

15 Mineral Resource and Mineral Reserve Estimates (Item 19)

15.1 Drillhole Database

The drillhole sample database was compiled by Apollo, reviewed for QA/QC by Analytical Solutions of Toronto Canada and is determined to be of good quality. The database, consists of five Microsoft Excel spreadsheets containing collar locations, drillhole orientations with down hole deviation surveys, assay intervals with results, geologic logs and geotechnical logs. SRK has reviewed previous data verification work, the procedures used by Apollo to update the database and has conducted spot checks of its own finding no problems or mistakes. The assay database contains several columns of gold assays representing the original 15g and 30g assays as well as numerous repeat assays including some screen metallic analyses. The Au assay data used for this Resource estimate was the original assay value unless repeat check analyses had been made. In this case, the average of all the assay results were used in place of the original assay.

The Resource database contains information from 1,889 drillholes totaling 335,983m of drilling. The maximum drillhole depth is 995m and the average is 178m. Most of the holes were drilled inclined to the north in order to intercept the south dipping mineralization at a high angle. Drillholes have been collared both on surface and underground.

Analysis of the sample intervals shows that the majority range between 0.5m to 2.0m however, there is a very small percentage of intervals up to 8m. The average sample interval is 0.9m.

15.2 Block Model

The Black Fox deposit was modeled only for gold content. The model has a uniform block size of 3m x 3m x 3m. All block estimates were made using only the 1.5m drillhole composites. The model boundaries based on local mine grid coordinates are presented in Table 15.2.1.

Table 15.2.1: Black Fox Model Limits

Direction	Minimum	Maximum
Easting	9,700	10,651
Northing	9,500	10,352
Elevation	9,400	10,000

15.3 Geologic Model

The Black Fox deposit is described by Prens (2006) as follows:

“Gold mineralization at the Black Fox deposit occurs in several different geological environments within the main ankerite alteration zone, which has an indicated strike length of over 1000 m and a variable true width ranging from 20 to over 100m . This mineralized envelope occurs primarily within komatiitic ultramafics and lesser mafic volcanics within the outer boundaries of the Dester-Porcupine Fault Zone. The auriferous zones have several modes of occurrence, from concordant zones which follow lithological contacts and which have been subsequently deformed, to slightly discordant ones which are associated with syenitic sills and quartz veins or stockworks.”

For this study, the mineralization is subdivided into three main domains based on the continuity and style of the mineralization. The first is called the “Main Zone” and is delineated by the primary domain of shearing and mineralization. It is broader near surface reaching a maximum true width of 150m normal to strike and dip and narrows at depth. It averages approximately 80m normal to strike and dip and has currently been drill tested to 600m below surface. Within the “Main Zone”, the mineralization occurs along both a foliated fabric cut by discrete shear zones and as stockwork carbonate veining. The second mineralization domain is called the “Flow Zones”. This mineralization occurs as numerous sigmoid and lens shaped bodies completely hosted within or adjacent to the “Main Zone”. This gold mineralization within these bodies has good geologic and grade continuity. The rock is distinctive with strong foliation, pervasive shearing and can be correlated reasonably well between adjacent drillholes. The third mineralization domain is called the “Hanging Wall Zone”. This includes all mineralization within the hanging wall above the “Main Zone” and a small portion in the footwall. Within this zone, the gold mineralization consist of small discontinuous pods localized along discrete structures. Each of the three mineralization domains were modeled independently.

15.4 Basic Statistics and Compositing

The gold assay data was first plotted on histogram and cumulative frequency graphs to understand the basic statistical distribution of the raw data. The histogram plots show a strong positive skewness and the cumulative frequency plot illustrates a continuous population set with no major changes in slope within the main data population. The cumulative frequency plot does show several outlier data values at the upper end of the grade distribution.

The raw drill data was composited into 1.5m intervals starting at the collar and continuing to the bottom of the hole. The appropriate codes for missing samples and no recovery were used during the compositing procedures. The 1.5m assay composites were also plotted on histogram and cumulative frequency graphs for comparison to the raw data and to access appropriate capping levels. Review of the cumulative distribution plot with composites greater than 100gpt showed a fairly continuous distribution of Au values up to about the 275gpt level (Figure 15-1). Based on the outlier nature of the composites above this level and statistical validations of models run at a variety of capping levels, the Au values were capped at 250gpt after compositing, to prevent the over estimation of grade in the block model. This resulted in 24 drillhole composites ranging from 252gpt to 1,169gpt being reduced to 250gpt-Au.

15.5 Specific Gravity

Specific gravity testing has been carried out, in house, by Apollo and described by Prenn (2006) as follows:

“A total of 1,218 density tests have been completed by Apollo from core intervals. The average density of mineralized material is 2.78”, while the average density of unmineralized material is 2.85.” Apollo was skeptical of these results and further refined this data by sending 107 samples to an outside laboratory for independent analysis. The laboratory results reported an average density of 2.84g/cm for the ore. This value was used for all material in this Resource estimate.

15.6 Variogram Analysis

Variogram analysis was conducted on the 1.5m drillhole data to determine appropriate projection ranges and to test for any preferred orientation of the mineralization. The composites were first

flagged to differentiate them into data sets to be used for an indicator estimation technique. All composites greater than 0.5gpt-Au were flagged as “mineralized group” and those below this cut-off were flagged as “non-mineralized group”. Variograms were then constructed using Vulcan software along all directions within the plane of the mineralization and perpendicular to it using only the ore group composites. The greatest range was oriented within the plane of the mineralization, striking at azimuth 73° dipping -50° S. The shortest range is oriented perpendicular to the plane of mineralization at azimuth 343° dipping -40°. Ranges, nugget values and total sill values are presented in Table 15.6.1.

