TESTWORK Desenvolvimento de Processo Ltda

REPORT Nº 007-2018 CERRADO REV. 1

FINAL REPORT

LABORATORY TESTWORK PROCESS DEVELOPMENT FOR GOLD RECOVERY FROM CERRADO GOLD ORE

MAY 2018

Content

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testwork@testwork.com.br – www.testwork.com.br – skipe:walterdemoura56

Distribution List

Name	Company	Position
Kurt Merchen	Cerrado Gold	Country Manager

Document Change Control

Version	Description	Author(s)	Date
Rev. 0	For comments	Walter de Moura	15/05/2018
Rev. 1	Revisions and WI inclusion	Walter de Moura	21/05/2018

Reference Term

Testwork Process Development Ltda conducted this work for Cerrado Gold, with the purpose to study the process route to treat the ore from Serra Alta Project. This report was written by Walter de Moura**,** Metallurgist, M.Sc. – CREA – 44611 –. Nac. Reg: 200543554-6. TESTWORK Process Development Ltda, Av. Presidente Kennedy, 1980 – Nova Lima – MG – Brazil - 34.004-214, Tel: (55)-(31)3542-5579, skype:walterdemoura56, testwork@testwork.com.br

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1. Introduction

Testwork Desenvolvimento de Processo Ltd. was requested by Mr. Kurt Merchen, Country Manager, to conduct a study of the best process route to recovery gold from Cerrado Gold ore, located in Tocantins State, Brazil.

The tests were performed in the Testwork Process Development Ltda laboratory located in Nova Lima, Minas Gerais, Brazil. All chemical analysis were performed by SGS Geosol laboratory, located in Vespasiano, Minas Gerais, Brazil.

2. Objective

The objectives of these testwork was to determine the process route to obtain the higher gold recovery, considering gravity concentration, leaching and flotation.

3. Scope of Work

The Figure 1 shows the scope of the testwork carried out on Serra Alta Project sample.

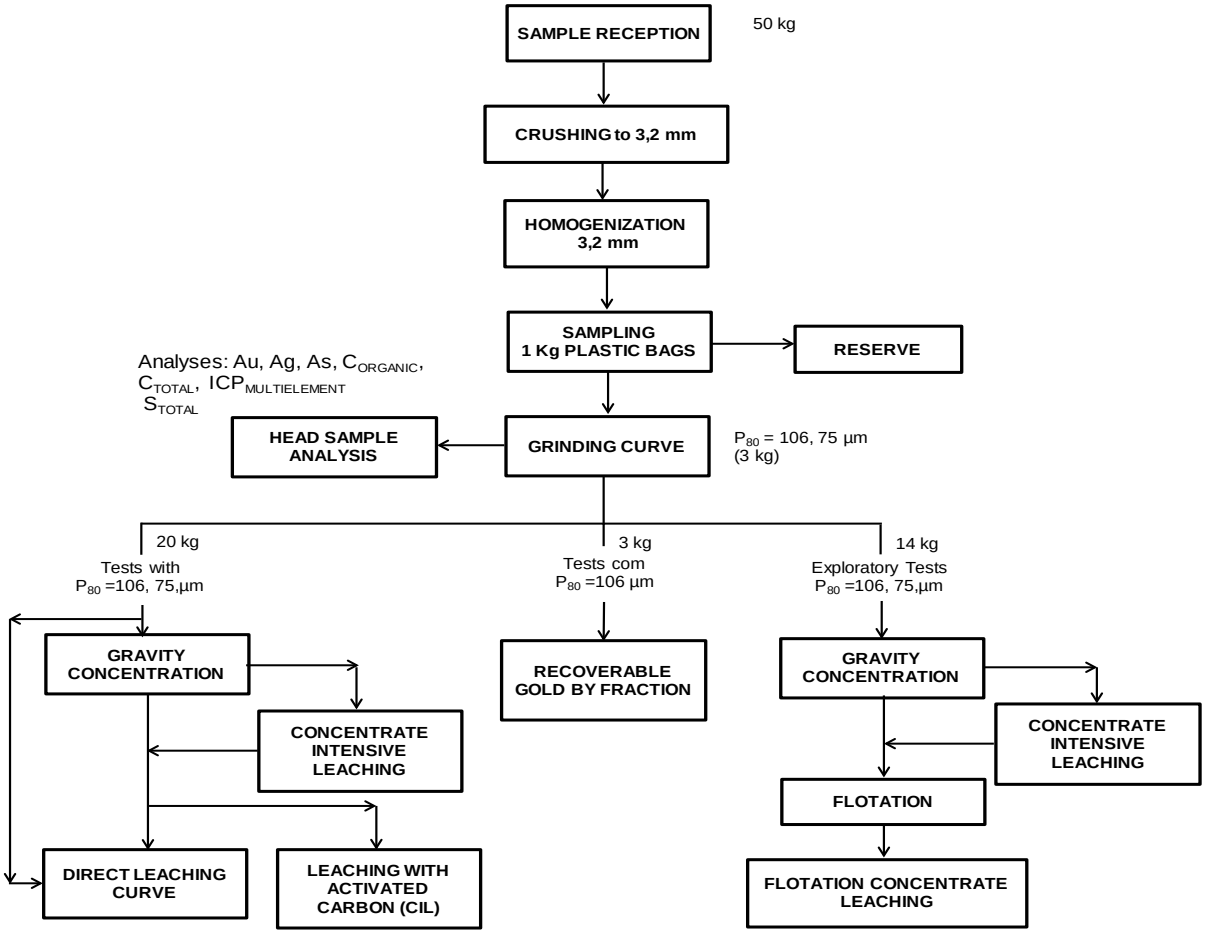

Figure 1 – Scope of Testwork

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4. Samples Preparation

Figure 2 shows the samples received in bags and identification.

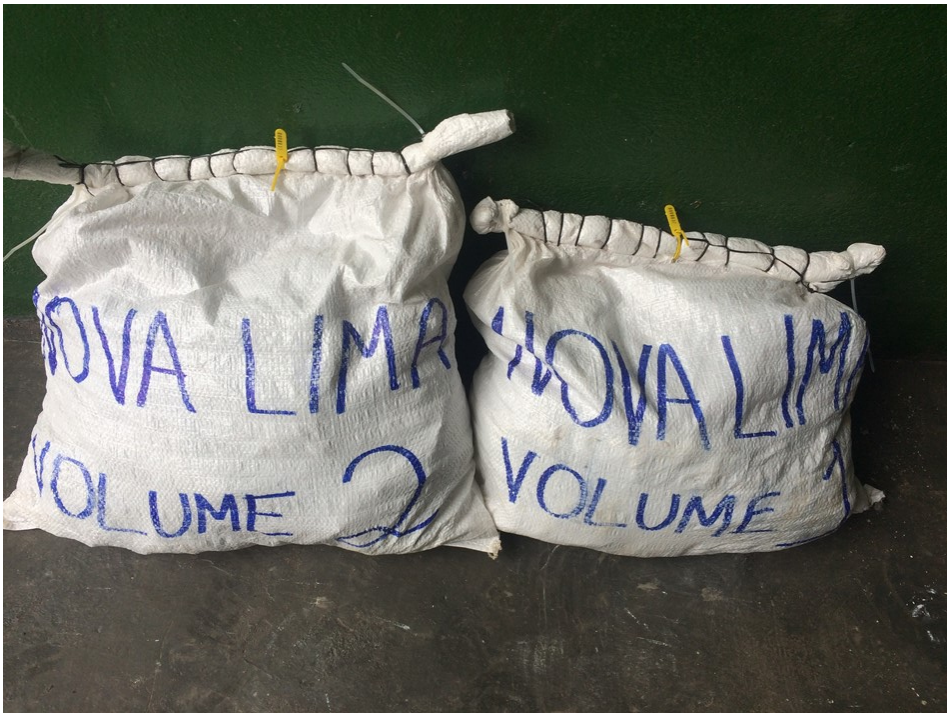

Figure 2 – Samples Received in Bags

Figure 3 – Samples Received

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The entire sample was crushed to less than 3.0 mm (1/8”). The material was homogenized, sampled and were placed in 1 kg plastic bags to be used for the tests.

The milling curve was made using 3 kg of sample chosen randomly from these plastic bags. The milling curve was made to determine the necessary time to reach P_{80}=106 and 75 µm.

5. Results and Discussions

5.1. Ore Characterization

5.1.1. Head Sample

Considering that, this sample have high percentage of free gold a special procedure was made to determine the gold grade in the head sample, to avoid the “nugget effect”.

Two kilos (2kg) of sample was milled to reach a P_{80}= 106 µm and passed through a Knelson lab concentrator MD3. The concentrate was, dried, weighted and sent for gold analysis. The gravity tailing was dried, weighted and sampled in 3 sub-samples for gold analysis. The composition of concentrate and tailing was the head sample grade.

The gravity concentration was carried out in the following conditions:

- Fluidization Water: 3,5 L/min
- Pressure: 4,0 PSI
- 150 G’s
- P_{80} = 106 µm
- 2 kg

Table 1 shows the gold grade in the gravity concentrate and tailing and Table 2 shows the calculated Head Gold Grade.

Table 1 –Gold Grade Analysis – Gravity Concentrate and Tailing

Sample ID	Au (g/t)
Gravity Concentrate	94,63
Tailing 1	0,47
Tailing 2	0,46
Tailing 3	0,44
Average	0,46
SD	0,02

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Table 2 – Composition of the Gold Head Grade

TEST 1	Weight (g)	% mass	Au Grade (g/t)	% Recov.	% Recov. Accum.
Concentrate	69,89	3,49%	**94,63**	88,16%	88,2%
Tailing	1930,1	96,51%	0,46	11,84%	100,0%
Feed. Calc.	2000,0	100 %	**3,75**		

The gold feed grade for the following testwork is 3,75 g/t.

A sample from the feed was sent for multi-element analysis by inductively coupled plasma mass spectrometry (ICP-MS). Table 3 shows the result.

Table 3 – ICP Analysis

CERRADO - FEED SAMPLE					
Element	Unit	Grade	Element	Unit	Grade
Ag	ppm	5	Pb	ppm	436
Al	%	4,43	S	%	0,08
As	ppm	<10	Sb	ppm	<10
Ba	ppm	234,0	Sc	ppm	<5
Be	ppm	<3	Se	ppm	<20
Bi	ppm	<20	Sn	ppm	<20
Ca	%	0,3	Sr	ppm	38
Cd	ppm	<3	Th	ppm	<20
Co	ppm	<8	Ti	%	0,06
Cr	ppm	<3	Tl	ppm	<20
Cu	ppm	74	U	ppm	<20
Fe	%	1,31	V	ppm	<8
K	%	3,63	W	ppm	<20
La	ppm	<20	Y	ppm	7
Li	ppm	4	Zn	ppm	141
Mg	%	0,06	Zr	ppm	60
Mn	%	0,03	C_ORG	%	<0,05
Mo	ppm	<3	C_ELE	%	<0,05
Na	%	2,33	C_CAR	%	0,1
Ni	ppm	<3			
P	%	<0,01			

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5.2. Direct Leaching Tests

Direct leaching tests of a sample of the whole ore, without gravity concentration, were carried out in duplicate with the sample milled in two different P_{80} (106 and 75 µm). For each test, 2 kg of sample were taken from the 1kg bags, randomly, and leached individually.

