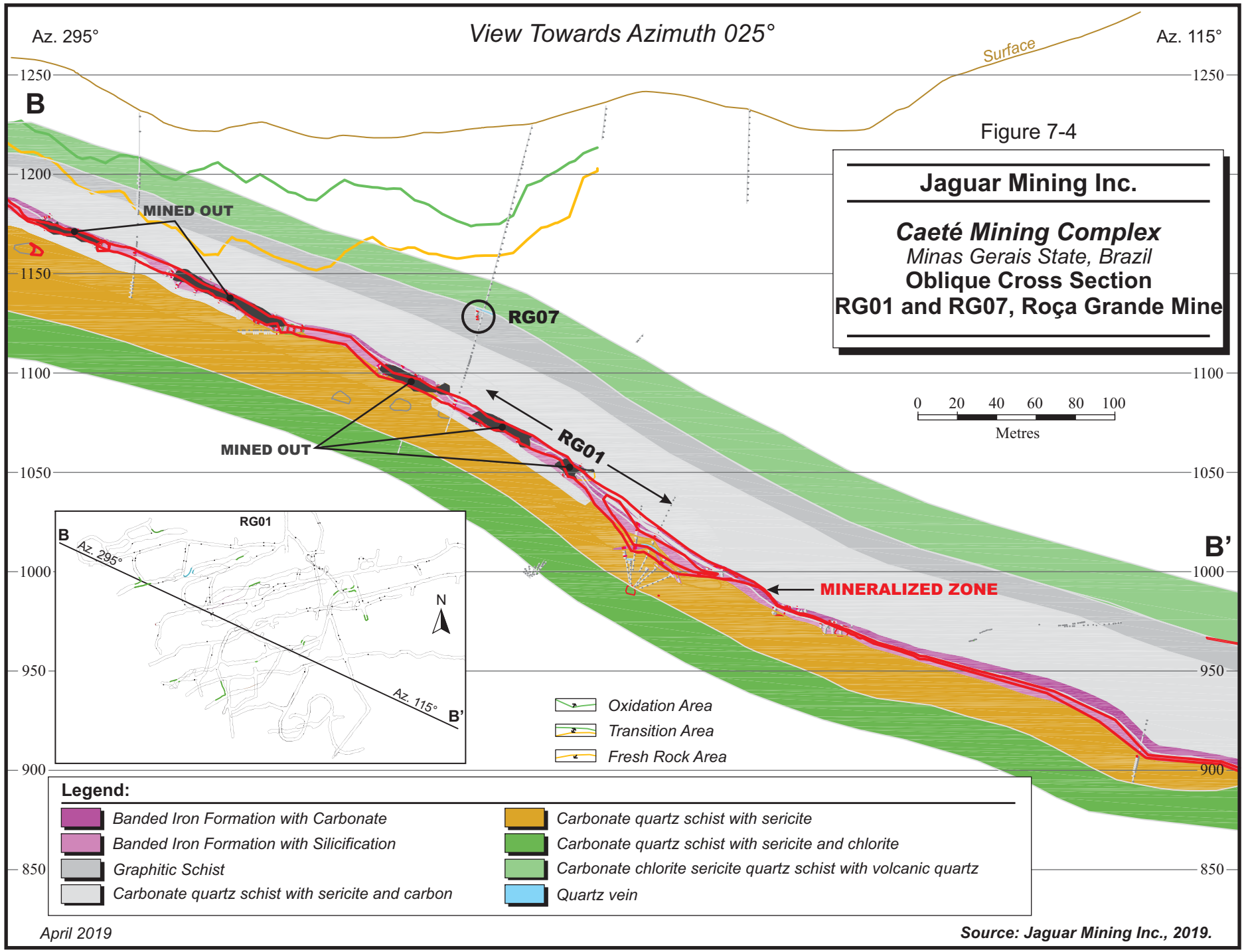


Figure 7-4

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Oblique Cross Section

RG01 and RG07, Roça Grande Mine

April 2019

Source: Jaguar Mining Inc., 2019.

PILAR DEPOSIT

The Pilar deposit is hosted by the basal units of the Nova Lima Group (Figure 7-5). The rocks in the region of the mine are comprised of tholeiitic basalts and komatiite flows of the Ouro Fino and Morro Vermelho Units, along with their intrusive equivalents. To the west, these basal units are in fault contact with mica-quartz schists, chlorite-quartz schists, chlorite-sericite schists, and chemical and clastic sedimentary rocks of the Santa Quitéria Unit. The chemical sedimentary rocks include chert and BIF. To the east, the units are in fault contact with migmatites and granitic gneisses of the Bação Complex that form the basement sequence.

On the mine property, all rock units strike in a northeasterly direction. The regional strike of the units changes to a southeasterly direction to the south of the mine property. Regional mapping has found that the foliations mostly dip steeply to the southeast. The regional-scale thrust faults also strike in a northeasterly direction and dip steeply to the southeast on the mine property.

On the property scale, at least three different orientations of faults are recognized. The earliest fault is the northeasterly-striking regional-scale thrust fault that forms the contact between the Santa Quitéria Unit and the Ouro Fino and Morro Vermelho Units. This thrust fault cross-cuts and terminates a more northerly set of faults that have a strike of approximately 020° and dip steeply to the east. The third set of faults are oriented in an east-west orientation and have subvertical dips. The displacement along these faults has been observed in underground exposures to be in the order of one to two metres (Figure 7-6).

The host rocks of the mine have been affected by at least one period of folding (Figure 7-7). Structural mapping on the property has shown that the orientation of the fold axes dip approximately 45° to the southeast (azimuth 135°).

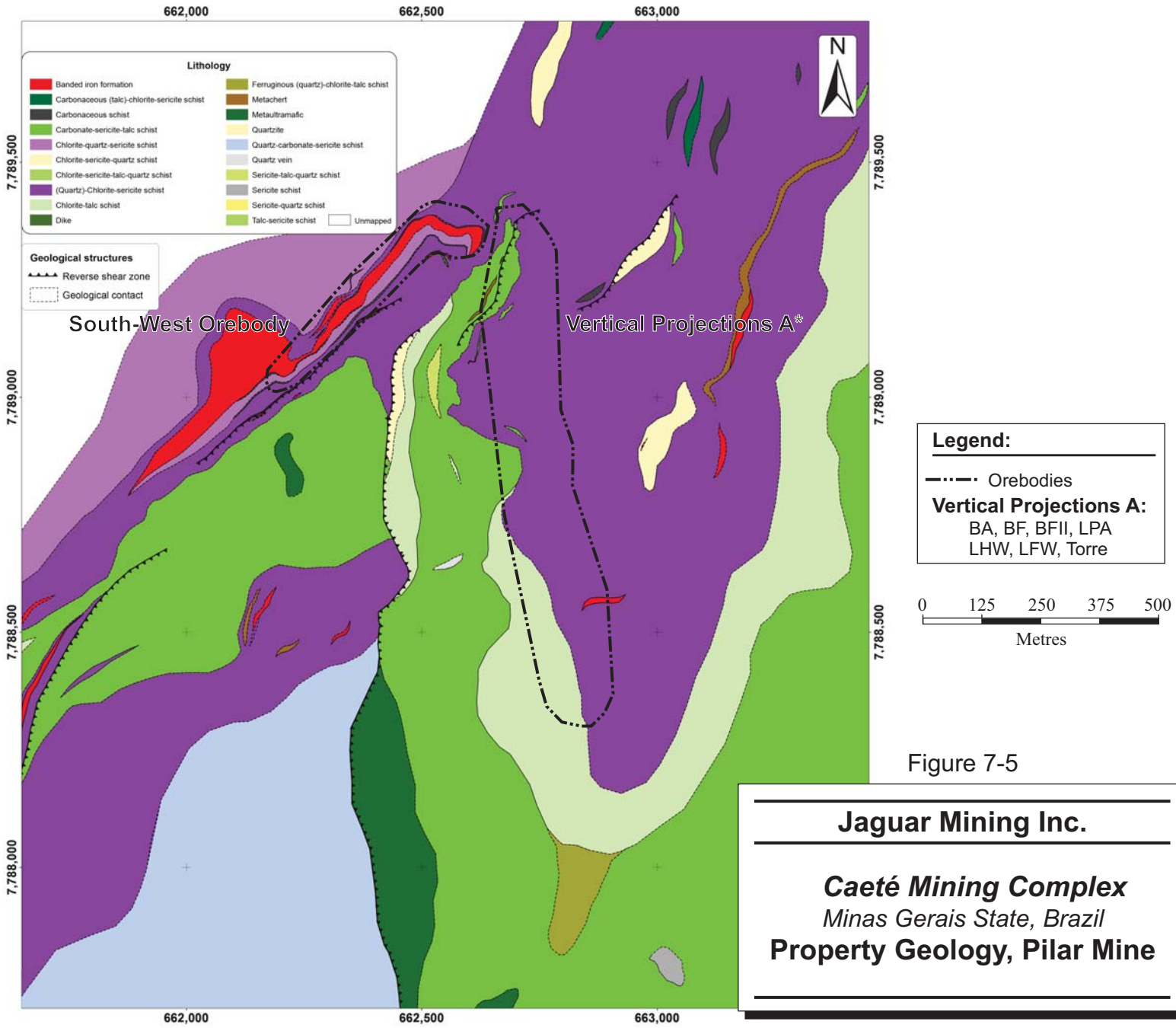


Figure 7-5

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Property Geology, Pilar Mine

Source: Jaguar Mining Inc., 2014.

Figure 7-6

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Late-Stage Cross Faults, Pilar Mine

April 2019

Source: RPA, 2016.

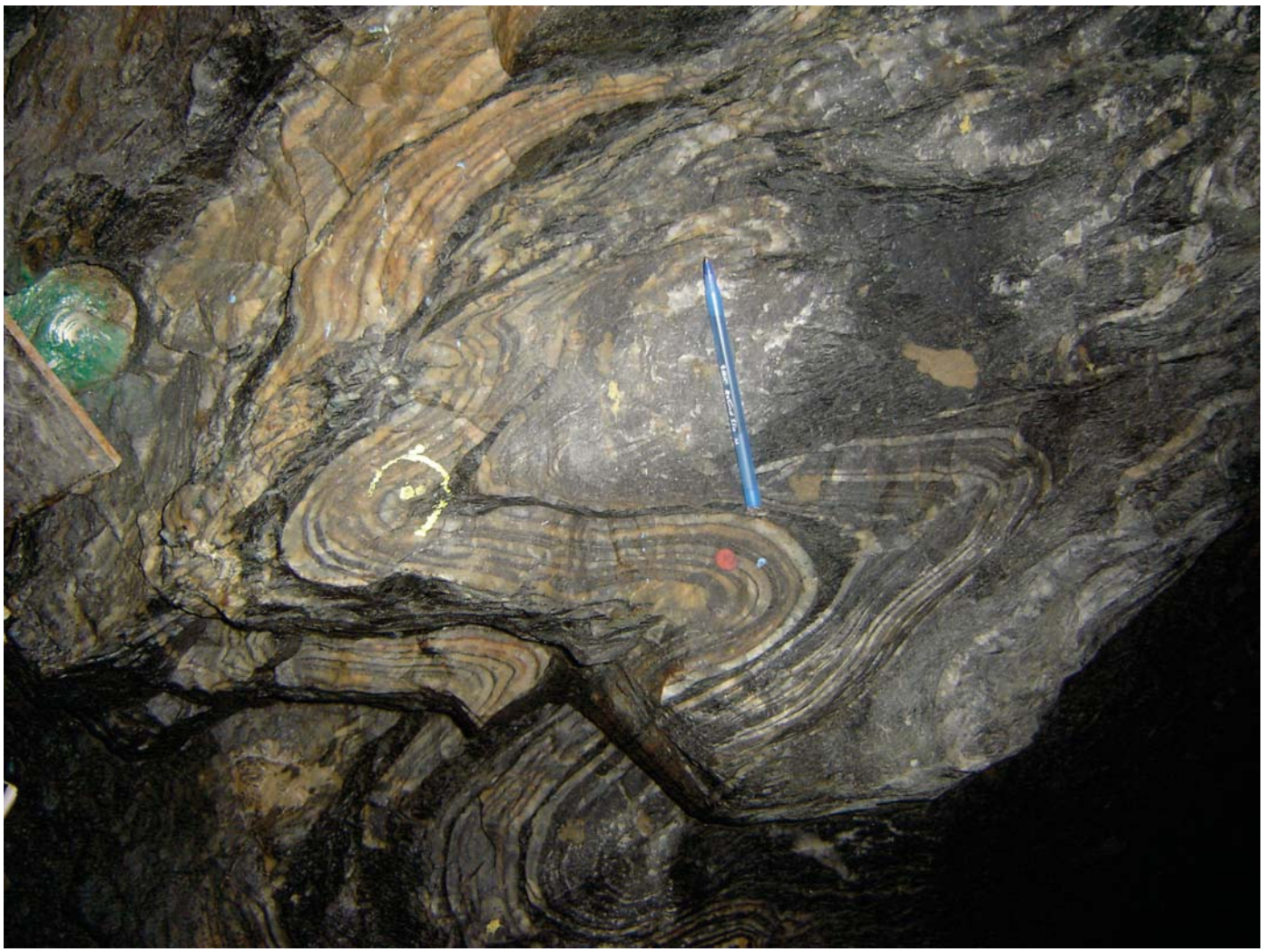


Figure 7-7

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Folded Iron Formation, Pilar Mine

April 2019

Source: RPA, 2016.

MINERALIZATION

ROÇA GRANDE

At Roça Grande, gold mineralization is more commonly associated with BIF horizons. In RG01, RG02, RG03, and RG06 mineralized bodies, the gold mineralization is developed roughly parallel to the primary bedding and is related to centimetre-scale bands of massive to disseminated pyrrhotite and arsenopyrite. In many cases, better gold values are located along the hangingwall contact of the iron formation sequence and is hosted by carbonate-facies iron formation. The grades generally decrease towards the footwall where the iron formation becomes more silica-rich. The thicknesses of the iron formations are observed to be affected by broad-scale boudinaged structures. Better gold grades are found in the thicker portions while the narrower portions of the boudinaged structures have lower grades. Late-stage, barren quartz veins are also ubiquitously present and also display a boudinaged form.

RPA recommends that structural mapping information be integrated with of isopach maps of the carbonate iron formation and trend analyses of the gold distribution to identify any primary controls on the distribution of the BIF-hosted gold mineralization.

In the RG07 mineralized body, gold is found to be hosted in quartz veins that are contained within a sericite (chlorite) schist associated with an east-west oriented shear zone (Machado 2010).

PILAR

The mineralization at the Pilar Mine is hosted by a number of the host rock units including the BIFs along with mafic schists and talc-chlorite schists. Gold mineralization is associated with sulphide mineralization consisting of arsenopyrite and pyrrhotite. Quartz veins and veinlets can also be present, but the presence of quartz is not a prerequisite for higher gold values. The sulphide minerals occur mostly as disseminations in the host rock, but can achieve semi-massive to massive concentrations locally over a few tens of centimetres (Figure 7-8). The majority of the gold mineralization is hosted within folded and faulted carbonate facies iron formations (Figure 7-9). Quartz veins are typically less than one metre in width and can be observed to be of two generations. The quartz veins of the first generation are typically associated with the gold mineralization and are folded. The quartz veins of the second generation are typically lower grade or barren and not affected by folding.

The SW Orebody is hosted by iron formation of the Santa Quitéria Unit. The remaining mineralized lenses are hosted by the mafic and ultramafic schists of the Ouro Fino and Morro Vermelho Units.

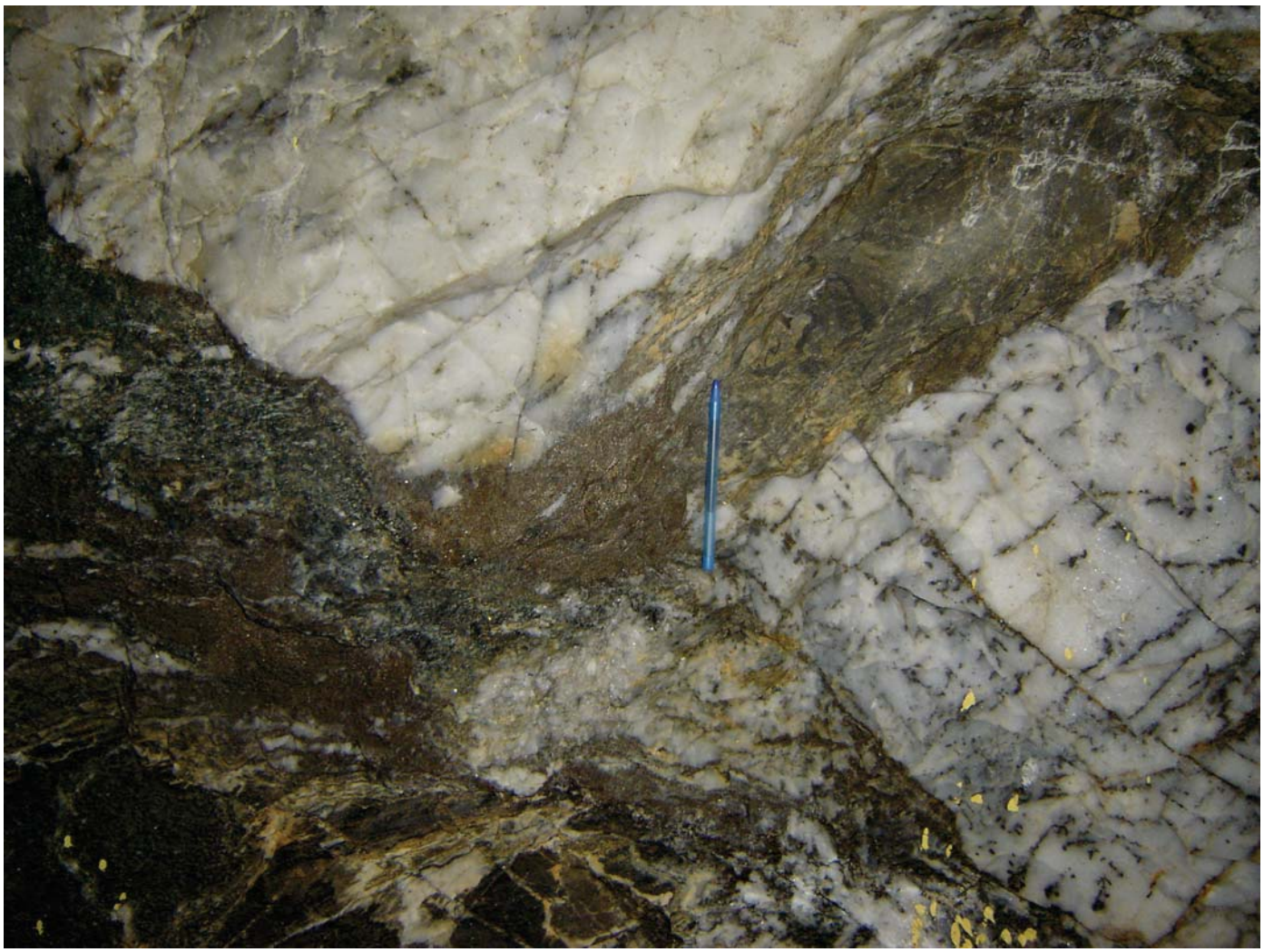


Figure 7-8

Jaguar Mining Inc.

Caeté Operations
Pilar Mine
Minas Gerais State, Brazil
Arsenopyrite-Pyrrhotite Mineralization, Pilar Mine

April 2019

Source: RPA, 2016.

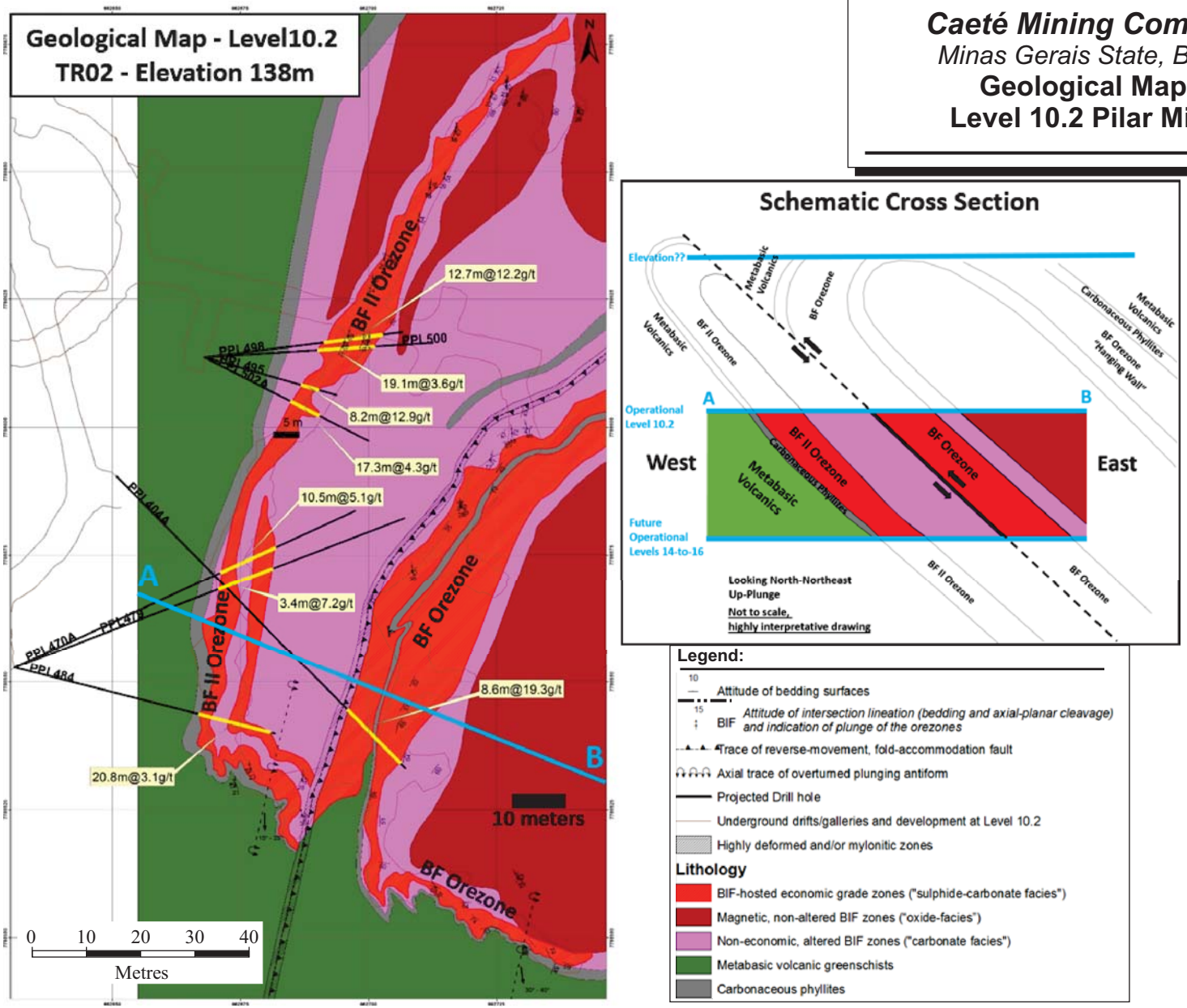
Figure 7-9

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Geological Map,
Level 10.2 Pilar Mine



Source: Jaguar Mining Inc., 2014.

8 DEPOSIT TYPES

Gold mineralization has been found mainly within three general types of deposits in the Iron Quadrangle:

1. Syngenetic deposits. These are hosted by BIF and chemical sedimentary rocks (meta-chert). Gold is typically associated with fresh to limonite-rich sulphide masses, ranging from disseminated to massive, in association with the BIF layers or in hydrothermally altered schists rich in quartz, chlorite, and sericite. Disseminated sulphides hosted in quartz schist, BIFs, and meta-cherts have also been economically exploited.

2. Epigenetic deposits dominated by hydrothermal quartz veins (silicification zones). Gold is related with masses of milky to microcrystalline quartz containing fresh to limonite-rich sulphides and, sometimes, visible gold. The veins are hosted by hydrothermally altered schists rich in quartz, chlorite, carbonate, and sericite.

3. Paleo-placer deposits. Conglomerates are found in the geologic section that contain clasts of quartzite, milky quartz, massive and banded chert, felsic volcanic rocks, and quartz schists. The matrix can be quartzitic, arkosic, or carbonaceous. Locally, round (buckshot) pyrite and crystalline pyrite are abundant in the matrix.

Most gold-bearing units in the Iron Quadrangle, with the exception of the gold-bearing conglomerates, are strongly controlled by linear structures such as fold axes, stretching lineations, and intersection foliations. The orebodies form cigar or pencil shapes, showing continuity along the plunge and relatively small distances laterally. They can be longer than 5 km, such as at the Morro Velho and Cuiabá mines. The thickness of the deposits varies from a few centimetres to more than 30 m.

Gold is associated with sulphides, mainly pyrite, pyrrhotite, and arsenopyrite. The distribution of the mineralized bodies is often controlled by mineral stretching lineations and fold axes.

9 EXPLORATION

ROÇA GRANDE

Jaguar has not carried out any surface-based exploration programs on the Roça Grande Mine property other than the drilling programs described in Section 10.

PILAR

The following exploration activities were carried out by Jaguar on the Pilar Mine property:

2014: Re-processing of magnetic data from the airborne Companhia de Desenvolvimento Econômico de Minas Gerais (CODEMIG) survey

2015: High definition induced polarization (IP) ground survey covering the south extension of the Pilar Mine. The estimated depth of penetration of the survey was up to 1,000 m.

Geological mapping and soil sampling on the Pacheca and Cubas targets.

Soil sampling campaign, 744 samples. Anomalous values (0.15 g/t Au to 0.48 g/t Au) were outlined along an 800 m long area oriented in a northeast-southwest direction.

10 DRILLING

ROÇA GRANDE

Jaguar has carried out a number of surface-based and underground-based drilling programs at the Roça Grande Mine since entering into a mutual exploration and option agreement with Vale in 2005. These in-fill and exploration drilling programs were focussed primarily on the RG01/07, RG02, RG03, and RG06 deposits.

Jaguar started diamond drilling at Roça Grande in August 2006. Following the completion of the first exploratory holes drilled at the RG01/07, RG02, RG03, and RG06 mineralized zones, Jaguar carried out an in-fill program to delineate these zones.

A summary of the drilling campaigns completed at the Roça Grande Mine is provided in Table 10-1. The distribution of drill holes and channel samples taken from the open pit mines is shown in Figure 10-1.

TABLE 10-1 SUMMARY OF DRILLING CAMPAIGNS, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Period	Target	Diamond Drilling		Roto-Percussive Drilling	
		No. Holes	Total Length (m)	No. Holes	Total Length (m)
		Vale			
1973-1993	Roça Grande	116	18,288		
1994-1995	Roça Grande			313	17,270
1996-1999	RG01	8	550		
	RG02	9	910		
	RG05	18	1,530		
	RG03,04 and 06	10	625		
2000	RG02	4	410		
	RG03	8	571		
	RG05	1	63		
	RG06	3	379		
Sub-Total, Vale		**177**	**23,325**	**313**	**17,270**
		Jaguar			
2004-2010	RG01/07	111	10,625		
	RG02	59	16,580		
	RG03	56	9,407		
	RG06	55	7,954		
2011	RG01/07	71	9,983		
2012	RG01/07		19,922		
2013	RG01/07		10,142		
2014	RG03/RG06	14	794		
Sub-Total, Jaguar			**79,407**		

RPA has not identified any drilling, sampling, or core recovery issues that could materially affect the accuracy or reliability of the core samples at the Roça Grande Mine.

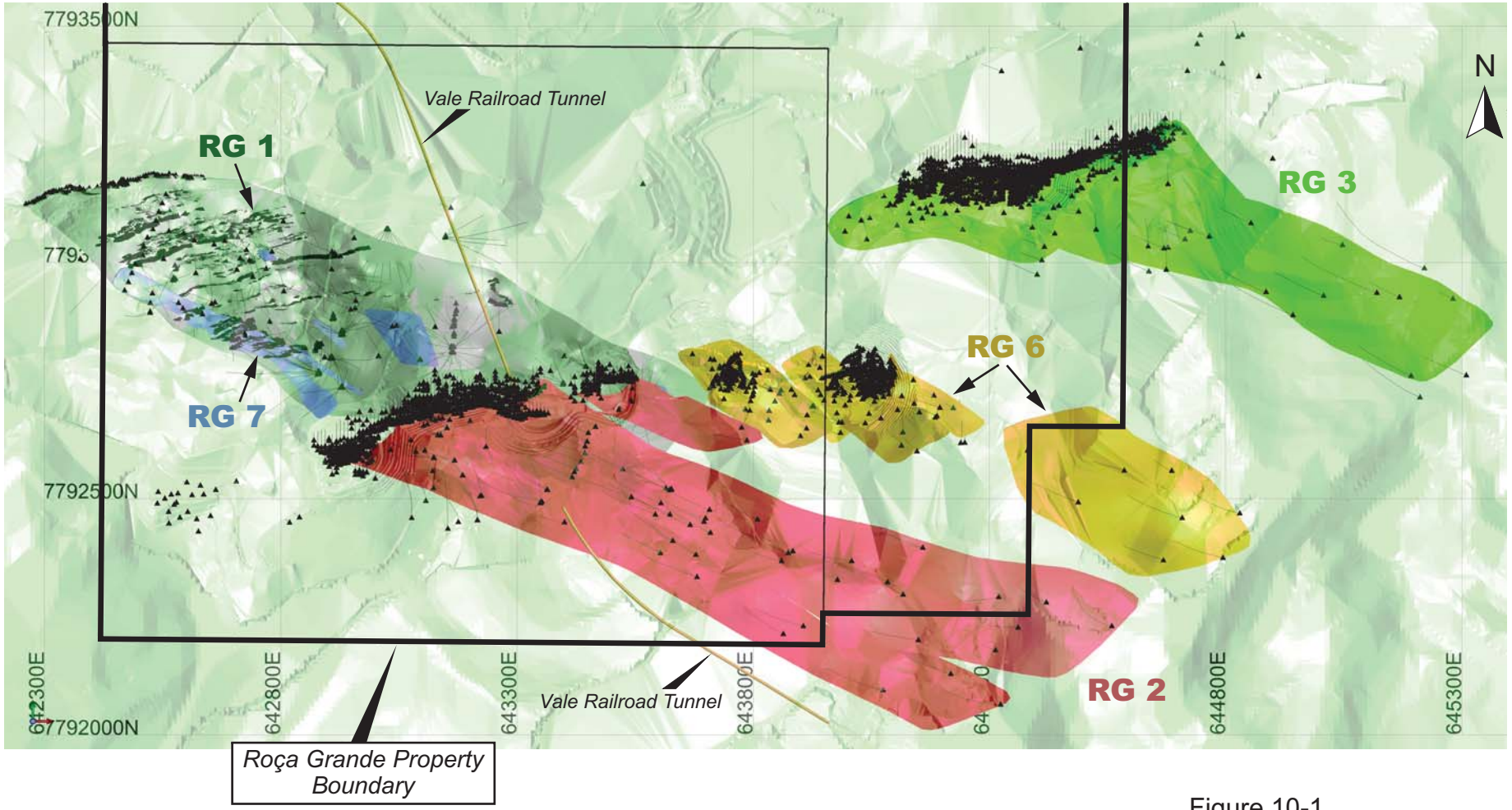


Figure 10-1

Jaguar Mining Inc.

Caeté Mining Complex
Minas Gerais State, Brazil
Drill Hole and Channel Sample Locations, Roça Grande Mine

April 2019

Source: RPA, 2019.

PILAR

In 2004, Jaguar started an exploration campaign at the Pilar property that targeted the Pilar Sul, São Jorge, and São Jorge Extensão sectors of the deposit. The exploration effort comprised three phases as follows.

PHASE 1

After interpretation of the available data, an exploratory diamond drilling program was carried out to test the structural controls and the continuity of the mineralization to 200 m below the surface. Mineralized shoots mainly occurred within the BIF. The holes intercepted several significant mineralized intervals and pointed out the need for additional investigation of the structural geology of the area. During this phase, a total 6,489 m was drilled in 36 diamond drill holes.

PHASE 2

Diamond drill holes tested the structural control and the continuity of the mineralization to 300 m below surface. Mineralized shoots occurred both within the BIF and the shear zone. A total of 12,926 m in 41 holes was drilled during Phase 2.

PHASE 3

Phase 3 included underground exploration and underground and surface diamond drilling. Infill underground drilling was completed to delineate mineralization at 693 MASL. Surface drilling was carried out to obtain more data on the structural control and the main zones of mineralization. Through December 2010, Jaguar completed a total of 10,390 m in ramps and drifts, 11,200 m of underground drilling in 180 holes, and 10,186 m of surface drilling in 19 holes.

Late in 2010 and during 2011 (subsequent to the Caeté Feasibility Study), Jaguar completed an underground drilling program to investigate the down plunge continuation of the mineralization to Level 11, approximately 860 m from surface. A total of 12,574 m in 44 drill holes were completed, confirming the extension of the mineralized zones to depth. Delineation drilling underground continued in 2012 and 2013 (Jaguar 2015b).

A small program of exploration drilling (nine holes, 910 m) was carried out in November 2014 to test near surface targets in the proximity of the crown pillar of the Pilar Mine. In late 2014 to May 2015, Jaguar carried out an underground exploration drilling program focussed on

testing for additional gold mineralization along the down-plunge projections of the AB and C orebodies. In all, 90 holes were completed for a total length of 14,875 m.

Jaguar carried out a program of growth exploration drilling during 2017 with the objective of targeting the down-plunge continuity of the principal mineralized BIF orebodies between Levels 11 to 16, up to approximately 350 m vertically below the then-current development. This drilling program was successful in intersecting the target zones along the down-plunge directions. A total of 23 holes were completed for a total length of 7,081 m.

Jaguar continued to carry out a drilling program during 2018 that continued to focus on locating and beginning to define the down-plunge extensions of the BA, BF, and BF II mineralized zones located between elevation 350 m to -210 m, approximately 200 m below the bottom of the ramp. The drilling program also focussed on providing additional detailed, in-fill information for those mineralized intersections discovered by the 2017 drilling program. A total of 87 definition holes were completed in 2018 for a total length of approximately 2,190 m. A total of 76 exploration and delineation drill holes were completed in 2018 for a total length of approximately 11,510 m (Figure 10-2).

The drilling procedures at the Pilar Mine were similar to those used at the Roça Grande Mine. Surface diamond drilling was carried out by the drilling contractor Mata Nativa. The underground drilling program in 2015 was completed by Geosol Ltd. of Belo Horizonte using BQ (36.5 mm), NQ (47.6 mm), HQ (63.5 mm), and LTK (36.3 mm) sized equipment. The location of all 2018 diamond drill hole collars was accurately surveyed using a Total Station survey instrument, and downhole deviations were surveyed using non-magnetic equipment with Icefield Tools' Gyro Path NSG equipment and SPT Stockholm Precision Tools with GyroMaster Solid State North-seeking gyro. In-fill drilling programs carried out from underground stations were completed by Jaguar staff and company-owned equipment.

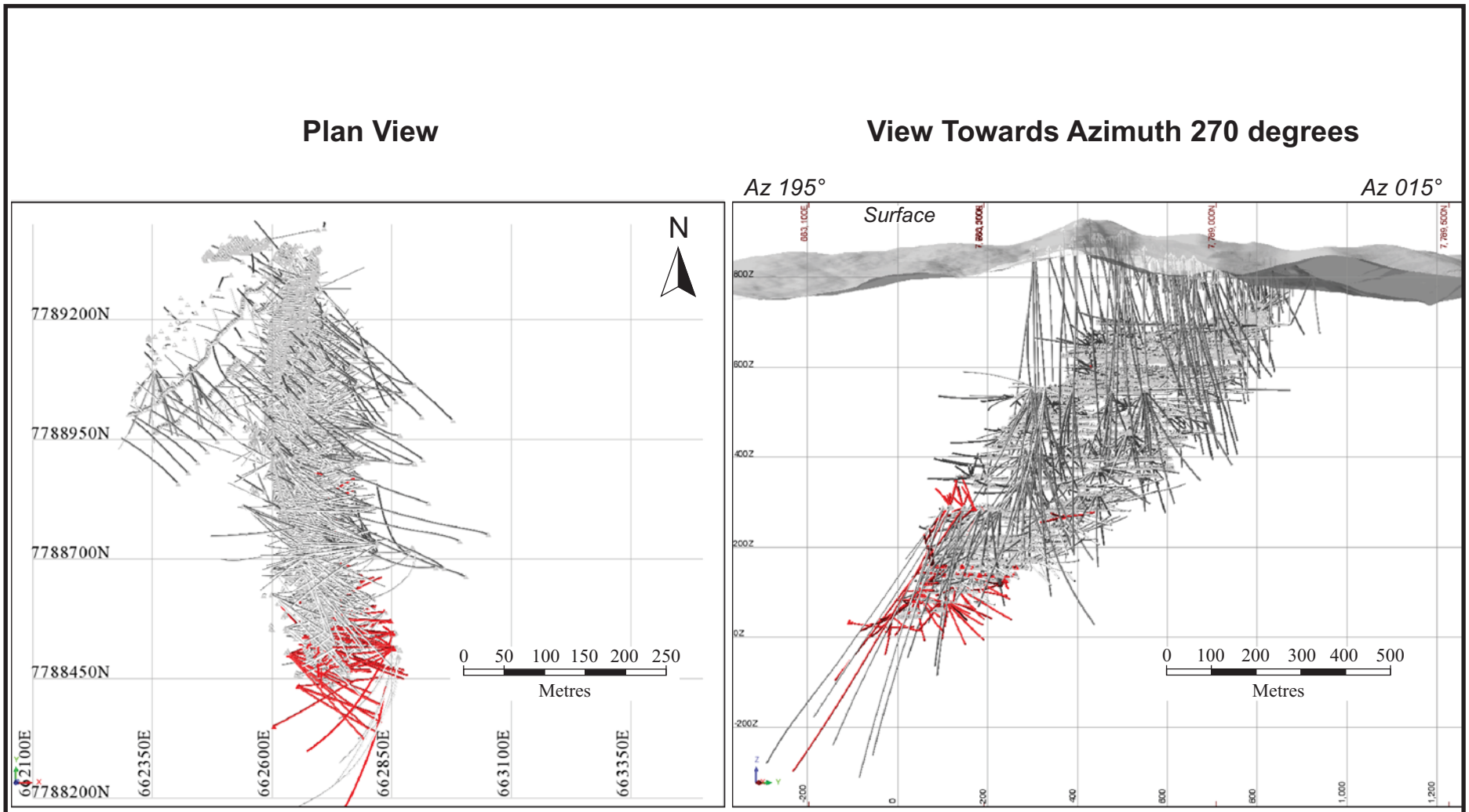


Figure 10-2

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

2018 Drill Hole Locations

April 2019

Source: RPA, 2019.

All core is transported to Jaguar's core shack that is located at the Roça Grande Mine where core technicians prepare the core boxes for logging and sampling. Each core box is identified with an aluminum tag that contains the hole number, the box number, and the from and to intervals of the core for each specific core box. The drill core is then logged by qualified geologists who record the major lithologies, alteration, structure, and mineralization into digital drill logs. The logging geologists also mark off those intervals of core which are to be sent for assaying. The core boxes are then passed along to the core technicians for sawing and sampling of the selected intervals. All remaining core is stored at the core storage facility at the Roça Grande Mine.

A summary of the drilling campaigns completed at the Pilar Mine is provided in Table 10-2 and a selection of significant intersections from the 2018 exploration program is provided in Table 10-3 (Jaguar 2018b).