Table 15.6.1: Variogram Results for 1.5m Composite Data

Orientation	Range	Nugget	C ₁ Sill Differential
All directions within plane 73°,-50°	30m	110	55
343°, -40°	20m	45	80
Model Variogram		110	55

15.7 Grade Interpolation

Geologic hard boundaries were used to confine the modeling of the “Main Zone”, the “Flow Zones” and the “Hanging Wall Zone”. For this purpose, drill log data was used to differentiate the characteristics of each zone in order to create 3-D solid shapes. The “Main Zone” is composed of a single body along the entire strike and dip of the current drilling. The “Flow Zones” consist of ten distinct bodies, all of which are located within or along the foot wall of the “Main Zone”. The “Hanging Wall Zone” includes all mineralized intercepts in the hanging wall rocks above the “Main Zone” and a few in the footwall. These three domains were all treated as hard boundaries such that the blocks within them were estimated only from composites also located within them. Two different estimation techniques were used within the three domains.

The grade estimation of the “Main Zone” and “Hanging Wall Zone” was conducted using a categorical indicator approach due to the strong spatial grade variability seen in the drilling data. This method first separates the composite data into lower grade and higher grade groups based on an appropriate cut-off value, in this case 0.5gpt-Au. Indicator values are then flagged into the composite data such that values below 0.5gpt-Au are flagged with a “0” and those above are flagged with a “1”. These composite indicator values are then interpolated into the block model thus creating indicator block values between 0 and 1. The indicator values were interpolated using an Inverse Distance Cubed algorithm. A min/max of 1/3 composites with an octant maximum of 2 was used. The estimation was allowed to search within a 35m x 35m x 9m ellipsoid, oriented within the mineralization plane striking 073° and dipping -50° south. The interpolation criteria were derived mainly from numerous trials and visual inspection of the results.

This procedure effectively assigns a probability to each block as to whether it would be above the 0.5gpt-Au cut-off. Blocks assigned with a value of 0.1 have a 10% probability, a 0.5 have 50% probability and those with a 1.0 have a 100% probability. For this model, all blocks assigned with a value of 0.2 or 20% Probability and above, are considered to be within the 0.5gpt-Au grade shell. The composites are next flagged with the interpolated block indicator values so that all composites located within the grade shell can be selected during the grade interpolation. The flagging procedure forces the grade interpolation to use all composites located within the indicator blocks regardless of there grade. The categorical indicator technique

precludes the necessity of creating very complex wire frame grade shells to control grade assignment.

The “Flow Zones” were modeled using wire frame hard boundaries as confining grade shells. Each of the ten individual bodies were combined into a single triangulation and all blocks located within this triangulation were allowed to receive a grade estimation.

The next step was to run Au grade interpolations within the three mineralization domains. Blocks within each zone were estimated using only composite data from within that same zone. Numerous grade estimations were conducted using several different inverse distance weighting powers and a variety of different modeling criteria. The results of each estimation, were analyzed by point validation. This procedure removes a drillhole from the database and then estimates grade for all the composites within it. It then removes the next drillhole etc until all composites have been estimated. An x-y scatter plot is then constructed from the estimated versus actual grades to evaluate the correlation. Numerous point validation runs are made to test the effects of different min/max composites/blocks, octant search limitations and minimum number of drillholes required to assign grade. Once an optimal set of estimation parameters is determined by point validation, the actual grade interpolation is then conducted. The Au grade interpolation was then analyzed within the historical underground mining area for reconciliation against the reported production data and the block model grades are compared statistically to the composites used to estimate them. These results are used to adjust the various modeling parameters until an appropriate estimation was achieved.

For the grade assignment, the three zones were estimated by differing Inverse Distance powers. The “Flow Zones” which represents strong, relatively continuous mineralization, was estimated using an Inverse Distance Cubed algorithm. The “Main Zone” and “Hanging Wall Zone” which represent less continuous mineralization were estimated using an Inverse Distance Squared algorithm. All these estimations required a minimum of three and a maximum of five composites to assign grade to each block. In addition, an octant search restriction was applied allowing a maximum of two composites from each octant. No restriction was placed on the number of drillholes required to assign grade. For the “Main” and “Hanging Wall Zones”, the composites flagged within the indicator blocks were combined with the indicator composites outside of the blocks and both data sets were used to assign grade. This combined data set was used so that composites which were above the indicator cut-off and close to the blocks could be used for the grade estimation. A search ellipsoid with a range of 35m down dip, 35m along strike and 9m across strike and dip was used. These ranges are based somewhat on the variography but mainly on the author’s evaluation of what is appropriate for the deposit. The low number of composites per block and the short search ranges were purposely chosen to restrict the grade assignment to consider only the drillholes in close proximity to the blocks. These techniques were chosen to try to emulate a pod like nature to the mineralization and prevent grade dilution into excessive blocks. The average distance to all composites and the number of drillholes used to estimate grade in each block were stored for later use in Resource classification.

15.8 Block Model Validation

The Black Fox model was validated using three procedures. First, the interpolated block grades were visually checked on sections and bench plans for comparison to the composite assay grades. Second, grade reconciliation against the historical underground production was

evaluated. Third, statistical comparisons were made between the interpolated block data, composite data and raw assay data.

The Black Fox deposit historically produced 1.1Mt of ore with an average grade of 6.03gpt-Au. Apollo has good survey records of all the underground development and has created 3-D solid shapes of these workings. To verify the SRK model, the block model was “mined” within the 3-D solid of the historical workings to determine the percentage of each block included within it. All full and partial blocks within the mined solid were tabulated for total tonnes and average grade for comparison to historical tonnes and grade of production. The SRK model was specifically designed to approximate the historical production while remaining conservative. Table 15.8.1 presents the results of this analysis.

Table 15.8.1: Model Validation by Comparison with Historical Production

Model	Au Cut-off	Mt	Grade Au gpt	Moz	Estimated vs. Mined (oz)
Historical Mine	Unknown	1.1	5.97	0.210	
SRK	1gpt	0.538	9.7	0.167	79%
	3gpt	0.319	15.00	0.154	73%

The final model validation is based on statistical comparisons between the interpolated block grades, 1.5m composite grades and raw assay grades for individual model zones and the entire model. This included evaluation of histogram patterns, cumulative distribution plots and basic statistical values (Table 15.8.2).