The testes were carried in the conditions described below. Samples of solution was taken out in the pre-determined times. In the end of the tests the tailings were washed, dried, sampled and sent for Au analysis. Tables 4 and 5 shows the results of the direct leaching tests and Figures 4, 5 and 6 shows the results in graphic form. The Control Sheets are in the APPENDIX 1.

The leaching conditions are below:

- pH adjusted to 10-11 (with hydrated lime)
- 50% solids
- Residence Total Time of 24 hours
- Sampling (Au, CN_{FREE}, pH) with 2, 6, 8, 24.
- Initial Cyanide Concentration of 1000 g/t

Table 4 – Direct Leaching Tests Results – P_{80} = 75µm

TEST		DIRECT LEACHING			
Sample		CERRADO			
Test ID		LT1		LT2	
Size		75 µm			
		Au			
Analysed Feed (g/t)		3,73			
Calculated Feed (g/t)		3,26		7,51	
Initial NaCN (g/t)		1500		1500	
NaCN Consumption (g/t)		1023		1118	
Carbon (g/L de pulp)		-		-	
	Time	Tailing	Recov.	Tailing	Recov.
	0	-	**0,0%**	-	**0,0%**
	2	-	**67,3%**	-	**22,5%**
	4	-	**80,4%**	-	**59,8%**
	8	-	**98,4%**	-	**92,3%**
	24	0,09	**97,2%**	0,10	**98,7%**

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Table 5 – Direct Leaching Tests Results – P_{80} = 75µm

TEST	DIRECT LEACHING			
Sample	CERRADO			
Test ID	LT3		LT4	
Size	106 µm			
	Au			
Analysed Feed (g/t)	3,73			
Calculated Feed (g/t)	3,54		6,09	
Initial NaCN (g/t)	1500		1500	
NaCN Consumption (g/t)	850		878	
Carbon (g/L de pulp)	-		-	
Time (h)	Tailing	Recov.	Tailing	Recov.
0	-	**0,0%**	-	**0,0%**
2	-	**42,4%**	-	**46,8%**
4	-	**79,2%**	-	**69,7%**
8	-	**92,2%**	-	**82,2%**
24	0,23	**93,5%**	0,60	**90,1%**

The recalculated feed gold grade of the tests number LT2 and LT4 were much higher than should be due to the solution grade (see APPENDIX 1)

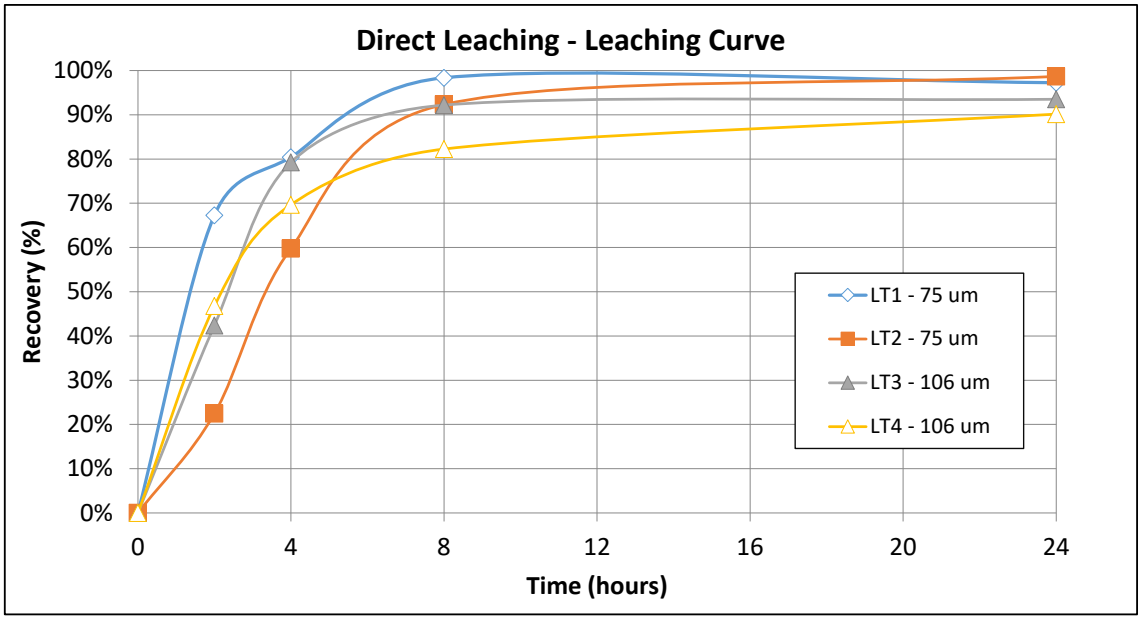

Figure 4 – Direct Leaching – Leaching Curve - P_{80} = 106 and 75µm

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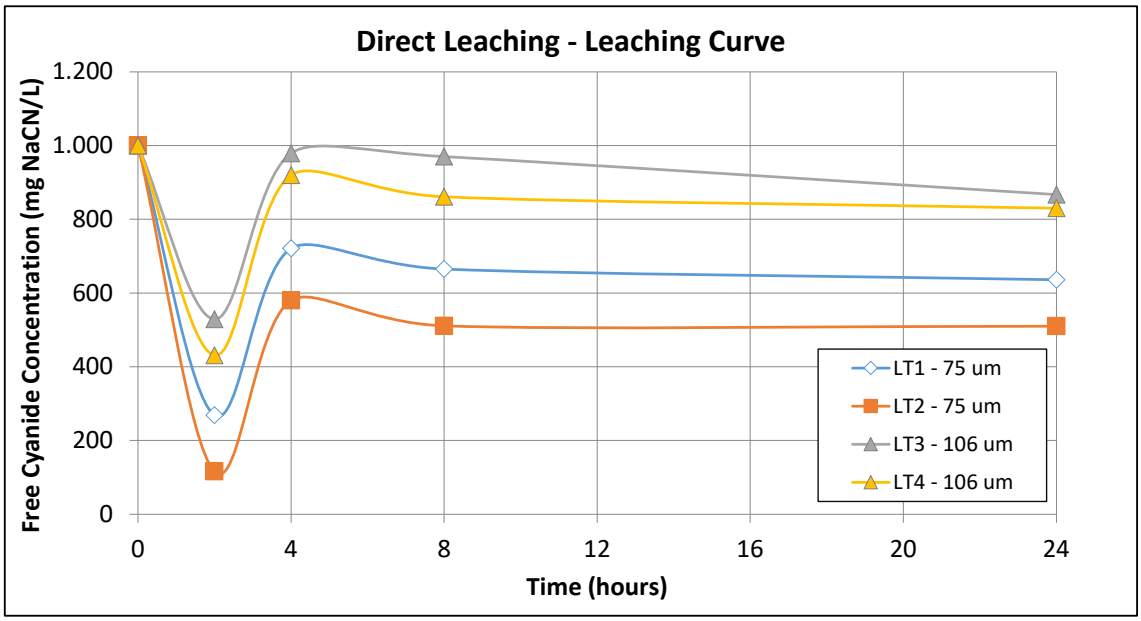

Figure 5 – Free Cyanide Concentration during Direct Leaching - P_{80} = 106 and 75µm

In the beginning of the leaching curve, the cyanide concentration decreased quickly due to the strong ferrocyanide formation in solution. Immediately more cyanide (500 g/t) were added to keep the free cyanide concentration close to 1000 mg/L in the beginning of the leaching. The cyanide consumption was higher with ore milled to P_{80} = 75 µm (1070 g/t) than P_{80} = 106 µm (863 g/t).

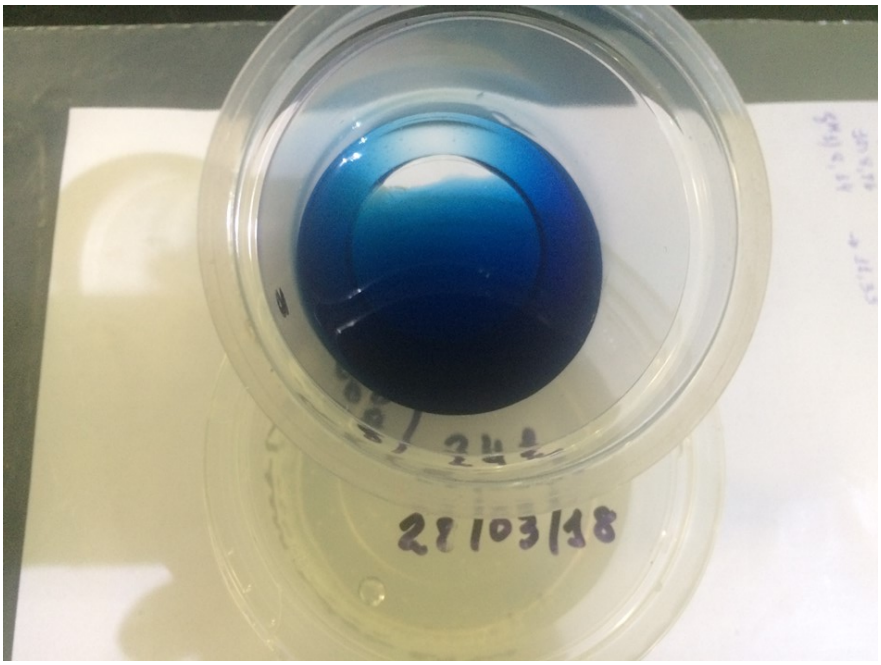

Figure 6 – Ferrocyanide formation During Direct Leaching

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5.3. Gravity Concentration Followed by Leaching Tests

The Leaching tests were carried out with the gravity concentration tailing. For kilos (4 kg) of sample were milled to P_{80} =106 and 75 µm, passed through a Knelson lab concentrator MD3 to remove the free gold from the sample.

The gravity concentrate was leached with high cyanide concentration in solution (intensive leaching – LI). The solution was sent for gold analysis and the tailing from the intensive leaching returned to be mixed back to the gravity concentration tailing, simulating what will happens in the industrial plant. The gravity concentration tailings was sampled, in pulp, to obtain 4 sub-samples for the leaching tests.

Gravity Concentration Procedure

For kilos (4 kg) of sample were milled to P_{80} = 106 and 75 µm (4 kg in each P_{80}) and passed once through the Knelson lab concentrator MD-3. The concentration conditions were: 150Gs (gravity force) and fluidization water 3.5 L/min.

Intensive Leaching Procedure

- pH adjusted to 10-11 (with hydrated lime)
- ~30 % solids
- P_{80} = 106 e 75 µm
- Leaching Time – 24 hours
- Initial Cyanide Concentration: 10.000 mg/L

Leaching Tests Procedure

The leaching tests were carried out under the conditions below.