TABLE 10-2 SUMMARY OF DRILLING CAMPAIGNS, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

		Diamond Drilling		Roto-Percussive Drilling	
Period	Target	No. Holes	Total Length (m)	No. Holes	Total Length (m)
Vale					
1989-1994		65	11,812	60	2,960
2002-2003		10	3,069		
Sub-Total, Vale		**75**	**14,881**	**60**	**2,960**
JAGUAR					
2004-2010	Phase 1	36	6,489		
	Phase 2	41	12,926		
	Phase 3-UG	180	11,200		
	Phase 3-Surface	19	10,186		
Q4 2010-2011		44	12,574		
2012	UG-Exploration	31	4,005		
	UG-Definition	121	9,705		
2013	UG- Exploration	40	5,978		
	UG-Definition	51	3,557		
2014	UG- Exploration	60	8,398		
	UG-Definition	125	10,818		
	Surface Exploration	9	910		
2015	UG- Exploration	30	6,477		
	UG-Definition	12	879		
2016	UG- Exploration	19	2,994		
	UG-Definition	89	8,143		
2017	UG- Exploration	23	7,081		
	UG-Definition	150	9,534		
2018	UG- Exploration	3	328		
	UG-Definition	172	12,172		
Sub-Total, Jaguar		**1,255**	**144,354**		

TABLE 10-3 SUMMARY OF SIGNIFICANT INTERSECTIONS, 2018 IN-FILL DRILLING PROGRAM, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Hole ID	From	To	Core Length (m)	Estimated True Width (m)	Average Grade Au (g/t)
PPL409	44.90	58.60	13.70	13.00	5.16
PPL419A	40.50	67.20	26.70	22.94	2.46
PPL420	46.15	61.60	15.45	14.17	12.38
PPL421	34.25	54.40	20.15	17.31	3.42
PPL446	139.1	143.0	3.9	3.4	36.6
And	154.0	165.8	11.8	9.6	15.9
and	161.9	165.8	3.9	3.2	29.5
PPL455	51.00	66.78	15.78	15.02	5.32
PPL460	75.2	84.65	9.45	8.3	8.52
PPL470A	44.6	55.65	11.05	10.52	5.06
PPL471	44.9	65.8	20.9	20.75	7.17
PPL472	40.65	68.85	28.2	27.97	6.67
PPL478	72	83.9	11.9	10.69	7.38
PPL479	72.3	81.55	9.25	8.14	7.23
PPL484	41.45	65.75	24.3	20.82	3.14
PPL485	46	52	6	5.36	12.45
and	53.7	64	10.3	9.47	5.3
PPL489A	65.7	86.4	20.7	15.03	3.54
and	91.9	113.5	21.6	10.14	13.56
PPL495	26.05	34.4	8.35	8.21	12.93
PPL496	26.15	38.8	12.65	10.48	7.29
PPL497A	75	96	21	9.5	5.78
PPL498	30	43	13	12.69	12.16
PPL500	43	59.2	16.2	14.8	4.63
PPL502A	23.3	43	19.7	17.25	4.27
PPL503	49.9	68.3	18.4	16.53	4.1
PPL508	101	137	36	34.25	3.98
PPL509	55.1	90.2	35.1	28.03	6.63
PPL510	43.5	67	23.5	20.85	2.68
and	69.8	90.5	20.7	18.67	3.7
PPL514	61.67	99	37.33	31.44	11.04
PPL515	72.5	99.6	27.1	24.38	2.96
And	116.1	162.85	46.75	41.21	6.08
and	177	223	46	43.87	3.38
PPL518	113	131.9	18.9	18.6	6.86
PPL523A	61.7	77.65	15.95	13.41	3.76
and	156.75	184.7	27.95	24.86	5.95
PPL524	128.1	151.6	23.5	20.1	2.62
And	155.35	194.05	38.7	34.32	3.343
and	194.05	206.9	12.85	11.66	7.91

Hole ID	From	To	Core Length (m)	Estimated True Width (m)	Average Grade Au (g/t)
PPL530	99.15	108	8.85	8.61	6.99
PPL536A	14.64	26	11.36	10.21	8.63
PPL537	64.9	71.2	6.3	5.45	22.76
PPL541A	58	74	16	13.69	4.41
FSB519	4.7	14.4	9.7	9.7	11.8
FSB528	0	6.8	6.8	6.65	12.38
FSB604	1.11	15.01	13.9	13.46	6.13
FSB648	2	14	12	11.08	4.86
FSB701	9	24	15	11.76	6.77
FSB715	8	42.7	34.7	33.12	2.37
FSB723	0	12.35	12.35	11.59	4.39
FSB726	8.25	30.75	22.5	14.44	4.6
FSB733	4.55	15.4	10.85	10.5	8.2

Notes:
1. No capping values applied when calculating the weighted average grades.
2. The estimated true widths are calculated in consideration of the angle of intersection of the drill hole with the local interpreted geometry of the target mineralized zone.

RPA has not identified any drilling, sampling, or core recovery issues that could materially affect the accuracy or reliability of the core samples.

REGIONAL EXPLORATION DRILLING

During 2008 and 2009, Jaguar completed 92 (31,501 m) and 53 (8,650 m) drill holes, respectively, in the exploration concessions that are part of the Caeté Project.

During the third quarter of 2012, Jaguar completed a Phase 1 diamond drilling campaign at the Moita Target, located four kilometres northwest of the Caeté processing plant. A total of 16 drill holes for 1,115 m were completed to test a 400 m by 50 m mineralized zone identified by soil sampling and trenching within hydrothermally altered meta-sediments hosted by a shear zone. Drilling results confirmed the southeast down plunge extension of the mineralization.

In 2017, Jaguar completed a small program of exploration drilling on the Pacheca Target (nine diamond drill holes, totalling 2,032 m in length) and the Cubas Target (three diamond drill holes, totalling 1,951.6 m in length). The results from the drilling at the Cubas Target were generally negative, however, four of the drill holes completed at the Pacheca Target

intersected anomalous gold mineralization. A summary of the significant intersections from the 2017 drilling program at the Pacheca Target is provided in Table 10-4.

TABLE 10-4 SUMMARY OF SIGNIFICANT DIAMOND DRILLING INTERSECTIONS, PACHECA TARGET
Jaguar Mining Inc. – Caeté Mining Complex

Hole ID	From	To	Core Length (m)	Average Grade (g/t Au)
FPCH001	45.35	55.05	9.70	0.34
	59.45	61.70	2.25	0.30
	63.50	65.50	2.00	2.81
	73.50	78.50	5.00	0.50
	86.05	89.05	3.00	0.15
	240.35	242.10	1.75	0.20
FPCH002	66.30	67.80	1.50	1.20
	72.25	73.00	0.75	0.96
	96.15	102.30	6.15	0.47
	108.60	110.60	3.30	0.49
FPCH003	85.05	85.50	0.45	0.50
FPCH004	224.10	228.10	4.00	0.28
	240.60	246.60	6.00	0.34

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

SAMPLING

The sampling procedures used by Jaguar are as follows.

SURFACE/EXPLORATION CHANNEL SAMPLING

- Channel samples are collected from outcrops and trenches as needed.
- The sites to be sampled are cleaned with a hoe, exposing the material by scraping it.
- Structures are mapped and the lithologic contacts defined, and samples marked so that no sample has more than one lithology.
- Samples have a maximum length of one metre and are from one kilogram to two kilograms in weight.
- Each sample is collected manually in channels with average widths between five and ten centimetres, and about three centimetres deep, using a hammer and a chisel.
- Either an aluminum tray or a thick plastic canvas drop sheet is used to collect the material.
- The samples are then stored in a thick plastic bag and identified by a numbered label, which is protected by a thin plastic cover and placed with the sample.
- At the sampling site, samples are identified by small aluminum plates, labels, or small wooden poles.
- Sketches are drawn with lithological and structural information. The sample locations are surveyed.

DIAMOND DRILLING CORE SAMPLING

- Surface drilling is performed by contractors with holes in HQ or NQ diameters.
- Underground drilling is performed either by Jaguar or contractors with holes in BQ and LTK diameters.
- Drill holes are accepted only if they have more than 85% of core recovery from the mineralized zone.
- All the drill holes have their deviations measured by Maxibor or equivalent survey tool.

- The cores are stored in wooden boxes of one metre length with three metres of core per box (HQ diameter) or four metres of core per box (BQ or LTK diameters).
- The number, depth, and location of each hole are identified in the boxes by an aluminum plate or by a water-resistant ink mark in front of the box.
- The progress interval and core recovery are identified inside the boxes by small wooden plates.
- During logging, all of the geological information, progress, and recovery measures are verified and the significant intervals are defined for sampling.
- Samples are identified in the boxes by highlighting their side or by labels.
- Samples are cut lengthwise with the help of a diamond saw and a hammer into approximately equal halves.
- One half of the sample is placed in a highly resistant plastic bag, identified by a label, and the other half is kept in the box at a warehouse.
- The remaining drill core from the surface-based drill holes is stored at a dedicated core storage facility that is located at the Roça Grande Mine.
- For many of the underground-based drill holes, samples are cut lengthwise with the help of a diamond saw and a hammer into approximately equal halves.
- For the shorter-length, bazooka-type drill holes completed from underground set-ups, the whole core is sampled as the core diameter does not permit splitting into halves.

UNDERGROUND PRODUCTION CHANNEL SAMPLING

- The sector of wall to be sampled is cleaned with pressurized water. Structures are mapped and lithologic contacts defined, and samples marked so that no sample has more than one lithology. Samples have a maximum length of one metre and are from two to three kilograms in weight.
- Channel samples were taken by manually opening the channels, using a hammer and a small steel pointer crowned by carbide or a small jackhammer.
- The channel samples have lengths ranging from 50 cm to one metre, average widths between five and ten centimetres, and are approximately three centimetres deep.
- Two sets of channel samples are regularly collected on the face. One set of channel samples is taken from the top of the muck pile once the work area has been secured. The second set of channel samples is taken at the waist height once the heading has been mucked clean and secured.
- Channel samples from the walls and back are collected at approximately 5 m intervals. The channel samples are collected starting at the floor level on one side and continue over the drift back to the floor on the opposite side.

- Either an aluminum tray or a thick plastic canvas is used to collect the material. The samples are then stored in a thick plastic bag and identified by a numbered label, which is protected by a thin plastic cover and placed with the sample.
- At the sampling site, samples are identified with paint.
- Sketches are drawn with lithological and structural information. The sample locations are surveyed.

SAMPLE PREPARATION AND ANALYSIS

For surface-based exploration drill holes completed prior to 2015, samples were prepared at the SGS laboratories in Belo Horizonte. For other drill holes and channels collected prior to 2015, samples were prepared at Jaguar's mine site laboratories by drying, crushing to 90% minus 2 mm, quartering with a Jones splitter to produce a 250 g sample, and pulverizing to 95% minus 150 mesh. Analysis for gold is by standard fire assay procedures, using a 50 g or 30 g sample and an atomic absorption (AA) finish.

The SGS laboratory based in Belo Horizonte meets international analytical standards and ISO 17025 compliance protocols. Analytical results from the SGS laboratory were forwarded to Jaguar's Exploration or Mine Departments by e-mail, followed by a hard copy.

All samples from the 2015 to 2018 drilling programs executed at the Pilar and Roça Grande mines were analyzed for gold at either Jaguar's mine site laboratory, or by the ALS Chemex laboratory located in Belo Horizonte. A summary of the sample preparation and analytical packages used in 2017 is presented in Table 11-1.

The ALS Chemex laboratory based in Belo Horizonte meets international analytical standards and ISO 17025 compliance protocols. The Jaguar mine site laboratory is not ISO 17025 certified.

TABLE 11-1 SUMMARY OF SAMPLE PREPARATION AND ANALYTICAL METHODS, ALS CHEMEX, 2017
Jaguar Mining Inc. – Caeté Mining Complex

Department	Section	Method Code	Number of Samples
Preparation	Pulverization	PUL-31: Pulverize split to 85% <75 µm	524
	Shipping	SHP-21: Per Sample Shipping Charge	5,022
	Prep Miscellaneous	LOG-24: Pulp Login – Rcd w/o Barcode	1,747
		LOG-27: Prep QC on Coarse Reject – 70%	8
		LOG 22d: Sample Login – Rcd w/o Barcode	100
	Crush	SPL-21d: Split Sample-duplicate	100
Fire Assay	FA-AAS	Au-AA24: Au 50 g FA AA finish	14
		Au-AA25: Ore Grade Au 30 g FA AA finish	8
		Au-AA26: Ore Grade Au 50 g FA AA finish	4,133
	FA-GRAV	Au-GRA22: Au 50 g FA-GRAV finish	105
	FA-ICPAES	Au-ICP22: Au 50 g FA ICP-AES finish	242
	FA-CON	Au-CON01: Control Au – Fire Assay	7
Spectroscopy	ICP-MS	ME-MS61: 48 element four acid ICP-MS	618
Package	Package	PREP-31: Crush, Split, Pulverize	2,731
		PREP-31B: Crush, Split, Pulverize 1 kg	497
		HYP-PKG: TerraSpec and Spectral Interp	100
Grand Total			**15,956**

At Jaguar's Caeté laboratory, samples from the Roça Grande and Pilar mines are dried and then crushed. A one kilogram sub-sample of the crushed material is selected for pulverization to approximately 70% minus 200 mesh. The ring-and-puck pulverizers are cleaned after each sample using compressed air and a polyester bristle brush. The analytical protocol for all samples employs a standard fire assay fusion using a standard 30 g aliquot, with the final gold content being determined by means of AA. The detection limit for fire assay analyses is 0.05 g/t Au. A second cut from the pulps is taken and re-assayed for those drill core samples where the grade is found to be greater than 30 g/t Au. If the two assays are in good agreement, only the first assay is reported. The AA unit is calibrated to directly read gold grades up to 3.3 g/t Au; samples with grades greater than this are re-assayed by diluting the solute until it falls within the direct-read range.

RPA recommends that the results from assays of all aliquots be reported by the laboratory and recorded in the drill hole database. The current database structure will require slight modification to allow for recording of all assay results for a given sample. The final assay for the sample will then be the average of all of the assay results.

RPA has reviewed the field and underground sampling procedures and is of the opinion that they meet accepted industry standards. In RPA's opinion, the sample preparation, analysis, and security procedures at the Roça Grande and Pilar mines are adequate for use in the estimation of Mineral Resources.

QUALITY ASSURANCE AND QUALITY CONTROL

Jaguar carried out a program of Quality Assurance/Quality Control (QA/QC) for all samples collected in 2018. The QA/QC protocol includes carrying out a duplicate analysis after every 20 samples, representing an insertion frequency of 5%.

Commercially sourced standard reference materials obtained from Rocklabs are inserted by the Pilar geological team into their sample stream at a frequency of every 45 to 50 samples. A list of the standard reference materials that were used is provided in Table 11-2.

TABLE 11-2 LIST OF CERTIFIED STANDARD REFERENCE MATERIALS, 2018 QA/QC PROGRAM
Jaguar Mining Inc. – Caeté Mining Complex

Standard No.	Recommended Value	Standard Deviation	Number Analyzed
HiSilK4	3.463	0.09	8
HiSilP3	12.240	0.246	19
SF85	0.848	0.018	42
SG84	1.026	0.025	3
SG82	1.333	0.027	54
Si81	1.79	0.03	93
SK93	4.079	0.089	10
SK94	3.899	0.084	30
SL76	5.96	0.192	60
SN91	8.679	0.194	19
SP73	18.17	0.42	6

Blank samples are inserted at a rate of one in every 20 samples, representing an insertion frequency of 5%. Blank samples are composed of crushed, barren quartzite or gneiss and are used to check for contamination and carry-over during the crushing and pulverization stage.

A number of pulp samples were forwarded to the ALS Chemex laboratory in Vespasiano, Minas Gerais, for third-party check analyses and the analytical results compared favourably with the Caeté analyses.

The results of the blanks, duplicates, and standards are forwarded to Jaguar's head office on a monthly basis for insertion into the Jaguar's internal database (BDI). There, the results from the standards samples are scanned visually for out-of-range values on a regular basis. When failures are detected, a request for re-analysis is sent to the laboratory. Only those assays that have passed the validation tests are inserted into the main database.

Sample control charts are presented in Figures 11-1 to 11-3.

FIGURE 11-1 CONTROL CHART FOR BLANK SAMPLES, 2018

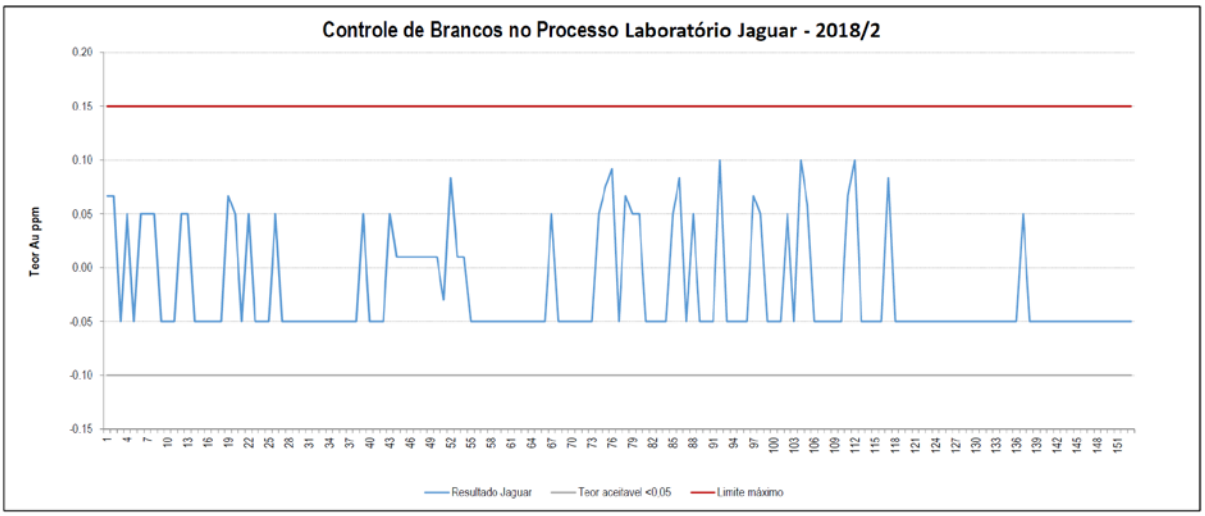


FIGURE 11-2 CONTROL CHART FOR CERTIFIED REFERENCE MATERIAL RL SI81, JANUARY TO JUNE 2018

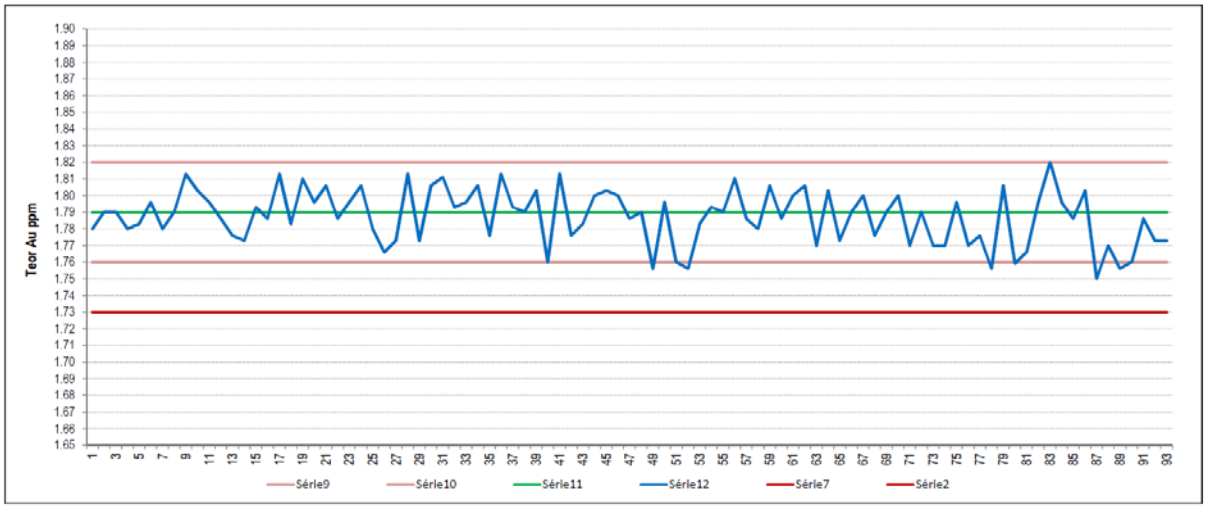
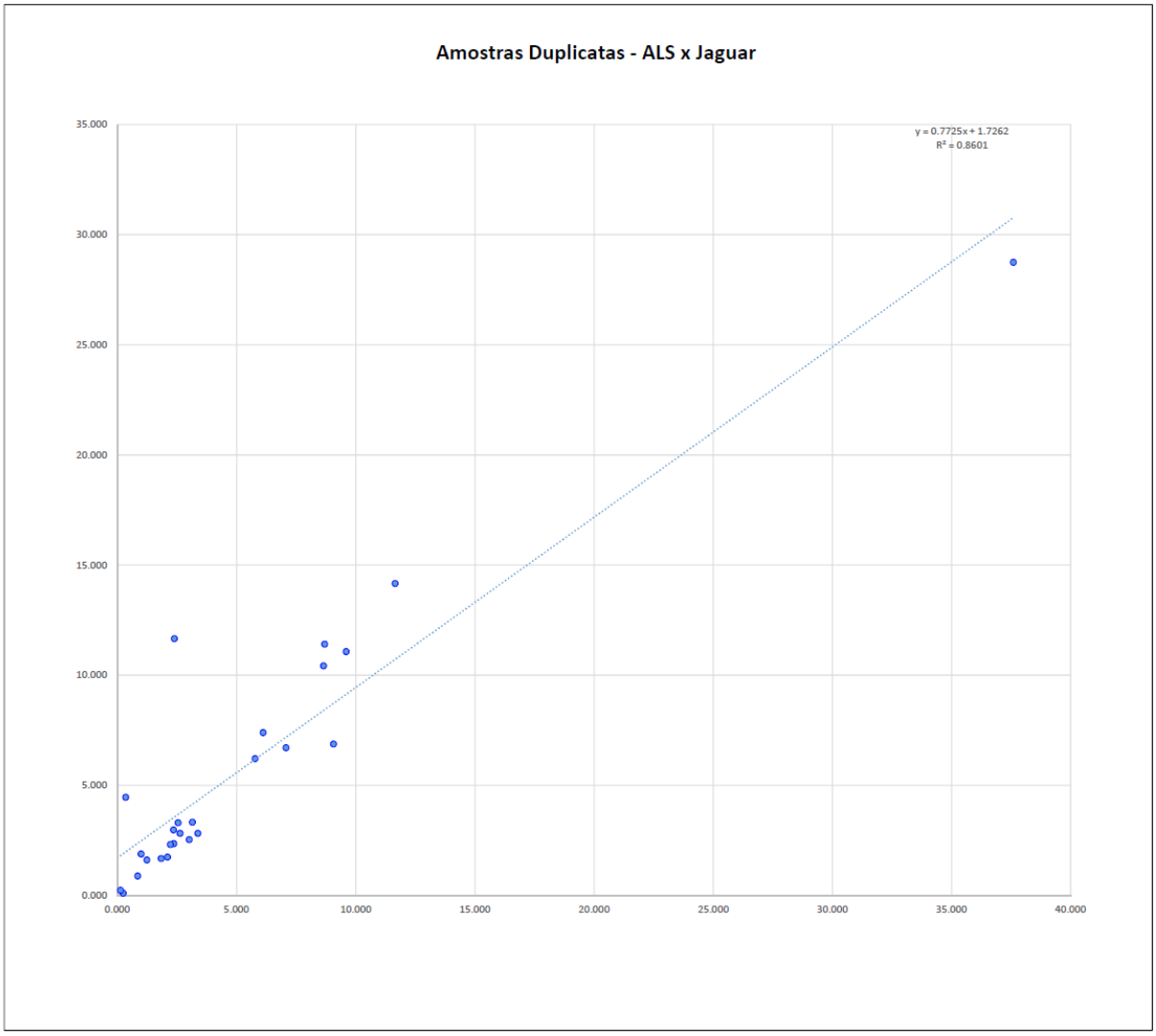


FIGURE 11-3 CONTROL CHART FOR EXTERNAL CHECK SAMPLES, 2018 - JAGUAR VS. ALS CHEMEX



In RPA's opinion, the QA/QC program as designed and implemented by Jaguar is adequate and the assay results within the database are suitable for use in a Mineral Resource estimate.

12 DATA VERIFICATION

RPA's validation checks on the drilling and sampling database for the Roça Grande and Pilar mines provided by Jaguar included:

- Conducted site visits in 2014 and 2017 to personally inspect the style and structural complexity of the gold mineralization and its host rocks at the Roça Grande and Pilar mines.
- Carried out a site visit to the Jaguar assay laboratory where the sample preparation and analytical procedures and equipment were reviewed.
- Carried out independent validation of the Pilar Mine drill hole database by means of spot checking as described in RPA (2015 and 2018).
- Carried out independent validation of the Pilar Mine drill hole database by means of spot checking of eight drill holes completed in the 2018 drilling program which intersected significant gold mineralization below Level 9 (elevation 170 m).
- Carried out independent validation of the Roça Grande Mine drill hole database by means of spot checking as described in RPA (2018).
- Checked collar locations relative to either the digital topographic surface or the location of the underground excavation digital model as appropriate.
- Reviewed drill hole and sample orientations (azimuth/dip) relative to the location of the mineralized zones.
- Completed validity checks for out-of-range values, overlapping intervals, and mismatched sample intervals.
- Reviewed the reasonableness of the geological interpretations relative to the nature of the previously extracted mineralization.
- Reviewed the geological wireframes to ensure that a minimum mining width was honoured.
- Reviewed the coding of the mined out material in the block model to ensure a reasonable match with the excavation model, and
- Carried out a small program of check assaying on 21 mineralized samples from drill hole PPL454B. The results were presented in RPA (2018).

No material errors were noted for the Collar, Survey, Lithology, or Assay records reviewed for the Pilar Mine. A small number of errors were noticed in the Downhole Survey records of the drill holes contained in the Roça Grande database. RPA did observe some minor discrepancies on the order of one metre between the location of the collars of some

underground-based drill holes and the excavation models. These discrepancies are likely due to survey errors in the determination of either the drill hole collars or the excavation models and may contribute to errors in the mine design and reconciliation phases of the mining operation. RPA recommends that Jaguar carry out a review of its surveying practices and cavity monitoring system (CMS) quality control procedures to ensure that all drill hole collars are accurately located prior to entry into the final drill hole database.

RPA observes that the surface and underground drill hole collar locations are reasonable and channel samples are appropriately located with respect to the existing underground infrastructures. RPA is of the opinion that the drilling and sampling databases are appropriate to be used in the preparation of Mineral Resource and Mineral Reserve estimates.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

The following information on mineral processing and metallurgical testing on the Caeté Mining Complex, which includes Roça Grande and Pilar mines, was extracted from TechnoMine Services, LLC's (TechnoMine) Amended Feasibility Study (Amended FS) dated October 2010 (Machado, 2010).

MINERALIZATION

In the Pilar and Roça Grande deposits, the mineralized rocks occur within BIFs and shear zones, represented by disseminated gold-bearing sulphides associated with silica-sericitic-carbonatic solutions originating from hydrothermal activity. Gold is associated with sulphides (arsenopyrite, pyrite, and pyrrhotite) or occurs as free gold in the quartz veins or in the contact quartz/sericite schist.

MINERAL PROCESSING AND METALLURGICAL TESTWORK

Jaguar constructed a centralized leaching, carbon-in-pulp, adsorption/desorption/recovery (CIP-ADR) metallurgical plant to process the sulphide, transition, and oxide ore from Pilar and Roça Grande.

Jaguar carried out additional investigative metallurgical testwork to assess the inclusion of a flotation plant before the CIP-ADR plant to reduce the mass of solids to be leached (flotation concentrate only). The flotation tailings would be cyanide-free and could then be directed to the underground mines as backfill material. Comprehensive testing was carried out by FLSmidth-Dawson Laboratories Inc (Dawson) in Salt Lake City, Utah, USA, which included gravity separation, flotation, leaching, and adsorption tests. The testing by Dawson was conducted on a representative sample of mill feed containing 40% Roça Grande, 40% Pilar, and 20% Roça Grande oxide ore (referred to as the Dawson sample). Test results reported in 2009 indicated that the CIP-ADR plant would need to treat only 10% of the solids mass contained in the mill feed, while 90% of the material would be available (fully cyanide-free and geotechnically-appropriate) to feed the backfill plant.

Based on Dawson laboratory testwork, TechnoMine estimated the overall gold recovery to be:

Recovery = 54% + (46% x 0.90 x 0.93 x 0.985) = 91.9%

- Gravity recovery = 54%
- Flotation recovery = 90%
- Leaching recovery = 93%
- ADR (Adsorption, Desorption, Electrowinning) recovery = 98.5%

This information was included as part of the process design criteria for the expansion of the Caeté plant. The plant expansion is based on increasing the bottleneck of tails filtration capacity, rather than upstream processing. From the feasibility study the first phase of the plant is to produce is 0.7 million tonnes per year and the second phase of the plant is to produce 1.1 million tonnes per year for the expansion.

14 MINERAL RESOURCE ESTIMATE

SUMMARY

RPA has audited and accepted the Mineral Resource estimates prepared by Jaguar for the Roça Grande and Pilar mines. Table 14-1 summarizes the Mineral Resources as of December 31, 2018 based on a US$1,400/oz gold price and an exchange rate of R$2.50 : US$1 for the Roça Grande Mine and a US$1,500/oz gold price and an exchange rate of R$3.70 : US$1 for the Pilar Mine. A cut-off grade of 1.46 g/t Au was used to report the Mineral Resources for the Roça Grande Mine, and a cut-off grade of 1.81 g/t Au was used to report the Mineral Resources for the Pilar Mine.

TABLE 14-1 SUMMARY OF MINERAL RESOURCES AS OF DECEMBER 31, 2018
Jaguar Mining Inc. – Caeté Mining Complex

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Roça Grande Mine:			
Measured	188	2.14	13
Indicated	889	2.91	83
Sub-total M&I	**1,077**	**2.77**	**96**
Inferred	1,759	3.48	197
Pilar Mine:			
Measured	3,079	4.40	435
Indicated	1,855	3.87	231
Sub-total M&I	**4,934**	**4.20**	**666**
Inferred	1,385	3.61	161
Total, Caeté Operations:			
Measured	3,267	4.26	448
Indicated	2,744	3.56	314
Sub-total M&I	**6,011**	**3.94**	**762**
Inferred	3,144	3.54	358

Notes:
1. CIM (2014) definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au for the Roça Grande Mine and 1.81 g/t Au for the Pilar Mine.
3. Mineral Resources are estimated using a long-term gold price of US$1,400 per ounce for the Roça Grande Mine and US$1,500 per ounce for the Pilar Mine.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 3.7 Brazilian Reais: 1 US Dollar for the Pilar Mine and 2.5 Brazilian Reais: 1 US Dollar for the Roça Grande Mine.
5. Mineral Resources for the Roça Grande Mine are prepared by depletion of the 2015 resource block model by the excavation volumes and production as of December 31, 2018.
6. A minimum mining width of approximately two metres was used.

7. Gold grades are estimated using inverse distance cubed for the Roça Grande Mine and ordinary kriging for the Pilar Mine.
8. No Mineral Reserves are currently present at the Roça Grande Mine. Mineral Resources are inclusive of Mineral Reserves for the Pilar Mine.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

RPA is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other factors that could materially affect the Mineral Resource estimates.

It is RPA's opinion that the Roça Grande and Pilar Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with Canadian Institute of Mining, Metallurgy and Petroleum (CIM) for Mineral Resources and Mineral Reserves dated May 10, 2014 (CIM (2014) definitions).

ROÇA GRANDE

The updated block model for the Roça Grande Mine is based on drilling and channel sample data using a data cut-off date of March 30, 2015 and June 30, 2015, respectively. The database comprises 649 drill holes and 6,517 channel samples. The estimate was generated from a block model constrained by three-dimensional (3D) wireframe models that were constructed using a minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A two metre minimum width criteria were subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of 3 gram-metres.

The gold grades are estimated using the inverse distance cubed interpolation (ID^3) algorithm using composited capped assays. A capping value of 30 g/t Au was applied for the RG01 and RG06 Orebodies while a capping value of 50 g/t Au was applied for the RG02, RG03, and RG07 Orebodies. The wireframe models of the mineralization and excavated material for the Roça Grande Mine were constructed using the excavation information as of December 31, 2018. The Roça Grande Mine was put on a care and maintenance basis in Q1 2018.

The mineralized material for each orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from

the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with these orebodies.

PILAR

The updated block model for the Pilar Mine is based on drilling and channel sample data using a data cut-off date of December 31, 2018. The database comprises 1,658 drill holes and 20,698 channel samples. The estimate was generated from a block model constrained by 3D wireframe models that were constructed using a minimum width of two metres. The gold grades are estimated using the ordinary kriging (OK) interpolation and ID^3 algorithms using composited capped assays. Various capping values were applied to each of the different orebodies, ranging from 60 g/t Au for the BA Orebody to 20 g/t Au for the LHW Orebody. The wireframe models of the mineralization and excavated material for the Pilar Mine were constructed using the excavation information as of December 31, 2018.

The mineralized material for each orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with this deposit.

ROÇA GRANDE MINE

DESCRIPTION OF THE DATABASE

The drilling and sampling practices involve the initial delineation of the location of the various mineralized lenses using surface and underground drill holes at a nominal spacing of 25 m to 50 m. Underground drilling is used to delineate the RG01 and RG07 mineralized lenses only, as no underground development has been carried out on the RG02, RG03, and RG06 lenses. As development of the underground access progresses on the RG01 and RG07 lenses, a series of channel samples are taken in two locales (one set on the face and one set along the back) for each round. The average sample spacing along development drifts is five metres. Channel samples that were taken during excavation of the open pit mines on the RG02, RG03, and RG06 lenses were also included into the drill hole database.

Jaguar maintains an internal database which is used to store and manage all of the digital information for all of its operations. The drill hole and channel sample information for the Roça

Grande Mine were extracted from this internal database into separate files for use in preparation of the Mineral Resource estimates.

The cut-off date for the channel sample assays in the drill hole database is March 31, 2015, while the cut-off date for the drill core sample assays in the drill hole database is June 30, 2015. No further diamond drilling has been carried out at the Roça Grande property, however, collection of channel sample information in support of limited production activities has continued through to early 2018. The drill hole and channel sample information were grouped into five sets to reflect the known mineralized lenses at Roça Grande. The drilling and sampling was carried out using the UTM Datum Córrego Alegre, Zone 23S grid coordinate system.

A summary of the drilling and channel sampling information is provided in Table 14-2.

TABLE 14-2 DESCRIPTION OF THE ROÇA GRANDE DATABASE AS AT AUGUST 24, 2015
Jaguar Mining Inc. – Caeté Mining Complex

Data Type	Description
Collars, Drill Holes	649 (total 97,250 m)
Collars, Chip & Channel Samples	6,517 (total 74,041 m)
Survey, Drill Holes	23,694
Survey, Chip & Channel Samples	72,321
Lithology, Drill Holes	11,328
Lithology, Chip & Channel Samples	29,791
Assays, Drill Holes	33,327
Assays, Chip & Channel Samples	77,035

This drill hole information was modified slightly so as to be compatible with the format requirements of the MineSight v.7.60 mine planning software and was imported into that software package by Jaguar. A number of new tables and variables were created during the estimation process to capture such information as the intersection information between the drill holes and the wireframe models, density readings, capped assays, and composites.

The database included a number of assay records which contained entries of negative values to represent intervals of no sampling, lost core, lost sample, or no core recovery, some of which are contained within the mineralized wireframes. Depending upon the specific local conditions, these null values can introduce an undesired positive bias upon the grade estimations. Jaguar

therefore elected to pursue a conservative approach by inserting a very low gold value of 0.01 g/t Au for these intervals of null values. A total of 33,033 records were adjusted in this process.

RPA notes that the controls on the gold mineralization at the Roça Grande Mine are well understood and that the mineralized lenses are well drilled and well sampled. The drilling and sampling protocols employed by Jaguar permit the identification and delineation of the mineralized areas with confidence. The drilling and sampling practices are carried out to a high standard. RPA is of the opinion that the drill hole and sampling database is suitable for use in preparation of Mineral Resource estimates.

MINERALIZATION WIREFRAMES

The interpreted 3D wireframe models of the gold mineralization have been created using the geology information and assay values from surface and underground drill holes, and channel sample data as described in RPA (2015). Wireframe models of the gold distribution for the three orebodies were created using the Leapfrog Geo version 2.0.2 software package. No changes have been made to the mineralized wireframes for the year-end 2018 Mineral Resource estimate.

The wireframe limits were drawn using a cut-off grade of 0.50 g/t Au and a nominal minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A two metre minimum width criterion was subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of 3 gram-metres. The wireframe models were clipped to the original, pre-mining topography surface.

The main underground production of the mine has been from the RG01 and RG07 lenses. The RG01 lens is a shallow dipping stratiform deposit that is generally associated with an iron formation assemblage comprised of carbonate, oxide and sulphide facies iron formation, chert, clastic sediments (including graphitic argillite), and fine-grained tuffaceous units. The average strike of the lens is to azimuth 075° and the average dip is 40° to 50° to the south (Figure 14-1).

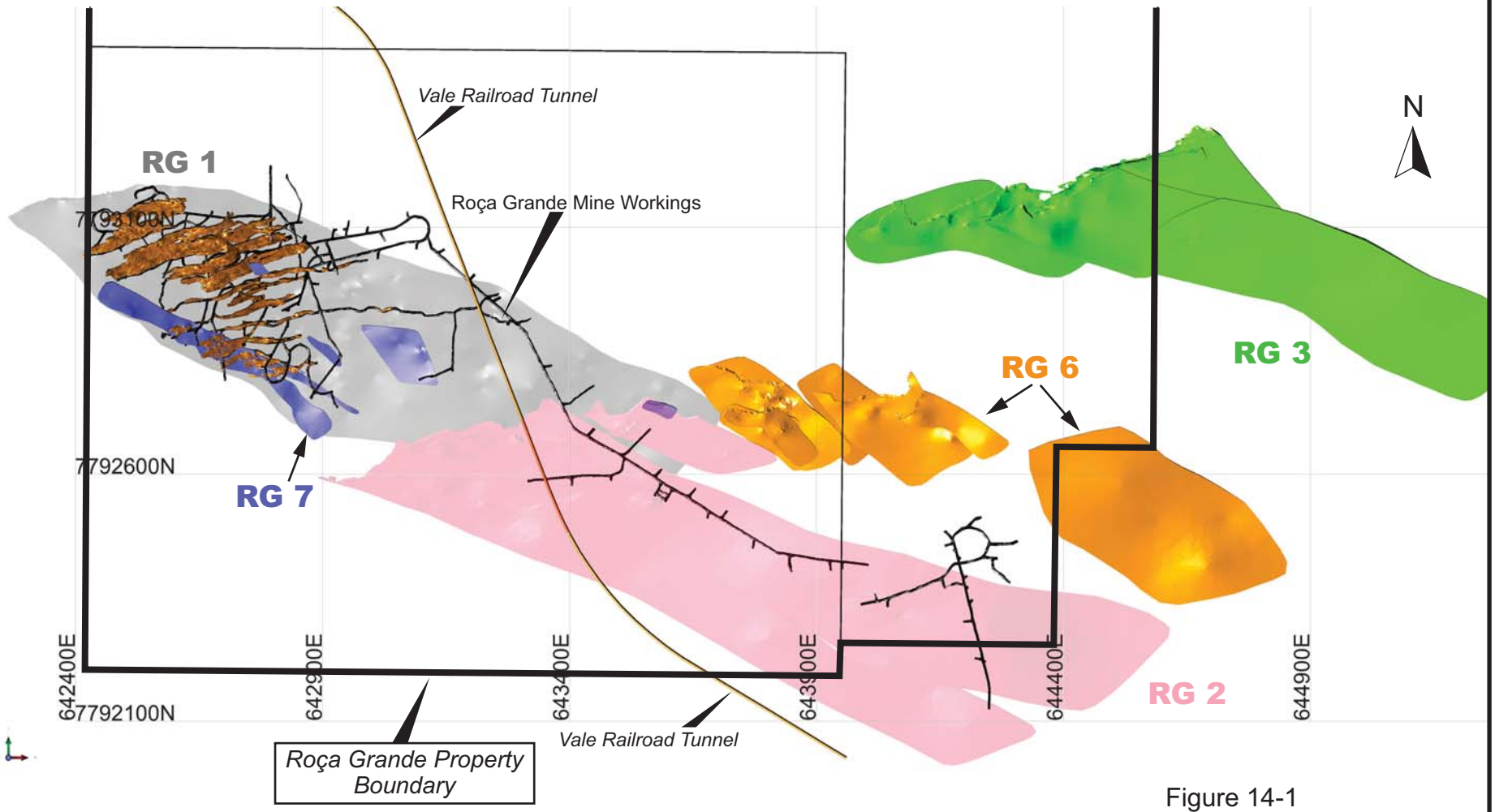


Figure 14-1

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Plan View of the Mineralized Wireframes and Underground Workings - Roca Grande Mine

April 2019

Source: RPA, 2019.

The RG07 lens in contrast is composed largely of vein quartz, which is oriented sub-parallel to the RG01 mineralized lens. The mineralization in the RG01 lens has been outlined along a strike length of approximately 500 m and along the down-dip direction of approximately 1,400 m to 1,500 m (approximately 400 m vertically below surface). The deposit is accessed by a ramp and a system of levels that provides access to a depth of approximately 230 m vertically from surface. The bottom of the ramp is currently located approximately 300 m vertically from surface. The mineralization in the RG01 lens has been defined by drilling below the lowest working level and good potential remains for discovering additional mineralization along the down-plunge projection with additional drilling.

Separate surfaces were also created to represent the bottom of the weathered material as well as representing the bottom of the transitional weathering zone. It is important to note that due to the presence of deeply penetrating fault structures, the bottom of the transition zone has been interpreted to penetrate deeper near the RG01 and RG02 lenses. This interpretation is supported by the rock quality information gained in the Vale railroad tunnel, the ramp access from the RG01 mine to the RG02 lens, and from drill holes that tested the RG02 lens which were collared from the RG02 decline.

TOPOGRAPHY AND EXCAVATION MODELS

A topographic surface of the mine area that is current as of May 2015 was used to code the block model for those portions of the RG02, RG03, and RG06 lenses that have been excavated by means of open pit mining methods. A wireframe model of the completed underground excavations as of December 31, 2018 was prepared and was used to code the block model for the portions of the RG01 and RG07 lenses that have been mined out as of that date.

The mineralization at the Roça Grande Mine is accessed by means of a ramp with a collar elevation at approximately 1,110 MASL. The bottom of the ramp is currently at an elevation of approximately 915 MASL. Due to the dip of the mineralization, the chief mining method that has been employed to-date has been a drift-and-fill method. In all, five levels have been developed to access the RG01 and RG07 lenses (Table 14-3). An attempt was made to access the RG02 lens by deepening and extending the RG01 ramp, however the attempt was stopped due to poor ground conditions. A second ramp has been excavated with the portal located in the hangingwall of the RG02 lens at an elevation of approximately 1,035 MASL. The bottom of this ramp is currently at an elevation of approximately 945 MASL, and has not penetrated the RG02 mineralized lens.

A railroad tunnel has been constructed by Vale in support of its mining operations in the area. A digital model of this tunnel has been prepared, which shows that it penetrates the mineralized wireframe of the RG02 lens (Figure 14-1).