Table 15.8.2: Statistical Comparisons of Au gpt within Raw Assays, Composite Assays and Block Model Assays

Model Domain	Data Group	Mean	Median	Maximum	Variance	No. of Samples
Flow Zone	Raw Assays	7.4	0.7	1942	2016	2717
	1.5m Composites	4.9	0.8	250	207	1690
	Blocks	4.5	1.8	178	67	28,821
Main Zone	Raw Assays	4.5	0.5	3884	2274	26,669
	1.5m Composites	3.9	0.8	250	247	14,219
	Blocks	3.9	1.4	250	90	223,257
Hanging Wall Zone	Raw Assays	1.7	0.6	250	67	2621
	1.5m Composites	1.5	0.6	216	48	1,400
	Blocks	1.4	0.7	127	27	92,548
All Zones	Raw Assays	4.7	0.6	3884	2150	30,841
	1.5m Composites	3.8	0.8	250	227	17,309
	Blocks	3.3	1.1	250	72	344,626

Previous studies conducted by SRK have shown that the Black Fox deposit is not sensitive to modeling algorithms. During the Pre Feasibility Study, Ordinary Kriging, Inverse Distance Squared and Inverse Distance Cubed techniques were used to model the deposit. The various techniques display minor statistical variations but they all produce very similar average grades and tonnes. For this reason, this exercise was not repeated here. A typical block model cross-section of Au grade with Au composite data shown in Figure 15-2.

15.9 Adequacy of Resource Estimation Methods

The Black Fox deposit has been estimated using a modern block modeling technique. This included proper geologic input, appropriate block model cell size, assay compositing and reasonable interpolation parameters. The results have been validated using three methods including; on screen proofing, rectification to historic production and statistical comparisons between the estimated block grades and the composites used to assign them.

15.10 Mineral Resource Classifications and Resource Statement

15.10.1 Resource Classification

The Mineral Resources are classified under the categories of Measured, Indicated and Inferred Mineral Resources according to CIM guidelines. Classification of the Resources reflects the relative confidence of the grade estimates, as a function of many factors including primarily; assay data quality, QA/QC procedures, quality of density data, and sample spacing relative to geological and geo-statistical observations regarding the continuity of mineralization.

In this study, the blocks were assigned to Indicated or Inferred based on the average distance to the composites and the number of drillholes used to estimate grade. The blocks estimated by at least two drillholes from at least two composites, where the distance to the closest composites was within 15m or less were classified as Indicated. The confidence of the projection distance used to determine Indicated Resource was determined from the drillhole variograms, reflecting a distance of approximately one-half the average range and the necessity of more than one drillhole and composite to predict the Au grade.

The blocks located greater than 15m from the nearest composite were classified as Inferred. Thus the Inferred category does contain blocks (approximately 10%) estimated by a single drillhole, by a single composite; some of which are located up to 35m away. The material estimated by a single drillhole and a single composite was isolated and compared statistically to that estimated by multiple drillholes. This showed a slightly lower grade for the blocks with the lower confidence and was therefore considered defensible for assignment to the Inferred category.

15.10.2 Mineral Resource Statement

The tonnage and grade for Indicated and Inferred Resources differentiated by different mining methods at appropriate Au cut-offs are shown in tables 15.10.2.1 and 15.10.2.2.

Table 15.10.2.1: Black Fox Indicated Resource Statement

Mining Method*	Category	Cut-off gpt-Au	Mt	Grade gpt-Au	Contained oz-Au (000's)
Open Pit	Indicated	1.0	4.8	5.3	813.1
Underground	Indicated	3.0	1.7	11.4	622.6

* Mining Method is determined by relative location above or below the 9,814.5m elevation

Table 15.10.2.2: Black Fox Inferred Resource Statement

Mining Method*	Category	Cut-off gpt-Au	Tonnes	Grade gpt-Au	Contained oz-Au (000's)
Open Pit	Inferred	1.0	2.7	4.7	408.3
Underground	Inferred	3.0	0.8	13.1	329.0

* Mining Method is determined by relative location above or below the 9,814.5m elevation

15.10.3 Mineral Resource Sensitivity

The grade tonnage distribution for Indicated and Inferred Resources at Black Fox are shown in Figures 15-3 through 15-6. The Resources have been subdivided based on the relative location above the mine elevation of 9,814.5m. This level represents the lowest bench potentially accessible by open pit mining; all Resources below this level would potentially be extracted by underground methods.

15.11 Reserve Estimation

The orientation, proximity to the surface, and geological controls of the Black Fox ore body will require mining of the ore reserves with open pit and underground mining techniques. Hence, the ore reserves are subdivided into open pit and underground categories.

15.11.1 Reserve Statement

Table 15.11.1.1: Open Pit and Underground Ore Reserve Statement

Classification	Category	Resource (kt)	Grade (gpt)	Gold (koz)
Open Pit	Proven	0	0	0
	Probable	4,350	5.2	730
	Proven and Probable	4,350	5.2	730
Underground	Proven	0	0	0
	Probable	2,110	8.8	600
	Proven and Probable	2,110	8.8	600
Combined	Total Proven	0	0	0
	Total Probable	6,460	8.8	1,330
	Total Proven and Probable	6,460	6.4	1,330

These reserves are based on a gold price of \$650/oz. A cut-off grade of 0.88gpt is used in the open pit and 3gpt in the underground design.

15.11.2 Conversion of Mineral Resources to Mineral Reserves

Open Pit

The conversion of mineral resources to open pit ore reserves requires accumulated knowledge achieved through pit optimization, pit design and associated modifying parameters.

Through the process of pit optimization and pit layout, a series of pit solid triangulations are created forming the basis for mine reserves. Figure 15-7 Illustrates the overall process flow and logic behind the formulation of mine reserves specific to the Black fox Project.

Two aspects are related for the conversion of resources to reserves:

- The ore extraction method(s) used in relation to the orebody characteristics which determine mining dilution and recovery; and
- Project operating costs and cut-off grade.

In accordance with the CIM classification system only Measured and Indicated resource categories can be converted to reserves (through inclusion within the open-pit mining limits). In all mineral reserve statements Inferred mineral resources are reported as waste.