- Carbon: with (18 g/L of pulp - CIL) and without
- pH adjusted to 10-11 (with hydrated lime)
- 50 % solids
- P_{80} = 106 e 75 µm
- Leaching Curve (without Activated Carbon) – 2, 4, 8 and 24 hours
- Initial Cyanide Concentration:1500 mg/L

Table 9 show the results gravity concentration before leaching tests. The gold recoveries are the “real” recovery, after intensive leaching. The Control Sheets are in the APPENDIX 1.

Tables 6, 7 and 8 show the leaching tests results, the Figures 7 and 8 show more details graphically.

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Table 6 – Gravity Concentration Recoveries before Leaching

SAMPLE	CERRADO	
Test ID	LT5	LT7
P_{80}	P_{80} = 106 µm	P_{80} = 75 µm
G Force	150	150
Fluidization flowrate (L/min)	3,5	3,5
	Au	Au
Calculated Feed (g/t)	3,68	3,74
Concentrate (g/t)	168,86	187,35
Tailing (g/t)	0,63	0,55
% mass to concentrate	1,81%	1,71%
Recovery (%)	**83,19%**	**85,64%**

OBS: The tailing grade is the average grade of the calculated feed of the leaching tests

Table 7 – Gravity Tailing Leaching – P_{80}=106µm – Without and With Activated Carbon

TEST		GRAVITY CONCENTRATION + TAILING LEACHING				GRAVITY CONCENTRATION + TAILING LEACHING (WITH ACTIVATED CARBON)			
Sample		CERRADO				CERRADO			
Test ID		LT10		LT11		LT12		LT13	
Size		106 µm				106 µm			
		Au				Au			
Analysed Feed (g/t)									
Calculated Feed (g/t)		0,60		0,63		0,68		0,61	
Initial NaCN (g/t)		1500		1500		1500		1500	
NaCN Consumption (g/t)		939		963		866		833	
Carbon (g/L de pulp)		-		-		18,00		18,00	
	Time (h)	Tailing	Recov.	Tailing	Recov.	Tailing	Recov.	Tailing	Recov.
	0	-	**0,0%**	-	**0,0%**	-	**-**	-	**-**
	2	-	**68,2%**	-	**70,2%**	-	**-**	-	**-**
	4	-	**77,2%**	-	**76,3%**	-	**-**	-	**-**
	8	-	**81,1%**	-	**82,9%**	-	**-**	-	**-**
	24	0,07	**88,3%**	0,08	**87,3%**	0,08	**88,2%**	0,07	**88,5%**

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Table 8 – Gravity Tailing Leaching – P_{80}=75µm – Without and With Activated Carbon

TEST	GRAVITY CONCENTRATION + TAILING LEACHING				GRAVITY CONCENTRATION + TAILING LEACHING (WITH ACTIVATED CARBON)			
Sample	CERRADO				CERRADO			
Test ID	LT14		LT15		LT16		LT17	
Size	75 µm				75 µm			
	Au				Au			
Analysed Feed (g/t)								
Calculated Feed (g/t)	0,44		0,46		0,51		0,78	
Initial NaCN (g/t)	1613		1596		1596		1596	
NaCN Consumption (g/t)	1247		1271		1270		1281	
Carbon (g/L de pulp)	-		-		18,00		18,00	
Time	Tailing	Recov.	Tailing	Recov.	Tailing	Recov.	Tailing	Recov.
0	-	**0,0%**	-	**0,0%**	-	**-**	-	**-**
2	-	**82,8%**	-	**77,0%**	-	**-**	-	**-**
4	-	**92,8%**	-	**89,1%**	-	**-**	-	**-**
8	-	**96,2%**	-	**92,1%**	-	**-**	-	**-**
24	0,04	**91,0%**	0,04	**91,3%**	0,07	**86,2%**	0,09	**88,4%**

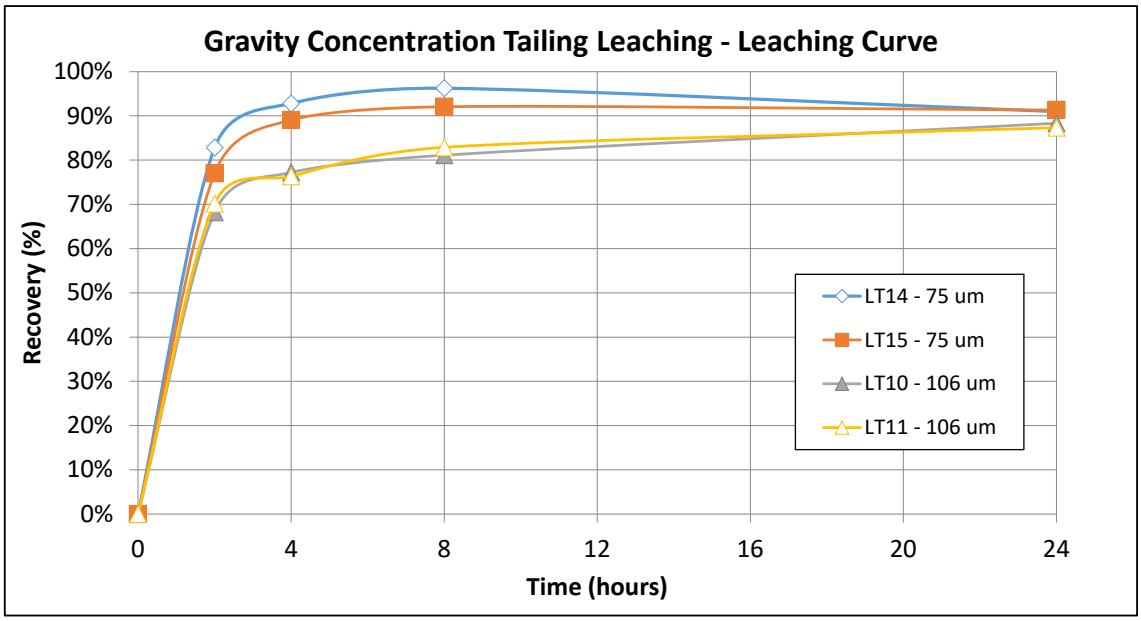

Figure 7 – Gravity Concentration Tailing Leaching – Leaching Curve - P80 = 106 and 75µm

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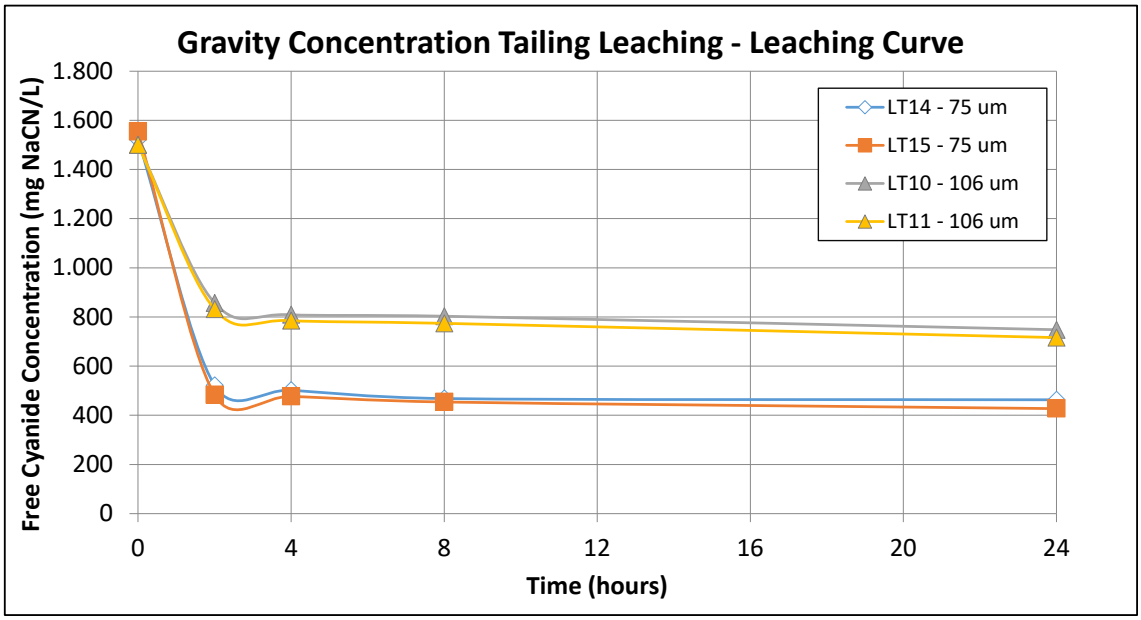

Figure 8 – Free Cyanide Concentration during Direct Leaching - P80 = 106 and 75µm

Based on the experience of the direct leaching tests, 1500 g/t of cyanide were added in these tests. Here also there was a strong ferrocyanide formation consuming must of the cyanide in the first two hours.

5.4. Gravity Concentration Followed by Flotation Tests

The flotation testwork were carried out with the gravity concentration tailing. Five kilos (5 kg) of sample were milled to P_{80} =106 and 75 µm, passed through a Knelson lab concentrator MD3 to remove the free gold from the sample.

The gravity concentrate was leached with high cyanide concentration in solution (intensive leaching – LI). The solution was sent for gold analysis and the tailing from the intensive leaching returned to be mixed back to the gravity concentration tailing, simulating what will happens in the industrial plant. The gravity concentration tailings was sampled, in pulp, to obtain 5 sub-samples for the flotation tests.

Gravity Concentration Procedure

Five kilos (5kg) of sample were milled to P_{80} = 106 and 75 µm (5kg in each P_{80}) and passed once through the Knelson lab concentrator MD-3. The concentration conditions were: 150Gs (gravity force); fluidization water 3,5 L/min.

Intensive Leaching Procedure

- pH adjusted to 10-11 (with hydrated lime)
- ~30 % solids
- P_{80} = 106 e 75 µm

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- Leaching Time – 24 hours
- Cyanide Concentration: 10.000 mg/L

Flotation Tests Procedure

The flotation tests were carried out to verify the total gold recovery in the following conditions below.

- 2 Liters cell capacity
- Collectors: SIBX (C3430) e C5460
- Activator: $CuSO_4$
- Frother: MIBC
- Concentrates: 5 Rougher concentrates (4,8,12,16, 20 min)
- % solids 33% solids
- pH: natural

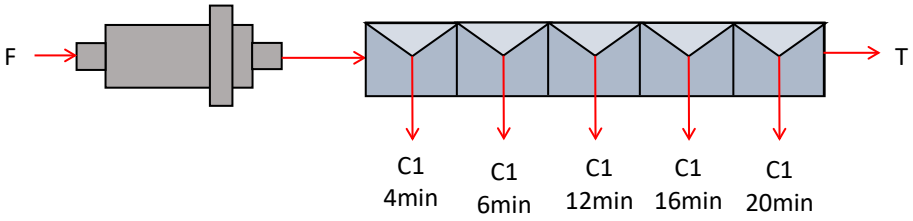

Table 9 show the results gravity concentration before flotation tests. The gold recoveries are the "real" recovery, after intensive leaching. The Control Sheets are in the APPENDIX 2.