TABLE 14-3 DESCRIPTION OF THE ROÇA GRANDE MINE LEVELS
Jaguar Mining Inc. – Caeté Mining Complex

Level	Floor Elevation (m)
Crown Pillar	1,220
1	1,160
2	1,120
3	1,044
4	970
5	922

SAMPLE STATISTICS AND GRADE CAPPING

The mineralization wireframe models were used to code the drill hole database and identify the raw assay samples, or resource assays, that are contained within the mineralized wireframes. These samples were extracted from the database into their respective domains, and then subjected to statistical analyses by means of histograms, probability plots, and decile analyses. A total of 65,964 samples were contained within the mineralized wireframes, of which approximately 3% comprised samples with null values which had been replaced by near-zero values. The resource assay statistics are summarized in Table 14-4. Selected histograms are provided in Figures 14-2 and 14-3.

On the basis of its review of the resource assay statistics, RPA believes that a capping value of 30 g/t Au is appropriate for the RG01 and RG06 mineralized lenses and a capping value of 50 g/t Au is appropriate for the RG02, RG03, and RG07 mineralized lenses. The selection of capping values can be re-examined in light of grade reconciliation information and adjusted accordingly as necessary.

TABLE 14-4 RESOURCE ASSAY DESCRIPTIVE STATISTICS, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Item	RG01		RG07		RG02		RG03		RG06	
	Au Raw	Au Cap	Au Raw	Au Cap	Au Raw	Au Cap	Au Raw	Au Cap	Au Raw	Au Cap
Length-Weighted Mean (g/t Au)	2.17	2.16	5.40	4.99	3.04	2.98	1.51	1.48	1.66	1.59
Median (g/t Au)	0.89	0.89	0.34	0.34	1.17	1.17	0.36	0.36	0.31	0.31
Mode (g/t Au)	0.01	0.01	0.01	0.01	0.01	0.01	0.07	0.07	0.01	0.01
Standard Deviation	3.60	3.41	13.84	9.46	6.14	5.44	4.15	3.62	4.71	3.49
CV	1.66	1.58	2.56	1.90	2.02	1.83	2.76	2.44	2.85	2.20
Sample Variance	12.96	11.64	191.45	89.57	37.67	29.61	17.24	13.09	22.23	12.21
Minimum (g/t Au)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum (g/t Au)	88.17	30.00	385.00	50.00	165.03	50.00	196.00	50.00	115.80	30.00
Count	22,834	22,834	3,060	3,060	13,386	13,386	22,307	22,307	2,299	2,299
Capping Value (g/t Au)	30		50		50		50		30	

FIGURE 14-2 RG01 RESOURCE ASSAY FREQUENCY HISTOGRAM

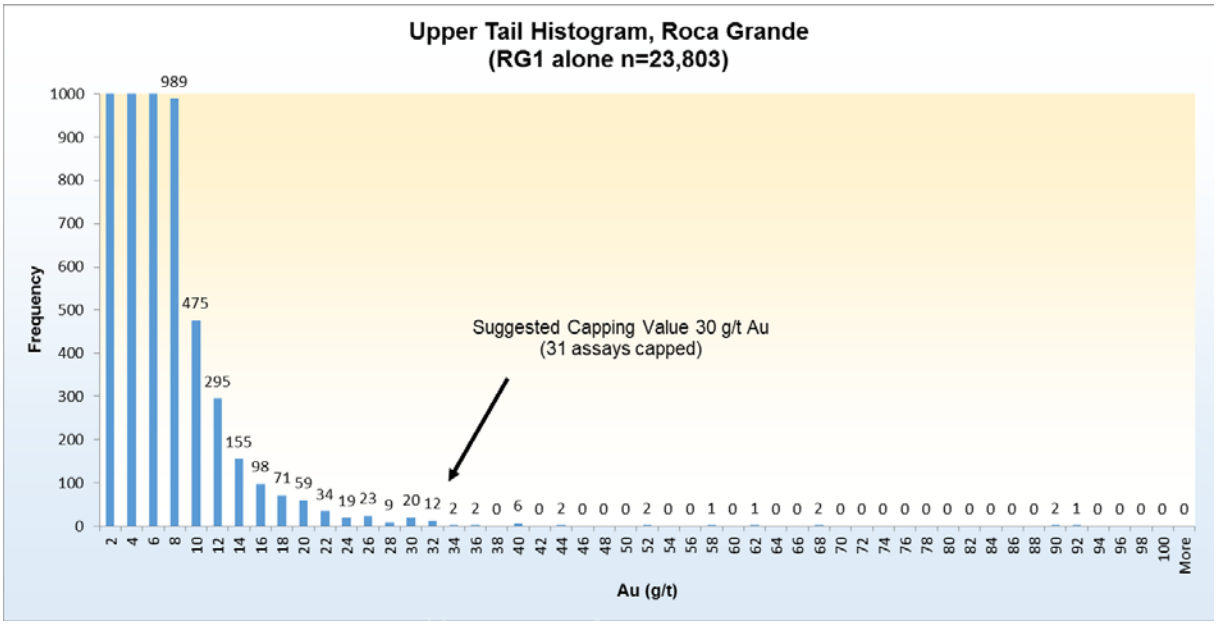
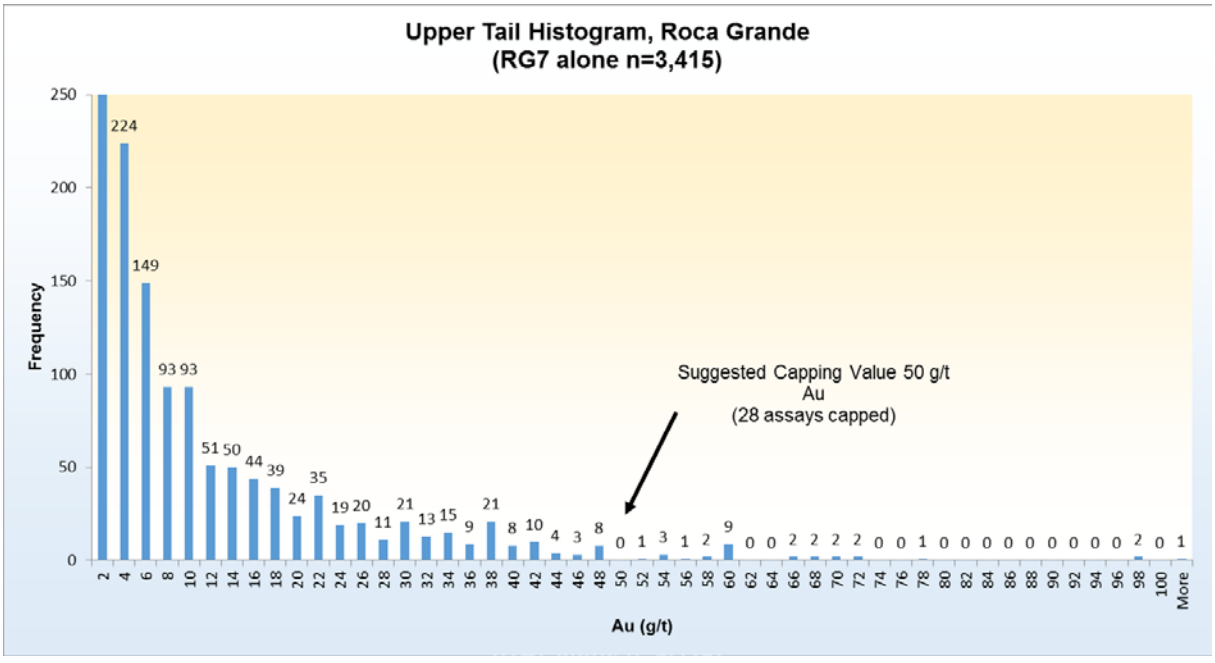


FIGURE 14-3 RG07 RESOURCE ASSAY FREQUENCY HISTOGRAM



COMPOSITING METHODS

The selection of an appropriate composite length began with examination of the descriptive statistics of the resource assays and preparation of sample length frequency histograms. Consideration was also given to the size of the blocks in the model.

Many of the sample lengths in the various mineralized wireframes were found to be approximately one metre in length. Consequently, on the basis of the available information, RPA believes that a composite length of one metre for all samples is reasonable. The resource assays were composited to a nominal one metre length using the best-fit function of the MineSight software package. The descriptive statistics of the composites are provided in Table 14-5.

TABLE 14-5 COMPOSITE DESCRIPTIVE STATISTICS, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Item	RG01		RG07		RG02		RG03		RG06	
	Comp Raw	Comp Cap	Comp Raw	Comp Cap	Comp Raw	Comp Cap	Comp Raw	Comp Cap	Comp Raw	Comp Cap
Length-Weighted Mean (g/t Au)	2.17	2.16	5.39	4.99	3.04	2.98	1.51	1.49	1.66	1.59
Median (g/t Au)	1.15	1.15	0.98	0.98	1.19	1.19	0.45	0.45	0.40	0.40
Mode (g/t Au)	0.01	0.01	0.01	0.01	0.07	0.07	0.07	0.07	0.01	0.01
Standard Deviation	3.07	2.94	14.33	8.96	6.06	5.33	3.84	3.32	3.82	3.06
CV	1.41	1.36	2.66	1.80	1.99	1.79	2.55	2.23	2.31	1.92
Sample Variance	9.39	8.67	205.3	80.25	36.75	28.38	14.76	10.99	14.62	9.35
Minimum (g/t Au)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum (g/t Au)	59.99	30.00	385.0	50.00	165.03	50.00	196.00	50.00	89.33	30.00
Count	11,500	11,500	1,541	1,541	7,091	7,091	12,103	12,103	1,817	1,817

BULK DENSITY

Jaguar has initiated a program of bulk density measurements on the various lithologies that are present at the Roça Grande Mine in 2015. The density measurements were made on representative samples of drill core from intervals of iron formation and quartz vein that are located within the mineralized wireframes, along with measurements carried out on samples of adjoining waste rock units. The density measurements were carried out at the Jaguar analytical laboratory located at the Roça Grande Mine using the water displacement method. In all, a total of 261 density measurements were completed in 2015. A summary of the results is presented in Table 14-6. A density of 2.00 tonnes/m^3 was applied to all material located above the oxidized surface and a density of 2.25 tonnes/m^3 was applied to all material located in the transition zone between the oxidized and fresh rock surfaces.

TABLE 14-6 SUMMARY OF 2015 DENSITY MEASUREMENTS, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Item	Iron Formation RG01, 2, 3, & 6	Quartz Vein RG07	Waste Rock
Mean (g/t Au)	2.87	2.75	2.73
Median (g/t Au)	2.86	2.73	2.73
Mode (g/t Au)	2.75	N/A	2.60
Standard Deviation	0.29	0.17	0.28
Sample Variance	0.08	0.03	0.08
Minimum (g/t Au)	2.24	2.45	2.00
Maximum (g/t Au)	4.13	3.19	3.88
Count	164	13	84

TREND ANALYSIS

As an aid in carrying out variography studies of the continuity of the gold grades in the mineralized domain models, a short study to examine the overall trends was carried out. For this exercise, a data file was prepared that contained the gold values for each drill hole and channel sample contained within the respective mineralized domain model. The resulting gold grade times thickness (GT) product were digitally contoured using the Leapfrog software package and the results are shown in Figures 14-4 and 14-5.

It can be seen that an overall down-plunge of the gold grade-thickness product is present for the RG01 and RG02 Orebodies. The trends further along the down-plunge projection are not as well defined, as the density of drill hole and channel sample information is lower in these areas.

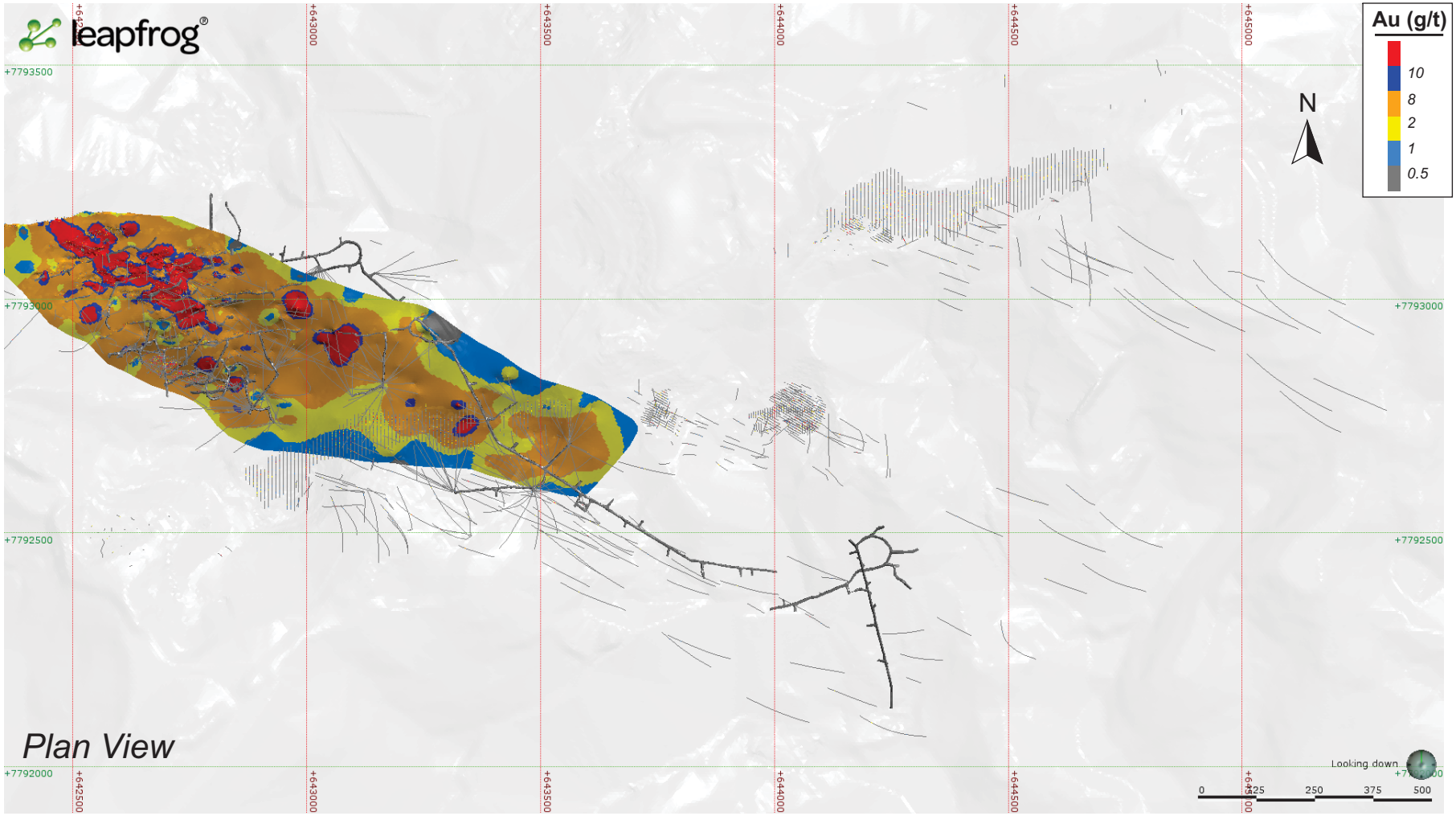


Figure 14-4

0 100 200 300 400 500
Metres

Jaguar Mining Inc.

Caeté Mining Complex
Mina Gerais State, Brazil
Grade x Thickness Product
RG01 Orebody

April 2019

Source: RPA, 2019.

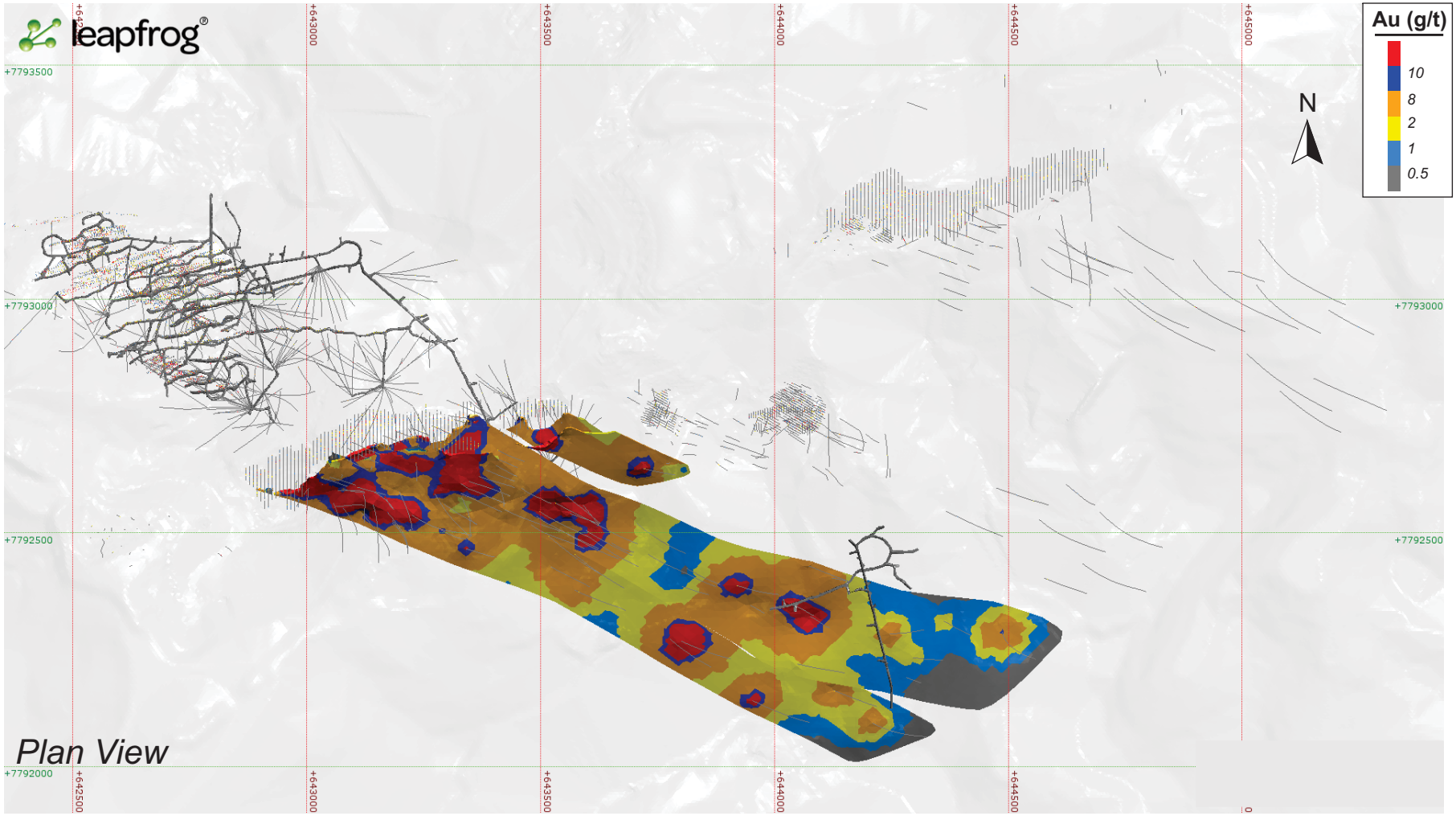


Figure 14-5

0 100 200 300 400 500
Metres

Jaguar Mining Inc.

Caeté Mining Complex
Mina Gerais State, Brazil
Grade x Thickness Product
RG02 Orebody

April 2019

Source: RPA, 2019.

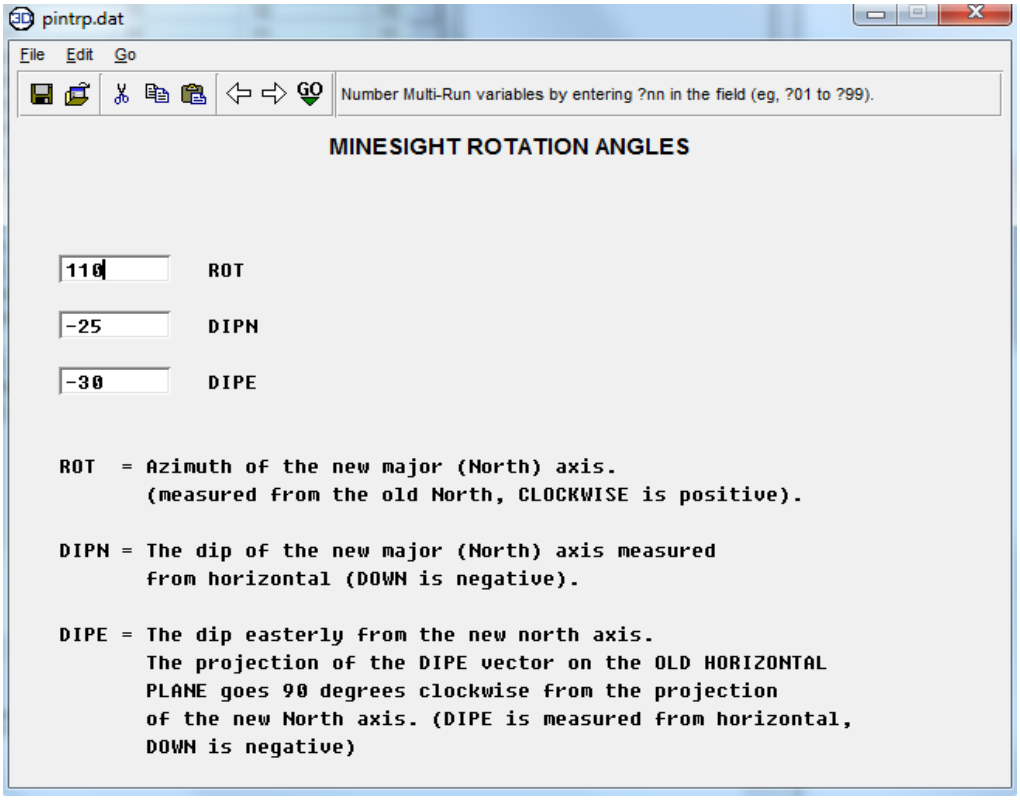
VARIOGRAPHY

Jaguar began its analysis of the spatial continuity by constructing separate downhole and omnidirectional variograms using the composite data for each of the orebodies, with the objective of determining an appropriate value for the global nugget (C0). The analysis proceeded with the evaluation of any anisotropies that may be present in the data, which resulted in successful variograms with reasonably good model fits. The variography package of the MineSight software package was used to construct the variograms. A summary of the variogram parameters derived for each of the five orebodies is presented in Table 14-7. The MineSight software package uses the azimuth/dip/plunge rotation convention (Figure 14-6).

TABLE 14-7 SUMMARY OF VARIOGRAPHY AND INTERPOLATION PARAMETERS, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Orebody	RG01	RG02	RG03	RG06	RG07
Variography Parameters:					
Nugget	3	15	5	2	30
Sill, Major Axis C1	4.00 (8 m)	8.00 (22 m)	3.50 (12 m)	4.00 (6 m)	30.00 (5 m)
Sill, Major Axis C2	1.44 (26 m)	6.20 (38 m)	2.57 (20 m)	1.34 (26 m)	14.40 (20 m)
Model Type	Spherical	Spherical	Spherical	Spherical	Spherical
Orientation	110/-25/-30	110/-20/-40	110/-25/-40	130/-37/-40	115/-35/-30
Anisotropy Ratio (Major/Semi-Major)	3.25	1.27	1.67	1.30	1.67
Anisotropy Ratio (Major/Minor)	4.33	7.60	3.33	2.60	3.33
Minimum Number of Samples	3	3	3	3	3
Maximum Number of Samples	8	8	8	8	8
Max. No. of Samples per Hole	2	2	2	2	2
Max. No. of Samples per Quadrant	2	2	2	2	2
Search Ellipse Axis Ranges (m):					
Main	26	38	20	26	20
Secondary	8	30	12	20	12
Minor	6	5	6	10	6

FIGURE 14-6 MINESIGHT ROTATION ANGLES



BLOCK MODEL CONSTRUCTION

The block model was constructed using the MineSight version 7.60 software package and comprised an array of 2 m x 2 m x 2 m sized blocks using a partial percentage attribute. The model is oriented parallel to the coordinate grid system (i.e., no rotation or tilt). The selection of the block size for this model was based upon the block sizes previously employed at the mine. The block model origin, dimensions, and attribute list are provided in Table 14-8. A number of attributes were created to store such information as rock code, material densities, estimated gold grades, mineral resource classification, mined out material and the like (Table 14-9).

Gold grades were estimated into the blocks by means of ID^3, OK, and nearest neighbour (NN) interpolation algorithms. A total of four interpolation passes were carried out using distances derived from the variography results and the search ellipse parameters presented above.

In general, “hard” domain boundaries were used along the contacts of the mineralized domain models. Only data contained within the respective wireframe model were allowed to estimate

the grades of the blocks within the wireframe in question, and only those blocks within the wireframe limits were allowed to receive grade estimates.

TABLE 14-8 BLOCK MODEL DEFINITION, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Type	Y (Northing)	X (Easting)	Z (Elevation)
Minimum Coordinates (m)	7,791,900	642,200	500
Maximum Coordinates (m)	7,793,700	645,600	1,500
Block Size (m)	2	2	2
Rotation (°)	0.000	0.000	0.000

TABLE 14-9 BLOCK MODEL ATTRIBUTES, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Attribute Name	Type	Decimals	Description
au_id3_c	Real	2	Gold by Inverse Distance Cubed
au_nn_c	Real	2	Gold by Nearest Neighbour
au_ok_c	Real	2	Gold by Ordinary Kriging
avd	Real	2	Average Distance of Informing Samples
class	Integer	-	Mineral Resource Classification (1=measured, 2=indicated, 3=inferred)
density	Real	2	Material Density
dm	Real	-	Code for Property Boundary (1=with RG claim boundary)
mined	Real	-	Mined Out (-1=Remaining Material, 1=Mined Out)
nsmp	Real	-	Number of Informing Samples
ore_pct	Real	2	Percent of Block Inside the Wireframe
rock	Integer	-	Material / Wireframe Code
rsrc	Integer	-	Resource/Reserve Reporting Flag (by wireframe)
topo_pct	Real	-	Percent of Block Below Topography Surface
vokc	Real	2	Kriging Variance
weath	Real	-	Weathering Code

Those portions of the mineralized wireframes that sit beyond the Roça Grande Mine property boundary were appropriately coded in the block model and omitted from the Mineral Resource statement.

BLOCK MODEL VALIDATION

Block model validation consisted of comparing the volume of the coded blocks in the block model against the volume report of the respective wireframe models as a high level check that the block model has been correctly coded for each of the wireframes (Table 14-10). In general,

the block model volumes compared well with the wireframe volumes for all domains except for the RG07 domain where the block model has been coded with slightly less volume.

A second validation exercise consisted of comparing the descriptive statistics from the composites against the block model estimated gold grades. In general, the block estimated mean grades compared well with the average of the composites for all domains except for the RG07 domain (Table 14-10). RPA attributes this difference to the clustering of the channel sample composites and to the relatively small number of composites that are used to interpolate some of the sub-domains for this wireframe.

A third validation exercise consisted of comparing the mill production statistics with the predicted volumes of diluted and recovered tonnes and grade from the block model for the period of January 2014 to March 2015 (Table 14-11). The reconciliation results are showing that there is a reasonable correlation between the block model predicted tonnages and grades against the mill production statistics for the period examined.

TABLE 14-10 BLOCK MODEL VALIDATION RESULTS, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Orebody	RG01	RG02	RG03	RG06	RG07
Block Model:					
Volume (m^3)	1,147,049	1,482,279	1,661,810	833,864	75,097
Tonnes	3,220,488	3,387,371	4,184,455	1,919,079	195,646
Grade (g/t Au)	1.73	2.85	1.48	1.51	6.15
Wireframe:					
Volume (m^3)	1,170,422	1,512,104	1,694,232	850,421	79,948
Difference (BM-Wf)	-23,373	-29,825	-32,422	-16,557	-4,851
% Difference	-2%	-2%	-2%	-2%	-6%
Composites:					
Grade (g/t Au)	2.04	2.92	1.46	1.36	4.13

Note. BM – block model, Wf - wireframe

TABLE 14-11 MODEL TO MILL COMPARISON, JANUARY 2014 TO MARCH 2015 – ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

	MODEL			MILL		
Month	**Tonnes**	**Grade (g/t Au)**	**Oz Au**	**Tonnes**	**Grade (g/t Au)**	**Oz Au**
2014						
January	16,407	2.25	1,186	14,916	2.29	1,096
February	11,007	2.26	801	12,030	3.16	1,223
March	12,390	1.59	632	14,155	2.17	988
April	16,426	1.74	920	15,563	1.88	942
May	10,079	1.56	506	12,032	2.19	846
June	14,624	2.18	1,027	12,617	2.50	1,015
July	15,416	2.15	1,063	14,702	2.74	1,295
August	15,045	2.12	1,024	14,174	2.59	1,180
September	17,511	2.28	1,284	15,589	2.40	1,203
October	14,650	2.01	948	16,296	2.41	1,263
November	14,182	1.90	867	14,857	2.30	1,097
December	11,566	1.64	611	15,043	2.24	1,083
Total - 2014	**169,303**	**2.00**	**10,868**	**171,975**	**2.39**	**13,231**
2015						
January	10,293	1.59	527	11,426	2.12	778
February	11,676	2.29	859	12,755	2.19	897
March	11,111	2.02	721	11,742	2.41	909
Total - 2015	**33,080**	**1.98**	**2,106**	**35,923**	**2.24**	**2,585**

	Variance			Factors		
Period	**Tonnes**	**Grade**	**Oz Au**	**Tonnes**	**Grade**	**Oz**
2014	+2,672	+0.39	+2,363	1.02	1.12	1.22
M-T-D 2015	+2,843	+0.26	+479	1.09	1.13	1.23

Note: Numbers may not add due to rounding.

MINERAL RESOURCE CLASSIFICATION

The Mineral Resources in this report were estimated in accordance with the definitions contained in CIM (2014).

The mineralized material for each wireframe was classified into the Measured, Indicated, or Inferred Mineral Resource category on the basis of the search ellipse ranges obtained from the variography study, the demonstrated continuity of the gold mineralization, the density of drill hole and chip sample information, and the presence of underground access.

On the basis of these criteria, Measured Mineral Resources comprise material that has been estimated using Pass #1 and that is located between developed levels. Indicated Mineral Resources comprise material that has been estimated using Pass #2, and Inferred Mineral Resources comprise material that has been estimated using Pass #3. Clipping polygons were used in a final stage of the classification process to ensure continuity and consistency of the classified blocks in the model. Jaguar employs an additional block model code to denote those areas considered to display good exploration potential for use in the decision process.

CUT-OFF GRADE

A cut-off grade of 1.46 g/t Au is used for reporting of Mineral Resources. This cut-off grade was calculated using a gold price of US$1,400/oz, an average gold recovery of 88%, average exchange rate of R$2.50 : US$1, and 2014 actual cost data for the Roça Grande Mine.

MINERAL RESOURCE ESTIMATE

There are no Mineral Reserves present at the Roça Grande Mine for the current reporting period. The Mineral Resource reports were prepared by creating clipping polygons that were used to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan or longitudinal views, as appropriate, and were applied to the block model prepared in 2015. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, were located completely within the boundaries of Jaguar's mineral rights holdings at the Roça Grande Mine, possessed a grade times thickness product of at least 3 gram-metres, and were not located in mined out areas as of December 31, 2018. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off. These

resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.

The Mineral Resources are presented in Tables 14-12 and 14-13. A plan view of the Mineral Resources for the RG 01 and RG02 domains is presented in Figures 14-7 and 14-8.

TABLE 14-12 SUMMARY OF MINERAL RESOURCES AS OF DECEMBER 31, 2018 – ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	188	2.14	13
Indicated	889	2.91	83
Sub-total M&I	**1,077**	**2.77**	**96**
Inferred	1,759	3.48	197

Notes:
1. CIM (2014) definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reais: 1 US Dollar.
5. Mineral Resources are stated by depletion of the 2015 grade-block model with excavation volumes and production as of December 31, 2018.
6. A minimum mining width of approximately two metres was used.
7. Gold grades are estimated using inverse distance cubed interpolation.
8. No Mineral Reserves are currently present at the Roça Grande Mine.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

TABLE 14-13 MINERAL RESOURCES BY OREBODY AS OF DECEMBER 31, 2018 – ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
	Orebody RG01:		
Measured	160	2.24	12
Indicated	383	2.08	26
Sub-total M&I	**543**	**2.13**	**37**
Inferred	300	2.92	28
	Orebody RG02:		
Measured	-	-	-
Indicated	215	4.07	28
Sub-total M&I	**215**	**4.07**	**28**
Inferred	756	3.91	95
	Orebody RG03:		
Measured	-	-	-

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Indicated	74	1.66	4
Sub-total M&I	**74**	**1.66**	**4**
Inferred	365	2.58	30
	Orebody RG06:		
Measured	29	1.63	2
Indicated	185	3.15	19
Sub-total M&I	**214**	**2.94**	**20**
Inferred	287	2.88	27
	Orebody RG07:		
Measured	-	-	-
Indicated	39	5.75	7
Sub-total M&I	**39**	**5.75**	**7**
Inferred	51	10.34	17
	Total Roça Grande Mine:		
Total, Measured	188	2.14	13
Total, Indicated	896	2.91	83
Total Measured & Indicated	**1,085**	**2.77**	**96**
Total, Inferred	1,759	3.48	197

Notes:

1. CIM (2014) definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reais: 1 US Dollar.
5. Mineral Resources are stated by depletion of the 2015 grade-block model with excavation volumes and production as of December 31, 2018.
6. A minimum mining width of approximately two metres was used.
7. Gold grades are estimated using inverse distance cubed interpolation.
8. No Mineral Reserves are currently present at the Roça Grande Mine.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

RPA has considered the Mineral Resource estimates in light of known environmental, permitting, legal, title, taxation, socio-economic, marketing, political, and other relevant issues and has no reason to believe at this time that the Mineral Resources will be materially affected by these items. Studies are currently in progress that examine whether the Mineral Resources may be materially affected by mining, infrastructure, or other relevant factors.

It is RPA's opinion that the Roça Grande Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014) definitions.

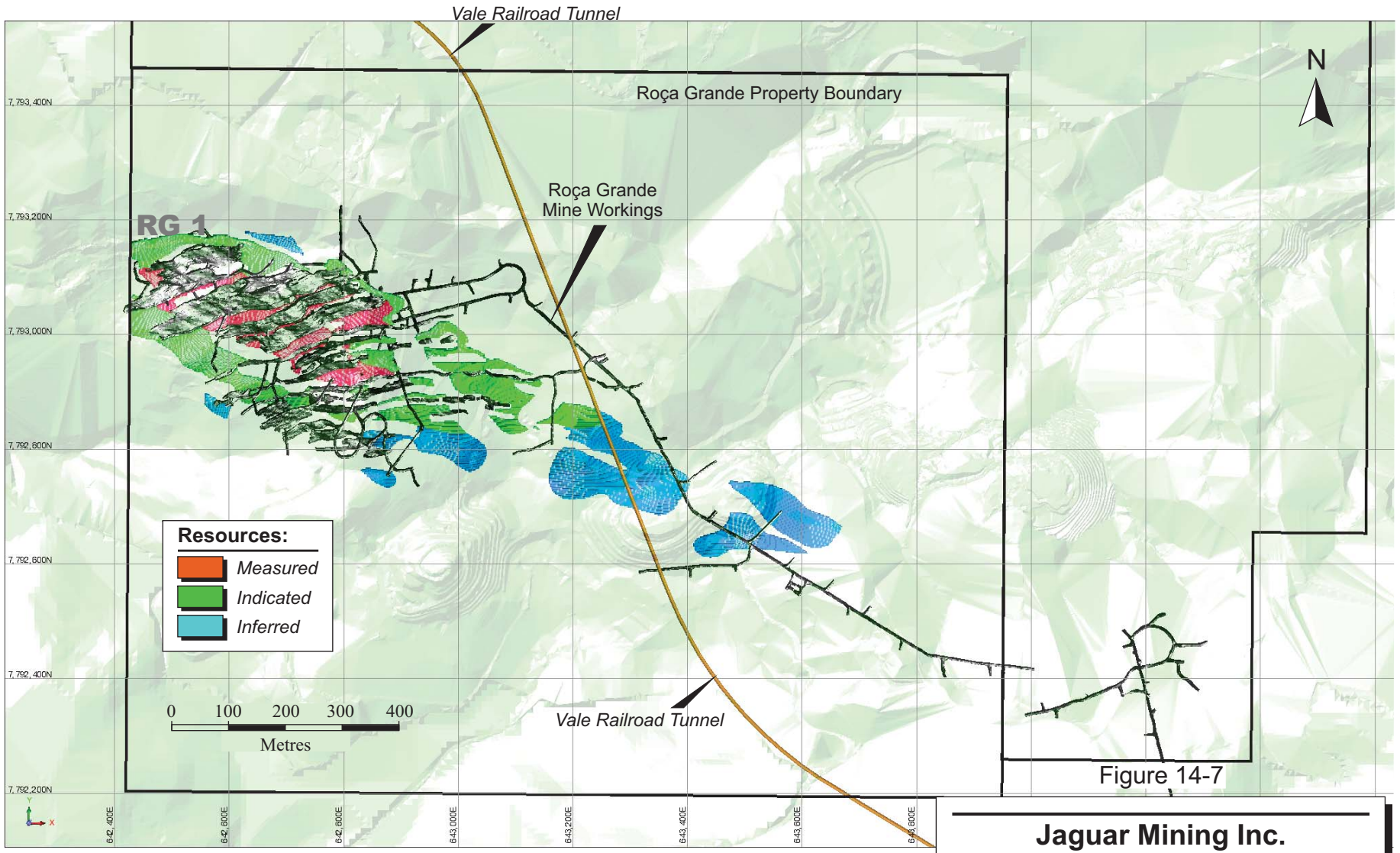


Figure 14-7

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Plan View of the
RG01 Mineral Resources

April 2019

Source: RPA, 2019.

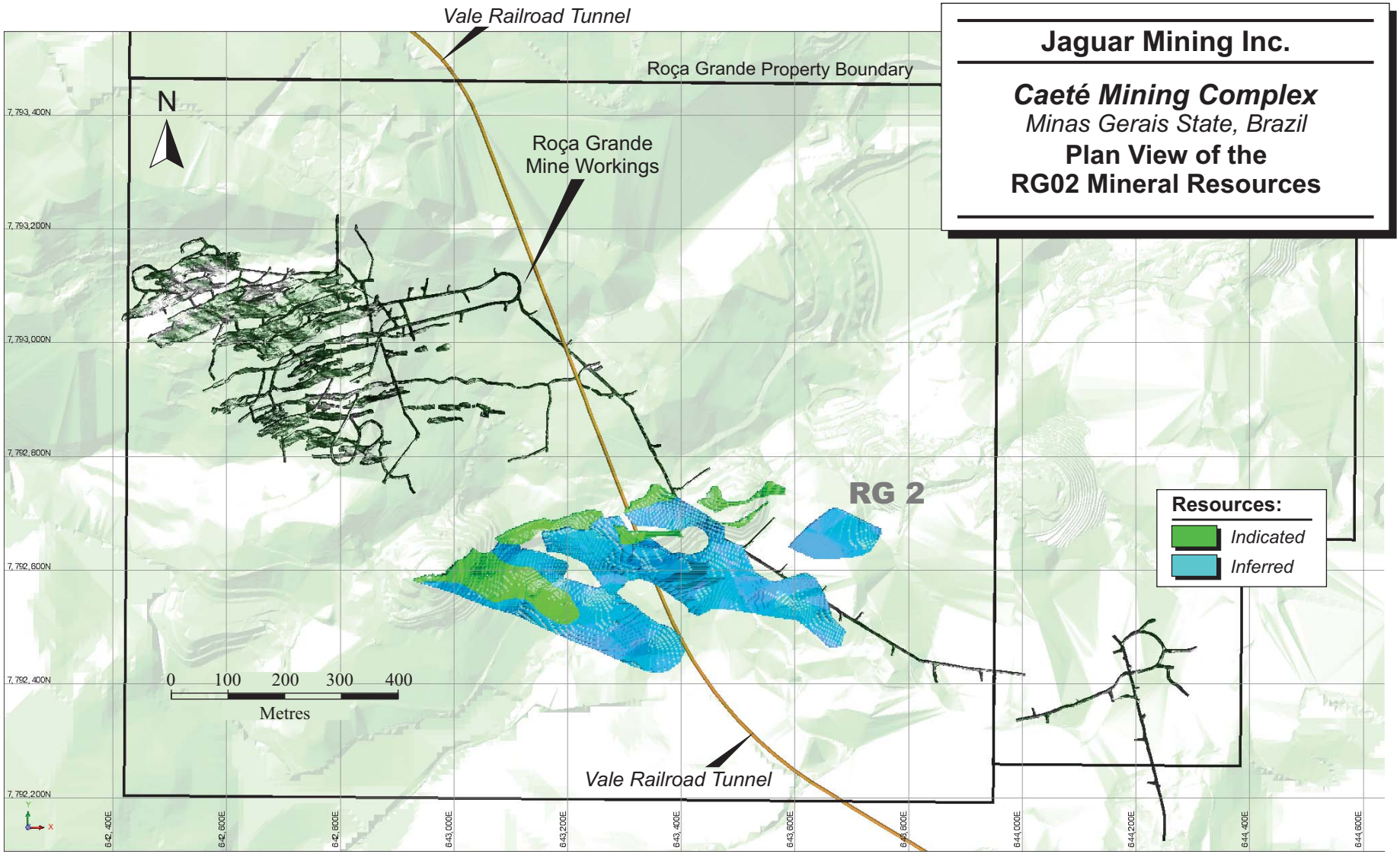
Figure 14-8

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Plan View of the RG02 Mineral Resources



April 2019

Source: RPA, 2019.