Cut-off grade is a function of technical and economic parameters and defines the economic portion of the resource at the time of determination. Break even cut-off grade considers the total unit operating costs, including mining, processing and administration, process recovery, metal prices and additional costs for freight, smelting and/or refining. Where applicable, royalties are included in the calculation.

Once such a CoG is defined all the ore with a gold grade above this value should be considered as economically mineable. Ore feed to plant will have an average grade higher than the cut-off grade value, and this difference provides the profit (return on capital) for the business.

The typical expression for a break even (BE) gold CoG is (allowing for appropriate use of units):

$$\text{BE Cut-Off Grade} = \frac{\text{Total Unit Mining, Processing \& Administration Operating Costs}}{(\text{Au Price} - (\text{Royalty} + \text{Final Refining Costs})) \times \text{Process Recovery}}$$

The CoG used by Whittle to determine whether a block was ore or waste was reported as 0.88gpt Au. To keep consistency with what was used in the optimization, 0.88gpt was used to define ore and waste.

Underground

A cut and fill mining method is used as the basis for the underground mine design. Cut and fill is most suited to the orebody because:

- The “nuggety” and complex nature of the mineralization will require a high degree of geological control and mining flexibility; and
- The shallow 50° dip of the orebody precludes the use of longhole mining methods.

The underground stopes are designed by slicing the resource block model on 3m plan views. The design is constructed using only the indicated resource blocks above the cut-off grade. Lower grade indicated blocks are displayed during the design process but are only included in the design if higher-grade material could be added by including them. Polygons are digitized to define the stope outlines on the 3m plan views. The polygons are then extruded 3m vertically to define the 3D stope shape.

During the estimation process inferred blocks within the stope designs are treated as mined tonnage with zero grade. Indicated blocks within the stope design with grade below the cut-off are included in the gold estimation.

The reserve estimate includes 17% planned dilution in the form of footwall and hangingwall waste material that is mined within the designed stope shapes and inferred material in which the grade has been zeroed out.

A further 5% of zero grade unplanned dilution is added to the estimate to account for overbreak on the hangingwall and footwall sides of the stopes.

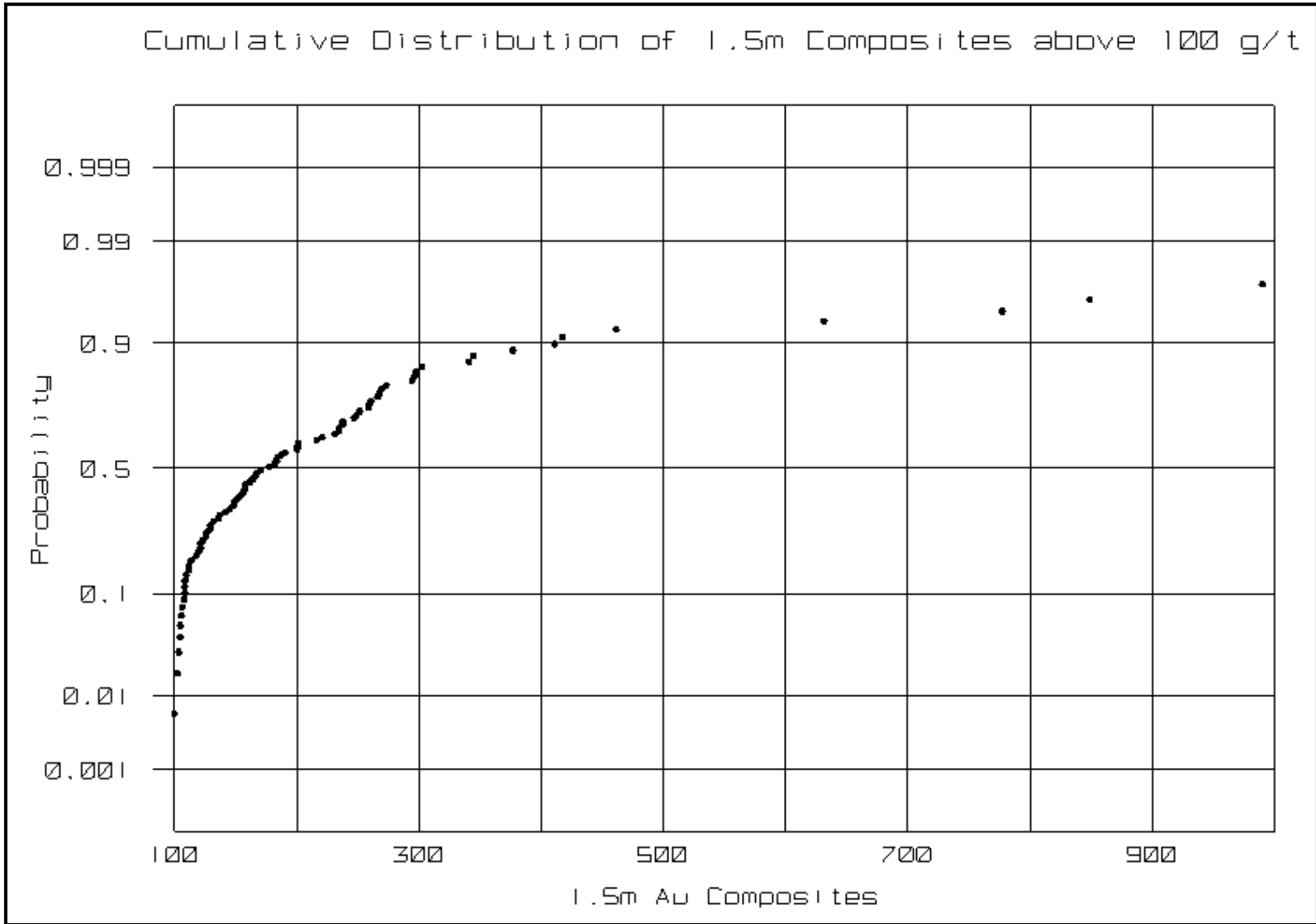
Table 15.11.2.1 presents the underground cut-off grade parameters and calculation. The mining milling and administration costs are based on the pre-Feasibility Study conclusions.