Table 9 – Gravity Concentration Recoveries before Flotation

SAMPLE	CERRADO	
Test ID	LT6	LT4
P_{80}	P_{80} = 106 µm	P_{80} = 75 µm
G Force	150	150
Fluidization flowrate (L/min)	3,5	3,5
	Au	Au
Calculated Feed (g/t)	3,02	3,58
Concentrate (g/t)	159,77	215,97
Tailing (g/t)	0,83	0,54
% mass to concentrate	1,38%	1,41%
Recovery (%)	**72,87%**	**85,12%**

OBS: The tailing grade is the average grade of the calculated feed of the flotation tests

Table 10 show the flotation tests results, the Figures 9, 10, 11 and 12 shows more details graphically.

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Table 10 – Flotation Tests Summary

Test ID	Test Condition				Sample	P_{80}		Mass Pull (%)	Grades			Global Recovery (GC + Flot)
						Mesh	µm		Calculated Feed	Concentrate	Tailing	
	CuSO4	C5460	SIBX	Mibcol					Au (g/t)	Au (g/t)	Au (g/t)	Au (%)
FT2	150	180	180	40		150	106	4,2%	0,85	17,03	0,13	85,3%
	CuSO4	A208	SIBX	Mibcol								
FT3		180	180	40		150	106	4,5%	0,89	17,51	0,10	89,2%
	CuSO4	C5460		Mibcol	Gravity Tailing							
FT4	150	180		40		150	106	5,4%	0,77	12,37	0,11	86,6%
	CuSO4	A208	SIBX	Mibcol								
FT5	150	180	180	40		150	106	3,8%	0,79	18,10	0,11	86,5%
	CuSO4	A208	SIBX	Mibcol								
FT6		180	180	40		150	106	4,4%	0,84	15,67	0,16	81,8%
							Average	**4,5%**	**0,83**	**16,13**	**0,12**	**85,9%**

Test ID	Test Condition				Sample	P_{80}		Mass Pull (%)	Grades			Global Recovery (GC + Flot)
						Mesh	µm		Calculated Feed	Concentrate	Tailing	
	CuSO4	C5460	SIBX	Mibcol					Au (g/t)	Au (g/t)	Au (g/t)	Au (%)
FT7	150	180	180	40		200	75	5,7%	0,57	8,59	0,08	86,7%
	CuSO4	A208	SIBX	Mibcol								
FT8		180	180	40		200	75	5,7%	0,50	7,66	0,07	86,8%
	CuSO4	C5460		Mibcol	Gravity Tailing							
FT9	150	180		40		200	75	6,4%	0,51	6,60	0,10	81,7%
	CuSO4	A208	SIBX	Mibcol								
FT10	150	180	180	40		200	75	6,1%	0,50	7,07	0,08	85,1%
	CuSO4	A208	SIBX	Mibcol								
FT11		180	180	40		200	75	6,5%	0,63	7,93	0,12	82,1%
							Average	**6,1%**	**0,54**	**7,57**	**0,09**	**84,5%**

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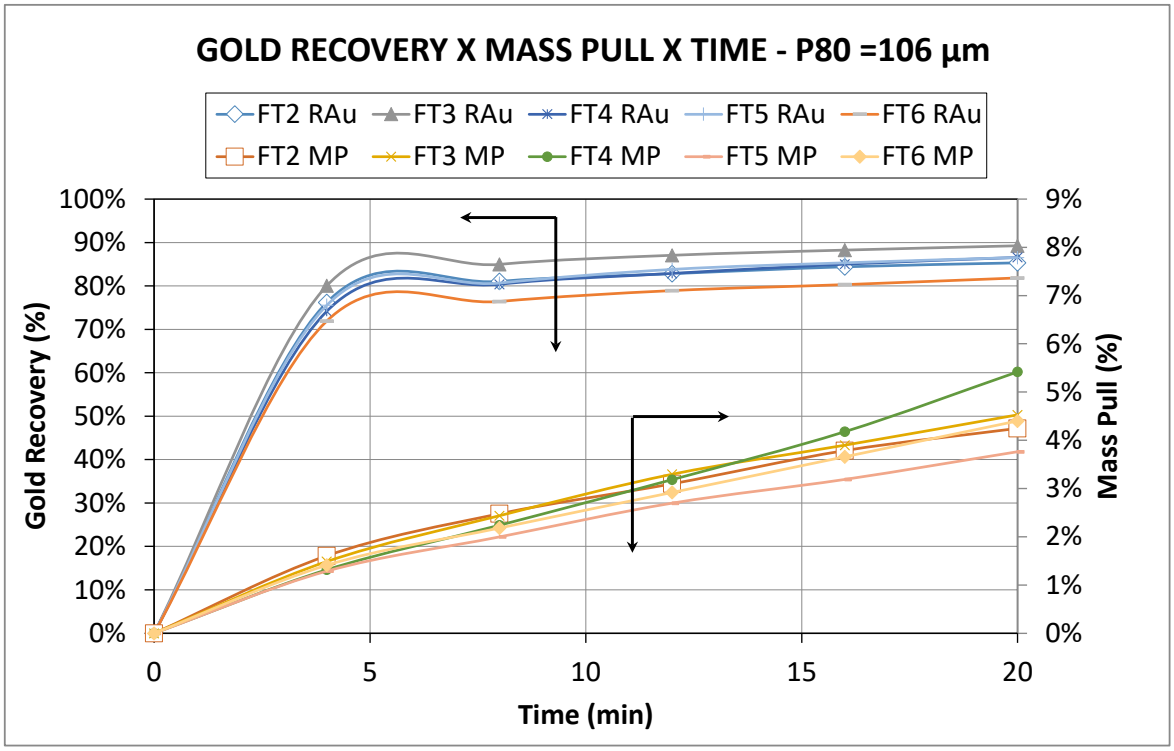

Figure 9 – Gold Recovery x Mass Pull x Time - P_{80} = 106µm

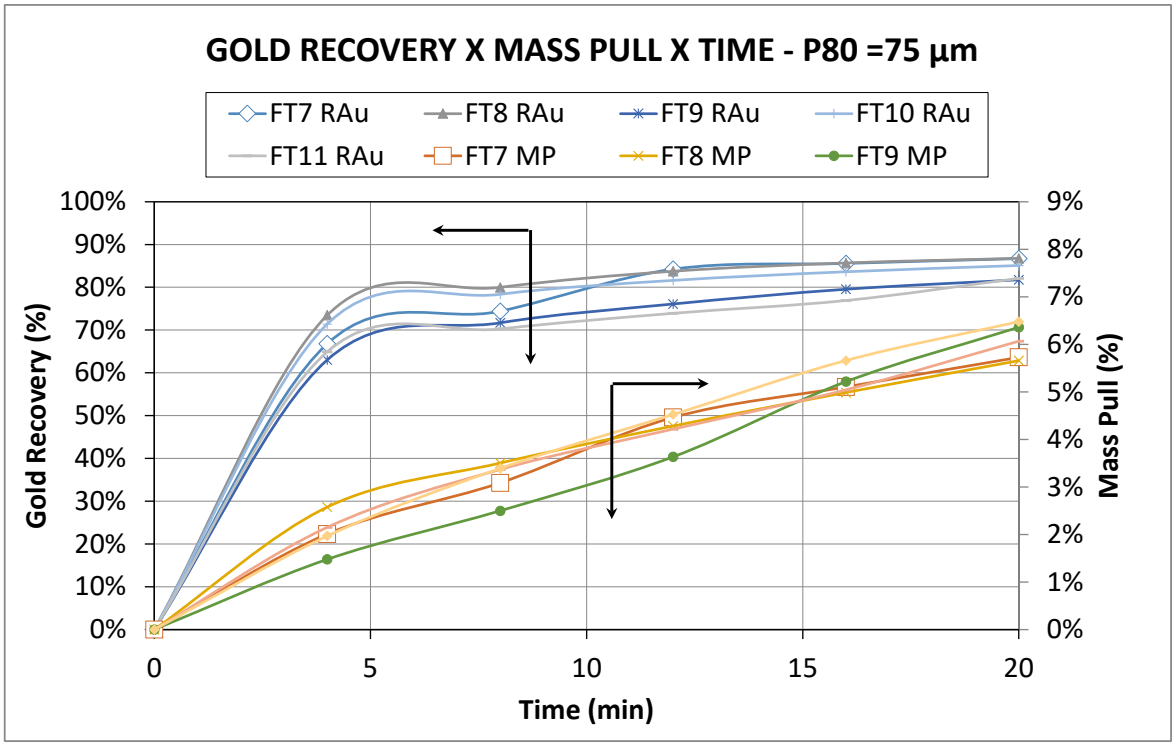

Figure 10 – Gold Recovery x Mass Pull x Time - P_{80} = 75µm

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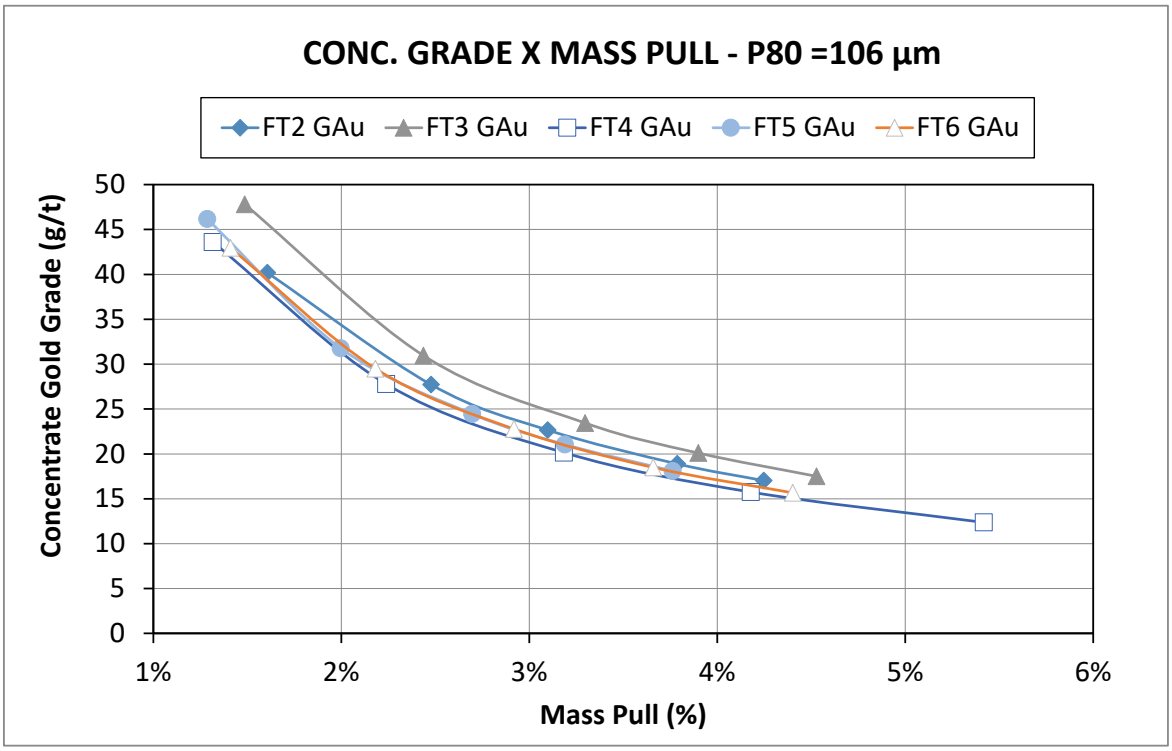