PILAR MINE

DESCRIPTION OF THE DATABASE

Current drilling and sampling practices employed by Jaguar involve the initial delineation of the location of the various mineralized lenses using surface and underground drill holes at a nominal spacing of 25 m to 50 m. Underground drilling is used to delineate the down-plunge projection of the Pilar mineralization. As development of the underground access progresses, a series of channel samples are taken in two locales (one set on the face and one set along the back) for each round. The average channel sample spacing along development drifts is five metres.

Jaguar maintains an internal database (known as the BDI database) which is used to store and manage all of the digital information for all of its operations. The drill hole database contains drill hole and channel sample information that is coded according to the following naming conventions:

AUGER	Auger holes (Open pit mine)
CN	Channel samples
FSB	In-fill & definition drill holes
GSW	SW Orebody drift drill holes
PILF	Surface-based exploration drill holes (prior owners)
PMS	Surface-based exploration drill holes (completed by Jaguar)
PPL	Exploration and in-fill drill holes (underground)
RC	Reverse circulation drill holes
SBF	Face channel samples
SBJ	Jumbo drill holes

The drill hole and channel sample information for the Pilar Mine was extracted from this internal database into separate files for use in preparation of the Mineral Resource estimates. This drill hole information was modified slightly so as to be compatible with the format requirements of the Hexagon HxGN MinePlan 3Dv.15.30 mine planning software and was imported into that software package by Jaguar. A number of new tables and variables were created during the estimation process to capture such information as the intersection information between the drill holes and the wireframe models, density readings, capped assay values, and composite values.

The cut-off date for the assays in the drill hole database is December 31, 2018. The drilling and sampling was carried out using the UTM Datum Córrego Alegre, Zone 23S grid coordinate system.

A summary of the drilling and channel sampling information is provided in Table 14-14. The location of the drill holes is presented in Figure 10-2.

TABLE 14-14 DESCRIPTION OF THE PILAR MINE DATABASE AS AT DECEMBER 31, 2018
Jaguar Mining Inc. – Caeté Mining Complex

Data Type	Number of Records
Collars (1,658 Drill Holes & 20,698 Chip/Channel Samples)	22,356
Survey	112,719
Lithology	96,907
Assays	198,947
Composites	59,512
Weathering code	61,668
Density (Mineralized: 938, Waste: 2,315)	3,253

The database included a number of assay records which contained entries of negative values to represent intervals of no sampling, lost core, lost sample, or no core recovery. Some of these negative values are contained within the mineralized wireframes. Depending upon the specific local conditions, these null values can introduce an undesired positive bias upon the grade estimations. Jaguar therefore elected to pursue a conservative approach by inserting a very low gold value of 0.01 g/t Au for these intervals of null values. A total of 5,102 records that were within a mineralized wireframe outline were adjusted in this process.

RPA recommends that a program of re-sampling be undertaken for those un-sampled intervals located within the mineralized wireframe boundaries if sufficient drill core is available.

RPA recommends that the drill hole sampling protocols be updated to ensure that full sampling coverage is obtained for all mineralized zones as part of the normal-course logging and sampling procedures. Preparation of current drill hole plans and sections by the logging geologist in either physical or digital format that show the location of the current drill hole relative to the remainder of the drilling information will greatly assist in achieving this goal.

Detailed review by the on-site geologists of the drill hole database revealed the presence of a number of older drill holes for which the collar, deviation, or downhole distances presented a poor correlation with the body of the surrounding drill hole and channel sample information or with newly acquired information. These drill holes and channel samples were identified by a unique flag code (Flag = 0) in the assay and composite tables and were not used in either preparation of the mineralization wireframes or estimation of the block gold grades. A summary of the erroneous and suspicious drill holes is presented in Table 14-15.

The assay table was also coded in such a manner that the jumbo drill holes (SBJ-series) were not used in the estimation process.

TABLE 14-15 SUMMARY OF DRILL HOLES EXCLUDED FROM ESTIMATION
Jaguar Mining Inc. – Caeté Mining Complex

Drill Hole Series	Number of Channels or Drill Holes
GSW	13
PILF	53
PMS	25
PPL	73
SW	5
Total	**169**

RPA recommends that all efforts be undertaken to carry out whatever remedial actions are available and appropriate to correct the erroneous or suspicious information for those drill holes that are located in the as-yet un-mined portions of the Pilar Mine. For those drill holes that remain, RPA recommends that they be removed from the active database into a database that is dedicated specifically for these records.

RPA notes that the understanding of the host stratigraphy, structural setting, and controls on the gold mineralization at the Pilar Mine by the mine geologists is increasing. This understanding permits an increased degree of success when designing exploration and in-fill drilling programs. The drilling and sampling protocols employed by Jaguar permit the identification and delineation of the mineralized areas with confidence. The drilling and sampling practices are carried out to an acceptable standard. RPA is of the opinion that the drill hole and sampling database is suitable for use in preparation of Mineral Resource estimates.

GEOLOGY AND MINERALIZATION WIREFRAMES

A series of 3D wireframe models were constructed of the main lithological units, along with models of the known major faults that are present in the vicinity of the mine workings. This lithological and structural modelling work has been successful in demonstrating that the main marker iron formation unit changes in its form from a shape similar to a broad, open fold at surface, to a series of compact, tightly folded structural slices at depth (Figures 14-9, 14-10, and 14-11). Jaguar staff are planning to initiate a mine-site program of detailed lithological and structural mapping program whose goal will be to improve the understanding of the nature and distribution of the main lithological units and structures, and their relationship to the mineralization.

The interpreted 3D wireframe models of the gold mineralization were created using the geology information and assay values from surface and underground drill holes, and channel sample data as available.

The wireframe limits were drawn using a cut-off grade of 0.50 g/t Au and a nominal minimum width of 2.0 m initially in cross sectional view for the BA, BF, BF II, LPA, and Torre mineralized zones using the MineSight software package. These cross sections were then sliced horizontally at two metre intervals, edited, and re-joined together to generate smooth outlines of the mineralized envelopes. The mineralized wireframe envelopes for all other mineralized zones were created using the Leapfrog version 4.4 software package. The wireframe models were clipped to the original, pre-mining topography surface. In total, eight separate orebodies were modeled, which reflect the current understanding of the spatial distribution and structural controls on the gold mineralization. Each of the domains was identified in the block model by a series of integer codes (Table 14-16). Of the eight orebodies, the BA, BF, and BF II account for the majority of the contained metal in the block model.

RPA recommends that the cut-off grade strategy used for preparation of the mineralization wireframes be amended to better reflect the potentially economic in-situ gold grades. As a minimum, the mineralization wireframes should be created using a cut-off grade similar to the reporting cut-off grade. By adoption of this strategy, it is anticipated that a lower number of below cut-off grade composite samples will be used in estimation of the block gold grades.

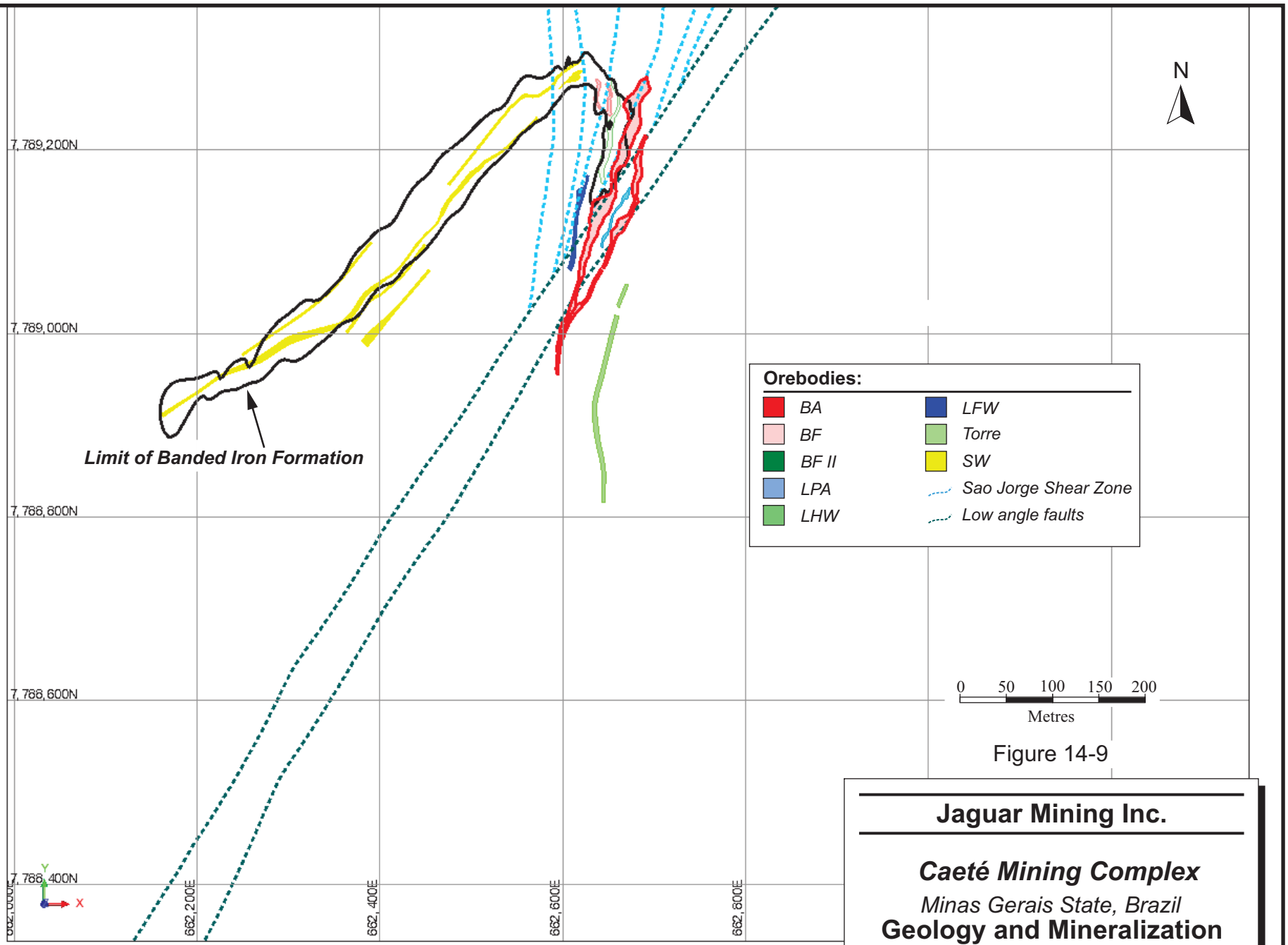


Figure 14-9

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Geology and Mineralization Wireframes Level 1 (691 m)

April 2019

Source: RPA, 2019.

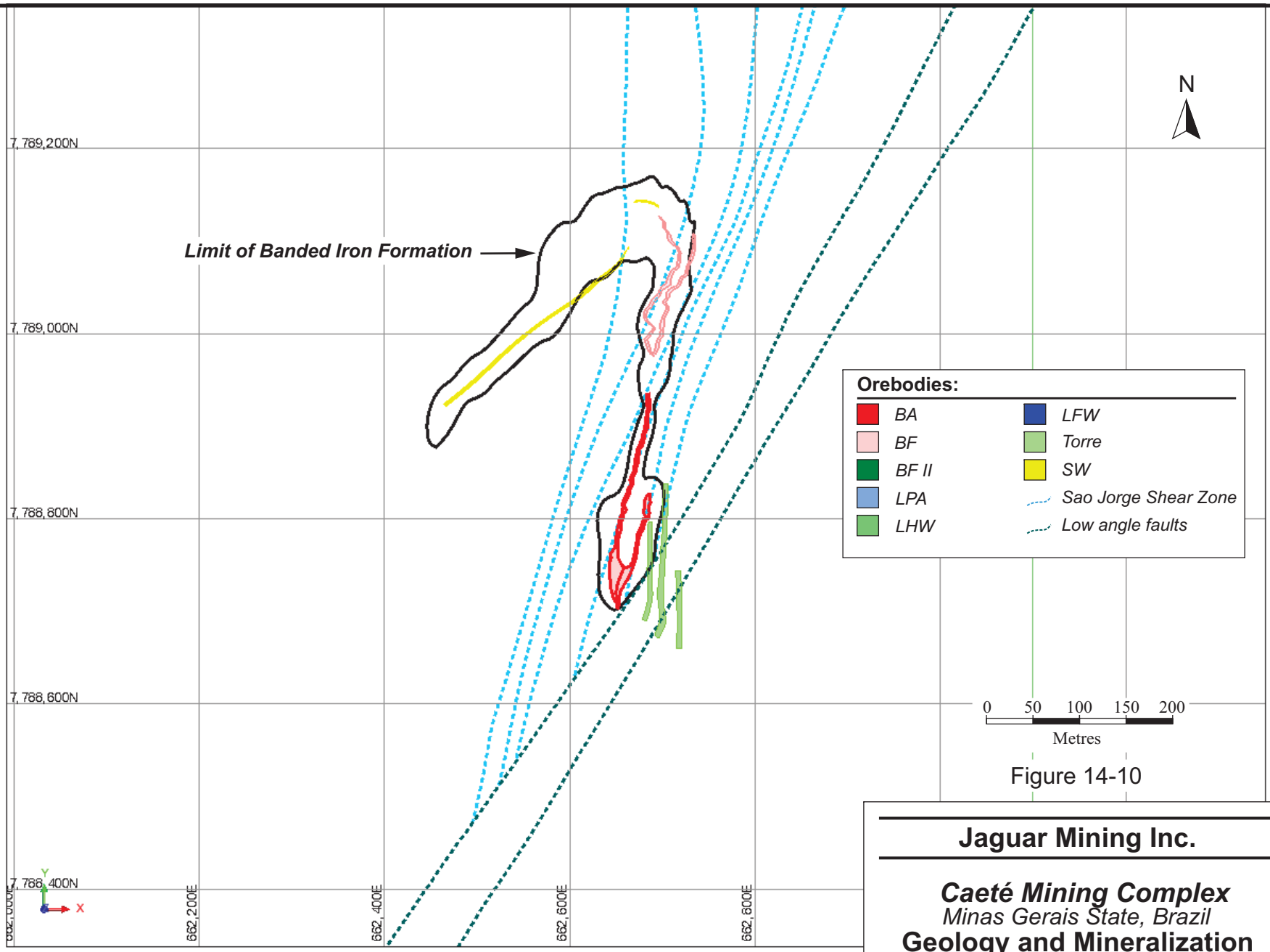


Figure 14-10

Jaguar Mining Inc.

Caeté Mining Complex
Minas Gerais State, Brazil
Geology and Mineralization Wireframes Level 4 (el 485m)

April 2019

Source: RPA, 2019.

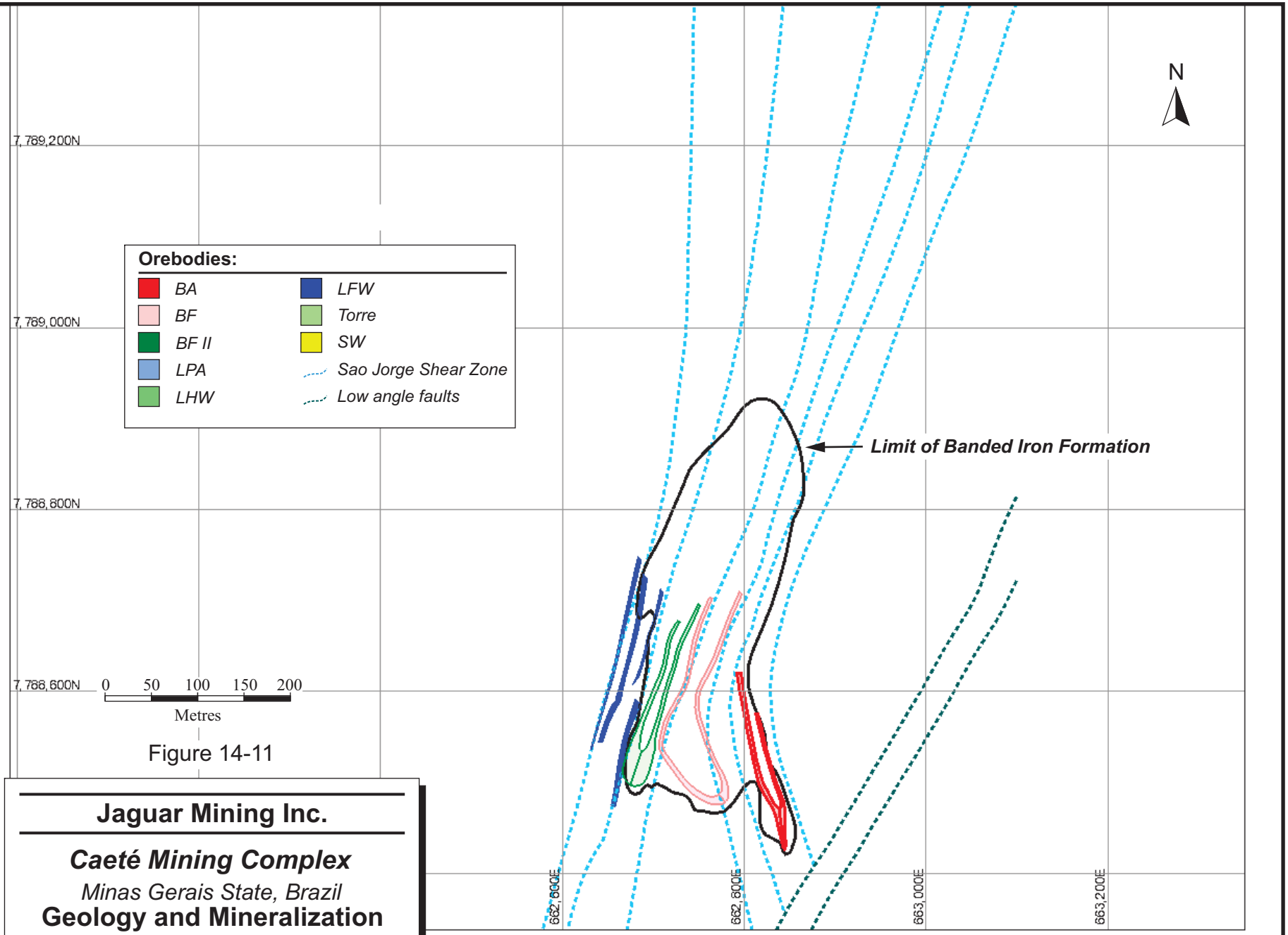


Figure 14-11

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Geology and Mineralization Wireframes Level 10 (116 m)

April 2019

Source: RPA, 2019.

TABLE 14-16 DESCRIPTION OF THE MINERALIZED DOMAINS, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Domain	Block Model Codes
BA (110)	111 - FW
	112 - HW
BF (120)	121 – FW
	122 – HW
BF II (130)	131 – FW
	132 – HW
	133-BF III
LFW	201 to 207
	700 to 704
LPA	301 to 304
LHW	401 to 403
Torre	501 to 506
SW Orebody	601 to 605

All of the mineralized lenses, with the exception of the SW Orebody, are located to the east of the São Jorge fault. In general terms, the mineralized lenses are sub-parallel to each other, have an average strike of 015°, and dip steeply to the east with an average dip of 65°. The available drill hole information suggests that the dip of the mineralized zones may begin to flatten to approximately 45° below the 120 m elevation (Figure 14-12). Three of the mineralized zones (BA, BF, and BF II) have been identified by drill hole and channel sample data to be isoclinally folded, with fold axes that plunge at approximately -40° to the southwest (approximately azimuth 210° to 225°). Many of the remaining mineralized zones (LFW, LPA, LHW, and the C Orebody) are interpreted to be more tabular in overall form. The LPA zone resides in the axial plane of the folded BF zone and thus provides evidence for multiple ages of gold mineralization.

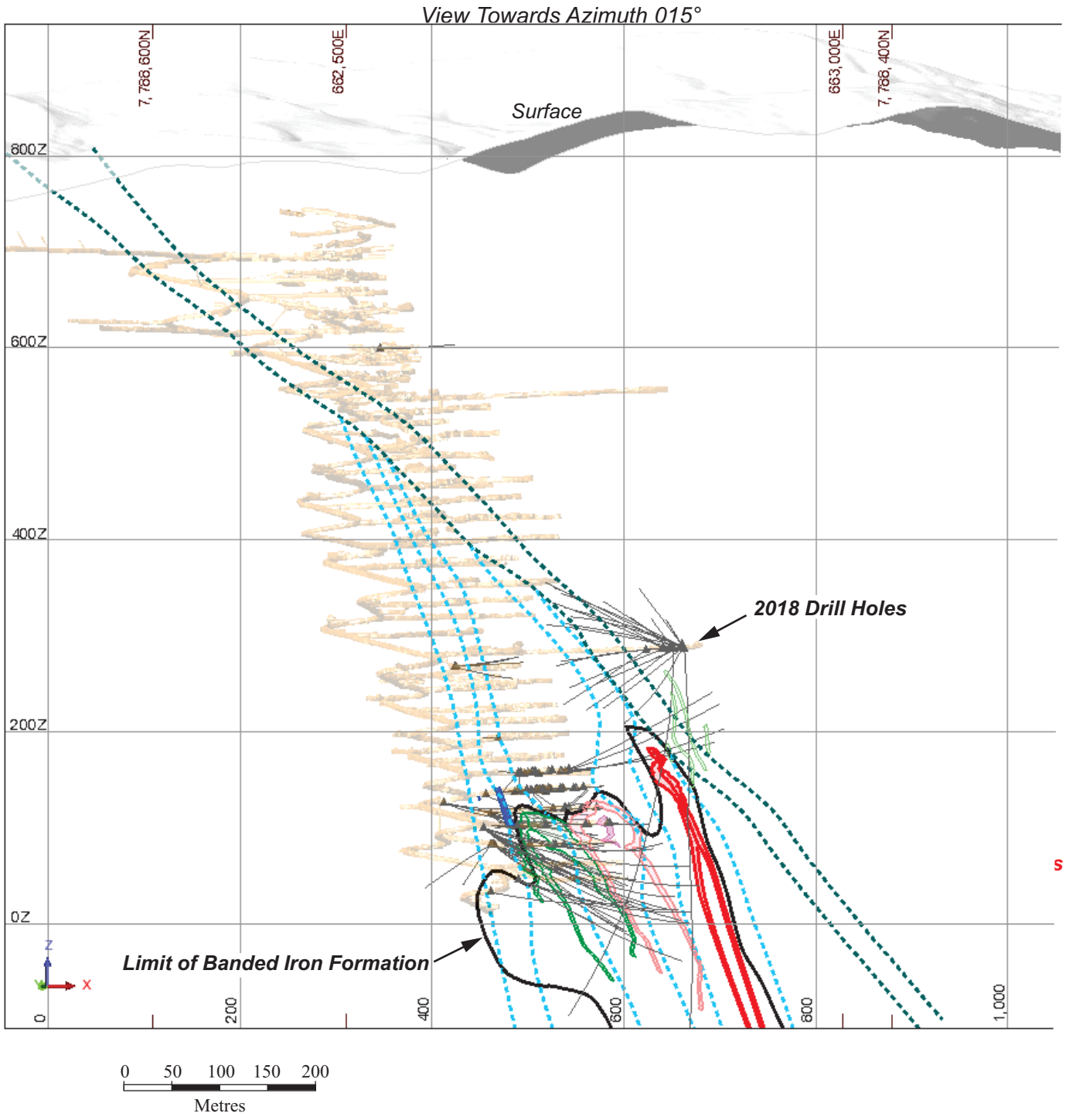


Figure 14-12

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Cross Section of the Geology and Mineralized Wireframes, Pilar Mine

Drilling / Channel Sample Legend

BA	LFW
BF	Torre
BF II	SW
LPA	Sao Jorge Shear Zone
LHW	Low angle faults

April 2019

Source: RPA, 2019.

TOPOGRAPHY AND EXCAVATION MODELS

A topographic surface of the Pilar Mine area that is current as of May 2015 was used to code the block model. The topographic map includes two open pit mines that are now depleted. A wireframe model of the completed underground excavations (development and stopes) as of December 31, 2018 was prepared and was used to code the block model for the portions of the mineralized zones that have been mined out.

The mineralization at the Pilar Mine is accessed by means of a ramp with a collar elevation at approximately 750 MASL. As of December 31, 2018, the bottom of the ramp is at an elevation of approximately 11 MASL. There are two mining methods currently in use. The cut and fill method is utilized in the narrower sections of the deposit whereas the long hole method is used in the thicker areas. In all, 12 levels have been developed to access the various mineralized zones (Table 14-17).

TABLE 14-17 DESCRIPTION OF THE PILAR MINE LEVELS
Jaguar Mining Inc. – Caeté Mining Complex

Level	Bottom Elevation (m)
1	690.5
2	615.2
3	544
4	485
5	417.3
6	330.5
7	263.5
8	220.3
9	168.6
10	114.7
11	59
12	4
13 (planned)	-50
14 (planned)	-104
15 (planned)	-158
16 (planned)	-212
17 (planned)	-266
18 (planned)	-320
19 (planned)	-400

SAMPLE STATISTICS AND GRADE CAPPING

The mineralization wireframe models were used to code the drill hole database and identify the raw assay samples, or resource assays, that are contained within the mineralized wireframes. These samples were extracted from the database into their respective domains, and then subjected to statistical analyses by means of histograms, probability plots, and decile analyses. A total of 66,738 samples were contained within the mineralized wireframes. The resource assay sample statistics and the selected capping values are summarized in Table 14-18. Selected histograms are provided in Figures 14-13 to 14-15.

TABLE 14-18 RESOURCE ASSAY DESCRIPTIVE STATISTICS, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Item	BA		BF		BF II		LFW	
	Au Raw	Au Cap	Au Raw	Au Cap	Au Raw	Au Cap	Au Raw	Au Cap
Length-Weighted Mean (g/t Au)	3.45	3.43	3.77	3.74	4.93	4.84	2.05	1.83
Median (g/t Au)	1.00	1.00	0.92	0.92	1.67	1.67	0.69	0.69
Mode (g/t Au)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Standard Deviation	6.86	6.69	7.44	7.15	8.35	7.63	8.9	2.95
CV	1.99	1.95	1.91	1.91	1.69	1.58	4.58	1.72
Sample Variance	47.1	44.7	55.3	51.1	69.8	58.3	78.4	8.7
Minimum (g/t Au)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (g/t Au)	109.00	60.00	120.5	60.00	159.65	45	507.5	20.00
Count	19,043	19,043	18,018	18,015	11,372	11,372	4,142	4,142
Capping Value (g/t Au)		60		60		45		20

Item	LPA		LHW		Torre		SW	
	Au Raw	Au Cap	Au Raw	Au Cap	Au Raw	Au Cap	Au Raw	Au Cap
Length-Weighted Mean (g/t Au)	3.32	3.23	2.01	1.92	2.11	2.05	1.73	1.72
Median (g/t Au)	1.03	1.03	0.75	0.72	0.71	0.71	0.46	0.46
Mode (g/t Au)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Standard Deviation	6.14	5.48	5.26	3.18	5.77	4.97	4.00	3.91
CV	1.85	1.70	2.61	1.66	2.73	2.42	2.31	2.27
Sample Variance	37.7	30.0	27.7	10.1	33.2	24.7	16.0	15.33
Minimum (g/t Au)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (g/t Au)	90.33	30.00	116.00	20.00	128.33	40.00	56.92	40.00
Count	3,164	3,164	1,918	1,918	5,714	5,714	3,369	3,369
Capping Value (g/t Au)		30		20		40		40

FIGURE 14-13 OREBODY BA RESOURCE ASSAY FREQUENCY HISTOGRAM

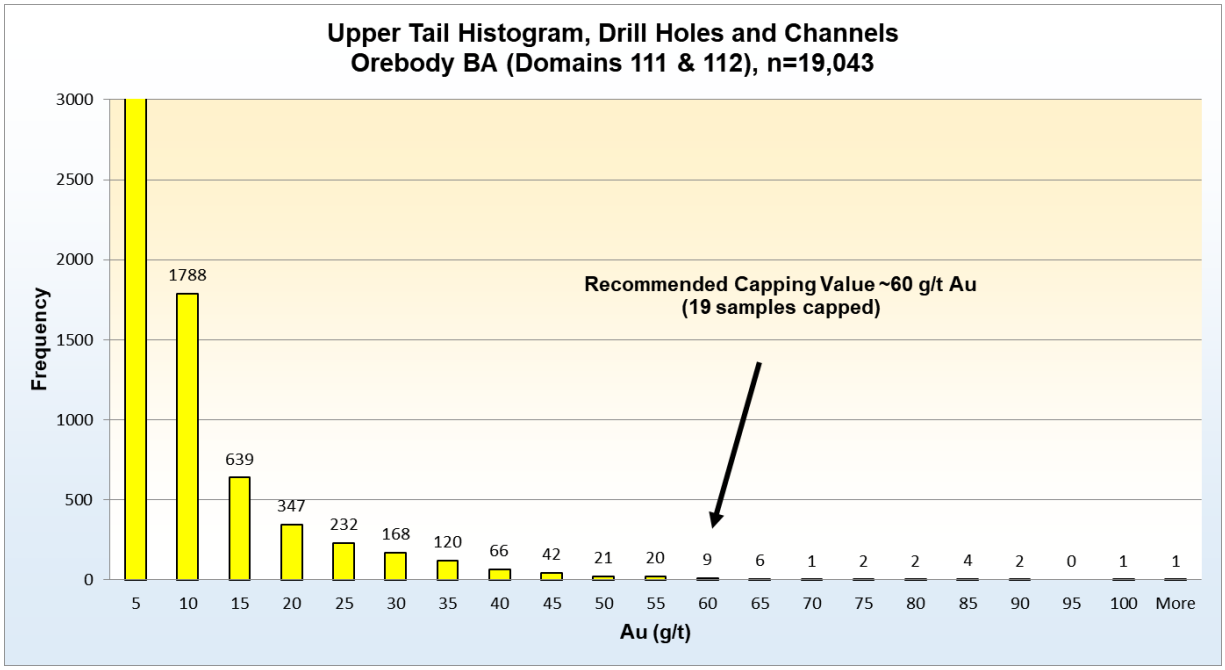


FIGURE 14-14 OREBODY BF RESOURCE ASSAY FREQUENCY HISTOGRAM

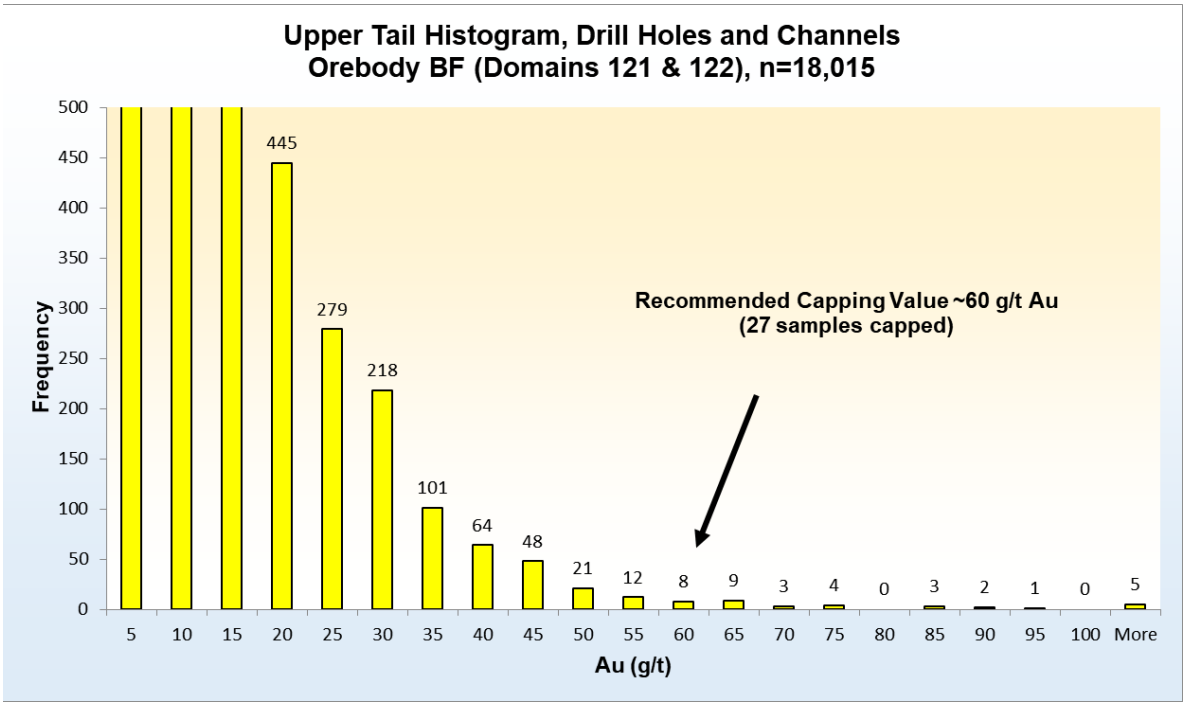
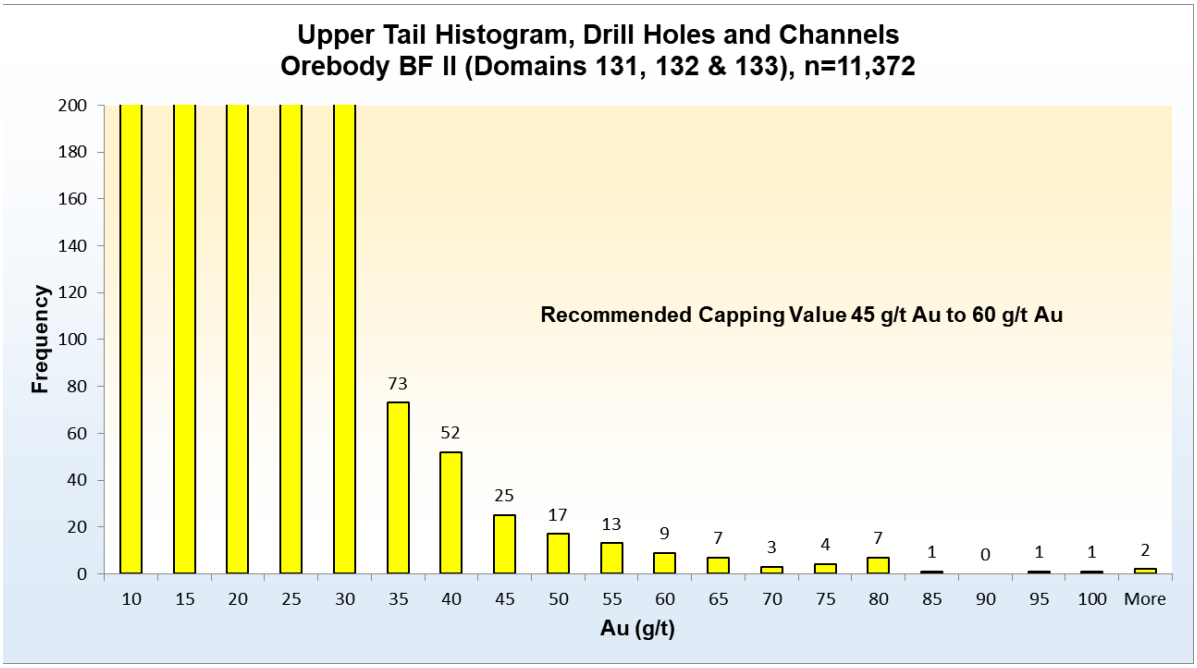


FIGURE 14-15 OREBODY BF II RESOURCE ASSAY FREQUENCY HISTOGRAM



COMPOSITING METHODS

The selection of an appropriate composite length began with examination of the descriptive statistics of the raw assay samples and preparation of sample length frequency histograms. Consideration was also given to the size of the blocks in the model.

Many of the sample lengths in the various mineralized wireframes were found to range from 0.5 m to one metre in length. Consequently, on the basis of the available information, RPA believes that a composite length of one metre for all samples is reasonable. All samples contained within the mineralized wireframes were composited to a nominal one metre length using the best-fit function of the MineSight software package. The descriptive statistics of the composite samples are provided in Table 14-19.

TABLE 14-19 DESCRIPTIVE STATISTICS OF THE COMPOSITES, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Item	BA		BF		BF II		LFW	
	Comp Raw	Comp Cap	Comp Raw	Comp Cap	Comp Raw	Comp Cap	Comp Raw	Comp Cap
Mean (g/t Au)	3.45	3.43	3.75	3.72	4.92	4.82	1.89	1.69
Median (g/t Au)	1.23	1.23	1.24	1.24	2.207	2.07	0.68	0.68
Mode (g/t Au)	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
Standard Deviation	6.26	6.11	6.45	6.13	7.39	6.74	8.94	2.60
CV	1.81	1.78	1.72	1.65	1.50	1.40	4.72	1.54
Sample Variance	39.1	37.3	41.7	37.6	54.7	45.5	79.9	6.8
Minimum (g/t Au)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (g/t Au)	93.21	60.00	115.17	60.00	159.65	45.00	507.50	20.00
Count	17,958	17,958	15,281	15,281	9,353	9,353	3,686	3,686

Item	LPA		LHW		Torre		SW	
	Comp Raw	Comp Cap	Comp Raw	Comp Cap	Comp Raw	Comp Cap	Comp Raw	Comp Cap
Mean (g/t Au)	3.78	3.28	2.04	1.94	2.11	2.05	1.73	1.72
Median (g/t Au)	1.32	1.32	0.88	0.88	0.69	0.69	0.49	0.49
Mode (g/t Au)	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01
Standard Deviation	5.33	4.85	3.73	2.84	4.95	4.30	3.67	3.58
CV	1.58	1.47	1.83	1.47	2.34	2.09	2.12	12.08
Sample Variance	28.4	23.5	13.93	8.08	24.5	18.5	13.4	12.8
Minimum (g/t Au)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (g/t Au)	48.1	30	58.42	20.00	128.33	40.00	56.17	40.00
Count	2,713	2,713	1,783	1,783	5,459	5,459	3,278	3,278

BULK DENSITY

Jaguar has continued its program of collecting bulk density measurements on the various lithologies that are present at the Pilar Mine through 2018. The density measurements were made on representative samples of drill core from intervals of iron formation and quartz vein that are located within the mineralized wireframes, along with measurements carried out on samples of adjoining waste rock units. The density measurements were carried out at the Jaguar analytical laboratory located at the Roça Grande Mine using the water displacement method. In all, the density database contains values for 3,254 density measurements, as of October 2018. Of these, a total of 1,005 density measurements were used to prepare the Mineral Resource estimate. A summary of the results is presented in Table 14-20. The distribution of sample densities for selected mineralized wireframes are presented in Figures 14-16 to 14-18. Review of the various histograms of the bulk density values contained within the mineralized wireframe outlines suggests that the rock types within these wireframes are

composed of either a single, silicate-based rock type or are composed of a mixture of silicate-based rock types and various iron formation facies.

RPA recommends that Jaguar continue to collect bulk density values for those samples within the mineralized wireframe outlines, especially for those zones having a low number of density values.

RPA also recommends that Jaguar prepare wireframe models of the major lithological units as aides in coding the density values to the block model.