The mineral reserves are calculated based on a gold price of US\$650/oz. A mill recovery of 95% is assumed and the refinery charge is US\$2.50/oz. There are no royalties payable at the 100% owned property.

The calculated cut-off value of 3.3gpt was rounded to 3gpt for the mine reserve design process.

Table 15.11.2.1: Underground Cut-off Grade

Parameter	Unit	Amount
Mining cost	\$/t	49.00
Milling cost	\$/t	13.00
Admin cost	\$/t	4.00
Total cost	\$/t	66.00
Gold price	\$/oz	650
Mill recovery		95%
Refinery Charges	\$/oz	2.50
Net oz value	\$/oz	647.5
Cut-off grade	gpt	3.30



SRK Job No.: 144418

File Name: Figure 15-1.doc

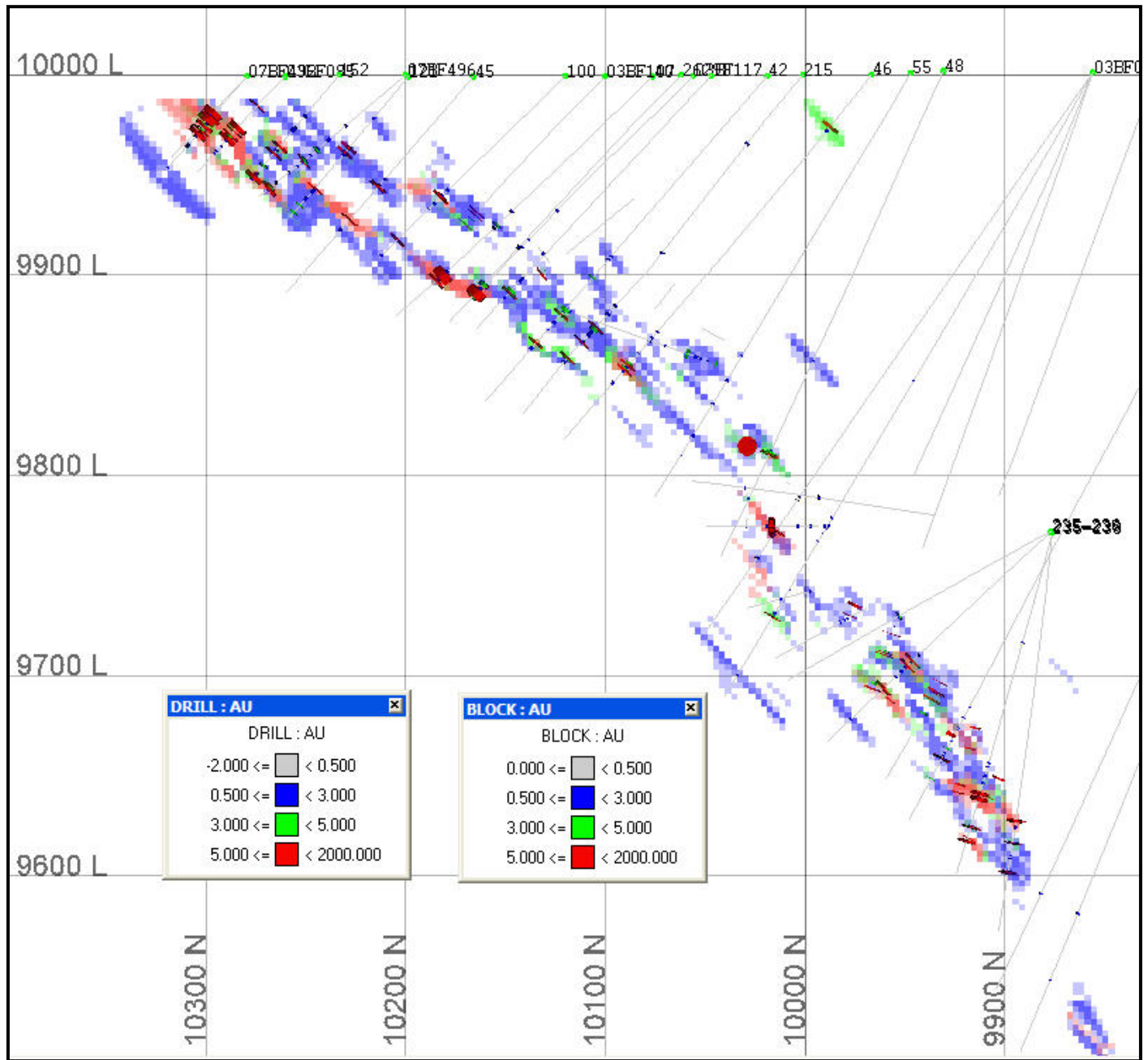