Figure 11 – Concentrate Gold Grade x Mass Pull - P_{80} = 106µm

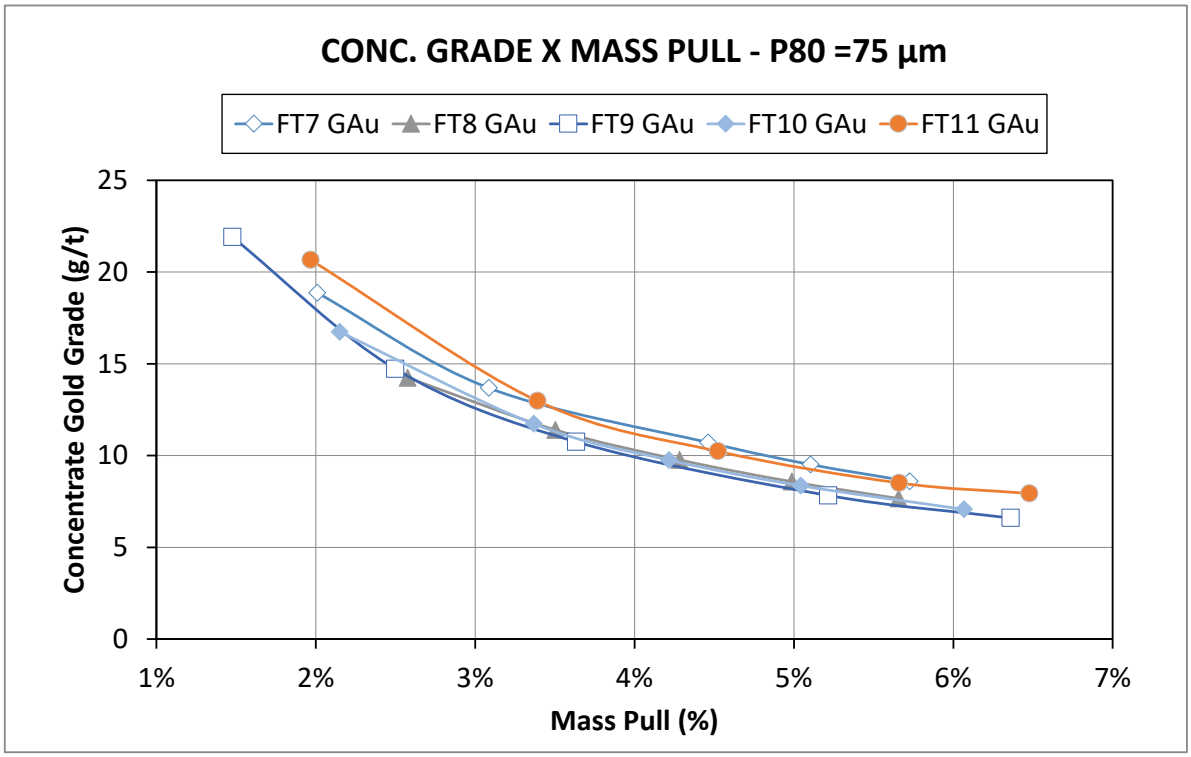

Figure 12 – Concentrate Gold Grade x Mass Pull - P_{80} = 75µm

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5.4.1. Flotation Concentrate Leaching

To verify the total gold recovery in the flotation, a flotation concentrate was generated using the best condition obtained in the flotation tests with P_{80} = 75 µm. The flotation concentrate leaching test was carried out under the conditions below.

- pH adjusted to 10-11 (with hydrated lime)
- ~30 % solids
- P_{80} = 75 µm
- Leaching Time – 24 hours
- Cyanide Concentration: 4 kg/t

The result of the concentrate leaching is shown in Table 11.

Table 11 – Flotation Concentrate Leaching Results

Sample		FLOTATION CONCENTRATION	
Test ID		LT18	
Size		ORE MILLED TO P_{80}=75 µm	
		Au	
Calculated Feed (g/t)		51,94	
Initial NaCN (g/t)		3920	
NaCN Consumption (g/t)		3681	
	Time	Tailing	Recov.
	24	33,35	**35,8%**

5.4.2. Recoverable Gold by Fraction

A sample (2,8 kg) was milled at a P80 = 106 µm and screened in fraction (65, 100, 150, 200, 325 and -325 mesh or 212, 150, 106, 75, 45 and -45 µm). Each fraction was leached with cyanide. The solution and tailings from each fraction were sent for gold analysis. Table 12, 13 and 14 and Figures 13 and 14 show the results.

Table 12 - Size Distribution of the Milled Sample

Mesh Tyler	Size (µm)	Mass (g)	% Retained Simple	% Retained Accum.	% Passing Accum.
65#	212	8,95	0,3%	0,3%	99,7%
100#	150	314,42	11,2%	11,5%	88,5%
150#	106	394,00	14,0%	25,5%	**74,5%**
200#	75	579,00	20,6%	46,1%	53,9%
325#	45	536,23	19,1%	65,2%	34,8%
<325#	<45	980,00	34,8%	100,0%	0,0%
	TOTAL	2812,60			

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Table 13 – Au Distribution by Fraction

Size Mesh	Size (µm)	Au Grade (g/t)	% Au Retained Simple	% Au Retained Accumulated	% Au Passing Accumulated
65#	212	86,62	6,1%	6,1%	93,9%
100#	150	5,87	14,5%	20,5%	79,5%
150#	106	5,91	18,2%	38,8%	61,2%
200#	75	3,85	17,5%	56,3%	43,7%
325#	45	4,56	19,2%	75,4%	24,6%
<325#	<45	3,20	24,6%	100,0%	0,0%
	Head	4,54			

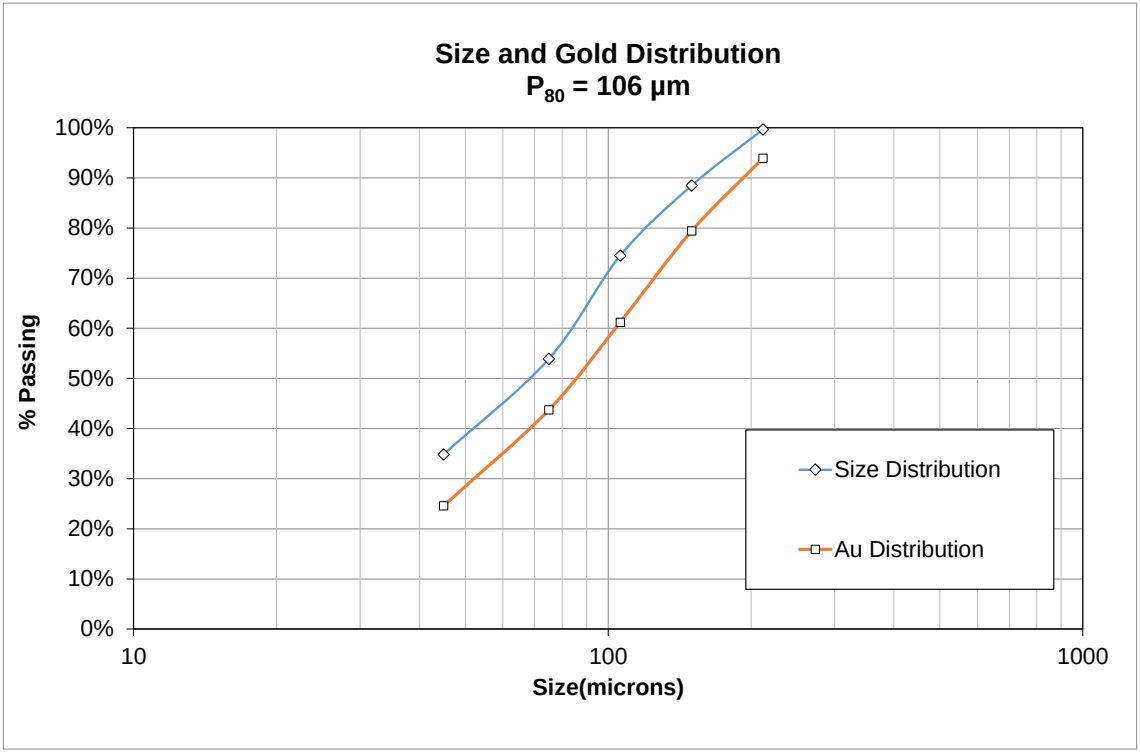

Figure 13 – Size Distribution and Gold Distribution by Fraction

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Table 14 – Gold Recovery by Fraction Related to Feed

Mesh Tyler	Size (µm)	Au Grade by Fraction (g/t)	Au Tailing by Fraction (g/t)	Au Recovered. by Fraction Au (%)	Au Recovery Related to the Feed	
					Au (%) Simple	Au (%) Accum
65#	212	86,62	0,14	99,8%	6,1%	6,1%
100#	150	5,87	0,13	97,8%	14,2%	20,2%
150#	106	5,91	0,13	97,8%	17,8%	38,1%
200#	75	3,85	0,10	97,4%	17,0%	55,1%
325#	45	4,56	0,07	98,5%	18,9%	73,9%
<325#	<45	3,20	0,05	98,4%	24,2%	**98,1%**
		4,54	0,08			