TABLE 14-20 SUMMARY OF 2018 DENSITY MEASUREMENTS, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Zone	Density (t/m^3)	Number of Samples
BA	2.97	113
BF	3.14	291
BF II	3.07	262
LFW	2.85	122
LPA		
Lens 301	3.21	25
Lens 302-304	3.12	15
LHW (Lens 401)	3.02	26
Torre	2.84	95
SW		
Lens 601, 603	3.17	49
Lens 602, 604, and 605	2.87	7

FIGURE 14-16 HISTOGRAM OF BULK DENSITY VALUES, OREBODY BA

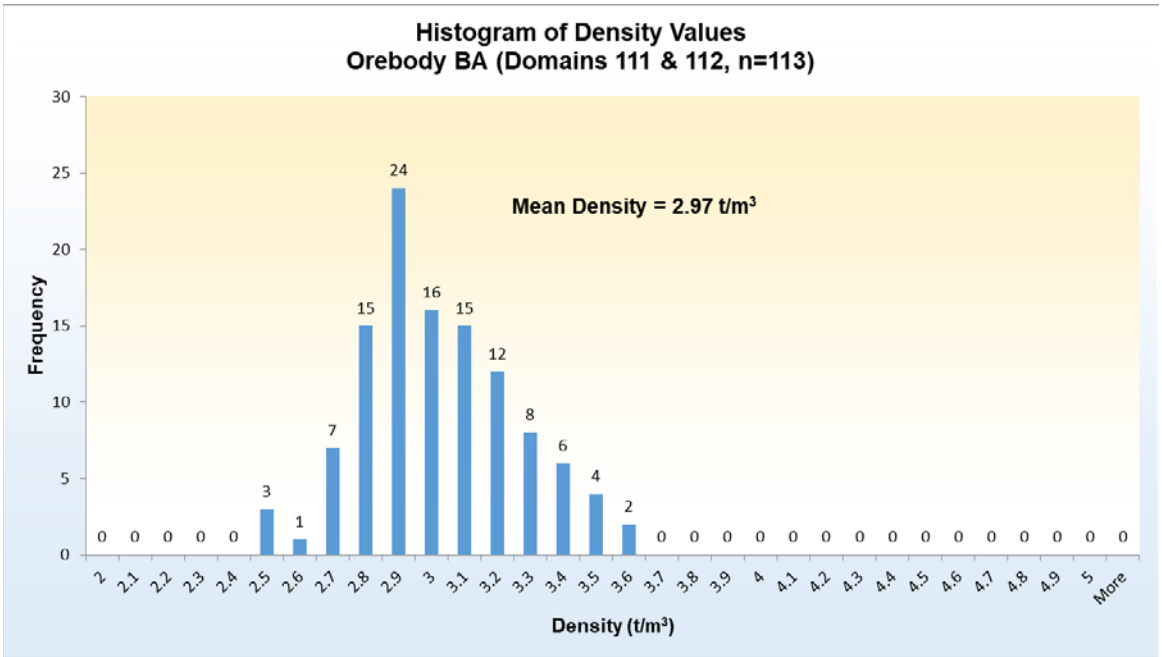


FIGURE 14-17 HISTOGRAM OF BULK DENSITY VALUES, OREBODY BF

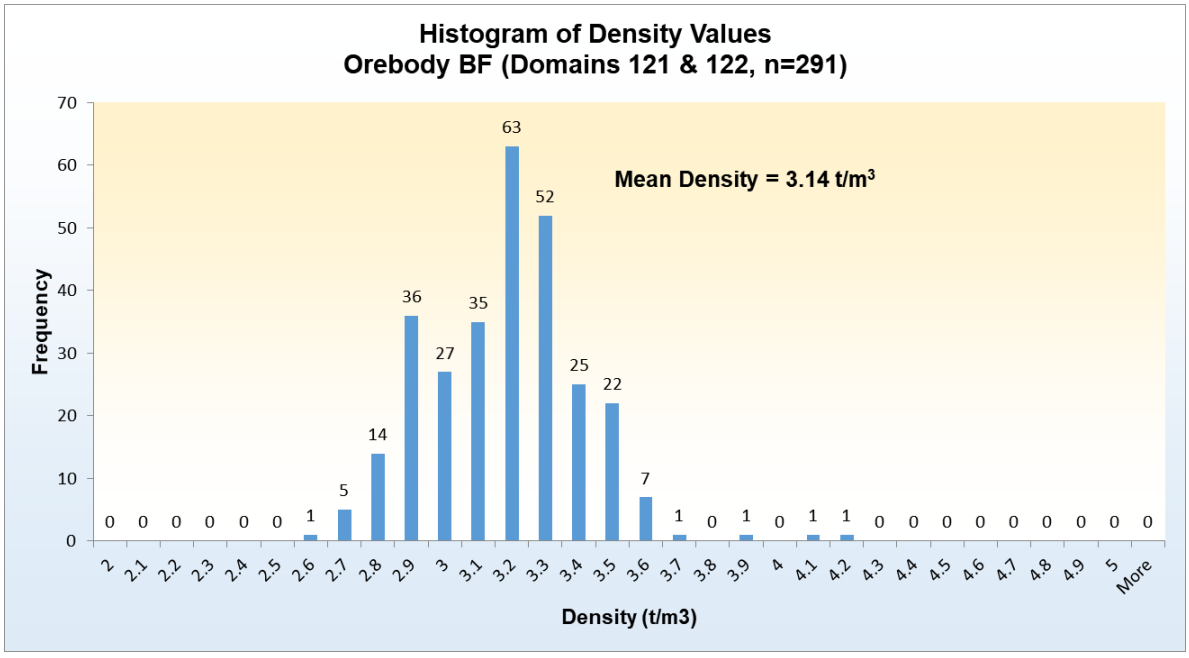
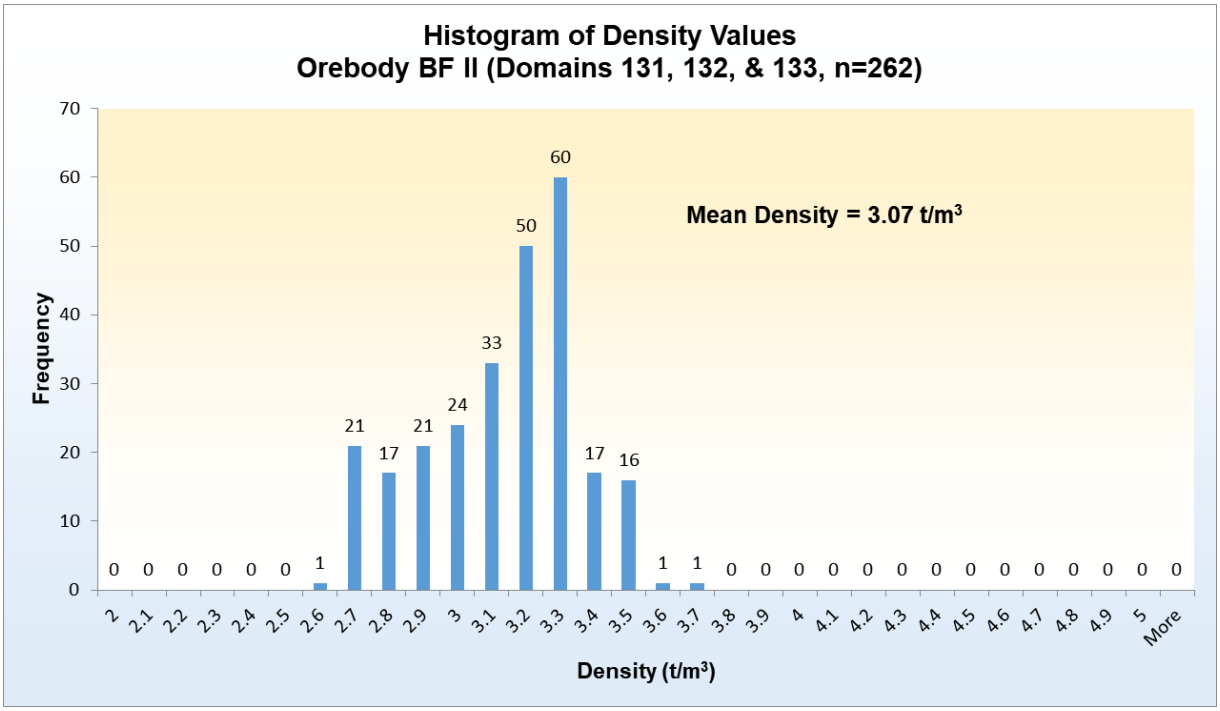


FIGURE 14-18 HISTOGRAM OF BULK DENSITY VALUES, OREBODY BF II



TREND ANALYSIS

As an aid in carrying out variography studies of the continuity of the gold grades in the mineralized domain models, a short study to examine the overall trends was carried out. For this exercise, a data file was prepared that contained the gold values for each drill hole and channel sample contained within the respective mineralized domain model. The resulting gold grades were digitally contoured using the Leapfrog software package and the results are shown in Figures 14-19 and 14-20. Additional contours of the gold grades were presented in RPA (2018).

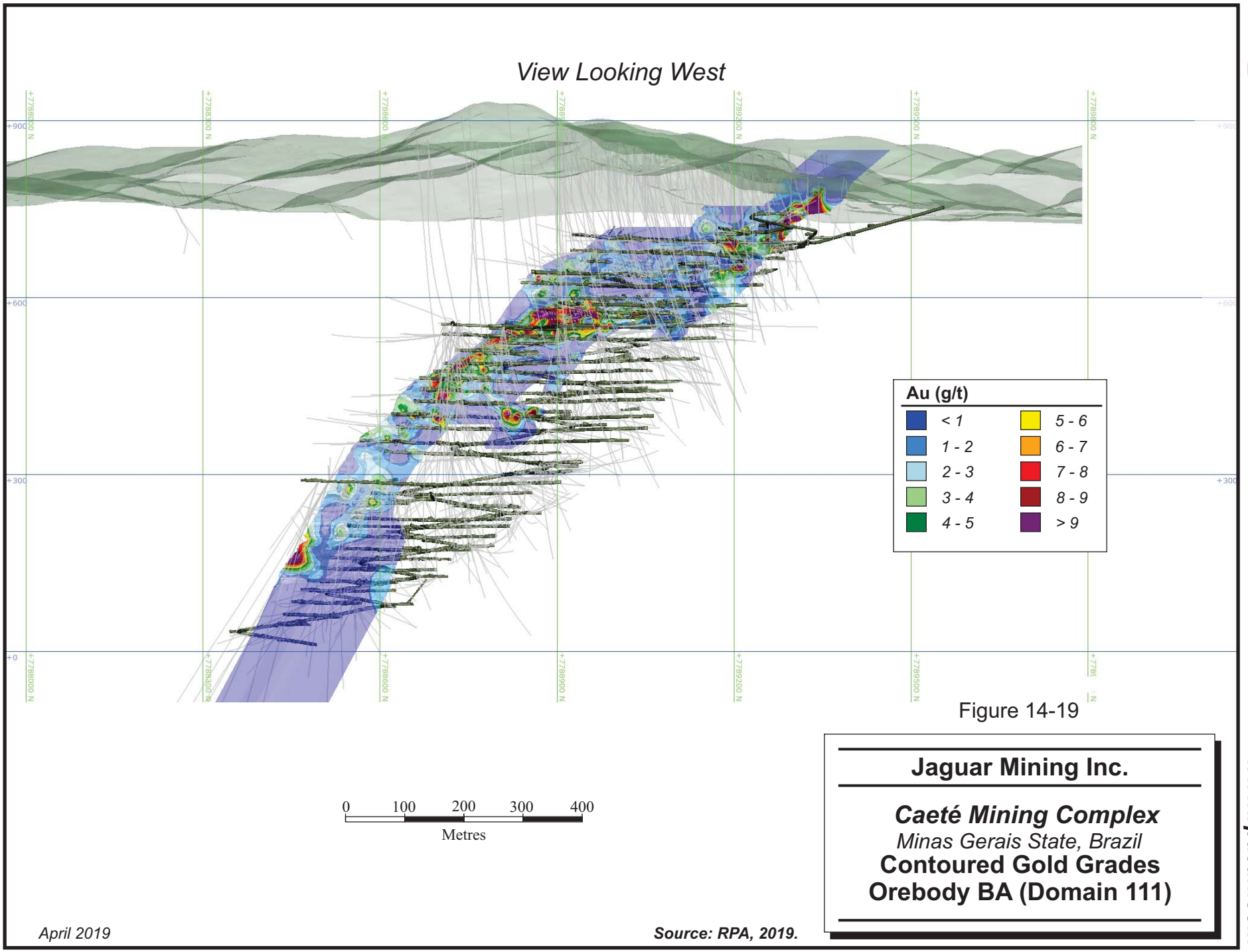


Figure 14-19

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Contoured Gold Grades

Orebody BA (Domain 111)

April 2019

Source: RPA, 2019.

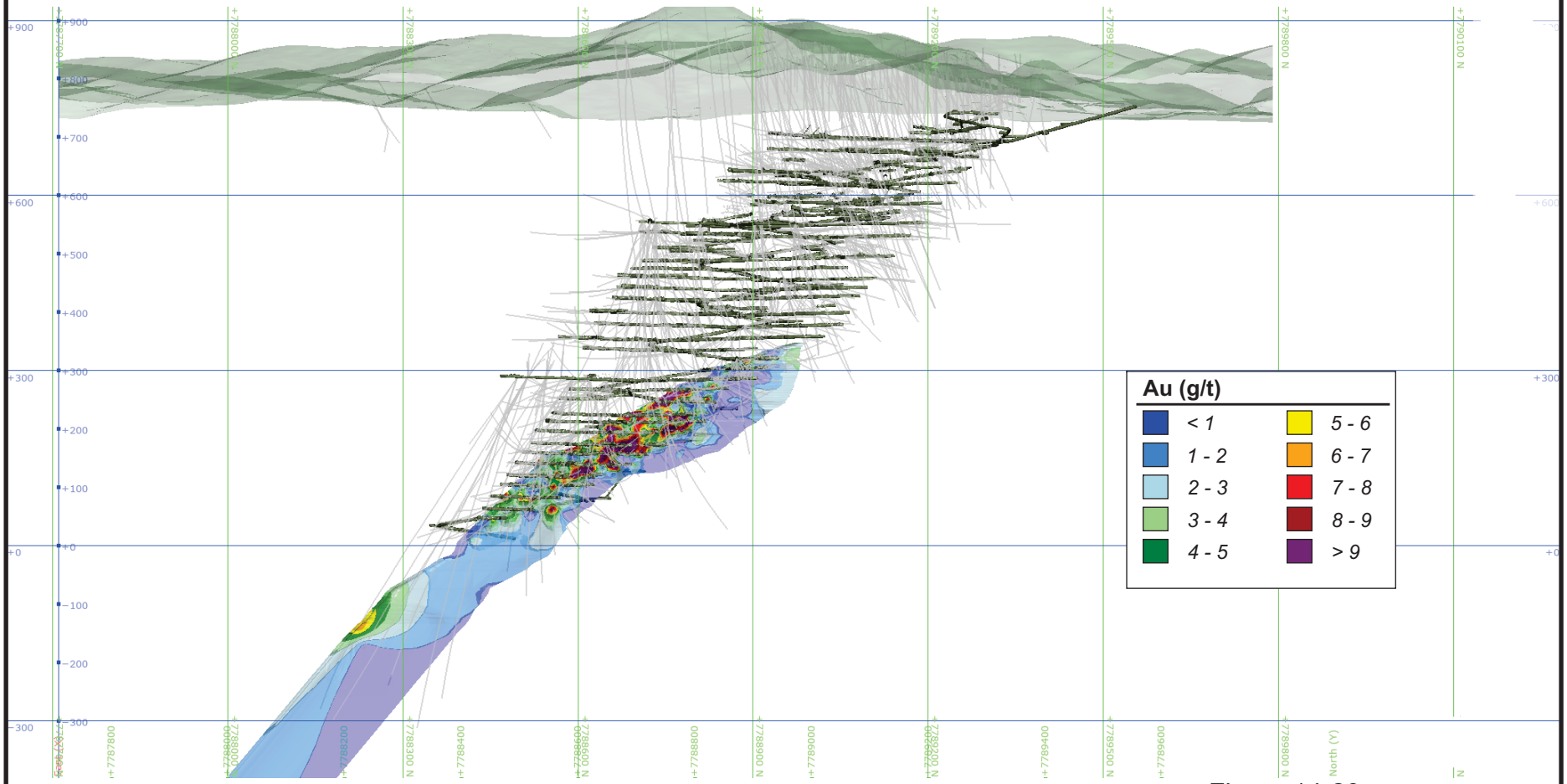


Figure 14-20

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Contoured Gold Grades

Orebody BF II (Domain 131)

April 2019

Source: RPA, 2019.

VARIOGRAPHY

An updated analysis of the spatial continuity of the gold grades for the various mineralized wireframes was carried out by Jaguar's geological staff using the combined drill hole and channel sample data sets. Example variograms are presented in Figures 14-21 to 14-23. A summary of the variogram parameters derived for each of the mineralized domains is presented in Table 14-21.

FIGURE 14-21 VARIOGRAM MODELS FOR THE BA DOMAIN

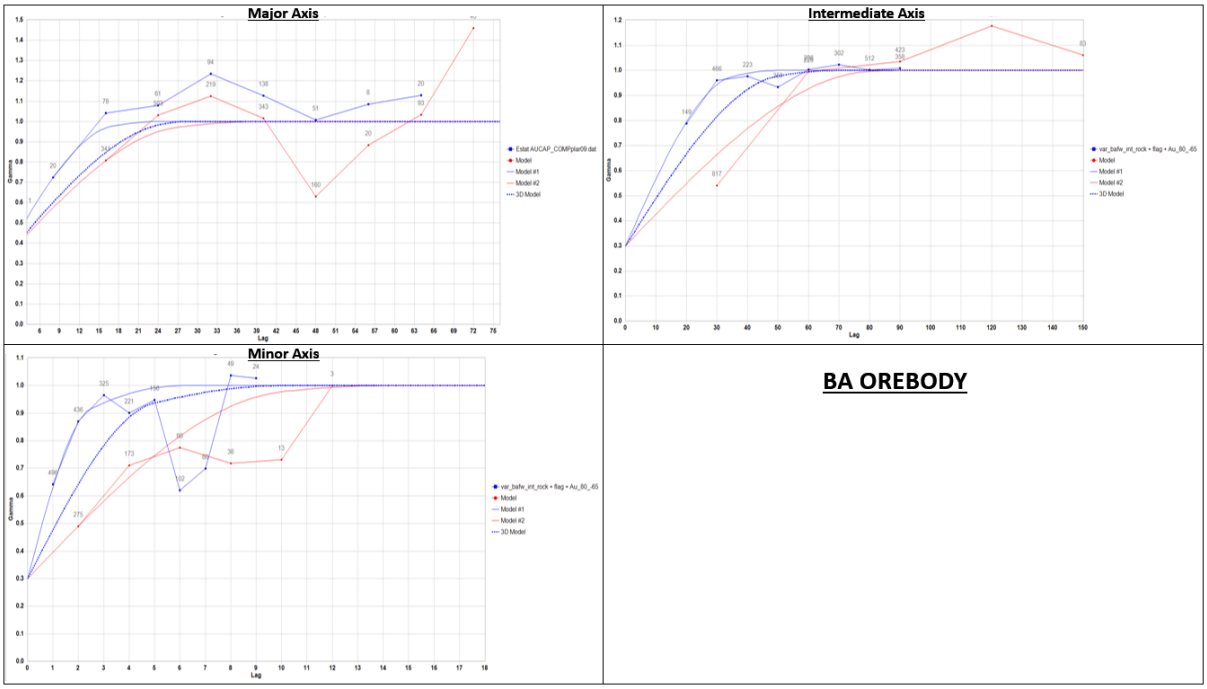


FIGURE 14-22 VARIOGRAM MODELS FOR THE BF DOMAIN

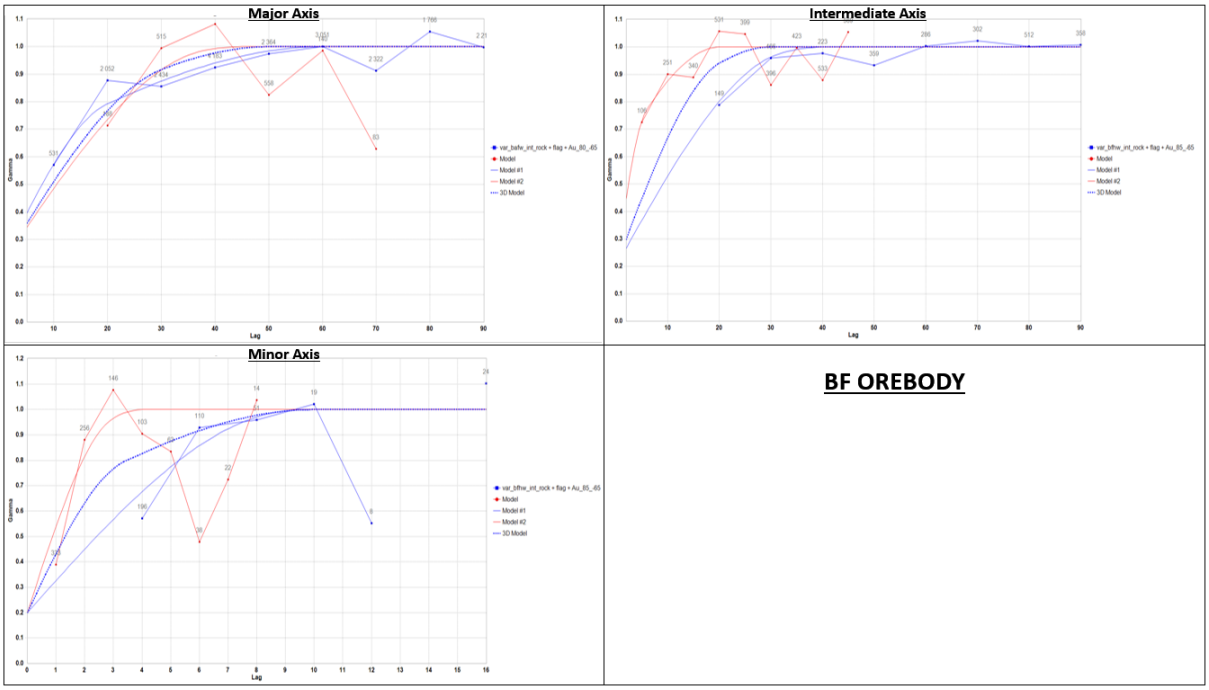


FIGURE 14-23 VARIOGRAM MODELS FOR THE BF II DOMAIN

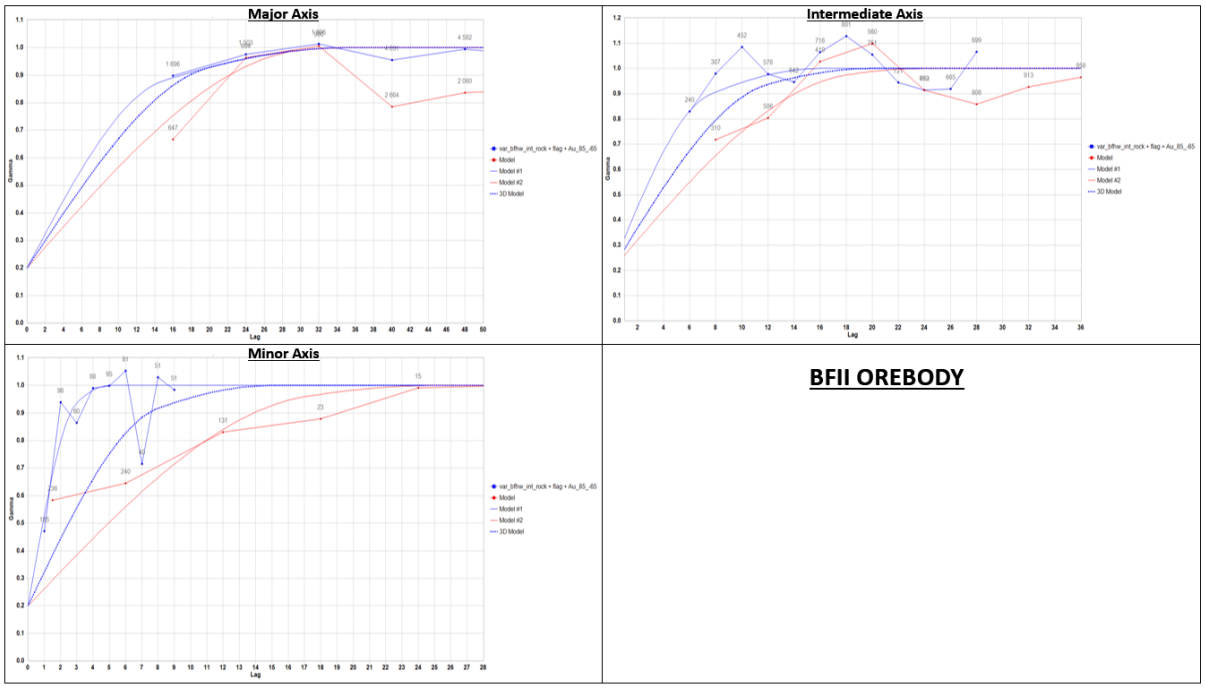


TABLE 14-21 SUMMARY OF VARIOGRAPHY AND INTERPOLATION PARAMETERS
Jaguar Mining Inc. – Caeté Mining Complex

Item	BA	BF	BFII	TORRE	LPA	LFW	LHW	SW
Nugget (C0)	0.3	0.2	0.2	0.2	0.2	0.1	0.3	0.3
Sill Major Axis (C1)	0.5	0.4	0.5	0.5	0.5	0.5	0.3	0.4
Sill Major Axis (C2)	0.2	0.4	0.3	0.3	0.3	0.4	0.4	0.3
Model Type	Sph	Sph	Sph	Sph	Sph	Sph	Sph	Sph
Orientation	080/-65/-40	350/50/-65	350/50/-65	155/-55/35	350/40/-60	110/-60/35	090/-65/-60	135/-55/00
Anisotropy Ratio (Major/Semi-Major)	2.5	1.7	1.8	1.3	5.8	3.5	1.3	1.5
Anisotropy Ratio (Major/Minor)	7.0	5.0	2.3	5.0	7.0	17.5	2.0	3.8
Minimum Number of Samples	3	3	3	3	3	3	3	3
Maximum Number of Samples	16	16	16	16	16	16	16	16
Maximum Number of Samples per Hole	2	2	2	2	2	2	2	2
Maximum Number of Samples per Quadrant	4	4	4	4	4	4	4	4
Distances:								
Structure1 Major (m)	50	30	20	30	56	60	5	36
Structure1 Semi-Major (m)	21	20	12	31	8	12	2	15
Structure1 Minor (m)	5	3	8	4	5	1.1	1.3	8
Structure2 Major (m)	70	50	35	50	70	70	8	45
Structure2 Semi-Major (m0	28	30	20	40	12	20	6	30
Structure2 Minor (m)	10	10	15	10	10	4	4	12

BLOCK MODEL CONSTRUCTION

The block model was constructed by Jaguar using the MinePlan 3D version 15.30 software package and comprised an array of 4 m x 4 m x 4 m sized blocks using sub-blocking with a minimum block size of 1 m x 1 m x 1 m. The model is oriented parallel to the coordinate grid system (i.e., no rotation or tilt). The selection of the block sizes for this model were carefully selected so as to minimize the variation when compared with the block model strategy previously employed at the mine. The block model origin, dimensions, and attribute list are provided in Table 14-22. A number of attributes were created to store such information as rock code, material densities, estimated gold grades, mineral resource classification, mined out material and the like (Table 14-23).

TABLE 14-22 BLOCK MODEL DEFINITION, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Type	Y (Northing)	X (Easting)	Z (Elevation)
Minimum Coordinates (m)	7,787,900	662,000	-400
Maximum Coordinates (m)	7,789,500	663,100	1,000
Block Size (m)	4	4	4
Rotation (°)	0.000	0.000	0.000

TABLE 14-23 BLOCK MODEL ATTRIBUTES, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Attribute Name	Type	Decimals	Default	Description
aui3c	Real	2	0	Gold by ID3
auokc	Real	2	0	Gold by OK
avd	Real	2	0	Average distance of informing samples
class	Integer	-	0	Initial categorization (1=measured, 2=indicated, 3=inferred)
clod	Real	2	0	Distance to nearest informing sample
density	Real	2	2.87	Density
fthd	Real	2	0	Distance to farthest informing sample
mined	Integer	-	0	Mined out (-1=remaining, 1=mined out)
ndh	Integer	-	0	Number of drill holes
nq	Integer	-	0	Number of quadrants with informing samples
nsamp	Integer	-	0	Number of Informing Samples
ore_pct	Real	2	0	Percent inside wireframe
pasID	Integer	-	0	Estimation pass, Inverse Distance (1=Half of Variogram Range, 2=Variogram Range, 3=2x Range, 4=4x Range)
PasOK	Integer	-	0	Estimation pass, Ordinary Kriging
rock	Integer	-	0	Rock code
rclass	Integer	-	0	Post-processed resource classification
topo_pct	Real	1	0	Percent below topo
var	Real	2	0	Kriging variance

Gold grades were estimated into the blocks by means of both ID^3 and Ordinary Kriging (OK) interpolation algorithms. A total of four interpolation passes at different ranges were carried out for each of the mineralized wireframes using distances derived from the variogram results and the search ellipse parameters presented above (Table 14-24). In general, all search ellipses were oriented along the overall down-plunge direction of the mineralized domains (Figures 14-24 and 14-25).

TABLE 14-24 SUMMARY OF THE ESTIMATION STRATEGY
Jaguar Mining Inc. – Caeté Mining Complex

	Range/2 PASS1	Rangex1 PASS2	Rangex2 PASS3	Extrapolation PASS4
Parameters	**Measured**	**Indicated**	**Inferred**	**Potential**
# min composites	3	2	1	1
# max composites	16	16	16	16
# max composites by DH	2	2	4	8
especial selection	split quadrant	split quadrant	split quadrant	split quadrant
# max composites por quad/oct	2	2	4	8
# empty quad/oct adjacent	-	-	-	-
min quad/oct with value	2	2	1	1

In general, “hard” domain boundaries were used along the contacts of the mineralized domain models. Only data contained within the respective wireframe model were allowed to be used to estimate the grades of the blocks within the wireframe in question, and only those blocks within the wireframe limits were allowed to receive grade estimates. For those mineralized lenses that exhibited tight folding, the individual wireframe models were further sub-domained into their two separate limbs and each were assigned unique block model codes for the hangingwall and footwall limbs (Figure 14-26). In order to avoid smearing of gold grades across the limbs, separate estimation passes were run for the hangingwall and footwall limbs of the isoclinally folded domains (BA, BF, and BF II) using the respective drill hole composite samples.

RPA recommends that the Jaguar team consider the use of a dynamic anisotropy method for estimation of gold grades into the model.

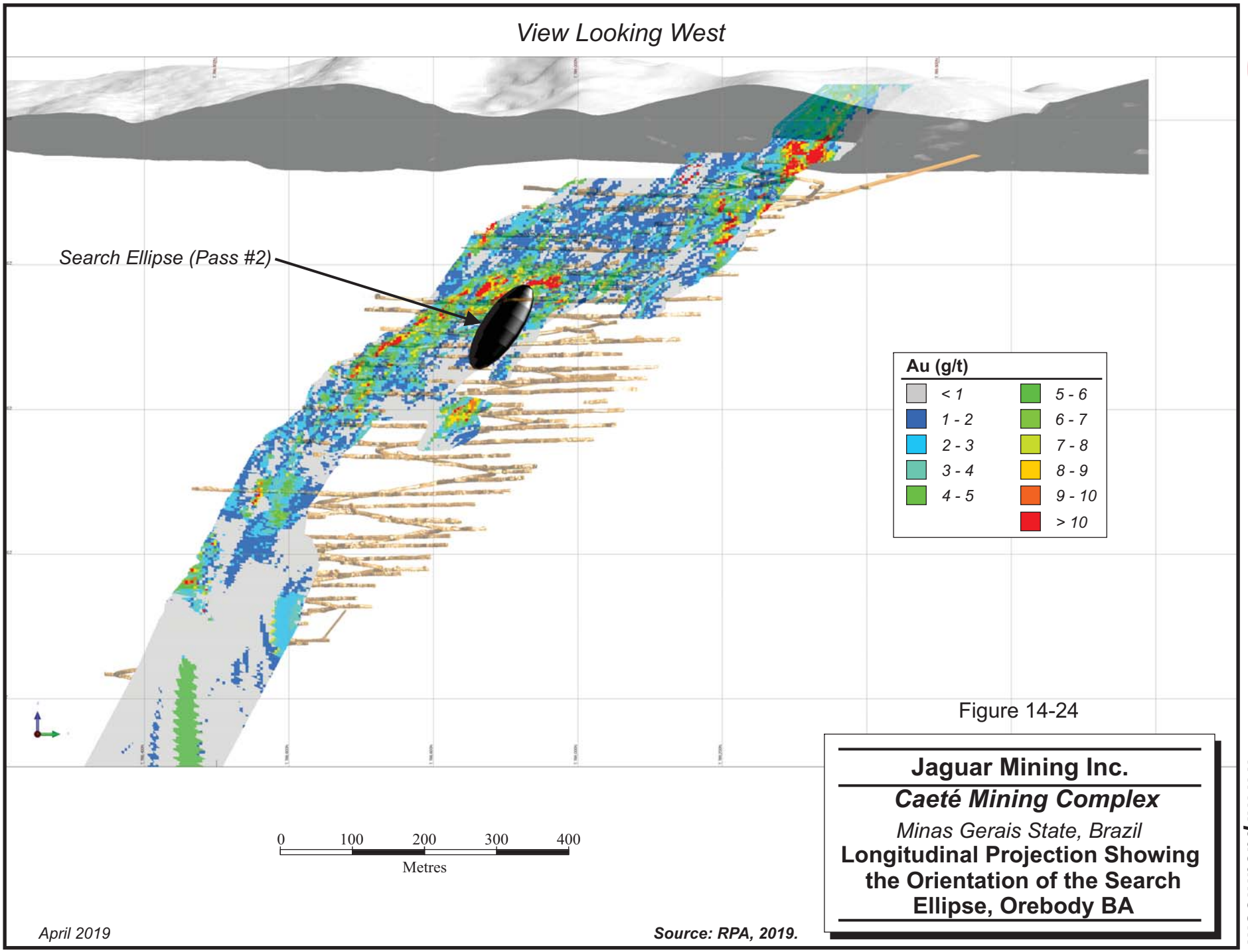


Figure 14-24

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Longitudinal Projection Showing the Orientation of the Search Ellipse, Orebody BA

April 2019

Source: RPA, 2019.

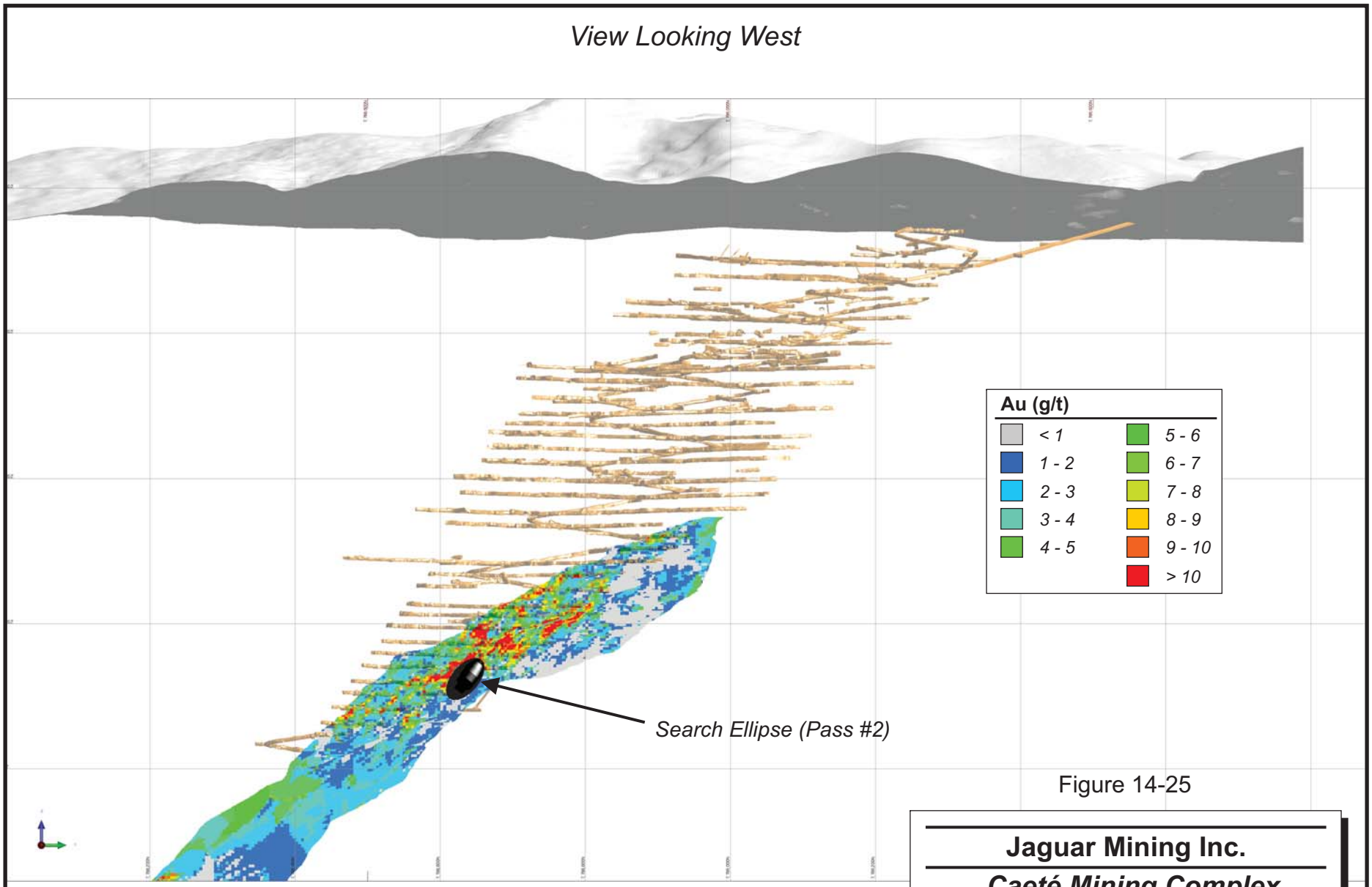


Figure 14-25

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Longitudinal Projection Showing Orientation of the Search Ellipse, Orebody BF II

April 2019

Source: RPA, 2019.

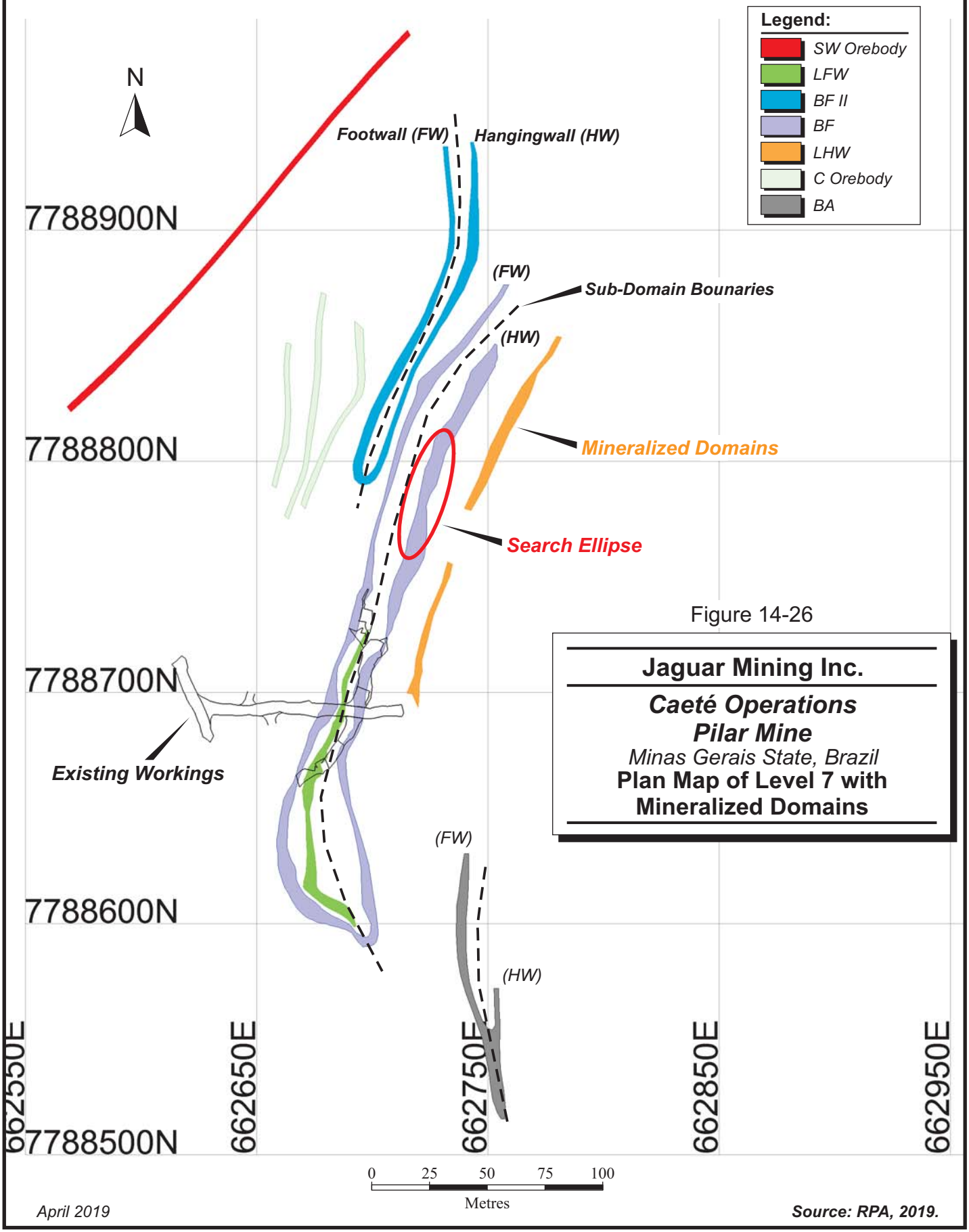


Figure 14-26

Jaguar Mining Inc.

Caeté Operations
Pilar Mine
Minas Gerais State, Brazil
Plan Map of Level 7 with Mineralized Domains

April 2019

Source: RPA, 2019.

BLOCK MODEL VALIDATION

Block model validation exercises consisted of comparing the volume of the coded blocks in the block model against the volume report of the respective wireframe models as a high level check that the block model has been correctly coded for each of the wireframes (Table 14-25).

A second validation exercise consisted of evaluating the accuracy of the global estimate by comparing the descriptive statistics from the composites against the block model gold grades (Table 14-26). In general, the block estimated mean grades for some of the mineralized domains were lower than the composites. RPA attributes this difference to the clustering of the channel sample composites.