**Black Fox,
Timmins, Ontario, Canada**

**Cumulative Frequency Plot of
1.5m Composites above
100g/t-Au in all Ore Types**

Date: 02/13/08

Approved: BaS

Figure: 15-1



SRK Job No.: 144418

File Name: Figure 15-2.doc

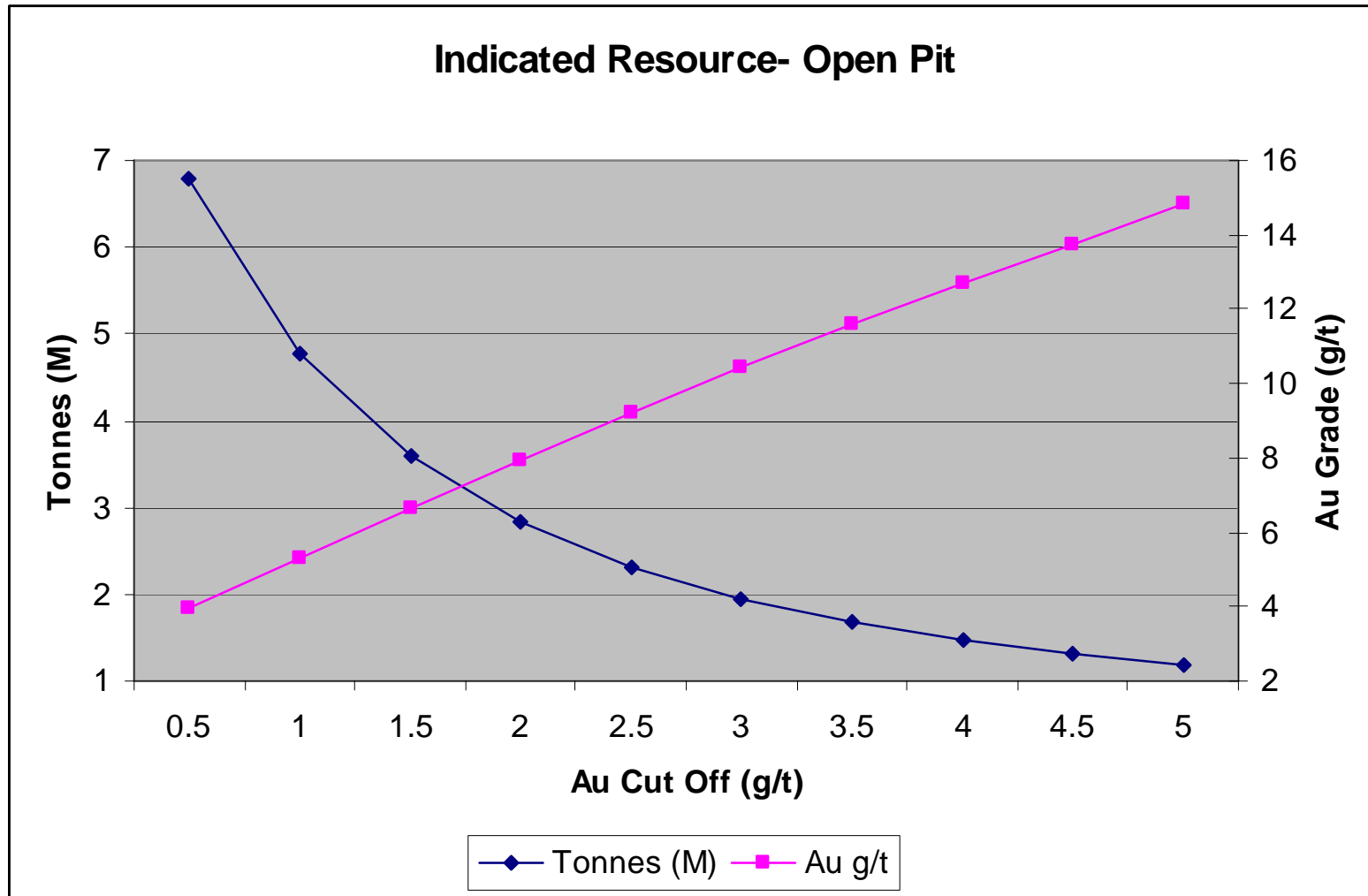
**Black Fox,
Timmins, Ontario, Canada**

**Black Fox Typical Block Model
Cross-section 10300E Showing
Distribution of Au in g/t**

Date: 02/18/08

Approved: BaS

Figure: 15-2



SRK Job No.: 144418

File Name: Figure 15-3.doc

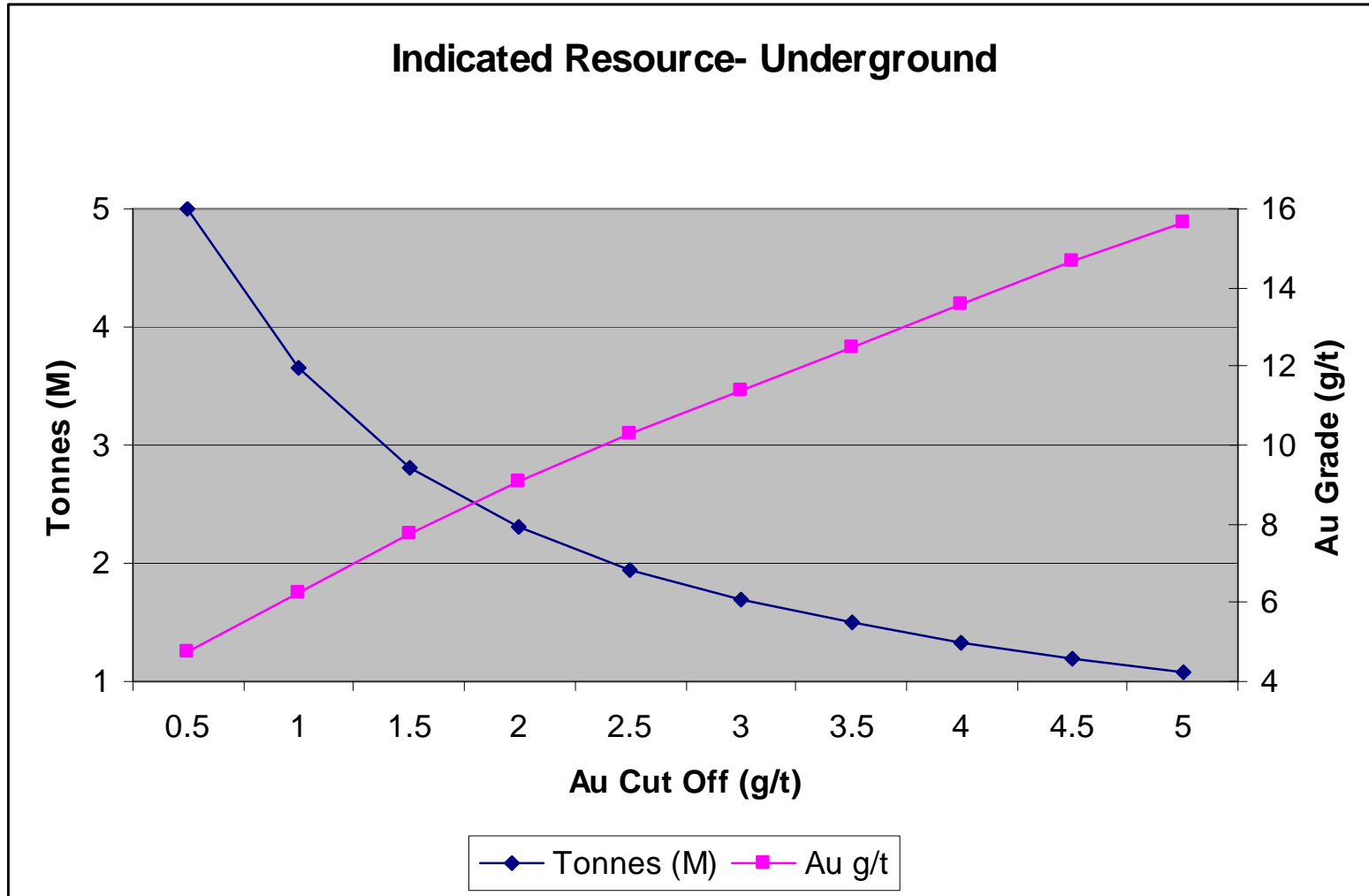
**Black Fox,
Timmins, Ontario, Canada**

**Grade Tonnage Curves for
Indicated Open Pit Resources
at Black Fox**

Date: 02/13/08

Approved: BaS