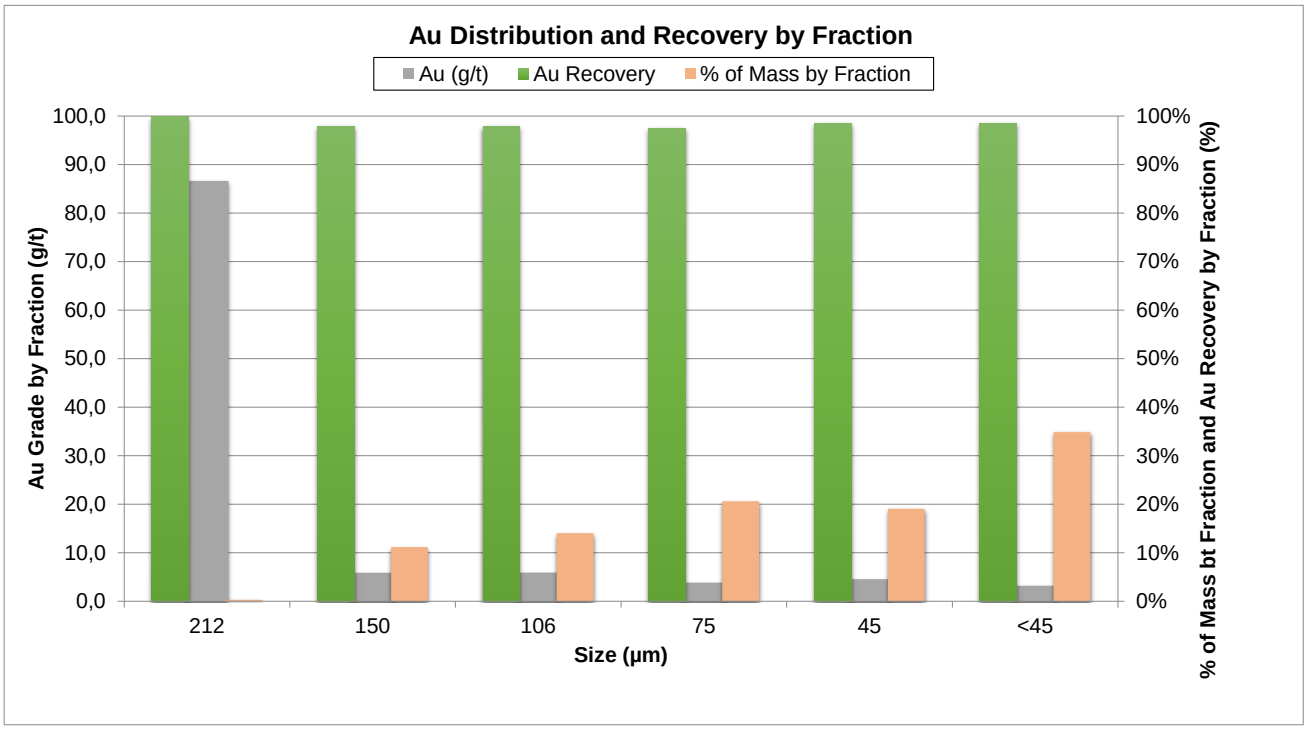

Figure 14 – Au Distribution and Recovery by fraction

The gold is basically free in all fraction but decreasing the size from 212 to <45 µm the gold grade in the tailings decrease from 0,14 to 0,05 g/t indicating that is possible maximize gold recovery when decreasing the P_{80}.

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5.4.3. Work Index Determination

Three kilos of sample, crushed to 3,2 mm, was sent to SGS Geosol for Bond Work Index determination. The Control Sheet is the APPENDIX 4.

The WI_{BOND} determined was 18,5 kWh/t.

6. Conclusions

- The analyzed head grade was 3.75 g/t and the average gold grade from the all tests were 3.55 g/t (not considering leaching tests LT2 and LT4).

- The gold recovery in the direct leaching of the whole ore were 93.5% for P_{80} = 106 µm and 97.3% for P_{80} = 75 µm.

- The gravity concentration shows very high gold recoveries with average of 78% for P_{80} = 106 µm and 85.4% for P_{80} = 75 µm.

- The gold recoveries on the gravity concentration tailing leaching were;

    - P_{80} = 106 µm - 87,8% (Tailing - 0,075 g/t) without activated carbon and 88,3% (Tailing - 0,075 g/t) with activated carbon.
    - P_{80} = 75 µm - 91,1% (Tailing - 0,04 g/t) without activated carbon and 87,3% (Tailing - 0,04 g/t) with activated carbon.
    - The total recovery (GC+Leaching) were:
        - (3,68 g/t – 0,075 g/t)/3,68 g/t = **97,9%** for ore milled P_{80}=106µm (considering the recalculated gravity feed)
        - (3,74 g/t – 0,04 g/t)/3,74 g/t = **98,9%** for ore milled P_{80}=75µm (considering the recalculated gravity feed)

- Flotation also gave very good recoveries showing 85,9% (P_{80}=106µm) with tailing grade of 0,12 g/t (average) and 84,5% (P_{80}=75µm) with tailing grade of 0,09 g/t (average)

- The total recovery (GC+Flotation) were:
    - (3,02 g/t – 0,12 g/t)/3,02 g/t = **96,0%** for ore milled P_{80}=106µm (considering the recalculated gravity feed)
    - (3,58 g/t – 0,09 g/t)/3,58 g/t = **97,4%** for ore milled P_{80}=75µm (considering the recalculated gravity feed)

- The flotation concentrate leaching shows an unexpected result with only 35% gold recovery. These results do not make sense since the direct leaching of the whole ore shows 98%. This test will be repeated.

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7. Recommendations

- Gravity concentration
  - Carry out new concentration tests:
    - With P_{80} = 2 mm, 150 µm (100 mesh) and 45 µm (325 mesh)
    - Proceed the GAT Testwork (Gravity Amenability Test for CVD application)
- Flotation – to maximize gold recovery, flotation looks to be the best way since is not necessary to leach the whole ore, saving cyanide and cyanide neutralization reagents and environment concerns. Still need to be done:
  - Reagents optimization tests
  - Variability tests with the best result
  - Flotation concentrate leaching with activated carbon. Cyanide consumption optimization avoiding ferrocyanide formation.

Walter de Moura
Metallurgist

Av. Presidente Kennedy, 1980
Silicóticos - Nova Lima – MG – Brasil – 34.004-214 - Tel: 55 31 3542-5579 / 3694-0248
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APPENDIX 1

Leaching Control Sheet

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 001
Sample	DIRECT LEACHING
Characteristics	P_{80} = 75 µm
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

DIRECT LEACHING - ORE MILLED TO P_{80} = 75 µm - WITHOUT ACTIVATED CARBON

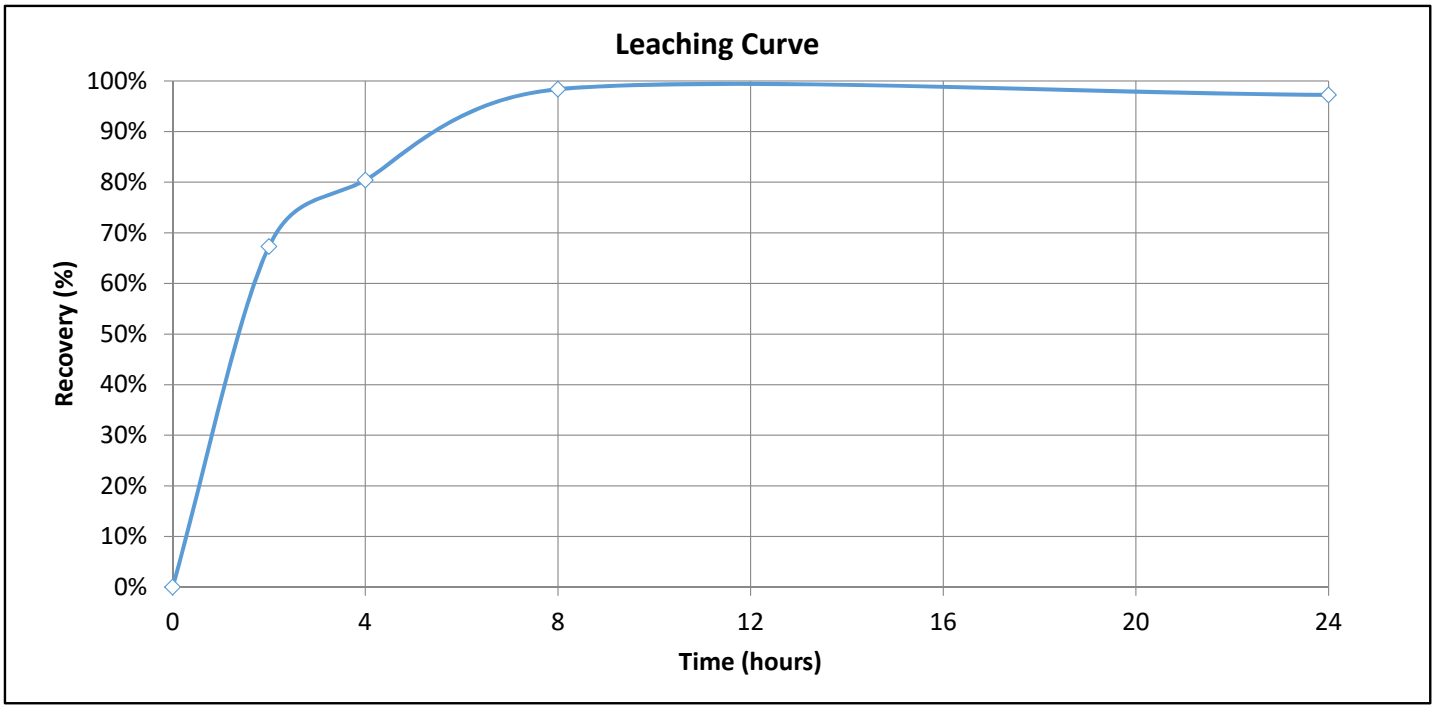
Time	Additions				Solution						Recovery (%)	
	Ore	Water	NaCN	Lime	Solution	pH	NaCN	Au	OD	eH	Au	
(hours)	(g)	(mL)	(g)	(g)	(mL)		(mg/L)	(mg/L)	(mg/L)	mV	Leaching	
0	1000	1000,0	1,00	0,41		11,35	1000				0,00%	
2		950,0	0,50		50	11,40	269	2,195	7,59	-71	67,29%	
4		900,0			50	11,05	721	2,645	7,47	-23	80,40%	
8		850,0			50	11,03	665	3,296	7,44	-19	98,36%	
24		750,0			100	10,67	636	3,253	7,52	-51	97,24%	

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	1000,0	0,09	90	2,76%
Solution (mL)	750,0	3,25	2439,75	74,80%
Sol. Sampling*			732,1	22,44%
(*) Au contained in sampled solutions during the test.				
Extration			3261,85	
Recovery				**97,24%**
Calculated Feed		3,26		
Analysed Feed				

OBS: **FERROCYANIDE FORMATION DURING TEST**

COMMENTS		
1. NaCN Addition	1500,00	(g/t)
2. NaCN effective consumption	1023,00	(g/t)
3. Hydrated lime consumption	0,41	(kg/t)
4. Water	Tap Water	
5. Initial weight of water	1000,0	(g)
6. P_{80}	75	µm
7. Solution Sampling	50	mL



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 002
Sample	DIRECT LEACHING
Characteristics	P_{80} = 75 µm
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