TABLE 14-25 COMPARISON OF BLOCK MODEL AND WIREFRAME VOLUMES, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Orebody	BA	BF	BF II	LFW	LPA	LHW	Torre	SW
Block model (m^3)	1,920,807	1,878,354	1,276,202	828,405	214,900	203,037	1,101,615	1,281,616
Wireframe (m^3)	1,921,600	1,880,355	1,276,693	766,814	215,175	203,366	1,103,400	1,282,795
Difference (BM-Wf)	-793	-2,001	-491	61,591	-275	-329	-1,785	-1,179
% Difference	0%	0%	0%	8%	0%	0%	0%	0%

TABLE 14-26 COMPARISON OF BLOCK MODEL AND COMPOSITE GRADES, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Orebody	BA	BF	BF II	LFW	LPA	LHW	Torre	SW
Block Model (g/t Au OK)	2.83	2.94	3.78	1.27	2.47	1.87	1.86	1.66
Composite (g/t Au)	3.43	3.71	4.82	1.69	3.28	1.94	2.05	1.72
Difference (AuOK-Comp)	-0.60	-0.77	-1.04	-0.42	-0.81	-0.07	-0.19	-0.06
% Difference	-18%	-21%	-22%	-25%	-25%	-3%	-9%	-4%

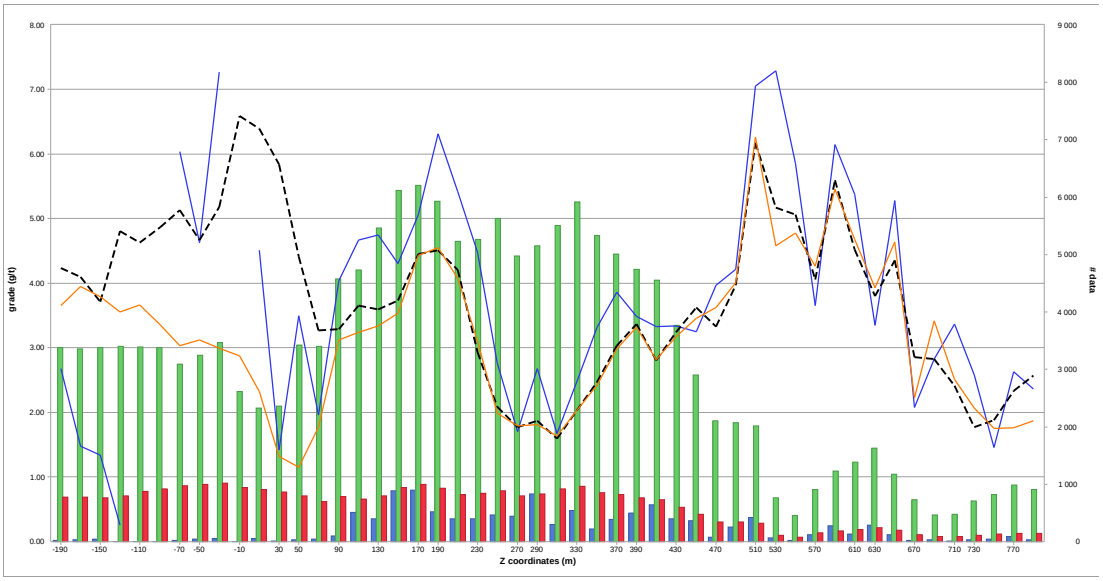
* Block model report includes Pass AuOK 1 and 2 (variogram range)

Evaluation of the accuracy of the local estimate was carried out by construction of a series of swath plots that compared the average composite grades to the average estimated block model grades in plan and section. Swath plots for selected wireframes are presented in Figure 14-27. The accuracy of the local estimate was also examined visually by comparing the

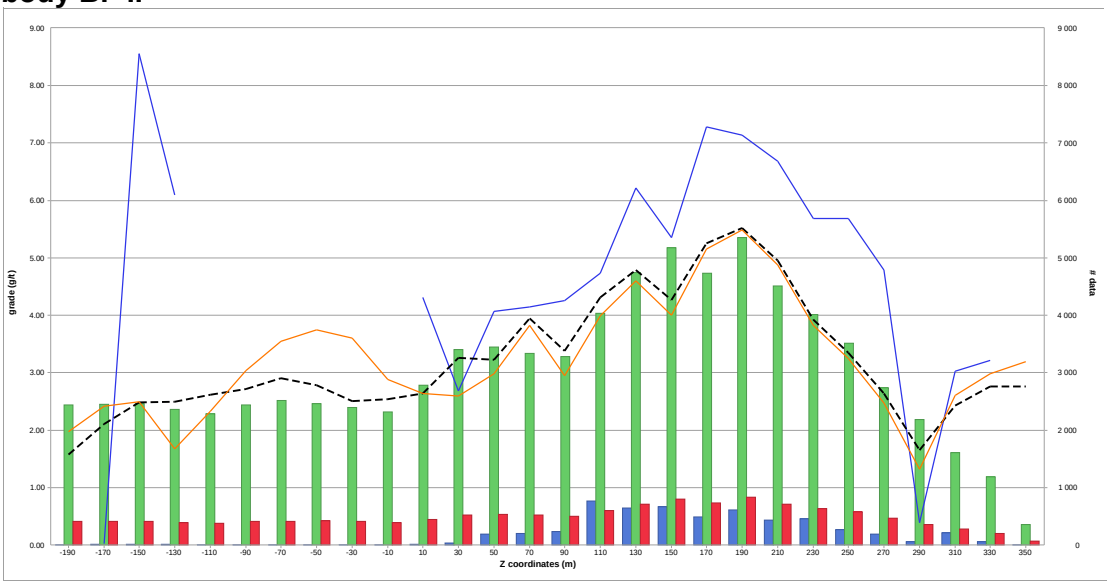
contoured grade distributions from the drill hole and channel sample information to the estimated block grades (Figures 14-28 and 14-29).

FIGURE 14-27 SWATH PLOTS BY ELEVATION, FW DOMAIN

Orebody BF



Orebody BF II



Number of composites

Number of blocks at old short term block model (2x2x2 m)

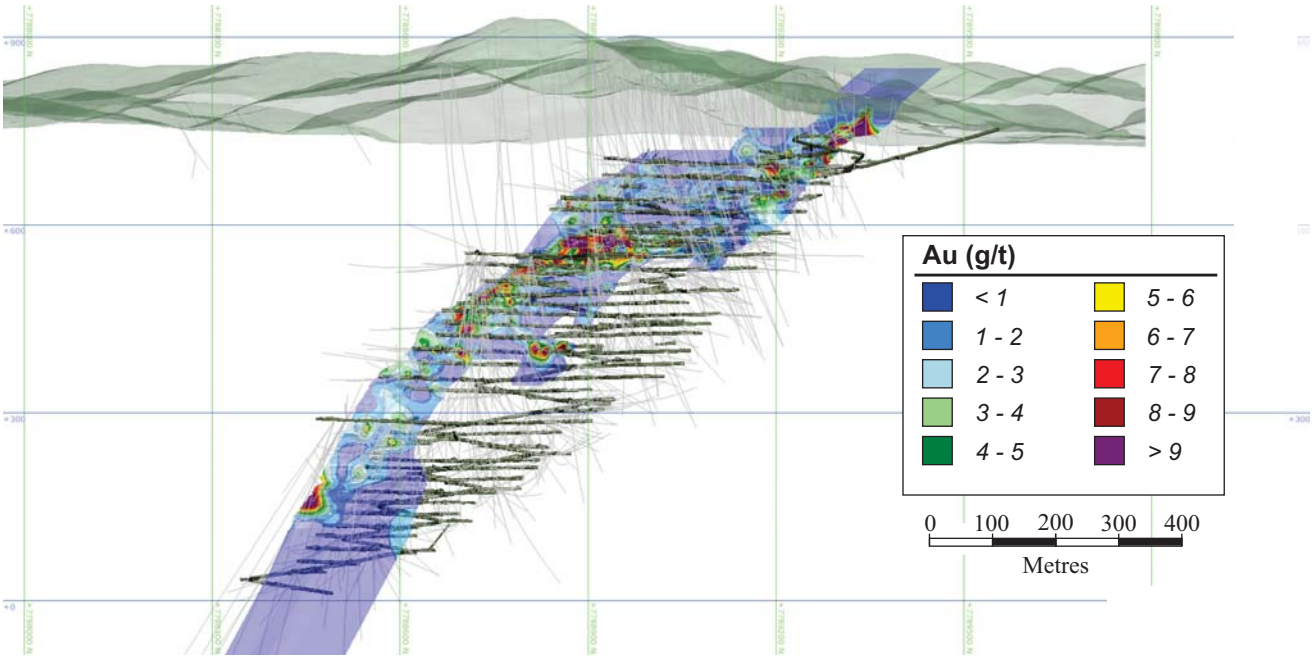
Number of blocks at new long term block model (4x4x4 m, subblocked 1x1x1 m)

Average grade of the composites

Average grade of the new long term block model (4x4x4 m, subblocked 1x1x1 m)

Average grade of the old short term block model (2x2x2 m)

View Looking West



View Looking West

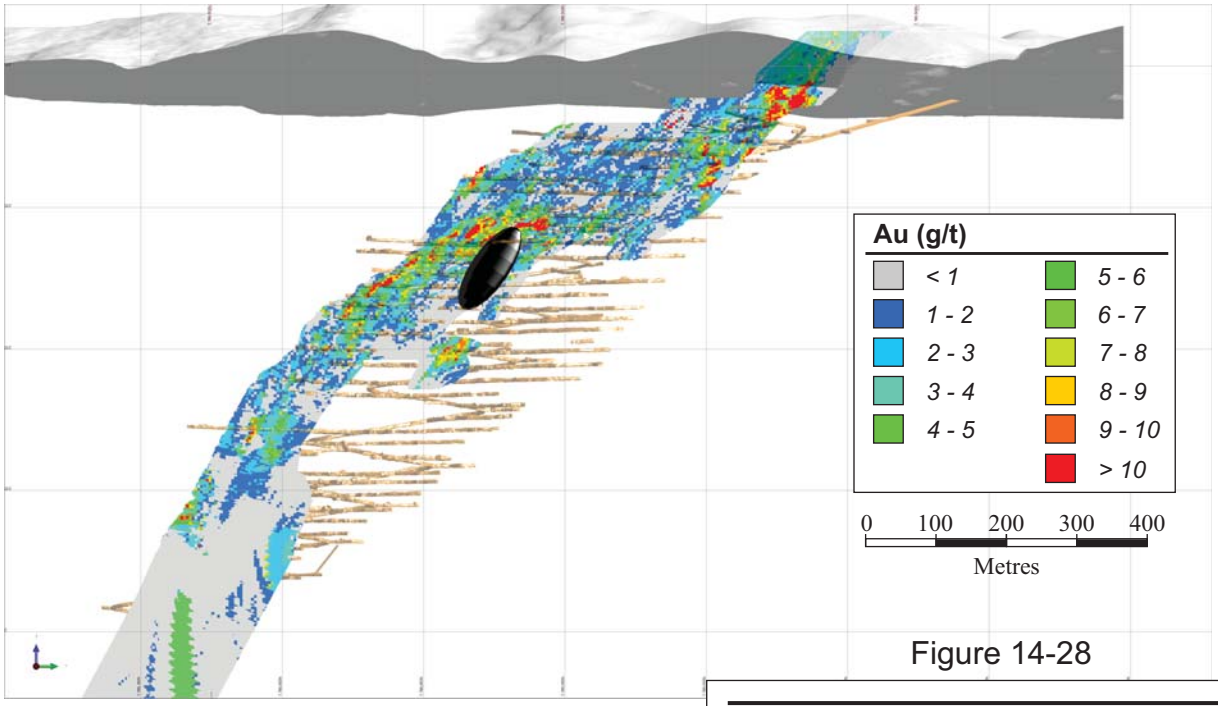


Figure 14-28

Jaguar Mining Inc.

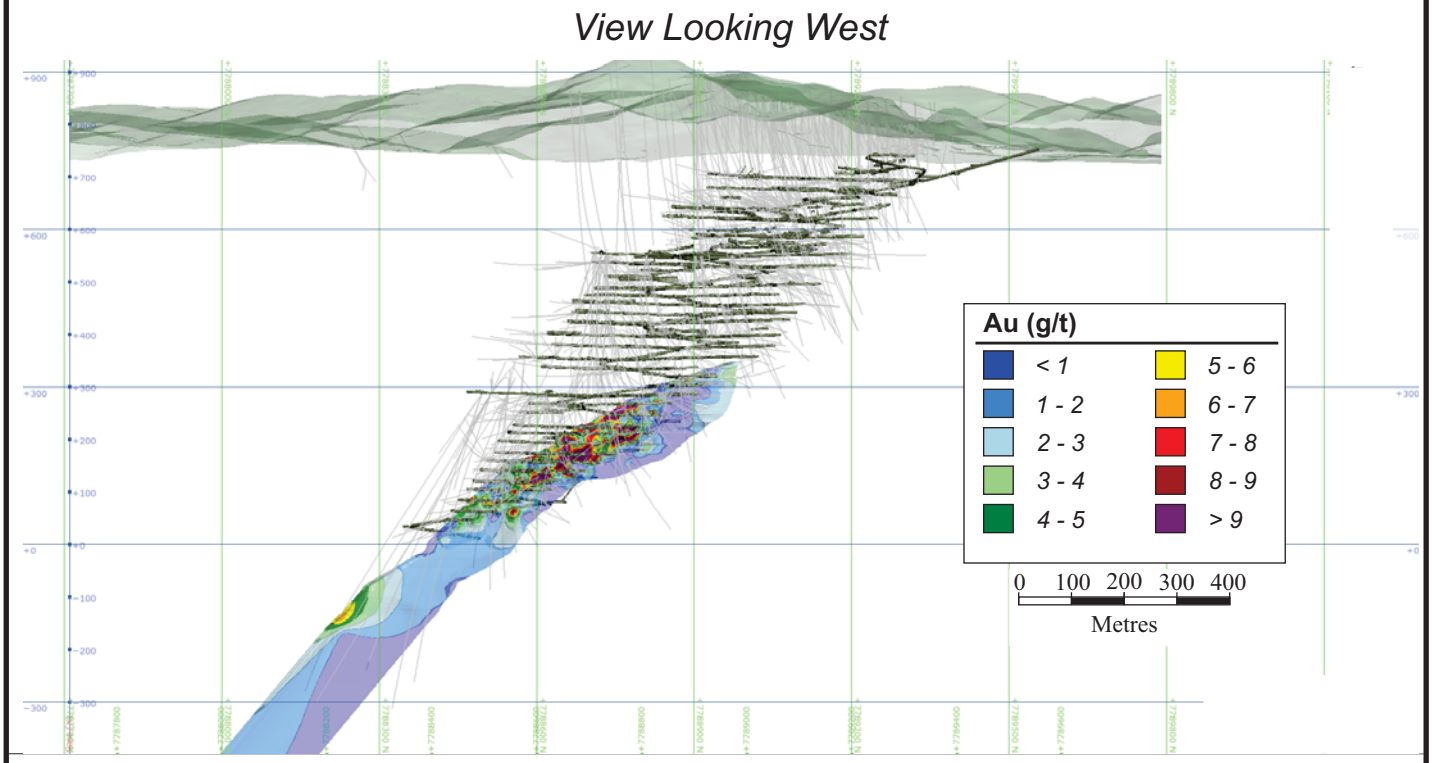
Caeté Mining Complex

Minas Gerais State, Brazil

Comparison of Contoured Gold Grades with Block Model Estimated Grades Orebody BA (Domain 111)

April 2019

Source: RPA, 2019.



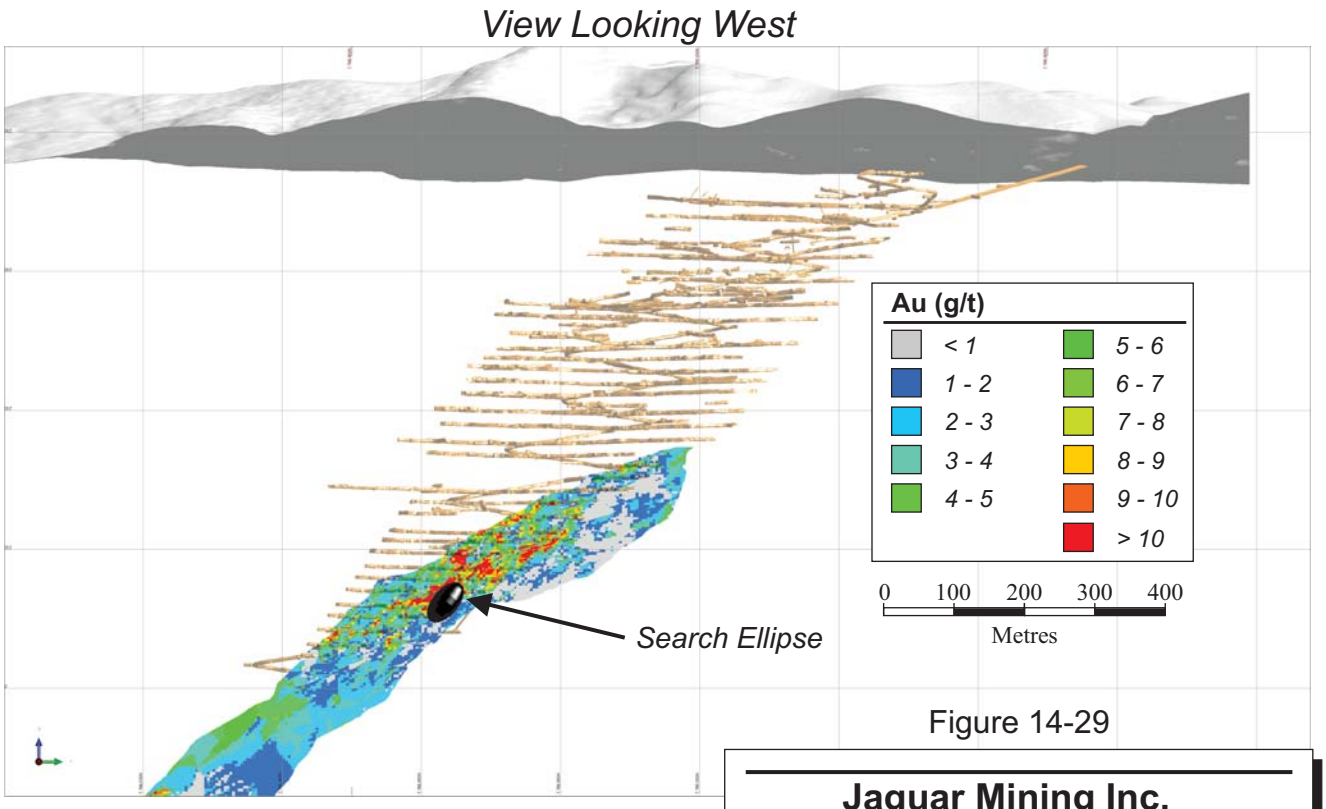


Figure 14-29

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Comparison of Contoured Gold Grades with Block Model Estimated Grades Orebody BF II (Domain 131)

April 2019 ***Source: RPA, 2019.***

RECONCILIATION TO PRODUCTION

Further validation of the accuracy of the estimated block model grades consisted of comparing the mill production statistics with the predicted volumes of diluted and recovered tonnes and grade from the block model for the period of January 2017 to December 2018 (Table 14-27). The material flow for the Pilar mine begins with the transportation of the broken development muck and stope tonnes to the surface, where the material is placed in a temporary laydown area for sampling. The material is then transported overland by truck to the processing plant which also receives a small amount of tonnes from the Roça Grande Mine.

Considering that the block model reported tonnage and grade was derived from both drill hole and channel sample data, this comparison corresponds closer to an F2 reconciliation (short-term model to plant) as described in Parker (2004). The monthly tonnage and grade figures derived from the 2018 block model utilized the as-mined excavation solids models for the development and stopes completed in 2017 and 2018 to constrain the reports. The mined out volumes were created using data collected using a Cavity Monitoring Survey (CMS) and/or total station survey equipment. In a small number of cases, the shape and size of the excavated volumes could not be picked up due to equipment failures, timing, or safety issues. RPA recommends that in the events where no CMS model is available for a given excavation volume, the design shape for the excavations in question (suitably modified for the estimated amount of overbreak) be used as a proxy when preparing the reconciliation reports.

The grade of all blocks that are located outside of the mineralized wireframe models (ostensibly the waste materials) has been set to a value of zero for the 2018 block model. This approach will then result in the inclusion of all waste tonnes (both planned and unplanned dilution) along with the recovered ore tonnes. The data then represent the fully diluted, recovered tonnes and grade as predicted from the block model and so will be appropriate for comparison with plant feed grade. The quarterly reconciliation results are presented in Figure 14-30.

The reconciliation results are showing that there is a good correlation between the block model predicted ounces against the mill production statistics for the periods examined (Figure 14-31). The block model generally predicted less tonnes at a higher grade than were received at the plant for the 2017 and 2018 production periods.

In RPA's opinion, the observed variance in the data can be ascribed to four factors:

- Inaccurate estimates of the block model tonnages and grades due to the use of incomplete CMS shapes of all excavations for the year's production,
- Inaccuracies in the CMS shapes,
- The discovery of additional ore during the development process than was not captured by the block model, and
- Overall block model predicted grades being too high due to slightly optimistic channel capping values.

TABLE 14-27 QUARTERLY PRODUCTION RECONCILIATION, 2017 AND 2018 PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Period	Mine Report			Plant Feed Grade			Block Model (December 31, 2018)		
	Tonnes	Grade (g/t Au)	Oz Au	Tonnes	Grade (g/t Au)	Oz Au	Tonnes	Grade (g/t Au)	Oz Au
2017/Q1	77,554	3.60	8,968	83,920	3.43	9,242	71,939	3.97	9,172
2017/Q2	85,318	3.54	9,705	85,209	3.25	8,911	83,733	3.94	10,600
2017/Q3	88,951	3.92	11,201	87,605	3.80	10,699	84,349	4.63	12,571
2017/Q4	83,283	4.12	11,039	81,022	3.68	9,592	79,255	5.18	13,202
2018/Q1	77,642	4.37	10,905	80,728	4.37	11,352	72,210	4.88	11,333
2018/Q2	94,051	3.90	11,799	94,377	3.90	11,839	87,295	4.12	11,574
2018/Q3	87,476	4.93	13,856	87,394	4.93	13,840	80,029	5.59	14,395
2018/Q4	94,233	3.82	11,583	92,541	3.82	11,372	95,430	4.44	13,623
Total, 2017	**335,106**	**3.80**	**40,914**	**337,756**	**3.54**	**38,445**	**319,275**	**4.44**	**45,545**
Total, 2018	**353,402**	**4.24**	**48,142**	**355,039**	**4.24**	**48,403**	**334,965**	**4.73**	**50,925**

FIGURE 14-30 QUARTERLY RECONCILIATION FACTORS, MODEL TO PLANT, PILAR MINE

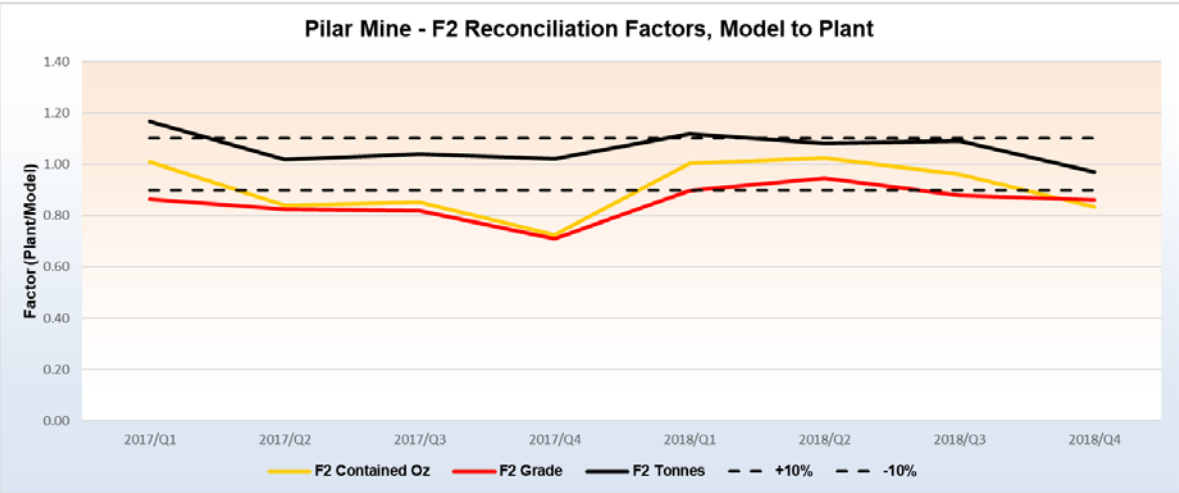
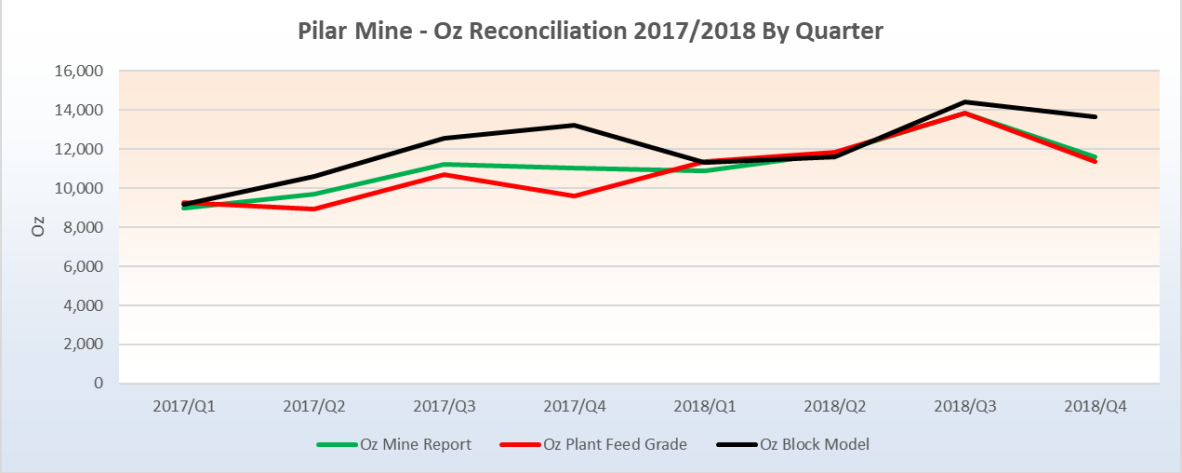


FIGURE 14-31 2017 AND 2018 RECONCILIATION INFORMATION BY QUARTER, CONTAINED OUNCES, PILAR MINE



The reconciliation information presented above utilizes the grade-block model that was prepared using the drill hole and channel sample information that was available as of December 31, 2018. The estimated grades are then compared to the production information for the previous periods, thus allowing an analysis of the effectiveness of the sampling, assaying, and estimation protocols.

In order to obtain a view of the forward-predicting accuracy of these sampling, assaying and estimation protocols, the block model that was prepared using drill hole and channel sample information as of December 31, 2017 was used to compare the predicted tonnages and grade against the 2018 production statistics. The comparison of the predicted ounces is presented in Figure 14-32 and the reconciliation factors are presented in Figure 14-33.

It can be seen that the year-end 2017 block model consistently under-predicted the amount of gold for all four quarters of 2018. Review of the reconciliation results shows that this is a result largely of an increase in the milled grade from that predicted by the block model.

FIGURE 14-32 GOLD PRODUCTION BY QUARTER, 2018

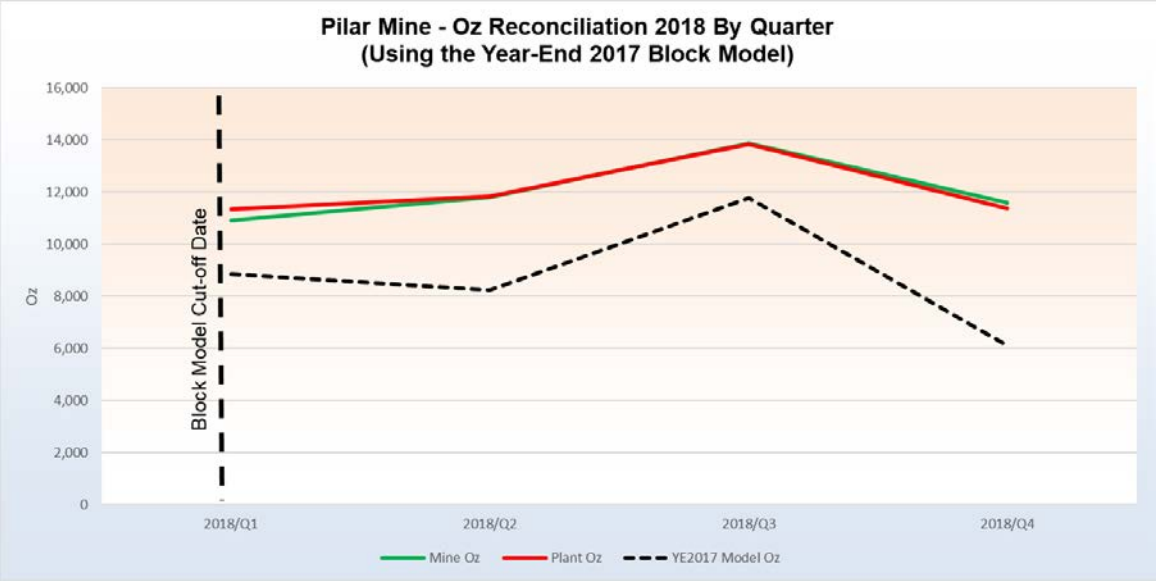
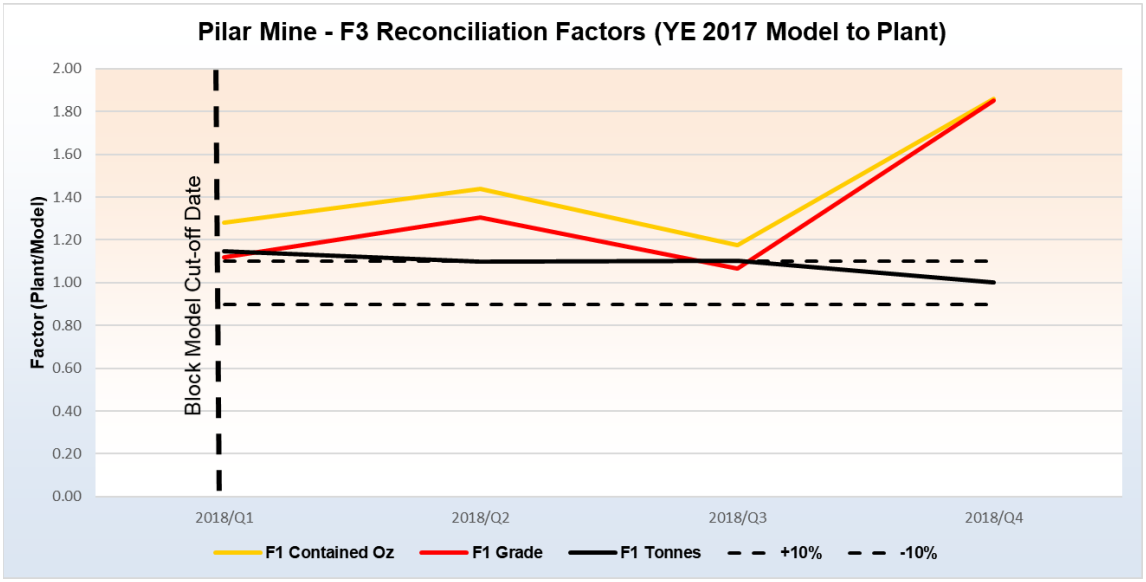


FIGURE 14-33 YEAR-END 2017 MODEL TO PLANT RECONCILIATION FACTORS



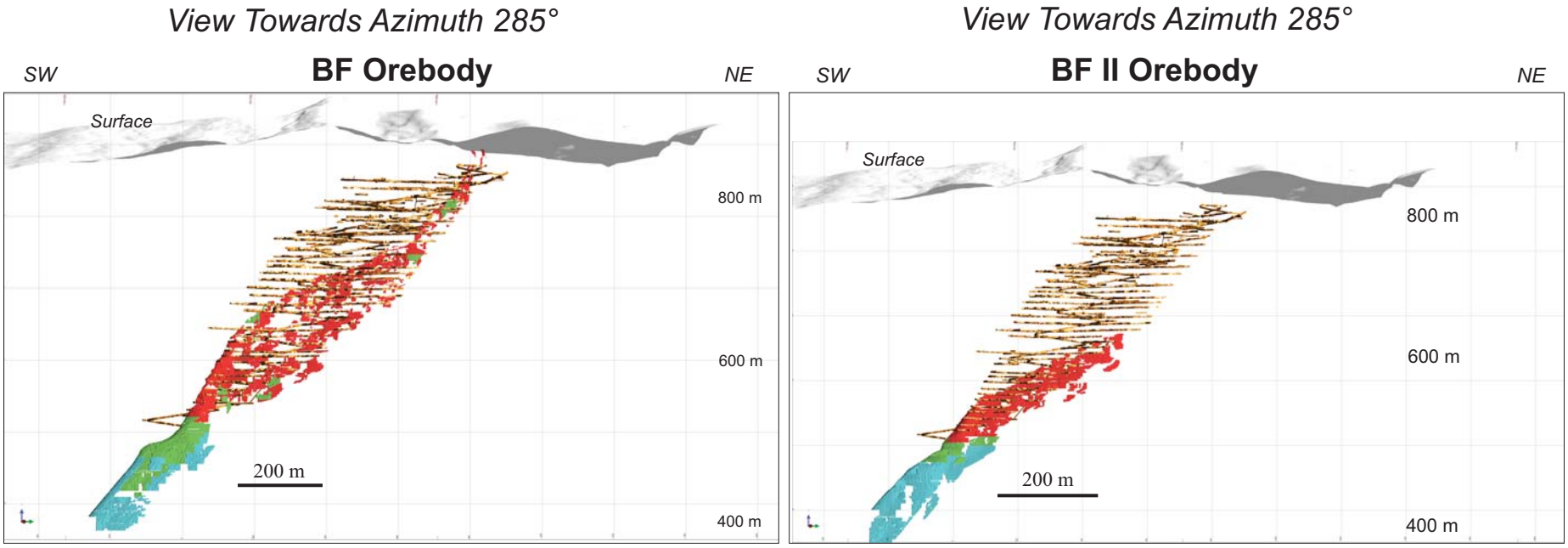
MINERAL RESOURCE CLASSIFICATION

The Mineral Resources in this report were estimated in accordance with the definitions contained in CIM (2014).

The mineralized material for each wireframe was initially classified into the Measured, Indicated, or Inferred Mineral Resource category on the basis of the search ellipse ranges obtained from the spatial continuity study, the demonstrated continuity of the gold mineralization, the density of drill hole and chip sample information, and the presence of underground access.

On the basis of these criteria, Measured Mineral Resources initially comprised material which has been estimated using Pass 1 and are located between developed levels. Indicated Mineral Resources initially comprised material that has been estimated using Pass 2, and Inferred Mineral Resources initially comprised material that has been estimated using Pass 3. Jaguar employs an additional block model code to denote those areas considered to display good exploration potential for use in the decision process, and this material was defined by those grades that were estimated with Pass 4.

A post-processing clean-up step was applied in a final stage of the classification process to ensure continuity and consistency of the classified blocks in the model. This was applied by manually creating a series of clipping polygons, which were subsequently used to assign the final classification codes into the block model. Figure 14-34 presents an example of the final classification layouts for the BF and BF II Domain.



Domain Legend:
- Measured
- Indicated
- Inferred

Source: RPA, 2019.

Figure 14-34

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Longitudinal Projection of the Mineral Resources, BF & BF II Domains

CUT-OFF GRADE

A cut-off grade of 1.81 g/t Au is used for reporting of Mineral Resources. This cut-off grade was arrived at using a gold price of US$1,500/oz, average gold recovery of 90%, average exchange rate of R$3.70 : US$1, and 2018 actual cost data for the Pilar Mine. Gold prices used for reserves are based on consensus, long term forecasts from banks, financial institutions, and other sources. For resources, gold prices used are slightly higher than those for reserves.

MINERAL RESOURCE ESTIMATE

The Mineral Resources are inclusive of Mineral Reserves. For those portions of the Mineral Resources that comprise the Mineral Reserve, the stope design wireframes were used to constrain the Mineral Resource reports.

Additional Mineral Resources are present that reside beyond the Mineral Reserve outlines as a result of the lower cut-off grade used for reporting of Mineral Resources. These are located as remnants above Level 11 (the limit of the current development) or as additional mineralized areas peripheral to the Mineral Reserve outlines in areas located below the current development. Three-dimensional resource polygons were prepared to aid in the reporting of the Mineral Resources to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan, section or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade and were not located in mined out areas. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off. Blocks with estimated grades above the stated cut-off grade but located along either the hangingwall, footwall, or otherwise in close proximity to an excavated stope were also excluded. These resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.

The current Mineral Resources are presented in Tables 14-28 and 14-29.

TABLE 14-28 SUMMARY OF MINERAL RESOURCES AS OF DECEMBER 31, 2018 – PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	3,079	4.40	435
Indicated	1,855	3.87	231
Sub-total M&I	**4,934**	**4.20**	**666**
Inferred	1,385	3.61	161

Notes:
1. CIM (2014) definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.81 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US$1,500 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 3.70 Brazilian Reais: 1 US Dollar.
5. Bulk densities used are variable for each mineralized wireframe.
6. A minimum mining width of approximately two metres was used.
7. Gold grades are estimated using ordinary kriging.
8. Mineral Resources are inclusive of Mineral Reserves.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

TABLE 14-29 MINERAL RESOURCES BY DOMAIN AS OF DECEMBER 31, 2018 – PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
	Orebody BA:		
Measured	521	4.13	69
Indicated	82	3.62	9
Sub-total M&I	**603**	**4.02**	**78**
Inferred	98	3.03	10
	Orebody BF:		
Measured	815	4.47	117
Indicated	459	5.24	77
Sub-total M&I	**1,274**	**4.74**	**194**
Inferred	398	3.29	42
	Orebody BF II:		
Measured	969	4.94	154
Indicated	186	3.46	21
Sub-total M&I	**1,155**	**4.71**	**175**
Inferred	538	4.42	77
	Orebody Torre:		
Measured	373	3.99	48
Indicated	273	3.95	35
Sub-total M&I	**646**	**4.00**	**83**
Inferred	300	3.02	29
	Orebody LFW:		

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	185	2.93	17
Indicated	18	2.84	2
Sub-total M&I	**203**	**2.91**	**19**
Inferred	10	3.08	1
	Orebody LHW:		
Measured	67	2.72	6
Indicated	7	2.33	1
Sub-total M&I	**74**	**2.94**	**7**
Inferred	-	0.00	-
	Orebody LPA:		
Measured	149	4.96	24
Indicated	-	0.00	-
Sub-total M&I	**149**	**5.01**	**24**
Inferred	-	0.00	-
	Orebody SW:		
Measured	-	0.00	-
Indicated	830	3.23	86
Sub-total M&I	**830**	**3.23**	**86**
Inferred	42	2.02	3
	Total Pilar Mine:		
Total, Measured	3,079	4.40	435
Total, Indicated	1,855	3.87	231
Total Measured & Indicated	**4,934**	**4.20**	**666**
Total, Inferred	1,385	3.61	161

Notes:

1. CIM (2014) definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.81 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US$1,500 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 3.70 Brazilian Reais: 1 US Dollar.
5. Bulk densities used are variable for each mineralized wireframe.
6. A minimum mining width of approximately two metres was used.
7. Gold grades are estimated using ordinary kriging.
8. Mineral Resources are inclusive of Mineral Reserves.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

RPA has considered the Mineral Resource estimates in light of known mining, infrastructure, environmental, permitting, legal, title, taxation, socio-economic, marketing, political, and other relevant issues and has no reason to believe at this time that the Mineral Resources will be materially affected by these items.

It is RPA's opinion that the Pilar Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014) definitions.

15 MINERAL RESERVE ESTIMATE

Table 15-1 summarizes the Mineral Reserves as of December 31, 2018 based on a gold price of US$1,300/oz for the Pilar Mine. A break-even cut-off grade of 1.90 g/t Au was used to report the Mineral Reserves for the Pilar Mine. While small-scale mining of Mineral Resources continues at Roça Grande Mine, Mineral Reserves are not currently estimated.

TABLE 15-1 MINERAL RESERVES – DECEMBER 31, 2018
Jaguar Mining Inc. – Caeté Mining Complex

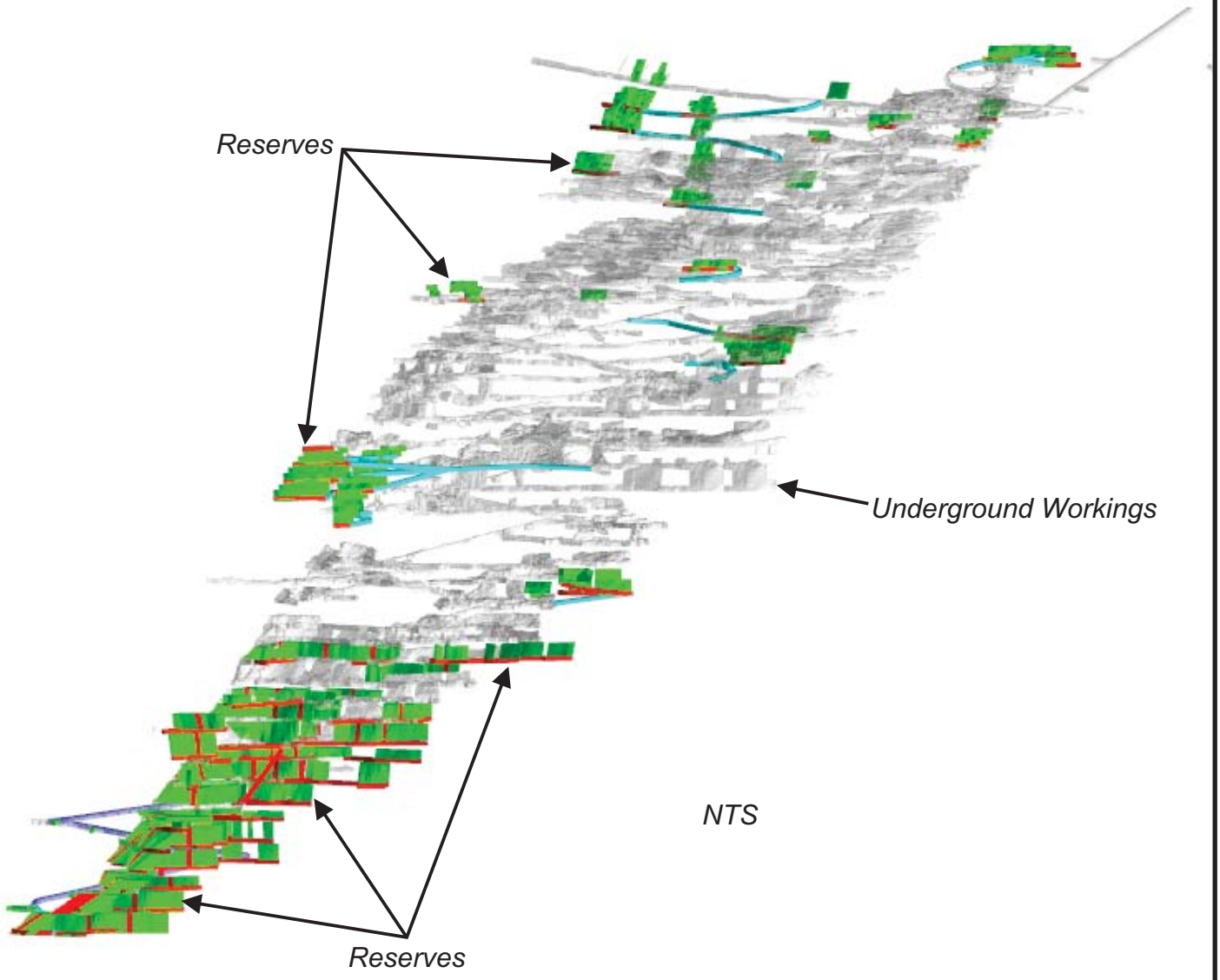
Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Proven	1,176	3.79	143
Probable	608	3.47	68
Total	**1,784**	**3.68**	**211**

Notes:
1. CIM (2014) definitions were followed for Mineral Reserves.
2. Mineral Reserves are estimated at a cut-off grade of 1.90 g/t Au.
3. Mineral Reserves are estimated using an average long-term gold price of US$1,300 per ounce and an exchange rate of 3.70 Brazilian Reais: 1 US Dollar.
4. A minimum mining width of approximately two metres was used.
5. There are no known environmental, permitting, legal, title, socio-economic, political, or other risk factors which could materially affect the Mineral Reserve estimates.
6. Numbers may not add due to rounding.