Figure: 15-3



SRK Job No.: 144418

File Name: Figure 15-4.doc

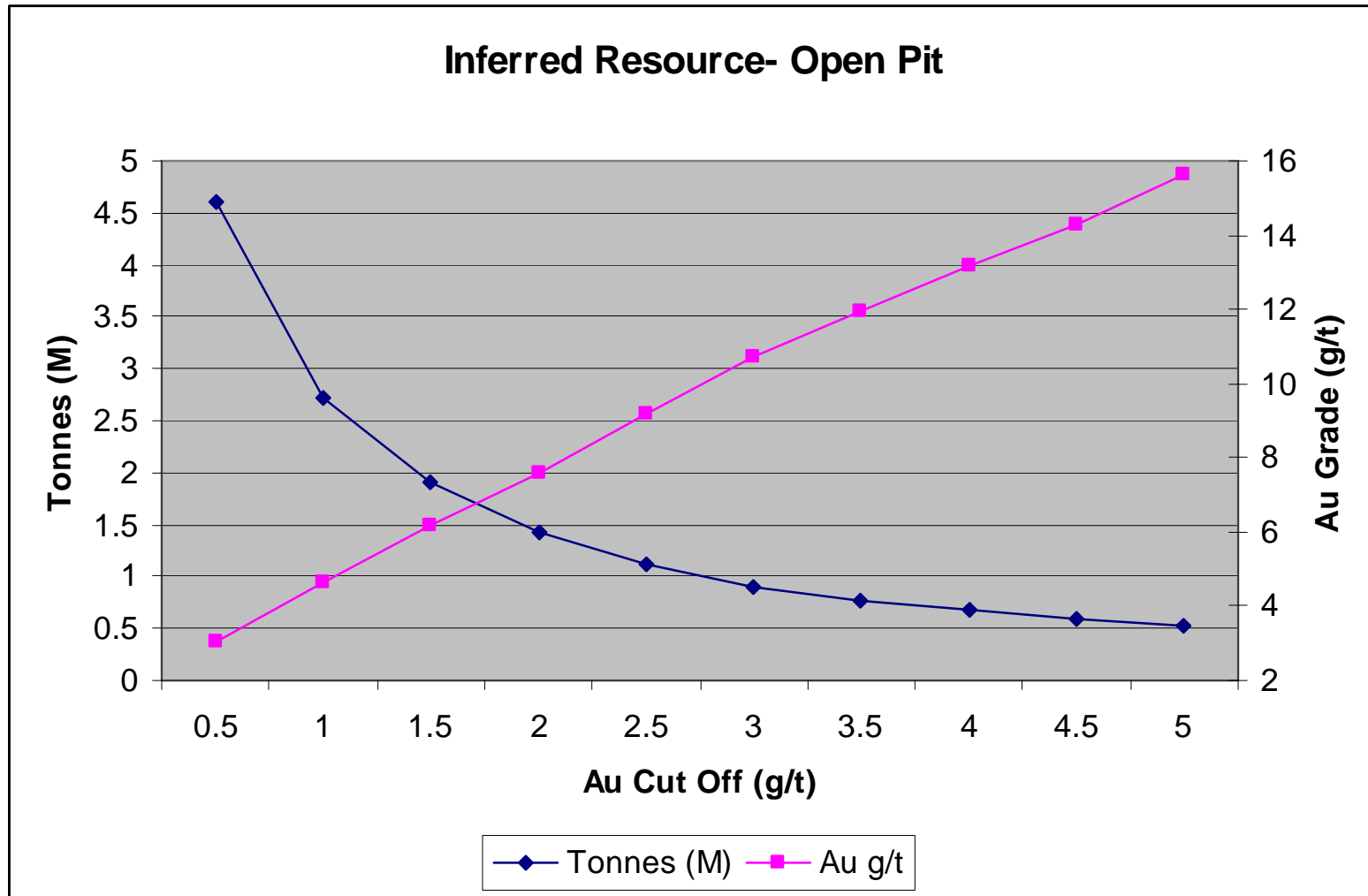
**Black Fox,
Timmins, Ontario, Canada**

**Grade Tonnage Curves for
Indicated Underground
Resources at Black Fox**

Date: 02/13/08

Approved: BaS

Figure: 15-4



SRK Job No.: 144418

File Name: Figure 15-5.doc

**Black Fox,
Timmins, Ontario, Canada**

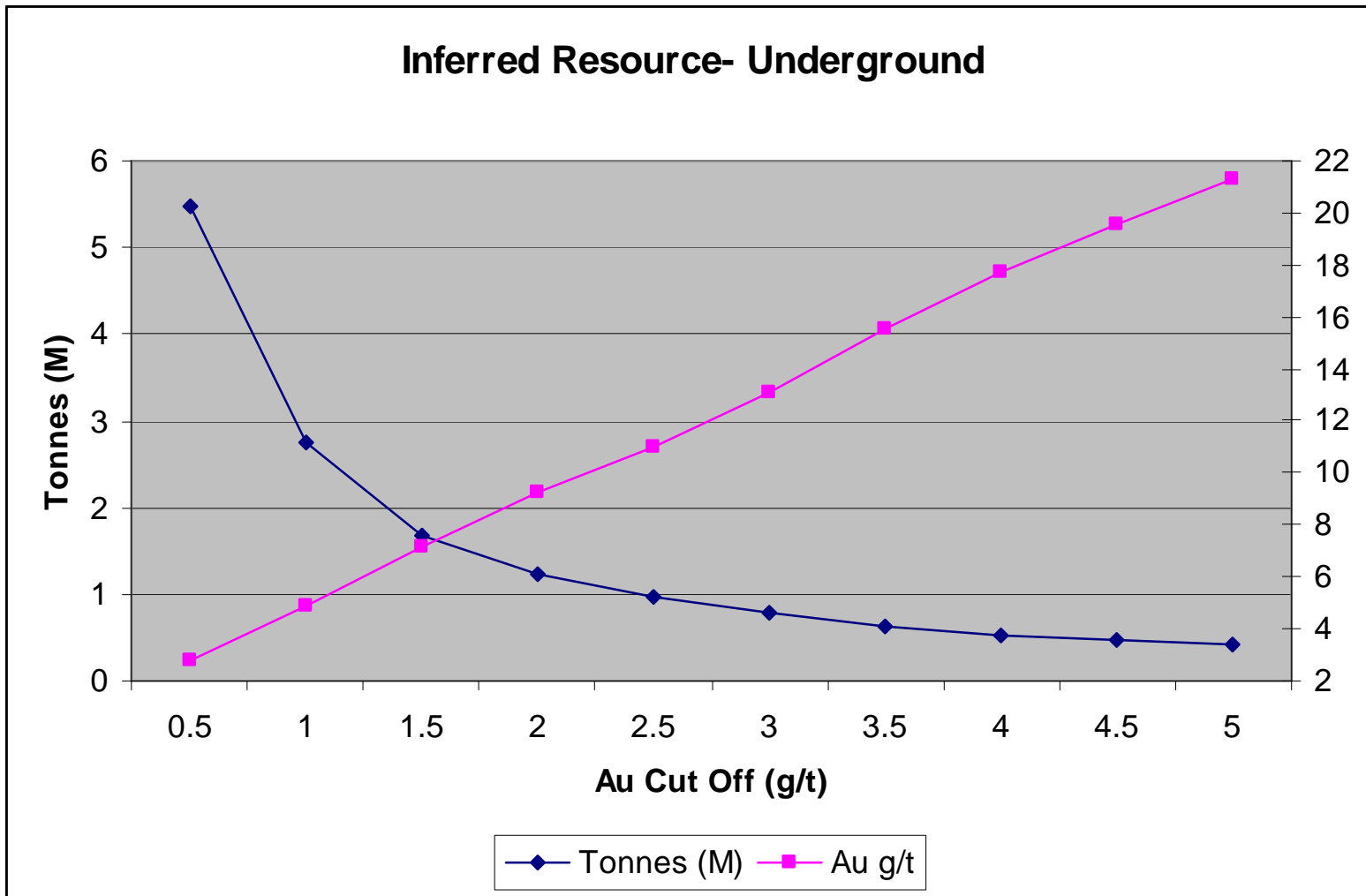
**Grade Tonnage Curves for
Inferred Open Pit Resources
at Black Fox**

Date: 02/13/08

Approved: BaS

Figure: 15-5

Inferred Resource- Underground



SRK Job No.: 144418

File Name: Figure 15-6.doc

**Black Fox,
Timmins, Ontario, Canada**

**Grade Tonnage Curves for
Inferred Underground