DIRECT LEACHING - ORE MILLED TO P_{80} = 75 µm - WITHOUT ACTIVATED CARBON

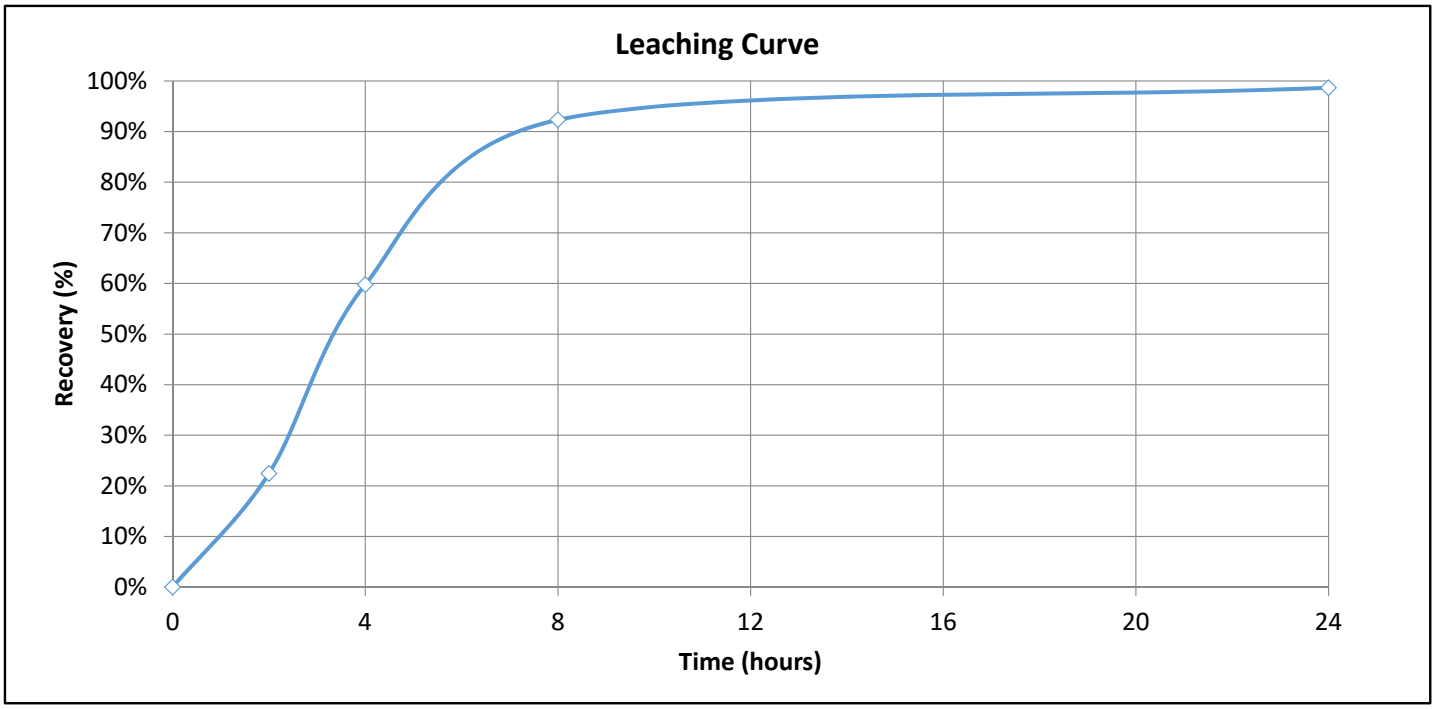
Time	Additions				Solution						Recovery (%)	
	Ore	Water	NaCN	Lime	Solution	pH	NaCN	Au	OD	eH	Au	
(hours)	(g)	(mL)	(g)	(g)	(mL)		(mg/L)	(mg/L)	(mg/L)	mV	Leaching	
0	1000	1000,0	1,00	0,47		11,45	1000				0,00%	
2		950,0	0,50		50	11,16	116	1,686	6,66	-97	22,46%	
4		900,0			50	11,05	580	4,634	7,42	-60	59,77%	
8		850,0			50	10,91	511	7,349	7,29	-28	92,32%	
24		750,0			100	10,66	510	7,910	7,56	-52	98,67%	

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	1000,0	0,1	100	1,33%
Solution (mL)	750,0	7,91	5932,5	79,03%
Sol. Sampling*			1474,45	19,64%
(*) Au contained in sampled solutions during the test.				
Extration			7506,95	
Recovery				**98,67%**
Calculated Feed		7,51		
Analysed Feed				

OBS: **FERROCYANIDE FORMATION DURING TEST**

COMMENTS		
1. NaCN Addition	1500,00	(g/t)
2. NaCN effective consumption	1117,50	(g/t)
3. Hydrated lime consumption	0,47	(kg/t)
4. Water	Tap Water	
5. Initial weight of water	1000,0	(g)
6. P_{80}	75	µm
7. Solution Sampling	50	mL



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 003
Sample	DIRECT LEACHING
Characteristics	P_{80} = 106 µm
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

DIRECT LEACHING - ORE MILLED TO P_{80} = 106 µm - WITHOUT ACTIVATED CARBON

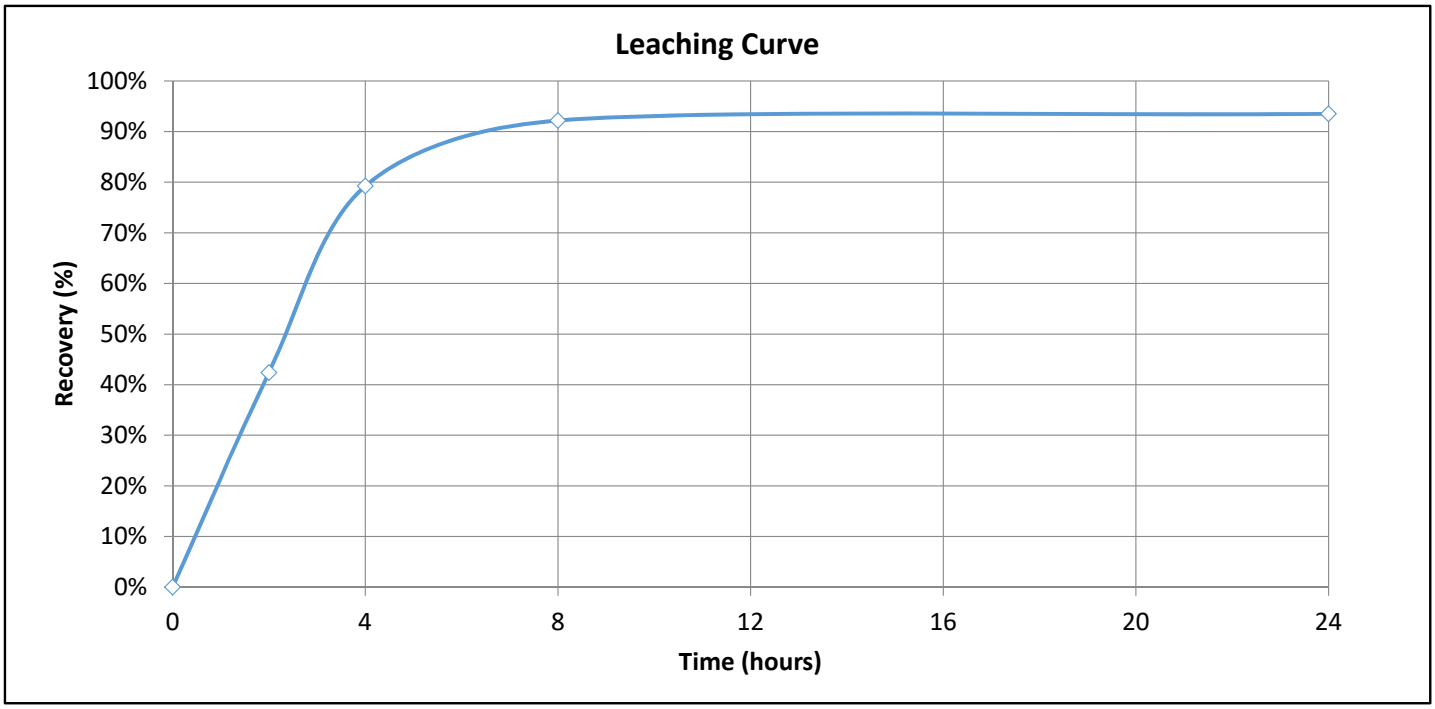
Time	Additions				Solution						Recovery (%)	
	Ore	Water	NaCN	Lime	Solution	pH	NaCN	Au	OD	eH	Au	
(hours)	(g)	(mL)	(g)	(g)	(mL)		(mg/L)	(mg/L)	(mg/L)	mV	Leaching	
0	1000	1000,0	1,00	0,47		11,40	1000				0,00%	
2		950,0	0,50		50	11,32	529	1,501	7,29	-62	42,39%	
4		900,0			50	11,05	979	2,875	7,31	-53	79,25%	
8		850,0			50	11,05	970	3,384	7,52	-19	92,18%	
24		750,0			100	10,68	867	3,439	7,67	-38	93,50%	

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	1000,0	0,23	230	6,50%
Solution (mL)	750,0	3,44	2579,25	72,84%
Sol. Sampling*			731,9	20,67%
(*) Au contained in sampled solutions during the test.				
Extration			3541,15	
Recovery				**93,50%**
Calculated Feed		3,54		
Analysed Feed				

OBS: **FERROCYANIDE FORMATION DURING TEST**

COMMENTS		
1. NaCN Addition	1500,00	(g/t)
2. NaCN effective consumption	849,75	(g/t)
3. Hydrated lime consumption	0,47	(kg/t)
4. Water	Tap water	
5. Initial weight of water	1000,0	(g)
6. P_{80}	106	µm
7. Solution Sampling	50	mL



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 004
Sample	DIRECT LEACHING
Characteristics	P_{80} = 106 µm
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