The Mineral Reserves consist of selected portions of the Measured and Indicated Mineral Resources that are within designed stopes and associated development. The stope design was completed by MCB Serviços e Mineração (MCB). It is RPA's opinion that the Pilar Mineral Reserve estimates were prepared in a professional and diligent manner and that the estimates comply with CIM (2014) definitions.

Over the past year, the technical staff at Pilar has evaluated the mining potential in the upper levels of the mine, where historical production has taken place. This has significantly increased the Mineral Reserves in these areas. Further optimization is required to determine what resources are not economically mineable and can be removed from the Mineral Resource estimate. This will assist in ensuring that capital, exploration, and operating expenditures are directed to economically viable areas of the orebody, as illustrated in figure 15-1.

Isometric View Looking North-west



NTS

Figure 15-1

Jaguar Mining Inc.

Caeté Mining Complex
Minas Gerais State, Brazil
Pilar Mineral Reserves

April 2019 ***Source: Jaguar Mining Inc., 2019.***

DILUTION

Dilution is addressed in two ways – internal to mine designs and external factoring. Internal, or planned, dilution is included in the mining shapes where they extend beyond the resource wireframe. Mining shapes are designed to be operationally achievable and respect minimum mining widths. Additional volume included in this manner averages approximately 15% across the Mineral Reserves.

External, or unplanned, dilution accounts for overbreak during blasting, minor ground failures in open stopes, and backfill mucked from the floor of stopes. It is addressed by applying percentage factors to various excavation types, as listed in Table 15-2:

TABLE 15-2 EXTERNAL DILUTION BY MINING METHOD
Jaguar Mining Inc. – Caeté Mining Complex

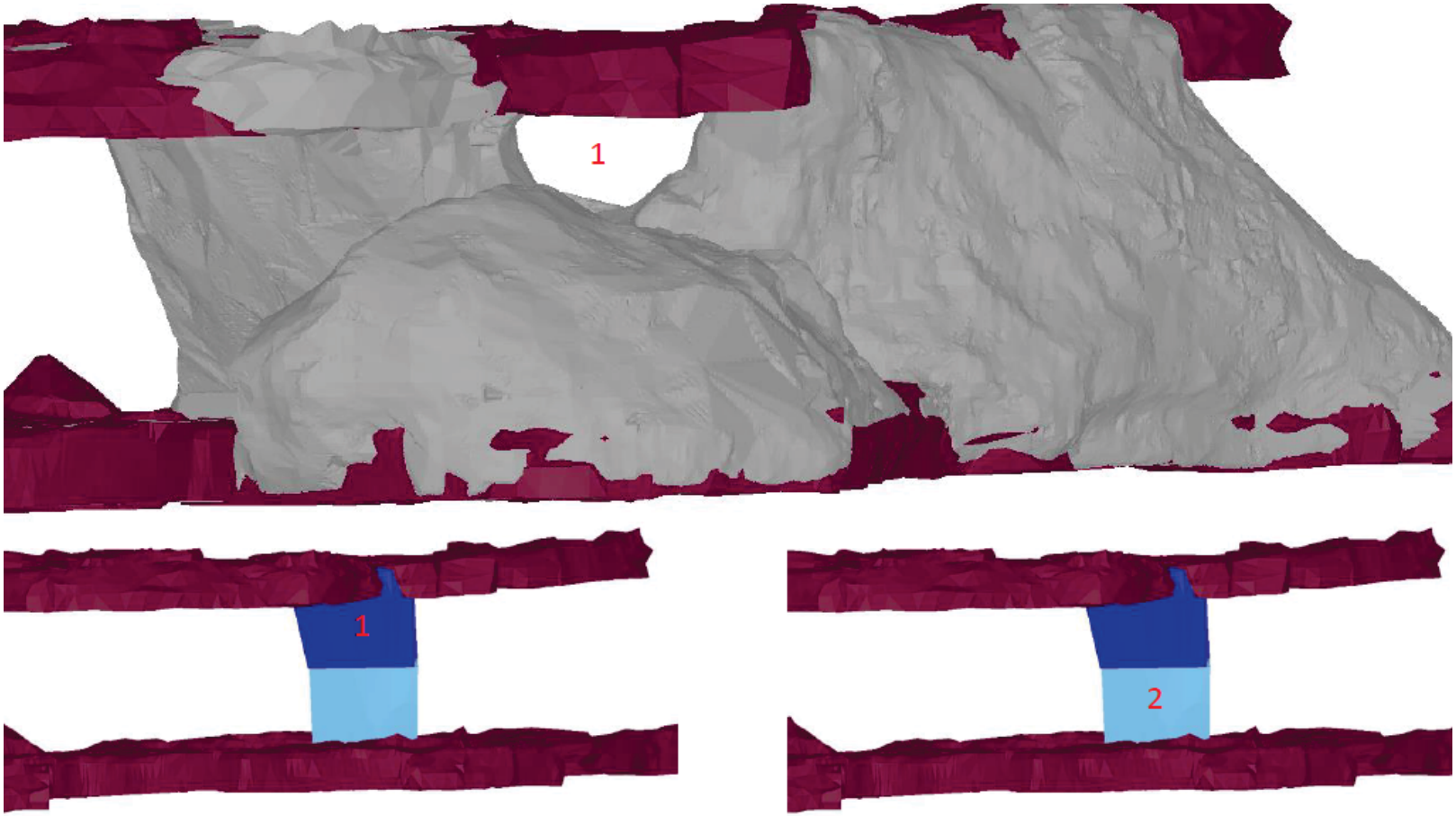
Mining Method	Dilution (%)
Raising	10
Development	20
Cut & Fill	8
Longhole Stoping	10

Total dilution included in reserves averages approximately 25%, which is a good match for measured results for 2018 mining.

Efforts to reduce dilution have been implemented. The principal change is the addition of stope pillars in low grade areas. An example, (taken from Jaguar's Turmalina Mine), is shown in Figure 15-2.

In order to reduce external dilution, stope pillars (1) are added in low grade areas as shown in the figure. A rib pillar is initially planned between the two stopes. Once the stope on the left is mined, the lower portion (2) of the rib pillar is recovered by drilling from the lower drill horizon, and then the next stope is mined

In the past, stope drilling was carried out from the upper and lower drill drifts. This caused excess dilution where the two patterns intersected. The current procedure is to only drill with down holes from the upper drill drift, except where the stope pillar is used.



1-Partial Rib Pillar: 2427 ton
Au (oz): 375

2-Rib Pillar (Recovery):
3470 ton
Au (oz): 481

Example taken from Turmalina Mine

Figure 15-2

Jaguar Mining Inc.

Caeté Operations
Roça Grande Mine
Minas Gerais State, Brazil
Typical Stope Pillar

April 2019

Source: Jaguar Mining Inc., 2019.

Extraction (mining recovery) is assumed to be 100%. Although some losses are encountered during blasting and mucking, they are minimal, and reconciliation to mill results indicates that high dilution/high extraction assumptions match up well.

CUT-OFF GRADE

Mineral Reserves were estimated using a break-even cut-off grade of 1.90 g/t Au, calculated using the following inputs, as well as the data from Table 15-3:

- Gold price of US$1,300/oz
- Exchange rate of US$1.00=BRL3.70
- Metallurgical recovery of 90%

Metal prices used for reserves match well with consensus, long term forecasts from banks, and other independent financial institutions. Exchange rates are based on bank forecasts. Metallurgical recovery is in line with recent operating results, as are operating costs.

TABLE 15-3 CUT OFF GRADE INPUTS
Jaguar Mining Inc. – Pilar Mine

Item	Value (US$/t)
Mining	35.59
Processing	30.64
G&A	3.52
Refining	0.19
Total Cost	**69.94**

$$\text{Breakeven CoG} = \frac{\text{Operating Costs}}{\text{Gold price} * 0.03215 * \text{Gold Recovery}}$$

16 MINING METHODS

The Caeté Mining Complex includes a processing plant at the Roça Grande Mine with a nominal capacity of 2,050 tpd, with separate tailings disposal areas for both fine flotation tailings and CIP tailings. Following a multi-year trend of increasing production rates, the Pilar Mine is currently producing at a rate of 1,500 tpd. Ore from the Pilar Mine is transported by truck 45 km to the Caeté Mining Complex for processing.

The Roça Grande Mine recently produced approximately 200 tpd, with production from Mineral Resources.

At the Pilar Mine, gold mineralization is contained within a shear zone with an average 50° to 60° dip. The mineralization is structurally complex due to intense folding and displacements (up to one metre) due to local faulting. This results in direction changes, pinching, and swelling of the vein over relatively short distances. The ore zone hanging wall (HW) and footwall (FW) contacts are visible by eye, however, sampling shows that there is, on occasion, an assay wall within the formation. The orebody is approximately 250 m to 350 m along strike and is mined along the strike access drive via cross cuts perpendicular to the orebody.

MINING METHODS

There are two mining methods in use. The cut and fill method is utilized in the narrower sections of the deposit, whereas the longhole method is used in the thicker areas. The current LOMP forecasts longhole mining with delayed backfill for the majority of the Mineral Reserves.

Ventilation for the mine is a pull system. Air is drawn down through the ramp and up an exhaust raise near the ramp. The ventilation on the levels uses auxiliary fans and vent ducting.

Pumping water to surface is done using submersible pumps. Water is pumped from level to level, then to surface.

The mine is accessed from a five metre by five metre primary decline located in the footwall of the deposit. The portal is located at an elevation of 760 MASL. The mine is divided into levels with Level 01 established at elevation 690 m. All ore is hauled to surface via the ramp using

both contractors and company personnel. Starting at this point, the level spacing is 75 m vertical, i.e., Level 02 is at elevation 615 m, Level 03 at elevation 540 m, etc. A three-metre thick sill pillar is left between levels. Sublevels are excavated from the main ramp at 15 m vertical intervals to provide for intermediate access to the mining panels. The decline has reached Level 7, a vertical depth of approximately 500 m (Figure 16-1).

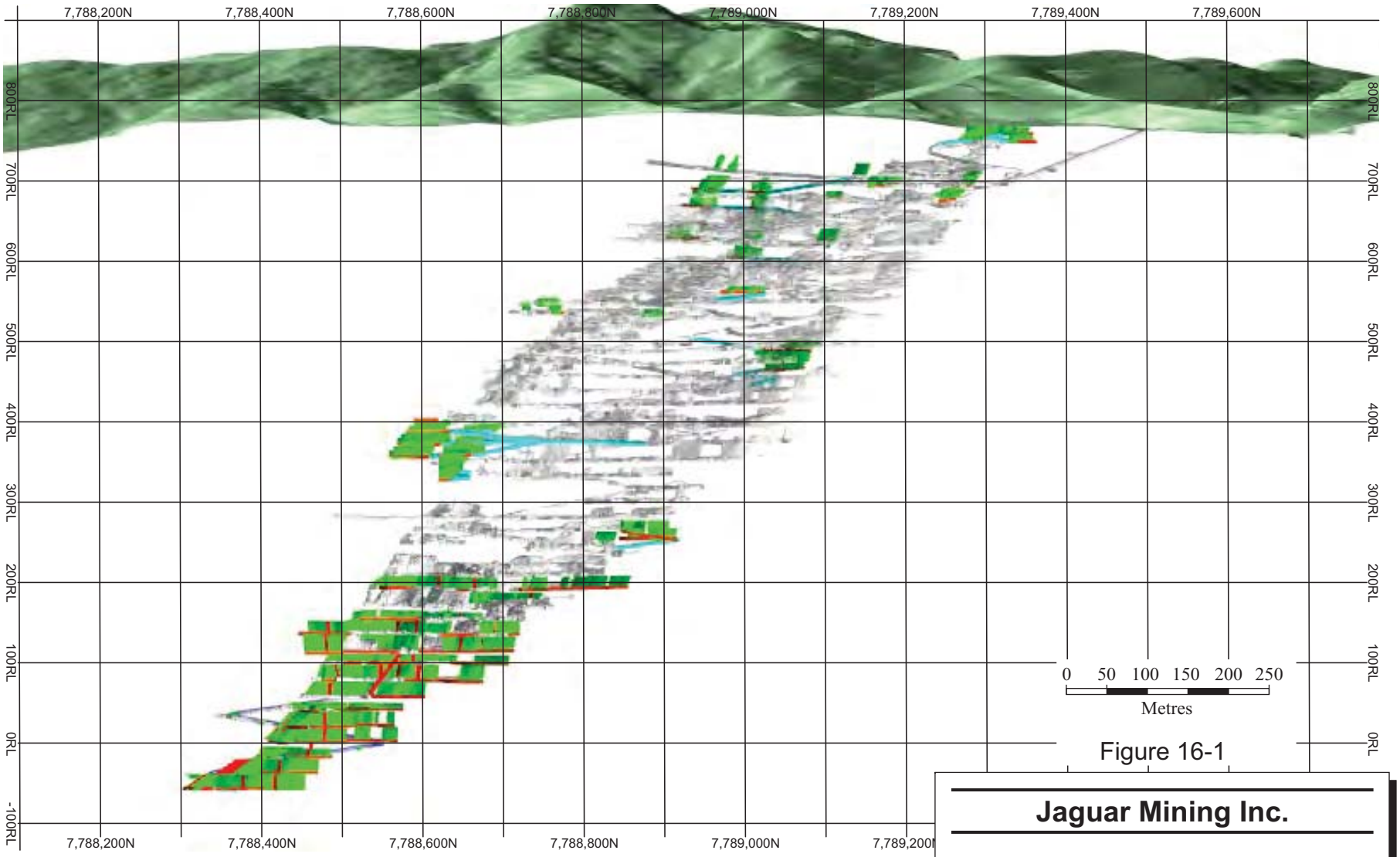


Figure 16-1

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Pilar Mine Long Section

April 2019

Source: RPA, 2019.

At each level and sublevel, drifts are developed near the centre of the mineralized zone to expose the FW and HW contacts. The drift is extended in both directions along strike, under geological control for alignment, continuing to expose the contacts until the limits of the deposit are reached. This provides for two working faces per sublevel.

Production at the Pilar Mine is mainly by the longhole mining method, which is carried out on a longitudinal retreat sequence, towards the central access. Stopes are up to 50 m in length and separated by three metre to five metre wide pillars, depending on the thickness of the zone. In order to reduce external dilution, five metre high by five metre long pillars are strategically left in the stope when there are adjacent stopes in parallel. The stope is then drilled from the lower drift underneath the pillar. When the mining of each longhole stope has been completed, the excavation is filled using a combination of development waste and hydraulically placed cemented classified flotation tailings. A drainage bund is constructed using development waste to contain the backfill. The backfill is then placed in the mined-out excavation. Once the cement is allowed to set, the next stope in the sequence is drained of excess water and can be mined. The sequence continues until the entire sublevel is mined. Mining then proceeds upward to the next sublevel and the sequence is repeated until the sill pillar is reached. Stopes are mined from several sublevels simultaneously in order to provide the required number of active workplaces needed to meet production targets.

Backfill is sourced from the filtered coarse portion of the flotation tailings from the Caeté Mining Complex mill, supplemented with available development waste. The filtered tailings are backhauled using the same highway trucks used to transport the ore from the mine to the mill. The fill is re-pulped on surface prior to being pumped underground.

MINE EQUIPMENT

The Pilar Mine is highly mechanized. Development and mining activities are accomplished with a fleet of two, two-boom and two one boom electric-hydraulic jumbos. Longhole drilling is completed with three Sandvik production drills. Four 10t Sandvik LH410 LHD units are used for mucking. A fleet of four Volvo A30 articulated trucks and one Iveco 25 t truck and are used to haul broken rock to surface. Contractors are used for haulage, as well, and the fleet is adjusted to meet the demand. A complete fleet list is shown in Table 16-1.

TABLE 16-1 PILAR FLEET
Jaguar Mining Inc. – Caeté Mining Complex

Item	Units
LHD	4
Jumbo	4
Fan Drill	3
Trucks	5
Rockbolter	1
Platform	4
Backhoe	3
Grader	1
Service Trucks	6

MANPOWER

Government regulations limit workers to six hours per day underground. As a result, Jaguar has decided to implement a four by six hour shift daily schedule that will increase labour utilization and productivity. This new schedule is similar to what other mines are doing in the region. This is reflected in the current LOMP.

GROUND CONDITIONS

Ground conditions were observed by RPA to be good. The main decline, portions of which were developed up to ten years ago, did not exhibit any roof or wall deterioration. Primary support in the mine is provided by the use of split sets, grouted rebar and, in the wider areas, grouted cable bolts. Two single-boom electric-hydraulic jumbos are used for rock bolting.

The addition of ground control engineers to Jaguar's workforce has resulted in improved quality of backfill and overall ground support at the mines. As mentioned, changes to the stope designs with strategic pillars have reduced dilution and increased stability. Regular ground support maintenance (QA/QC testing) has been implemented at the mines on the main infrastructure. The maintenance includes bolt testing, proper cable bolt designs and empirical stope design analysis.

LIFE OF MINE PLAN

Stope and development designs, and production scheduling were carried out by MCB using Deswik mine design software, and modified by Jaguar to deplete for stopes mined out as of December 31, 2018.

The LOMP production schedule covers a mine life of 3.4 years based on Mineral Reserves, and is summarized in Table 16-2.

TABLE 16-2 LOMP PRODUCTION SCHEDULE
Jaguar Mining Inc. – Caeté Mining Complex

Item	Units	2019	2020	2021	2022	Total
Ore Tonnes	Tonnes (000)	546	538	478	221	1,784
	g/t Au	3.48	3.53	3.97	3.95	3.68
Total Mill Feed	Tonnes (000)	546	538	478	221	1,784
	g/t Au	3.48	3.53	3.97	3.95	3.68
	Ounces (000)	61	61	61	28	211
Recovery	%	90%	90%	90%	90%	90%
Gold Produced	Ounces (000)	55	55	55	25	207

Production rates in the LOMP are forecast to be 1,500 tpd. The increase of production is based on adding a fourth shift to the work day and adding haulage equipment to move the ore to surface. The mining sequence provides two active stopes per sublevel, with simultaneous access to multiple sublevels, as shown in Figure 16-2.

In 2017, Pilar produced 335,000 tonnes and 41,000 ounces of gold. In 2018, Pilar produced 353,500 tonnes and 48,000 ounces of gold, as shown in Table 16-3. With a fourth shift, and more headings to mine, it is plausible to increase production from 1,000 tpd to 1,500 tpd. The current production of 1,500 tpd has been demonstrated to be achievable in the short-term and, in RPA's opinion, this rate can be maintained over the LOMP time period.

As mining advances at depth, the Mine will approach its maximum output due to truck haulage cycle times and ventilation limitations. In order to increase production, alternative workplaces (such as remnant mining or new orebodies) or material handling changes (such as a winze) will be required.

TABLE 16-3 QUARTERLY MINE PRODUCTION RECONCILIATION, 2017 AND 2018 PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Period	Mine Report		
	Tonnes	Grade (g/t Au)	Oz Au
2017/Q1	77,554	3.60	8,968
2017/Q2	85,318	3.54	9,705
2017/Q3	88,951	3.92	11,201
2017/Q4	83,283	4.12	11,039
2018/Q1	77,642	4.37	10,905
2018/Q2	94,051	3.90	11,799
2018/Q3	87,476	4.93	13,856
2018/Q4	94,233	3.82	11,583
Total, 2017	**335,106**	**3.80**	**40,914**
Total, 2018	**353,402**	**4.24**	**48,142**

The excavation quantities scheduled in the LOMP limit the development for a crew to 60 metres per month. There is approximately 3,200 metres of development required for the LOMP. RPA is of the opinion that the scheduled development rates are reasonable.

Even with the increase of production, the plant is still under capacity, leaving the possibility of cost savings through batch processing.

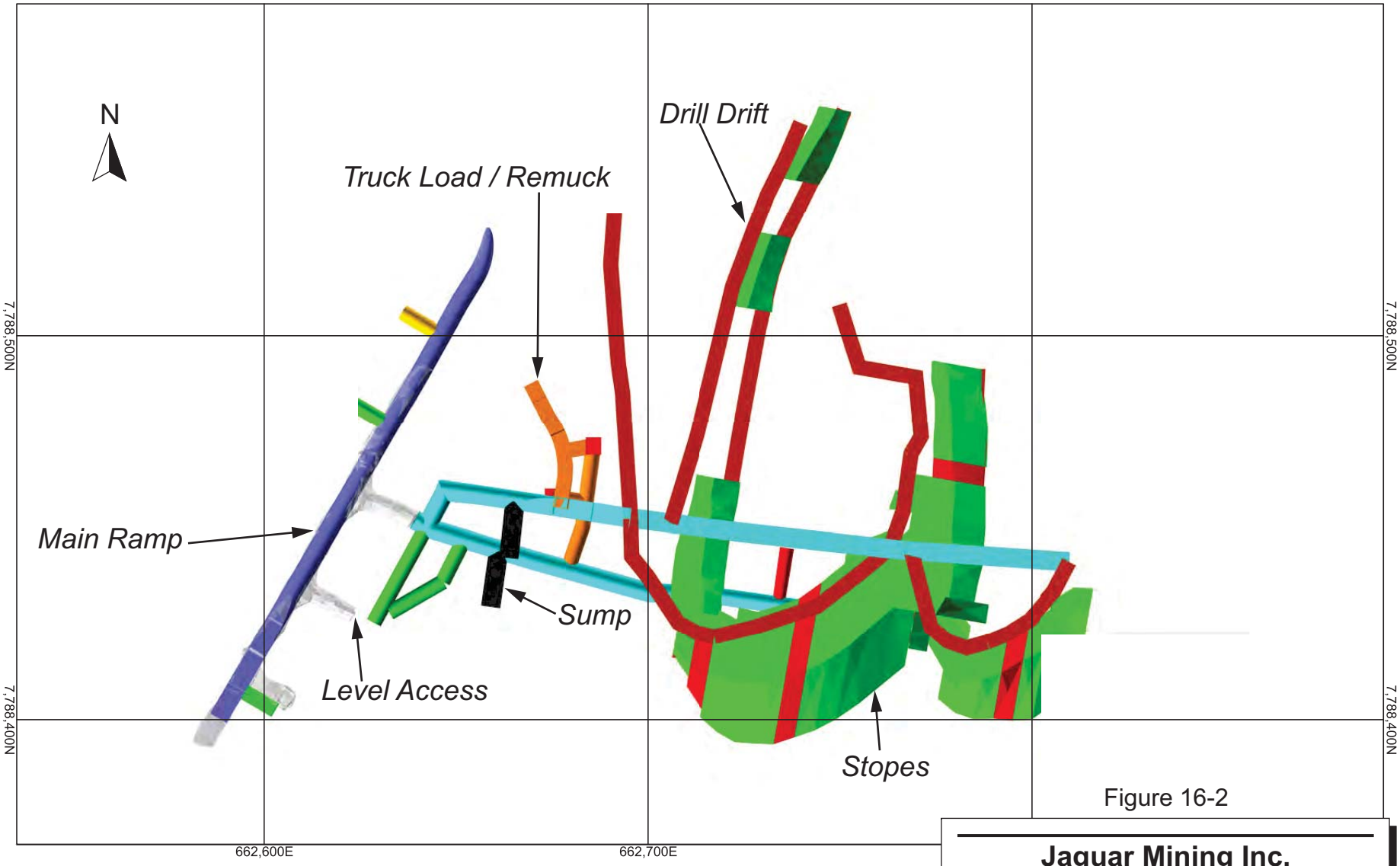


Figure 16-2

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Pilar Level 12
Sublevel 3

April 2019

Source: RPA, 2019.

17 RECOVERY METHODS

The Caeté processing plant has a design capacity of 720,000 tpa of ROM ore. In 2018, the plant processed feed from the Pilar and Roça Grande mines. Over the past three years of operation, the Caeté processing plant operated at approximately 60% of its design capacity. This was mainly due to mine production issues. If more mill feed was available, tailings filtration capacity would limit the plant to 720,000 tpa.

The overall gold recovery achieved in 2018 was 89%.

The process flowsheet consists primarily of the following unit operations (a flow sheet is presented in Figure 17-1):

- Crushing
- Grinding
- Gravity Gold Recovery
- Flotation
- Leaching and CIP
- Gold Recovery
- Detoxification
- Tailings Disposal

CRUSHING

The ore from the Pilar and Roça Grande mines is transported by trucks to the crushing circuit and placed in the ROM stockpile. The crushing circuit is made up of a CJ411 - 111 kW primary jaw crusher in open circuit, and secondary (CH440-223 kW) and tertiary (CH440 223 kW) cone crushers operating in closed circuit.

The ROM stockpile ore is fed to the jaw crusher though a grizzly and vibrating feeder. The jaw crusher discharge feeds a multi deck screen (3,500 x 1,800 mm – with three panel decks consisting of apertures of 75 mm, 35 mm, and 16 mm respectively top to bottom), the undersize of each deck feeds secondary crushing, tertiary crushing, or the final product conveyor respectively. The secondary cone crusher operates in closed circuit with a double deck screen (5,700 x 2,400 mm – with two panel decks consisting of 35 mm and 16 mm apertures). Product

from the double deck screen either recirculates back to the secondary crusher, feeds the tertiary crusher, or goes to the final product conveyor. The tertiary cone crusher operates in closed circuit with a single deck screen (3,500 x 1,800 mm – with a panel deck aperture of 16 mm), with the oversize recycling to the crusher and undersize product going to the final product conveyor, which discharges onto the crushed ore stockpile. The final particle top size of the crushing process is 16 mm.

GRINDING AND GRAVITY GOLD RECOVERY

The grinding circuit consists of a 2240 kW ball mill (5 m x 6m EGL) with a capacity of up to 100 tonnes per hour, operating in closed circuit with a series of hydrocyclones. The overflow from the hydrocyclones (-200 mesh or -74 µm) proceeds to the flotation circuit, and the underflow (+200 mesh or +74 µm) either feeds the gravity concentration circuit (75%) or is recycled to the ball mill feed (25%).

Gravity concentration uses a Knelson centrifugal gravity concentrator to recover fine particles of free gold. The gravity concentrate proceeds to an Acacia intensive cyanidation reactor (Acacia), from which the gold bearing solution is pumped directly to a dedicated set of electrolytic cells. The precipitate from the cells is processed into doré bars in the refinery.

FLOTATION

The flotation circuit consists of a series of twelve 14.1 m^3 (500 ft^3) flotation cells, the first three operating as roughers, three operating as primary scavengers, three operating as secondary scavengers, and the last three operating as tertiary scavenger cells. The concentrate produced by the primary scavenger cells is returned to the roughers, and the secondary and tertiary scavenger concentrate is recirculated to the primary scavenger circuit. The final gold bearing concentrate (82-87% -325 mesh or -45 µm), from the rougher concentrate is sent to a concentrate thickener to achieve an underflow density of approximately 40% solids (w/w). The thickener overflow is recycled for use as process water.

The tailings from the tertiary scavenger cells is sent to a series of hydrocyclones for separation. The cyclone underflow is sent back to the mine to be used as backfill, and the cyclone overflow is sent to a tailings thickener, with the thickened underflow pumped to the RG02 West or East tailings area. The thickener overflow is recycled for use as process water.

LEACHING AND CARBON-IN-PULP GOLD RECOVERY

LEACHING

The concentrate thickener underflow slurry (40% solids w/w) is pumped to an agitated conditioning tank, where lime and cyanide are added, and then further pumped to a set of three agitated leach tanks operating by gravity, in series.

The lime is used to keep the pH above 10.0 to 10.5, in order to minimize the generation of hydrogen cyanide gas. Cyanide is used to dissolve the gold from the solids in the slurry. Cyanide can be added to any of the leach tanks as required.

Oxygen, is introduced through spargers to enhance the dissolution of gold and the oxidation of unstable sulphides (e.g., pyrrhotite). This oxidation reduces cyanide consumption and increases gold recovery.

The slurry from the last leach tank flows by gravity to a series of four agitated CIP tanks that are arranged in series.

CARBON IN PULP

The four CIP tanks allow slurry to flow from tank to tank, while retaining activated carbon in each tank. The carbon adsorbs the gold cyanide complex created in the leach tanks.

The slurry flows downstream from Tank 1 to Tank 4, while the carbon is pumped counter currently from Tank 4 to Tank 1. The pumping frequency is determined by the loading of gold on the carbon. The highest loaded carbon from Tank 1 is pumped over a screen, with the slurry returning to the tank and the loaded carbon going to gold desorption. For 1.1 million tonnes per year (Mtpa), two additional CIP tanks will be required.

The slurry exiting the last CIP tank passes through a safety screen that recovers any carbon that may have left the tank, and then to a detoxification circuit to partially destroy residual cyanide.

GOLD RECOVERY

The loaded carbon is transferred to a desorption column. A hot solution (approximately 98°C) of 1.5% caustic soda and 0.5% cyanide concentration is pumped upwardly through the elution column to desorb the gold cyanide complex from the carbon.

The gold-bearing solution leaves the top of the column and feeds an electrolytic cell(s), where the gold is deposited onto steel wool and stainless steel cathodes. The solution from the electrolytic cell is pumped back to the heating tank and reused. The solution is recirculated through the electrolytic cell for approximately 24 hours to remove most of the gold from solution.

After the desorption cycle, the sludge is washed from the stainless steel wool cathodes and pumped to a pressure filter. The cake is dried in an oven and sent to the refinery for production of doré bars containing about 80-90% gold. The doré bars are sent to a refinery for further refining.

The desorbed carbon goes through an acid wash step using a 5% hydrochloric acid solution to remove carbonates. The carbon is then regenerated at 700°C in a kiln to remove organic material and return the carbon's ability to adsorb gold. This regenerated carbon is pumped to the last tank in the CIP circuit. Periodically, fresh carbon is added to the tank, as some degradation of the carbon occurs, resulting in the need for replacement.

TAILINGS

The flotation tails are cycloned and sent to either underground for backfill or thickened and sent to the RG02 West or East(W/E) tailings area. Thickener overflow is pumped directly back to the plant. After cycloning and thickening, 56% of the flotation tailings is transported to the underground mines and the remaining 34% of the material is conveyed to an unlined rejects dam (exhausted open pit mine). The remaining 10% CIP tailings is sent to the lined tailings facility that is an exhausted open pit where a dam was constructed to increase the storage capacity (the Moita tailings area).

The tailings from the CIP circuit are treated for cyanide removal and piped to the Moita tailings area. Reclaim water from the tailings facility is treated to recover gold and further cyanide destruction, before being returned to the plant. The tailings capacity for the RG02W tailings area is 633,531 m^3, and the tailings capacity for the Moita tailings area is 366,181 m^3. The full details regarding the tailings dam information is located in Section 20.

DETOXIFICATION

The partial cyanide detoxification process consists of adding hydrogen peroxide into the slurry as it flows by pipeline to the Moita tailings area located approximately four kilometres from the plant. Mixing of the hydrogen peroxide and the slurry occurs in the pipe. Hydrogen peroxide and ambient air flow (weather) result in the destruction of free cyanide. Long residence time is beneficial to reduce total cyanide from 600-800 ppm to 200-300 ppm.

The water reclaimed from the ponded clear water passes initially through two activated carbon columns to recover any soluble gold left in solution. The activated carbon is periodically recovered and sent to the gold recovery circuit for gold removal. The water is then dosed with a copper sulphate solution and flocculant and allowed to settle in a decantation tank. The overflow is pumped back to the plant for use as process water, with the sludge drained back into the Moita tailings area.

RECOVERY AND PRODUCTION

In RPA's opinion, the processing circuit unit operations are reasonable to recover gold as expected and provide for adequate throughput. Operations have improved over time, resulting in higher recoveries, however, full capacity has not been achieved due to lack of plant feed.

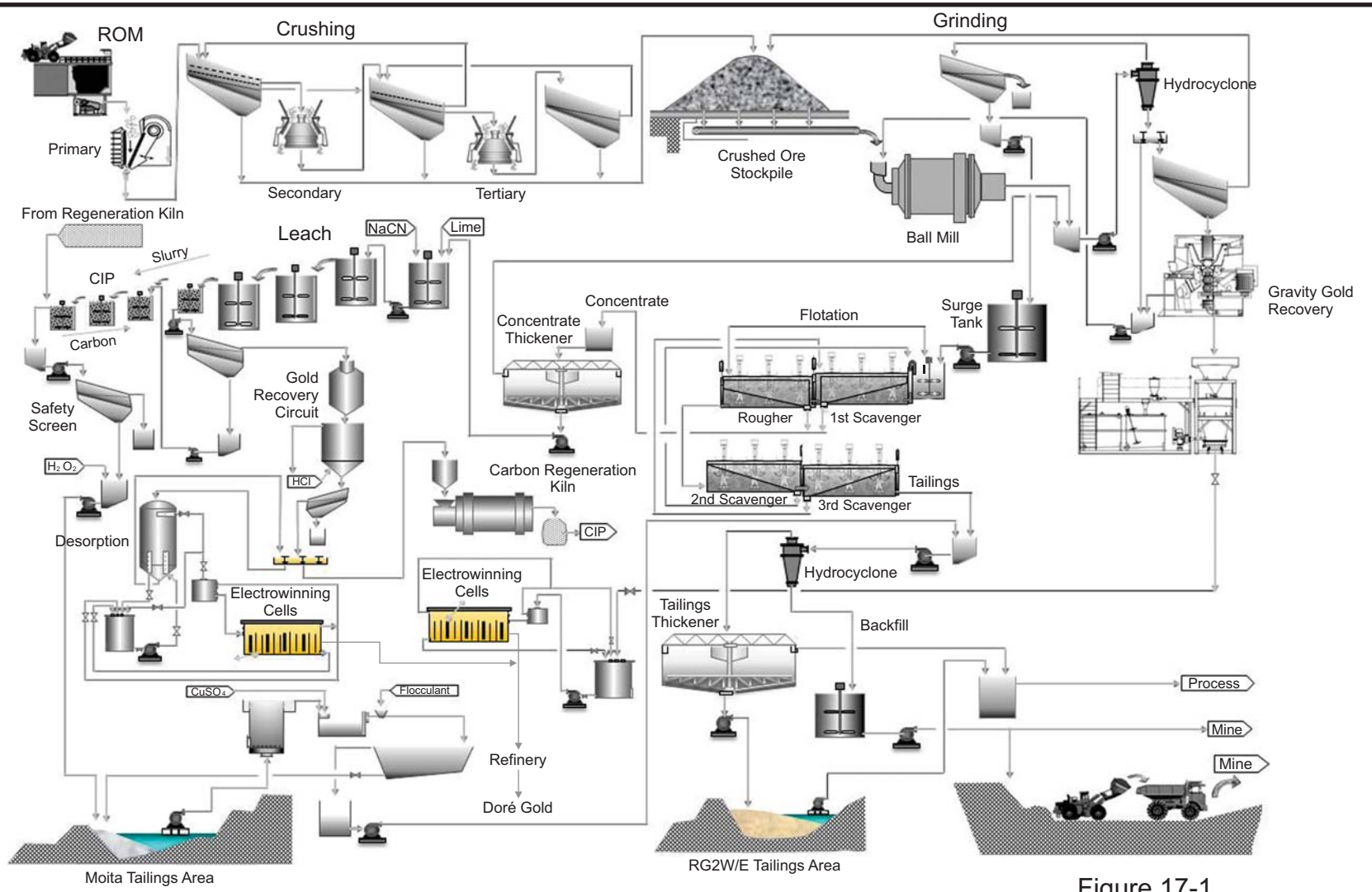


Figure 17-1

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Caeté Process Block Diagram

April 2019

Source: Jaguar Mining Inc., 2016.

18 PROJECT INFRASTRUCTURE

The Caeté Mining Complex includes a nominal 2,050 tpd processing plant with separate tailings disposal areas for both fine flotation tailings and CIP tailings. Electrical power supply is provided through the national power grid. The process plant is located at the Roça Grande Mine at an elevation of approximately 1,250 MASL as shown in Figure 18-1.

An administration complex is located at the entrance to the plant site, with such ancillary buildings as offices, conference rooms, cafeteria, maintenance shops, compressors (mine and mill), a dry, a first aid station, warehouse, backfill preparation, and a water treatment plant, which is located near the process plant. The assay laboratory and process testing laboratory are also located near the process plant. The Roça Grande Mine is accessed by an adit that is located approximately 800 m to the southwest of the plant at an elevation of approximately 1,100 MASL. Trailers located at the mine adit provide local storage and office space. The explosives and blasting accessories warehouses are located 3.5 km away from the mine area, in compliance with the regulations set forth by the Brazilian Army.

The surface infrastructure at the Pilar Mine is limited to shops, offices, cafeteria, first aid, and warehouse facilities. The mine is accessed by an adit that is located at an elevation of approximately 750 MASL.

Figure 18-1

Jaguar Mining Inc.

Caeté Mining Complex

Minas Gerais State, Brazil

Mill and Tailings Complex

0 200 400 600 800

Metres

April 2019

Source: Google Earth, 2019.

19 MARKET STUDIES AND CONTRACTS

Gold is freely traded, at prices that are widely known, so that prospects for sale of any production are virtually assured. A gold price of US$1,300 per ounce was used for estimating Mineral Reserves. RPA notes that this price is consistent with consensus long-term forecasts, and prices used by other gold producers.

20 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

PROJECT PERMITTING

ROÇA GRANDE MINE

TAILINGS DAMS

RPA relies on the conclusions of tailings dam inspections commissioned by Jaguar and provides no conclusions or opinions regarding the stability of the listed dams and impoundments.

MSOL began its mining activities at the Roça Grande Mine in August 2006 under Corrective Operation Licence No. 333/2006 (COPAM process number 10022/2003/001/2005). This operating licence included the permit to operate a process plant to treat oxidized gold ore from the mines in the Sabará, Caeté, and Santa Barbara project areas, as well as feed from the RG02 open pit at the Roça Grande Mine.

The processing plant was decommissioned due to changes required in the mineral treatment process as the oxidized ore reserves were depleted. The processing of sulphide gold ores from the underground mines of the Caeté Project required construction of a new treatment plant that used the CIP-ADR process (Carbon in Pulp / Adsorption Desorption Recovery). This plant has been permitted through the process COPAM No. 10022/2003/002/2007.

As a result, an updated design was required for the tailings storage area. An application for the Preliminary Licence for proposed new tailings storage areas was accepted by SUPRAM on July 7, 2007. A site visit was subsequently carried out by SUPRAM on October 4, 2007. The operating licence was issued on November 29, 2007 (Certificate No. 029/2007, COPAM process 10022/2003/003/2007). This licence certified the environmental feasibility of storage of the process tailings in the previously excavated open pit mines at the RG02 deposit (RG02-W and RG02-E), referred to as the Moita tailings area.

Although the two old open pit mines were previously permitted for storage of process tailings from the first processing plant under the preliminary licence issued on November 29, 2007, MSOL required an updated licence for the construction of the tailings storage facilities.

The installation licence was issued on May 11, 2009 (Certificate No. 077/2009, COPAM process 10022/2003/004/2008).

The construction and commissioning of each of the separate tailings containment areas were carried out through a separate licensing process. After all construction was completed, an operating licence was requested on March 25, 2010 and Certificate No. 117/2010 was issued on April 31, 2010 (COPAM process 10022/2003/008/2010). A provisional operating licence (APO) for the new Moita tailings area was issued on April 15, 2010 and is currently being renewed. Table 20-1 provides technical details for the Moita tailings dam.

TABLE 20-1 MOITA TAILINGS DAM TECHNICAL DETAILS
Jaguar Mining Inc. – Caeté Mining Complex

ITEM	VALUE
Height of the dam (m)	19
Full Capacity (m^3)	366.181
Total length of the crest (m)	388
DPA (associated potential damage)	High
CRI (category of risk)	Low
Class by the law nº 70.389/2017	B
Class by the law DN nº 62/2002	III
Waste Class	Class I
Construction Method	Single downstream step
Spillway System	Yes
PAEBM	Yes
Construction year	2009
Sealing Dam	Yes

RG02-W Storage Area

In previous environmental studies, it was proposed that the tailings from the new process plant would be returned to the mines for use as backfill material in the stopes, however, it was determined that the storage volume in the mines was insufficient to accept the full volume of tailings generated. Therefore, an additional storage area was required for the tailings from the flotation circuit which did not contain cyanide. A volume of approximately 418,000 m^3 was estimated to be required. The tailings were to be transported to the RG02-W containment area by means of pipelines. It is important to note that the RG02-W open pit does not have conventional characteristics of a tailings dam such as embankments, as it was excavated for the purposes of mining.