Resources at Black Fox**

Date: 02/13/08

Approved: BaS

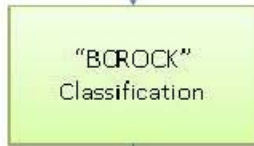
Figure: 15-6

Reserve Calculation Flow Sheet

Raw Data



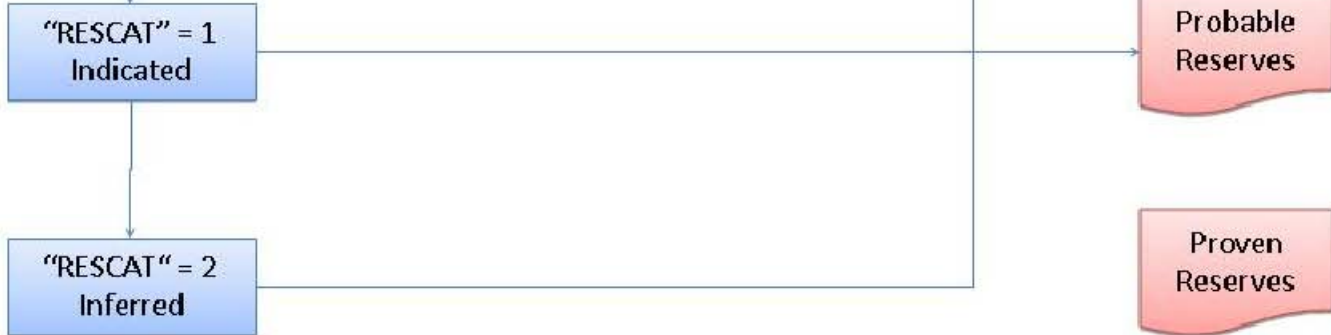
Rock Classification



Product Classification



Confidence Classification



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Engineers and Scientists
 7175 West Jefferson Ave. Suite 3000
 Denver, Colorado 80235
 303-985-1333

SRK JOB NO.: 0144418.00 / TASK 0005

FILE NAME: 0144418.00.Flg, 15-7, Reserve, Calc, Flow.dwg

ApolloGold™

TIMMINS, ONTARIO, CANADA

BLACK FOX			
RESERVE CALCULATION FLOW DIAGRAM			
DATE: MAR. 2008	APPROVED: BS	FIGURE: 15-7	REVISION NO. A