The application for the construction of the RG02-W first embankment was submitted on January 29, 2010. The construction licence was issued on May 31, 2010 under Certificate No. 114/2010 (COPAM process 10022/2003/007/2010). The licence process was formalized by MSOL on June 23, 2010. An APO for the site was issued on July 7, 2010 and the operating licence was issued on August 30, 2010 as Certificate No. 201/210 (COPAM process 10022/2003/010/2010). According to law, RG02W became a tailings dam after this first embankment. This operating licence is currently in the renewal process. Table 20-2 provides technical details of the dam.

TABLE 20-2 RG02W TAILINGS DAM TECHNICAL DETAILS
Jaguar Mining Inc. – Caeté Mining Complex

ITEM	VALUE
Height of the dam (m)	11
Pit level (m)	50
Full Capacity (m^3)	632,531
Total length of the crest (m)	186
DPA (associated potential damage)	Medium
CRI (category of risk)	Low
Class by the law nº 70.389/2017	C
Class by the law DN nº 62/2002	II
Waste Class	Class IIB
Construction Method	Upstream
Spillway System	Yes
PAEBM	Yes
Construction year	2010

On May 16, 2013, MSOL initiated the licensing process for raising the RG02-W dam using upstream method. The regulatory agency granted concurrent preliminary and construction licences (LP + LI). This lift raised the height of the dam to an elevation of 1,296 m and increased the storage capacity of the facility by 354 m^3 to a total capacity of 884 m^3. The LP + LI was issued on October 29, 2013 under Certificate No. 170/2013 (COPAM process 10022/2003/016/2013). On July 14, 2015, MSOL requested an operating licence for the new lift to 1,296 m, however, this licence was not granted and the additional volume was not used. A new regulation from February 2019 prohibited upstream dams.

All dams are inspected twice a month by an external geotechnical consultant. This is an operating inspection. There are twice annual geotechnical stability inspections done by an external geotechnical consultant (Instituto Brasil). All dams have control processes, through

periodic inspections and reports of stability conditions and a monitoring network that allows the company to be constantly alert about its structures.

The company has been following all the recent changes in laws and reports compliance with all regulations.

RG02-E Storage Area

On April 12, 2011, MSOL submitted an application for concurrent preliminary and construction licences for the expansion of the RG02-E tailings storage area, which is located within the former RG02 open pit mine.

In September 2011, SUPRAM surveyed the open pit and the licence was issued on April 10, 2012. The operating licence was requested on October 7, 2013 and since January 27, 2014, the storage area has operated through an APO.

PROCESS PLANT

Amended operation licence 333/2006 (COPAM process 10022/2003/001/2005) authorized the operation of the new decommissioned plant to process oxide gold ores. Due to the change of the process flowsheet to process the new feed stock from the underground mines, an application for a construction licence was filed with SUPRAM on April 17, 2007. SUPRAM surveyed the proposed plant site on July 2, 2007 and determined that the proposed new plant would occupy the same footprint as the previous plant and that there would be no further disturbance to either the surface or the vegetation.

The construction licence for the new processing plant was issued on January 4, 2008, under Certificate No. 097/2008 (COPAM process 1002/2003/002/2007). On March 25, 2010, MSOL made application for the operating licence which was subsequently issued on May 3, 2010, under Certificate number 090/2010 (COPAM process 10022/2003/009/2010). An application for renewal of the operating licence was submitted by MSOL in January 2014, which is currently under review by the environmental regulatory agency (COPAM process 1002/2003/020/2014).

UNDERGROUND MINE

The underground mining activity at the Roça Grande Mine was authorized through two operating licences: licence LO 035/2008 related to the RG01 deposit and licence LO 036/2008 relates to the development of the RG02 deposit.

Operating licence 035/2008 (COPAM process 10022/2003/012/2011) was issued on April 16, 2008 and authorized the execution of underground mining activities on claim 831.057/2010. Prior to this operating licence, MSOL had an Operation Environmental Authorization (AAF), No. 01109/2007, for the underground mining activity. The operating licence is currently in the renewal process through COPAM process 10022/2003/015/2012.

Operating licence 036/2008 (COPAM process 22352/2011/005/2011) was requested on February 11, 2008 and was issued on April 16, 2008. This licence authorized the execution of underground mining activities on claim number 831.056/2010. It is to be noted that prior to this operating licence, the company had AAF No. 01109/2007 for the underground mining activity. The operating licence is currently in the renewal process through COPAM process 22352/2011/006/2012, however, in May 2018, the environmental agency was officially informed about the temporary stoppage of the RG01 mine and its respective environmental licence.

OPEN PIT MINES

On April 9, 2010, MSOL formalized the previously issued concurrent open pit construction and operating licences (LP + LI) for the expansion of the existing open pit mines on claim 831.056/2010. This licence relates to open pit mining activity on the RG03 and RG06 deposits.

Both the LP + LI licences were administered under Certificate No. 173/2010 (COPAM process 22352/2011/003/2011) and the APO for the open pit expansions was issued on October 7, 2011. No activities are currently taking place at the open pit mines and the LP + LI request remains under review by the environmental agency.

WASTE ROCK STORAGE

The initial waste materials from the open pit mines were placed on waste piles previously constructed by Vale. The operating licence for that activity was issued on September 22, 2009. The material was placed in cells that were created using waste rock generated from the underground mine and was compacted by the passage of the mining equipment. MSOL

constructed drain structures along the bottom and peripheries of the waste rock piles to control and manage the rainwater to the appropriate containment areas.

SUPRAM issued the operating licence on November 30, 2009 under Certificate No. 298/2009 (COPAM process 1002/2003/005/2009). A renewal of the operating licence was requested by MSOL on August 23, 2013 (COPAM process 1002/2003/018/2013), and this renewal application is currently under review by SUPRAM.

On May 8, 2010, MSOL requested the LP + LI for the second expansion of the waste rock piles, as additional storage capacity was required after evaluation of the mining plans for the integrated operations. The LP + LI was issued on September 26, 2011 under Certificate No. 253/2011 (COPAM process 10022/2003/017/2013). An APO was issued on February 2017. The operating licence awaits the final decision from the environmental agency and an archeological search is being done in the area to complete the licensing process.

A summary of the environmental licences for the Roça Grande Mine is provided in Table 20-3.

TABLE 20-3 LIST OF EXISTING LICENCES, ROÇA GRANDE MINE
Jaguar Mining Inc. – Caeté Mining Complex

Enterprise	Certificate number	Process number (PA COPAM)	ANM	Issue Date	Expiry Date	Observation
Tailings Dam – “Cava do Moita”	LO 117/2010	10022/2003/008/2010	NA	31/05/2010	31/05/2014	This licence is being renewed since 2014, COPAM process 10022/2003/020/2014
Tailing Dam – “RG02-W”	LO 218/2010	10022/2003/010/2010	NA	30/08/2010	30/08/2014	This licence is being renewed since 2014, COPAM process 10022/2003/020/2014
Tailing Dam – “RG02-E”	APO	10022/2003/019/2013	NA	27/01/2014	NA	Application for an operating licence under review by environmental agency
Plant	LO 090/2010	10022/2003/009/2010	NA	03/05/2010	03/05/2014	This licence is being renewed since 2014, COPAM process 10022/2003/020/2014
Underground mining – RG-01	LO 035/2008	10022/2003/012/2011	831.057/2010	16/04/2008	16/04/2012	This licence is being renewed since 2012, COPAM process 10022/2003/015/2012
Underground mining – RG-02	LO 036/2008	22352/2011/005/2011	831.056/2010	16/04/2008	16/04/2012	This licence is being renewed since 2012, COPAM process 22352/2011/006/2012
Open pit – ANM 831.056/2010	APO	22352/2011/004/2011	831.056/2010	07/10/2011	NA	Application for an operating licence under review by environmental agency. This licensing process refers to RG-03 and RG-06
Waste dump – First Expansion	LOC 298/2009	10022/2003/005/2009	NA	30/11/2009	30/11/2013	This licence is being renewed since 2013, COPAM process 10022/2003/018/2013
Waste dump – Second Expansion	LP+LI 253/2011	10022/2003/011/2010	NA	26/09/2011	26/09/2015	Operating licence requested on July 2013, COPAM process 10022/2003/017/2013
Surface water pumping	Outorga 02725/2010	07024/2007	NA	11/11/2010	27/10/2015	This licence is being renewed since 2015, process 31767/2015. “Captação túnel Marembá” or “Captação túnel do Andre´”

PILAR MINE

The mining title for the Pilar Mine (claim 830.463/1983) initially belonged to the Companhia Vale do Rio Doce (Vale), which initiated the environmental licensing process in 1999 and obtained a preliminary licence for the open-pit mining of the oxidized ore. Due to strategic changes of Vale, they decided at that time not to move forward with the mining project.

In 2003, Vale transferred the mineral rights to MSOL which resumed the environmental licensing process for the implementation of the open pit mining project. MSOL obtained the Preliminary Licence, Construction Licence, and finally, the Operating Licence on June 27, 2006, through the COPAM process 00132/1999/003/2005.

In preparation for permitting of the underground mine, MSOL acquired a preliminary licence for the activity through COPAM process 00132/1999/004/2007. SUPRAM issued the Preliminary Licence on August 16, 2007 under Certificate No. 021/2007.

MSOL subsequently carried out the required environmental studies and submitted an application for a construction licence under COPAM process number 00132/1999/006/2008. SUPRAM issued the construction licence for the mining and processing of sulphide ores by the CIP-ADR process flowsheet on August 25, 2008 under Certificate No. 152/2008.

On September 22, 2009, MSOL applied for an operating licence which was subsequently issued by SUPRAM on June 30, 2010 under Certificate No. 153/2010 (COPAM process 00132/1999/007/2009). On February 23, 2016, MSOL applied for a renewal of the operating licence, through COPAM process 00132/1999/009/2016, and the renewal application is currently under review.

Operating licence LO 153/2010 is currently the only licence relating to the Pilar Mine. A list of the water permits is presented in Table 20-4.

TABLE 20-4 LIST OF EXISTING WATER PERMITS, PILAR MINE
Jaguar Mining Inc. – Caeté Mining Complex

Ordinance	Issue Date	Expiration Date	Procedure number	Watercourse	Permitted Rates	Status
1500917/2018	24/11/2018	23/11/2023	01706/2013	Water well	1.4 m³/h	Active Permit 1706/2013
01543/2006	19/10/2006	19/10/2011	02973/2006	Conceição River	100.8 m³/h	In revalidation process (009155/2011)
02948/2011	07/10/2011	30/06/2016	05713/2010	Lowering water level for mining	98.08 m³/h	In revalidation process (5804/2016)

SOCIAL OR COMMUNITY REQUIREMENTS

CORPORATE SOCIAL RESPONSIBILITY

Understanding the concerns of stakeholders is crucial to develop relevant actions and ensure sustainable performance; the social actions reinforced the company's commitment toward sustainability. Jaguar always works closely with the communities, building upon its 2016 Sustainability Guideline as the main cornerstone. Through this Guideline, Jaguar strives to devise new local development processes by integrating cultural, social, environmental, and financial aspects, in addition to valuing tangible and intangible resources in the areas where the company operates.

Creativity, collaboration, and sharing are some of the values that guide Jaguar's relationships and interactions and define its initiatives and engagement in the work of entrepreneurs to improve people's lives in the communities. Based on this goal, the company has intensified its involvement in local projects, focussing on the needs and interests of community organizations. The company also refined its dialogue with public authorities and civil society, to the benefit of everyone involved.

A good example is the Seeds of Sustainability Program, Jaguar's most important social initiative, which was restructured to ensure a more efficient and organized management, helping develop local projects. By increasing the focus on the community's needs, Jaguar was also able to streamline its initiatives and ultimately contributed towards achieving the UN's Sustainable Development Goals. Together, these projects directly benefit approximately 1,500 people.

CAETÉ MINING COMPLEX

The Caeté Mining Complex is located in the cities of Caeté (Roça Grande Mine) and Santa Barbara (Pilar Mine), in Minas Gerais state. The transport route for the ore from the Pilar Mine also affects the city of Barão de Cocais, located between the two municipalities, as it passes through the city.

ROÇA GRANDE MINE

The city of Caeté is located approximately 48 km east of Belo Horizonte and has a territory of 542.571 km^2. According to the most recent census, the population is estimated as 43,739 residents. Caeté is a historic town of over 300 years of age and is known for its religious tradition. Its main tourist attraction is the Serra da Piedade, a mountain with a peak of 1,746 MASL. It has a Catholic shrine that shelters the Patroness of Minas Gerais and which receives pilgrims throughout the year. The Astronomical Observatory Frei Rosário, an initiative of the Federal University of Minas Gerais, is also located in Caeté.

Jaguar's Roça Grande Mine is located close to the urban area and has little impact on the neighbouring communities due to its isolated nature, which greatly facilitates the operation. Up to 2013, the ore coming from Pilar Mine was transported through the streets of Caeté, which caused considerable damage to the roads and discomfort for the population. To compensate for this impact, Jaguar donated an asphalt plant to the municipality. After a major negotiation with the city of Barão de Cocais, an alternate route was created, which brought significant ore transportation cost savings, and the social licence was achieved. In 2017, Jaguar invested in another alternative route, to reduce the distance between the metallurgical plant in Caeté and the Pilar Mine. This route had fewer houses along its length and thus less impact on the surrounding communities.

Since start of operations, Jaguar has developed several environmental education programs with local schools, held training courses for mining in cooperation with the town council, and provided support to the Santa Casa de Saúde, the main hospital in the region. Together with the city council, annually in honour of International Women's Day, free mammograms are donated. In addition, the company supports the municipality in various cultural events that are part of the city's tradition.

In 2015, the city of Caeté was facing a water supply crisis and Jaguar provided the Autonomous Service of Water and Sewage (SAAE) with 3,000 hydrometers to help estimate the losses between the production and distribution of water.

- During the last three years, Jaguar invested approximately R$227,000 in the Seeds of Sustainability Program providing consulting services to participating organizations as follows: assistance in developing projects and services;
- training and mediating interactions with local entrepreneurs in incentive and funding mechanisms;
- assistance in mapping, mobilizing, and reinforcing a network of partners for participating initiatives;
- promoting organizations by establishing communication channels and organizing partner and support networks.

In addition to providing financial support, the Seeds of Sustainability Program promotes local projects and organizations, to develop the cultural, socio-environmental, and financial aspects of its communities.

The Seeds of Sustainability Program allowed participating organizations to improve the structure and management of their activities. Jaguar provided consulting for these institutions to assist them in preparing public and private announcements to raise financial funds. Within the last three years, this program applied for R$1,602,204.00 in edicts and received R$243,000.00.

PILAR MINE

Santa Barbara has a long history of mining. It is located approximately 98 km east of Belo Horizonte, has an estimated population of 27,876 inhabitants, and has an area of 684.060 km². Situated at the foot of the impressive Serra do Caraça - Natural Heritage Private Reserve (NHPR), Santa Barbara is considered as one of the most beautiful towns in Minas Gerais. With a history of more than 300 years, the city is known for its religious and entrepreneurial traditions. Its economy is based on mining of iron and gold and production of honey and honey products, as well as reforestation activities for production of cellulose and charcoal.

Jaguar's operations in Santa Barbará affect three communities: Brumal, Beco do Pau Comeu, and André do Mato Dentro.

Brumal is situated across from the main entrance of the mine site, on the other side of state highway MG 436. As a result, there have been complaints of detonations and truck noise from the community, however, in daily operation Jaguar manages to minimize these impacts and maintains constant dialogue with the community. Since Jaguar's involvement, various social and cultural projects have been supported, as well as environmental education programs in schools in the region. Every year, Jaguar supports the "Cavalhada de Brumal", an event held for over 82years.

Other important projects supported by the Seeds of Sustainability Program include the "Tecelãs de Brumal", a group of women from the community that use loom weaving as sources of income and instruments of citizenship. In 2018, Jaguar provided support to the project "Tecendo as Tramas da Cavalhada", which included the group's participation at the Multi-sector Fair of Santa Bárbara, as a sponsor of the stand.

MINE CLOSURE REQUIREMENTS

Two years before the mine is exhausted, the company must present a Mine Closure Plan ("Plano de Fechamento de Mina", or PAFEM) to SUPRAM for approval, according to the "Deliberação Normativa COPAM nº 127". This regulation enforces that all mining activities in the state of Minas Gerais must include the rehabilitation plan of disturbed areas and defines its Terms of Reference.

The actions and steps for the environmental recovery of the areas impacted by mining activity were adopted when the LI was granted and will continue until after the mine is exhausted.

Progressive rehabilitation and closure activities have been scheduled for the LOMP. The total cost of closure is US$7.2 million. The breakdown of the cost is found in Table 20-5.

TABLE 20-5 PROGRESSIVE REHABILITATION AND CLOSURE COST ESTIMATES
Jaguar Mining Inc. – Caeté Mining Complex

Roça Grande Mine and Caeté Processing Plant (US$000)

Description	2019	2020	2021	2022	2023	2024	2025	2026	Total
Waste Pile	71	-	-						71
Pit	22	-	-						22
Dam	-	273	66	-	-				339
Infrastructure	88	514	567	51	-	-			1,220
Plant	-	649	681	51	-	-			1,380
G&A	228	188	156	132	177	18	-	-	900
Contingency	69	276	250	40	30	3	-	-	668
Total	**478**	**1,899**	**1,721**	**274**	**208**	**21**	**-**	**-**	**4,601**

Pilar Mine (US$000)

Description	2019	2020	2021	2022	2023	2024	2025	2026	Total
Waste Pile	-	-	80	-	-				80
Pit	-	-							
Dam	-	-							
Infrastructure	22	16	9	526	-	-			572
Plant	-	-	33	-	-				33
G&A	28	15	67	296	262	306	295	273	1,542
Contingency	9	5	32	140	44	52	50	46	379
Total	**59**	**36**	**221**	**962**	**306**	**358**	**345**	**319**	**2,605**

21 CAPITAL AND OPERATING COSTS

CAPITAL COSTS

The capital cost estimate for the Caeté Mining Complex were prepared by Jaguar and includes primary access development, mine equipment replacement, plant equipment replacement, sustaining capital, tailings dam expansion, and mine closure. The capital cost estimates for the LOMP are summarized in Table 21-1.

TABLE 21-1 CAPITAL COSTS
Jaguar Mining Inc. – Caeté Mining Complex

Description	Unit	2019	2020	2021	2022+	Total
Mining	US$000	5,541	2,468			8,009
Plant	US$000	1,555	1,555	1,555	1,555	6,218
Sustaining	US$000	4,398	2,881	3,012	3,391	13,683
Closure	US$000	537	1,934	1,942	2,792	7,206
Total	**US$000**	**12,031**	**8,838**	**6,509**	**7,738**	**35,116**

Note: Numbers may not add due to rounding

OPERATING COSTS

Operating cost estimates for the Caeté Mining Complex were prepared by Jaguar, based on recent actual costs, and include mining, processing, and general and administration (G&A) expenses. Table 21-2 summarizes unit operating costs.

TABLE 21-2 UNIT OPERATING COSTS
Jaguar Mining Inc. – Caeté Mining Complex

Description	Units	2016	2017	2018	2019 Budget
Mining	US$/t milled	107.99	57.71	48.06	43.97
Processing	US$/t milled	16.18	21.08	22.30	30.83
G&A	US$/t milled	8.32	11.52	12.86	6.24
Total	**US$/t milled**	**132.49**	**90.31**	**83.23**	**81.04**
Production	**'000 tonnes**	**296**	**335**	**380**	**547**

TABLE 21-3 OPERATING COSTS
Jaguar Mining Inc. – Caeté Mining Complex

Description	Unit	Type	2016	2017	2018	2019
Mining						
Labour	US$ '000	Fixed	4,134	5,841	5,438	7,892
Maintenance	US$ '000	Variable	2,907	2,495	2,116	3,805
Electricity	US$ '000	Variable	840	638	541	558
External Services	US$ '000	Variable	4,199	5,971	4,412	4,612
Mining Materials	US$ '000	Variable	1,679	2,024	1,899	2,042
Internal Services	US$ '000	Fixed	129	249	-	-
Accounting Adjustments	US$ '000	Variable	(517)	(543)	-	-
Mining Taxes	US$ '000	Variable	388	603	-	1,620
Indirect Costs	US$ '000		-	308	-	1,620
Secondary Development	US$ '000		16,804	-	2,867	2,374
Total Mining	**US$ '000**		**30,563**	**17,585**	**17,274**	**24,523**
			-	-	-	-
Processing	US$ '000		-	-	-	-
Labour	US$ '000	Fixed	1,033	1,572	2,494	4,881
Maintenance	US$ '000	Variable	452	536	1,329	1,773
Electricity	US$ '000	Variable	969	1,252	1,382	3,213
External Services	US$ '000	Variable	452	479	681	982
Plant Consumables	US$ '000	Variable	1,098	1,496	2,043	5,902
Internal Services	US$ '000	Fixed	517	755	87	-
Total Processing			**4,522**	**6,090**	**8,017**	**16,750**
G&A	US$ '000	Fixed	2,196	3,147	4,623	1,926
Belo G&A	US$ '000	Fixed	129	181	-	-
Refinery	US$ '000	Variable	65	59	-	104
Indirect Costs	US$ '000		2,907	4,143	4,710	2,029
Total G&A	**US$ '000**		**5,297**	**7,531**	**9,334**	**4,059**
Total Op Costs	**US$ '000**		**40,381**	**31,205**	**34,625**	**45,332**

RPA reviewed the cost estimates in comparison to recent operating results, and found them to be reasonable as shown in Table 21-3. For the LOMP, the 2019 budget values appear to be high considering the increased production. Fixed costs would be expected to decrease on a unit cost basis. In RPA's opinion, Jaguar may achieve lower unit costs if production targets are met.

22 ECONOMIC ANALYSIS

This section is not required as Jaguar is a producing issuer, the property is currently in production, and there is no material expansion of current production. RPA reviewed a LOMP cash flow model that confirms the economic viability of the Mineral Reserves, at a gold price of US$1,300/oz and an exchange rate of US$1.00=BRL3.70.

23 ADJACENT PROPERTIES

RPA is not aware of any relevant adjacent properties.

24 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this Technical Report understandable and not misleading.

25 INTERPRETATION AND CONCLUSIONS

MSOL has been successful in increasing Mineral Resources and replacing depleted Mineral Reserves on a year-over-year basis. The Life of Mine Plan (LOMP) for the Caeté Mining Complex forecasts 3.4 years of production at an average of approximately 55,000 ounces of gold per year. The plant has capacity to process more ore, should it become available.

Conclusions by area are discussed in more detail below.

GEOLOGY AND MINERAL RESOURCES

- In RPA's opinion, the Roca Grande and Pilar Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and the estimates comply with CIM (2014) definitions.

ROÇA GRANDE MINE

- At a cut-off grade of 1.46 g/t Au, the Measured and Indicated Mineral Resources at the Roça Grande Mine total 1.08 million tonnes, at a grade of 2.77 g/t Au, containing 96,000 ounces of gold. In addition, Inferred Mineral Resources total 1.76 million tonnes, at a grade of 3.48 g/t Au, containing 197,000 ounces of gold.

- The mineralization at the Roça Grade Mine consists of a number of thin, moderately dipping tabular bodies. These tabular bodies are grouped into five Orebodies (RG01, RG02, RG03, RG06, and RG07).

- The main production of the mine has been from the RG01 and RG07 Orebodies, although a small amount of gold was produced by means of open pit mining from the RG03 and RG06 Orebodies. The RG01, RG02, RG03, and RG06 Orebodies are strataform to stratabound mineralized portions of a BIF assemblage which dip moderately to the southeast. The RG07 Orebody is comprised mostly of a quartz vein which is hosted by a BIF.

- The updated Mineral Resource estimate for the Roça Grande Mine was prepared based on drilling and channel sample data using a data cut-off date of June 30, 2015. The wireframe models of the mineralization remained unchanged from 2015. The wireframe models of the excavated volumes for the Roça Grande Mine were constructed using the information available as of December 31, 2018.

PILAR MINE

- At a cut-off grade of 1.81 g/t Au, the Measured and Indicated Mineral Resources at the Pilar Mine total 4.93 million tonnes, at a grade of 4.20 g/t Au, containing 666,000 ounces of gold. In addition, Inferred Mineral Resources total 1.39 million tonnes, at a grade of 3.61 g/t Au, containing 161,000 ounces of gold.

- The mineralization at the Pilar Mine comprises a number of sub-parallel, quartz-rich mineralized lenses which have an average strike in the upper levels of the mine of 015°, and dip steeply to the east with an average dip of 65°. The available drill hole information suggests that the strike of the mineralized zones becomes more northerly and the dip of the mineralized zones may begin to flatten to approximately 45° below the 120 m elevation. Three of the mineralized zones (BA, BF, and BF II) have been identified by drill hole and channel sample data to be isoclinally folded, with fold axes that plunge at approximately -40° to the southwest (approximately azimuth 210° to 225°). Many of the remaining mineralized zones (LFW, LPA, LHW, and the Torre Orebodies) are interpreted to be more tabular in overall form. The LPA zone resides in the axial plane of the folded BF zone and thus provides evidence for multiple ages of gold mineralization.

- Examination of the three-dimensional relationship of the Torre Orebody to the modelled outline of the BIF units shows that the overall dip of this mineralization gradually decreases with depth. This occurs with a change in the host rocks of this zone from the BIF to the enclosing chlorite schist units, such that an increased level of vigilance will be required of the core logging geologists to recognize and correctly sample potentially economic mineralization that is located by host rocks other than the BIF.

- The diamond drilling program carried out in 2018 was successful in outlining significant gold grades across mineable widths along the down-plunge continuations of the BA, BF, and BF II Orebodies, below the current active mining areas. The results from these drill holes have been incorporated into the updated block model. This drilling program, along with the normal-course mapping and sampling activities carried out by the mine geologists, has discovered a small, new mineralized zone (BF III).

- As a result of the additional information collected from the recently completed drilling programs, along with production information collected from detailed mapping and sampling programs, the level of understanding of the relationship of the mineralized zones to the host stratigraphy and structure is increasing.

- Reconciliation studies carried out for the 2018 production period clearly demonstrate that the sampling and assaying protocols, along with the block model estimation work flow, are producing reliable predictions of the tonnage and grade received at the processing plant.

- In RPA's opinion, the observed reconciliation variances in the data can be ascribed to four factors:

  - Inaccuracies in the CMS shapes,
  - Inaccurate estimates of the block model tonnages and grades due to the use of incomplete CMS shapes of all excavations for the year's production,
  - The discovery of additional ore during the development process that was not captured by the block model, and
  - Overall block model predicted grades being too high due to slightly optimistic channel sample capping values.

- Additional Mineral Resources are present that reside beyond the Mineral Reserve outlines as a result of the lower cut-off grade used for reporting of Mineral Resources. These are located as remnants above Level 12 (the limit of the current development) or as additional mineralized areas peripheral to the Mineral Reserve outlines in areas

located below the current development. Three-dimensional resource polygons were prepared to aid in the estimation and reporting of the Mineral Resources to ensure that the requirement for spatial continuity was met. These resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.

MINING AND MINERAL RESERVES

ROÇA GRANDE MINE

- The Roça Grande Mine is presently on care and maintenance. Mineral Reserves are not currently estimated at the mine.

PILAR MINE

- The Pilar Mine is a well-run and professional operation currently producing at 1,500 tpd.
- The Pilar Mineral Reserve estimates were prepared in a professional and diligent manner by qualified professionals and the estimates comply with CIM (2014) definitions.
- At a cut-off grade of 1.90 g/t Au, the Proven and Probable Mineral Reserves at the Pilar Mine comprise 1.78 million tonnes at an average grade of 3.68 g/t Au containing 211,000 ounces of gold.
- Total dilution included in reserves averages approximately 25%, which is in agreement with results for 2018 mining.
- The LOMP for Pilar Mine forecasts 3.4 years of production, at a rate of 1,500 tpd. Gold production is forecast to average 55,000 ounces per year.
- The LOMP cash flow model confirms the economic viability of the Mineral Reserves, at a gold price of US$1,250/oz and an exchange rate of US$1.00=BRL3.70.

PROCESSING

- The processing circuit unit operations are reasonable to recover gold and provide for adequate tailings treatment for cyanide destruction. Operations have improved over time, resulting in higher recoveries, however, full capacity has not been tested due to lack of plant feed.

ENVIRONMENT AND PERMITTING

- RPA is not aware of any environmental liabilities on the property. Jaguar has all required permits to conduct the proposed work on the property. RPA is not aware of any other significant factors and risks that may affect access, title, or the right or ability to execute the proposed LOMP on the property.

LIFE OF MINE PLAN

- The current LOMP leaves capacity for processing more material, should it become available, or conversely, to explore cost saving measures at the plant such as weekend shutdowns at the mill.

- At the current production rate of 1,500 tpd, the mine is approaching the maximum output for continuing at depth. In order to further increase production, a different haulage system would be required. Alternatively, other sustainable sources of ore would be required at the site in order to increase production.

- RPA reviewed capital and operating cost estimates prepared by Jaguar, and found them to be reasonable.

26 RECOMMENDATIONS

RPA's recommendations by area are summarized below.

GEOLOGICAL DATA

- Review surveying practices to ensure that all drill hole collars are accurately located prior to entry into the final drill hole database.
- Review CMS quality control procedures.
- Continue preparation and updating of the written procedures for such tasks as the collection of geological and sampling information, database management, and administration, and preparation of Mineral Resource estimates.
- Carry out a program of re-sampling any unsampled intervals within the mineralized wireframe boundaries, as the availability of drill core permits.
- Update the drill hole sampling protocols to ensure that full sampling coverage is obtained for all mineralized zones as part of the normal-course logging and sampling procedures. Preparation of current drill hole plans and sections by the logging geologist in either physical or digital format that show the location of the current drill hole relative to the remainder of the drilling information will greatly assist in achieving this goal.
- Amend the data management protocols to include the secured archiving of all digital information that was used to prepare any Mineral Resource or Mineral Reserve estimates on the Jaguar server(s). Primary copies of all digital files could be archived in secured folders on the servers at each of the mine sites, while duplicate copies of all digital files could also be stored in secured folders on the Jaguar Corporate server located in Belo Horizonte.
- Carry out all remedial actions that are available and appropriate to correct the erroneous or suspected erroneous information for those excluded drill holes that are located in the as-yet unmined portions of the Pilar Mine. For those drill holes that remain, RPA recommends that they be removed from the active database into a database that is dedicated specifically for these records.

ASSAY LABORATORY

- The certificate number for each assay batch should be included in the Jaguar internal database (the BDI database).
- The central BDI database should be updated to store drill core recovery, channel sample recovery, and sample tracking (lost sample) information. This will assist in deciding how to address null values in future resource estimates.

- The QA/QC program should be amended to include the channel samples.

- At present, the pulverizers are cleaned with compressed air and a polyester fibre brush after each sample. As a minimum, the pulverizers should be cleaned with a wire brush. No special protocols are in place to clean the pulverizers after passing a sample of known high gold grade. The pulverizers should be cleaned with silica sand after processing each known high grade sample.

- All gold grades are determined by fire assay (FA)–atomic absorption (AA). The AA unit is currently calibrated to direct-read gold values up to 3.3 g/t. Any samples containing gold values in excess of this are analyzed by diluting the solute. High grade samples should be determined using a gravimetric method.

- The assay laboratory automatically re-assays all samples containing gold grades greater than 30 g/t Au, and the average of the re-assays are reported to the sites. All sample results should be reported to the site, without averaging.

- The threshold of 30 g/t Au is high. Re-assay thresholds of 10 g/t Au to 15 g/t Au are commonly used in other gold operations.

- The results from assays of all aliquots should be reported by the laboratory and recorded in the drill hole database. The current database structure will require slight modification to allow for recording of all assay results for a given sample. The final assay for the sample will then be the average of all of the assay results.

MINERAL RESOURCES

- Structural mapping information should be integrated with isopach maps of the carbonate iron formation at the Roça Grande Mine and trend analyses of the gold distribution to identify any primary controls on the distribution of the BIF-hosted gold mineralization.

- Preparation of a detailed geological model for the Roça Grande Mine will aid in understanding the controls on the distribution of the gold mineralization.

- Preparation of a three-dimensional model of the major regional fault encountered in the Vale railroad tunnel using all available data will greatly assist in development of exploitation strategies for the Mineral Resources contained within the RG02 Orebody at the Roça Grande Mine.

- Continuation of the detailed geological, alteration, and structural mapping program at the Pilar Mine is warranted. This information will assist in furthering the understanding of the detailed relationships between the host rocks and timing of the various episodes of mineralization and faulting.

- The cut-off grade strategy used for preparation of the mineralization wireframes should be amended to better reflect the potentially economic in-situ gold grades. As a minimum, the mineralization wireframes should be created using a cut-off grade closer to the reporting cut-off grade. By adoption of this strategy, it is anticipated that a lower number of below cut-off grade composite samples will be used in estimation of the block gold grades.

- Collection of detailed density measurements of the mineralization at the Pilar Mine should continue especially for those zones having a low number of density values.

- Wireframe models of the major lithological units should be prepared as aides in coding the density values to the block model.

- The use of a dynamic anisotropy method should be considered for estimation of gold grades into the model.

- In-fill drilling on the RG01 Orebody along the down-plunge projection of the encouraging drilling results is warranted.

- In-fill drilling of the mineralization found below Level 11 at the Pilar Mine is warranted. The goal of this drilling program is to increase the confidence in the distribution of the mineralization and to assist in the preparation of mine development and production schedules.

- Additional work that will provide further detailed information of the gold distribution in the area of the new mineralized zone, BFIII, is warranted and justified.

- A detailed geological review of the controls on the mineralization contained within the SW Orebody at the Pilar Mine should be carried out to aid in selecting high priority areas for future exploration programs.

- The reconciliation procedures should be expanded to evaluate the accuracy of the long-term block model, with and without the channel data, to begin to gauge the optimal drill hole spacing required for preparing Mineral Resource estimates.

- In the events where no CMS model is available for a given excavation volume, the design shape for the excavations in question (suitably modified for the estimated amount of overbreak) should be used as a proxy when preparing the reconciliation reports.

- A detailed evaluation of those Mineral Resources contained within the area of the current mine workings as possible additional feed sources at both the Pilar and Roça Grande mines is warranted.

MINING AND MINERAL RESERVES

- Efforts to reduce dilution should continue with cable bolts and stope pillars, and measurements using CMS should be used to analyze dilution by mining type. Measured results should be used to choose inputs to the reserve estimation process.

- The plans and implementations put in place by the rock mechanics engineers should continue. The implementation of stope pillars, cable bolt designs, and regular maintenance of the main infrastructure should continue.

LIFE OF MINE PLAN

- Review alternative feed sources to utilize unused capacity at the process plant. This is in progress regarding remnant mining in the upper levels, which has increased the Mineral Reserves.

- Review alternatives for the plant operating schedule.

- Continue efforts to exploit the opportunities in the upper areas of the mine to increase the LOMP. There are additional Mineral Resources in the old workings that can potentially be mined at reduced haulage distances. A detailed mining plan and costing is required.

- Consider undertaking studies to explore the opportunities of an open pit at Pilar. There are Mineral Resources close to surface that may potentially be mined using surface mining methods.

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28 DATE AND SIGNATURE PAGE

This report titled “Technical Report on the Caeté Mining Complex, Minas Gerais State, Brazil” with an effective date of April 5, 2019 was prepared and signed by the following authors:

(Signed and Sealed) *Jeff Sepp*

Dated at Toronto, ON
April 5, 2019

Jeff Sepp, P.Eng.
Senior Mining Engineer

(Signed and Sealed) *Reno Pressacco*

Dated at Toronto, ON
April 5, 2019

Reno Pressacco, M.Sc. (A), P.Geo.
Principal Geologist

(Signed and Sealed) *Avakash Patel*

Dated at Toronto, ON
April 5, 2019

Avakash Patel, P.Eng.
Principal Metallurgist

29 CERTIFICATE OF QUALIFIED PERSON

JEFF SEPP

I, Jeff Sepp, P.Eng., as an author of this report entitled “Technical Report on the Caeté Mining Complex, Minas Gerais State, Brazil” prepared for Jaguar Mining Inc., with an effective date of April 5, 2019, do hereby certify that:

1. I am a Senior Mining Engineer , with Roscoe Postle Associates Inc. of Suite 501, 55 University Ave Toronto, ON, M5J 2H7.

2. I am a graduate of the Laurentian University, Sudbury, Ontario, Canada, in 1997 with a Bachelor of Engineering degree in Mining Engineering.

3. I am registered as a Professional Engineer in the Province of Ontario (Reg. #100139899). I have worked as a Mining Engineer for a total of 22 years since my graduation. My relevant experience for the purpose of the Technical Report is:
   - Review and report as a consultant on many mining operations and projects around the world for due diligence and regulatory requirements
   - Feasibility Study project work on many mining projects, including South American projects.
   - Operational experience as Planning Engineer and Senior Mine Engineer with three North American mining companies
   - Work as a mining engineer consultant on various projects around the world

4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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 Roça Grande and Pilar mines on December 10, 2018. I had previously visited the mines on December 13 and 14, 2017.

6. I am responsible for Sections 15, 16, 18 to 22, and 24 and relevant disclosure in Sections 1, 2, 3, 25, 26, and 27 of the Technical Report.

7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.

8. I have prepared a previous NI 43-101 Technical Report dated April 17, 2018 on the property that is the subject of the Technical Report.

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.

Dated this 5th day of April, 2019

(Signed and Sealed) ***Jeff Sepp***

Jeff Sepp, P.Eng.

RENO PRESSACCO

I, Reno Pressacco, M.Sc(A)., P.Geo., as an author of this report entitled “Technical Report on the Caeté Mining Complex, Minas Gerais State, Brazil”, prepared for Jaguar Mining Inc., with an effective date of April 5, 2019, do hereby certify that:

1. I am Principal Geologist with Roscoe Postle Associates Inc. of Suite 501, 55 University Ave., Toronto, ON, M5J 2H7.

2. I am a graduate of Cambrian College of Applied Arts and Technology, Sudbury, Ontario, in 1982 with a CET Diploma in Geological Technology, Lake Superior State College, Sault Ste. Marie, Michigan, in 1984, with a B.Sc. degree in Geology and McGill University, Montreal, Québec, in 1986 with a M.Sc.(A) degree in Mineral Exploration.

3. I am registered as a Professional Geologist in the Province of Ontario (Reg. #939). I have worked as a geologist for a total of 33 years since my graduation. My relevant experience for the purpose of the Technical Report is:
   - Review and report as a consultant on numerous exploration and mining projects around the world for due diligence and regulatory requirements, including preparation of Mineral Resource estimates and NI 43-101 Technical Reports.
   - Numerous assignments in North, Central and South America, Finland, Russia, Armenia and China in a variety of deposit types and in a variety of geological environments; commodities including Au, Ag, Cu, Zn, Pb, Ni, Mo, U, PGM and industrial minerals.
   - A senior position with an international consulting firm.

4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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 most recently visited the Roça Grande Mine on December 14, 2017 and the Pilar Mine on December 13, 2017. I had previously visited the Roça Grande Mine on November 22, 2014 and the Pilar Mine on November 21, 2014.

6. I am responsible for Sections 4 to 12, 14, and 23 and relevant disclosure in Sections 1, 2, 3, 25, 26, and 27 of the Technical Report.

7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.

8. I have previously prepared public domain Mineral Resource estimates and Technical Reports for the properties that are the subject of the Technical Report.

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.

Dated this 5th day of April, 2019

(Signed and Sealed) ***Reno Pressacco***

Reno Pressacco, M.Sc.(A)., P.Geo.

AVAKASH PATEL

I, Avakash Patel, P.Eng., as an author of this report entitled “Technical Report on the Caeté Mining Complex, Minas Gerais State, Brazil” prepared for Jaguar Mining Inc., with an effective date of April 5, 2019, do hereby certify that:

1. I am Vice President, Metallurgy and Principal Metallurgist with Roscoe Postle Associates Inc. of Suite 501, 55 University Ave., Toronto, ON M5J 2H7.

2. I am a graduate of the University of Regina, Saskatchewan in 1996 with a B.A.Sc. in Regional Environmental Systems Engineering (Civil/Chemical).

3. I am registered as a Professional Engineer in the Province of Ontario (Reg. #90513565) and in the Province of British Columbia (Reg. #31860). I have worked as a metallurgical engineer for a total of 22 years since my graduation. My relevant experience for the purpose of the Technical Report is:
   - Reviews and reports as a metallurgical consultant on numerous mining operations and projects for due diligence and regulatory requirements.
   - Senior positions at numerous base metal and precious metal operations, and consulting companies responsible for general management, project management, and process design.
   - Sr. Corporate Manager – Metallurgy and Mineral Processing with a major Canadian mining company and a junior Canadian mining company.
   - Manager of Engineering/Processing Engineering with two large international Engineering companies responsible for designing, planning, and execution for multiple complex mining projects.

4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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 not visited the Roça Grande Mine or the Pilar Mine.

6. I am responsible for Sections 13 and 17 and relevant disclosure in Sections 1, 2, 3, 25, 26, and 27 of the Technical Report.

7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.

8. I have had no prior involvement with the property that is the subject of the Technical Report.

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.

Dated this 5th day of April, 2019

(Signed and Sealed) *Avakash Patel*

Avakash Patel, P.Eng.