DIRECT LEACHING - ORE MILLED TO P_{80} = 106 µm - WITHOUT ACTIVATED CARBON

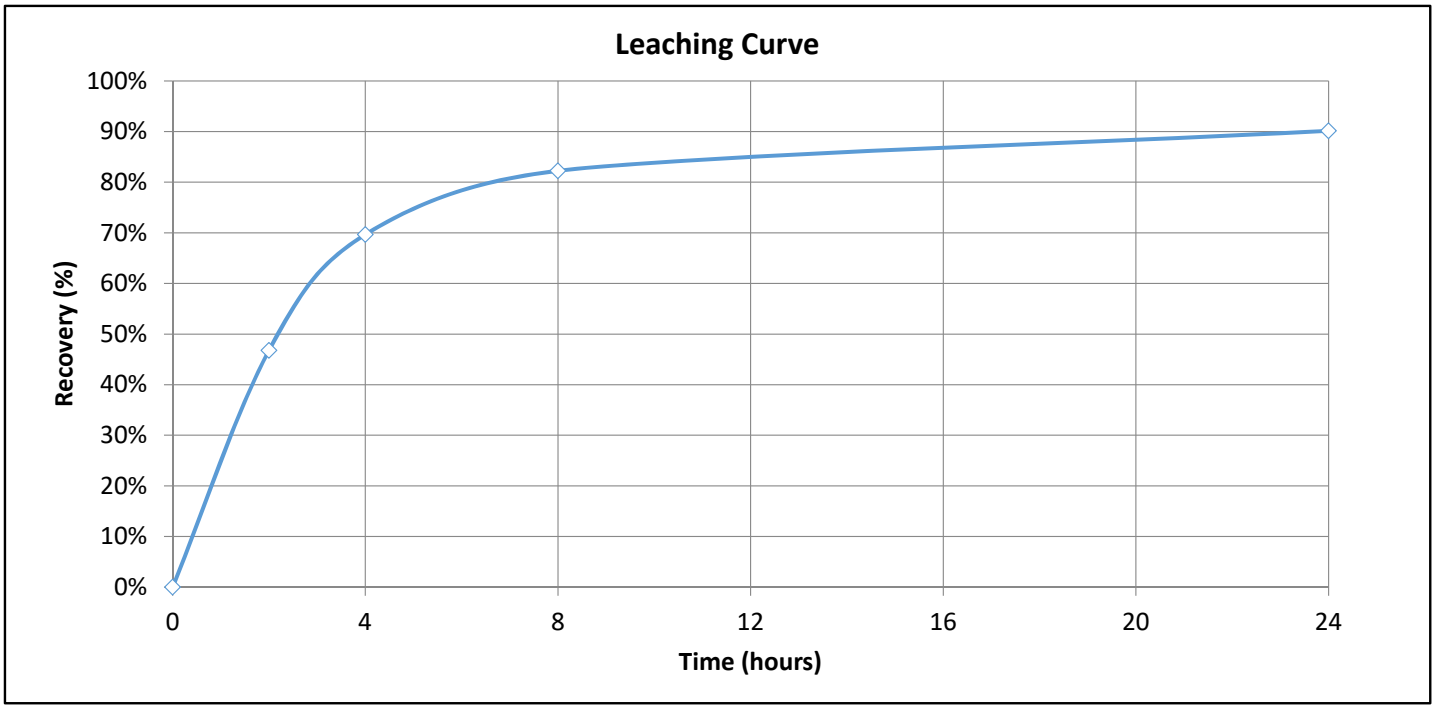
Time	Additions				Solution						Recovery (%)	
	Ore	Water	NaCN	Lime	Solution	pH	NaCN	Au	OD	eH	Au	
(hours)	(g)	(mL)	(g)	(g)	(mL)		(mg/L)	(mg/L)	(mg/L)	mV	Leaching	
0	1000	1000,0	1,00	0,44		11,21	1000				0,00%	
2		950,0	0,50		50	11,30	431	2,848	7,10	-56	46,76%	
4		900,0			50	11,06	920	4,316	7,38	-48	69,66%	
8		850,0			50	10,94	861	5,168	7,90	-22	82,25%	
24		750,0			100	10,78	830	5,734	7,91	-44	90,15%	

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	1000,0	0,6	600	9,85%
Solution (mL)	750,0	5,73	4300,5	70,61%
Sol. Sampling*			1190	19,54%
(*) Au contained in sampled solutions during the test.				
Extration			6090,5	
Recovery				**90,15%**
Calculated Feed		6,09		
Analysed Feed				

OBS: **FERROCYANIDE FORMATION DURING TEST**

COMMENTS		
1. NaCN Addition	1500,00	(g/t)
2. NaCN effective consumption	877,50	(g/t)
3. Hydrated lime consumption	0,44	(kg/t)
4. Water	Tap water	
5. Initial weight of water	1000,0	(g)
6. P_{80}	106	µm
7. Solution Sampling	50	mL



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT-005
Sample	CERRADO - CG1 - CT1
Characteristics	Gravity Concentration - P80 = 106 µm
	Gravity Concentrate Leaching - 24 Horas
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

AMC	Au (g/t)
SONA	

Test	Fluidization Water (L/min)	Gs
1	3,5	150

GRAVITY CONCENTRATE INTENSIVE LEACHING

Test	Additions						Final Test Information				
	Bottle (g)	Sample (g)	Water (mL)	Total Weight (g)	Initial pH	NaCN (mg/L)	Final Weight (g)	Solution (mL)	Final pH	NaCN (mg/L)	Au (mg/L)
1	514,75	72,43	320,6	907,75	11,57	10000	907,5	320,3	10,93	7796	38,181

Test	Recovery (%)			
	Au			
	Tailing Grade (g/t)	Solution (g/t)	Feed (g/t)	Au Recup. (%)
1		168,86	168,86	

kg/t conc.	kg/t Ore
9,75	0,18

NaCN Consumption

OBS: **FERROCYANIDE FORMATION DURING TEST**

GRAVITY CONCENTRATION DATA:

TEST CONDITION: Fluidization / G Force = 3,5 L/min / 150 Gs

SAMPLE WEIGHT (g): 4000 g

TEST 1	Weight (g)	Weight (kg)	% mass	Au		
				Au (g/t)	Au (mg)	% Recov.
Concentrate	72,43	0,07	1,81%	168,86	12,23	**83,19%**
Tailing	3927,6	3,93	98,2%	**0,63**	2,47	16,81%
Calculated Feed	4000,0	4,00		3,68	14,701	
Analysed Feed	4000,0	4,00				

OBS: The gravity concentration tailing grade is the average of the recalculated feed grade of the leaching tests LT10/11/12/13

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT-006
Sample	CERRADO - CG1 - CT2
Characteristics	Gravity Concentration - P80 = 106 µm
	Gravity Concentrate Leaching - 24 Horas
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

AMC	Au (g/t)
SONA	

Test	Fluidization Water (L/min)	Gs
1	3,5	150

GRAVITY CONCENTRATE INTENSIVE LEACHING

Test	Additions						Final Test Information				
	Bottle (g)	Sample (g)	Water (mL)	Total Weight (g)	Initial pH	NaCN (mg/L)	Final Weight (g)	Solution (mL)	Final pH	NaCN (mg/L)	Au (mg/L)
1	478,85	68,82	320,1	867,78	11,62	10000	869,6	322,0	11,86	8804	34,151

Test	Recovery (%)			
	Au			
	Tailing Grade (g/t)	Solution (g/t)	Feed (g/t)	Au Recup. (%)
1		159,77	159,77	

kg/t conc.	kg/t Ore
5,56	0,08

NaCN Consumption

OBS: **FERROCYANIDE FORMATION DURING TEST**

GRAVITY CONCENTRATION DATA:

TEST CONDITION: Fluidization / G Force = 3,5 L/min / 150 Gs

SAMPLE WEIGHT (g): 5000 g

TEST 1	Weight (g)	Weight (kg)	% mass	Au		
				Au (g/t)	Au (mg)	% Recov.
Concentrate	68,82	0,07	1,38%	159,77	11,00	**72,9%**
Tailing	4931,2	4,93	98,6%	**0,83**	4,09	27,13%
Calculated Feed	5000,0	5,00		3,02	15,088	
Analysed Feed	5000,0	5,00				

OBS: The gravity concentration tailing grade is the average of the recalculated feed grade of the flotation tests FT2/3/4/5/6

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT-007
Sample	SERRADO - CG1 - CT3
Characteristics	Gravity Concentration - P80 = 75 µm
	Gravity Concentrate Leaching - 24 Horas
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

AMC	Au (g/t)
SONA	

Test	Fluidization Water (L/min)	Gs
1	3,5	150

GRAVITY CONCENTRATE INTENSIVE LEACHING

Test	Additions						Final Test Information				
	Bottle (g)	Sample (g)	Water (mL)	Total Weight (g)	Initial pH	NaCN (mg/L)	Final Weight (g)	Solution (mL)	Final pH	NaCN (mg/L)	Au (mg/L)
1	474,37	68,44	320,6	863,39	11,52	10000	865,2	322,4	11,84	8242	39,768

Test	Recovery (%)			
	Au			
	Tailing Grade (g/t)	Solution (g/t)	Feed (g/t)	Au Recup. (%)
1		187,35	187,35	

kg/t conc.	kg/t Ore
8,23	0,14

NaCN Consumption

OBS: **FERROCYANIDE FORMATION DURING TEST**

GRAVITY CONCENTRATION DATA:

TEST CONDITION: Fluidization / G Force = 3,5 L/min / 150 Gs

SAMPLE WEIGHT (g): 4000 g

TEST 1	Weight (g)	Weight (kg)	% mass	Au		
				Au (g/t)	Au (mg)	% Recov.
Concentrate	68,44	0,07	1,71%	187,35	12,822	**85,6%**
Tailing	3931,6	3,93	98,3%	**0,55**	2,149	14,4%
Calculated Feed	4000,0	4,00		3,74	14,972	
Analysed Feed	4000,0	4,00				

OBS: The gravity concentration tailing grade is the average of the recalculated feed grade of the leaching tests LT14/15/16/17

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT-008
Sample	CERRADO - CG1 - CT4
Characteristics	Gravity Concentration - P80 = 75 µm
	Gravity Concentrate Leaching - 24 Horas
Water	NOVA LIMA WATER - MG - BRASIL
Date	27/03/2018

AMC	Au (g/t)
SONA	

Test	Fluidization Water (L/min)	Gs
1	3,5	150

GRAVITY CONCENTRATE INTENSIVE LEACHING

Test	Additions						Final Test Information				
	Bottle (g)	Sample (g)	Water (mL)	Total Weight (g)	Initial pH	NaCN (mg/L)	Final Weight (g)	Solution (mL)	Final pH	NaCN (mg/L)	Au (mg/L)
1	489,12	70,49	320,9	880,54	11,78	10000	882,5	322,9	12,00	8358	47,149

Test	Recovery (%)			
	Au			
	Tailing Grade (g/t)	Solution (g/t)	Feed (g/t)	Au Recup. (%)
1		215,97	215,97	

kg/t conc.	kg/t Ore
7,48	0,11

NaCN Consumption

OBS: **FERROCYANIDE FORMATION DURING TEST**

GRAVITY CONCENTRATION DATA:

TEST CONDITION: Fluidization / G Force = 3,5 L/min / 150 Gs

SAMPLE WEIGHT (g): 5000 g

TEST 1	Weight (g)	Weight (kg)	% mass	Au		
				Au (g/t)	Au (mg)	% Recov.
Concentrate	70,49	0,07	1,41%	215,97	15,223	**85,1%**
Tailing	4929,5	4,93	98,6%	**0,54**	2,662	14,88%
Calculated Feed	5000,0	5,00		3,58	17,885	
Analysed Feed	5000,0	5,00				

OBS: The gravity concentration tailing grade is the average of the recalculated feed grade of the flotation tests FT7/8/9/10/11

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 010
Sample	CERRADO - RG1 - CT1
Characteristics	P_{80} = 106 µm
	GRAVITY CONCENTRATION TAILING LEACHING
Water	NOVA LIMA WATER - MG - BRASIL
Date	02/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 106 µm - WITHOUT ACTIVATED CARBON

Time	Additions				Solution						Au Recovery (%)	
(hours)	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	Au (mg/L)	OD (mg/L)	eH mV	In the Leaching	
0	1000,0	1000,0	1,5	0,51		11,20	1500	0,00			0,00%	
2		950,0			50	11,26	857	0,409	7,40	-35	68,18%	
4		900,0			50	10,74	809	0,466	7,33	-16	77,20%	
8		850,0			50	11,04	803	0,492	7,37	-41	81,11%	
24		750,0			100	10,54	748	0,543	7,66	16	88,33%	

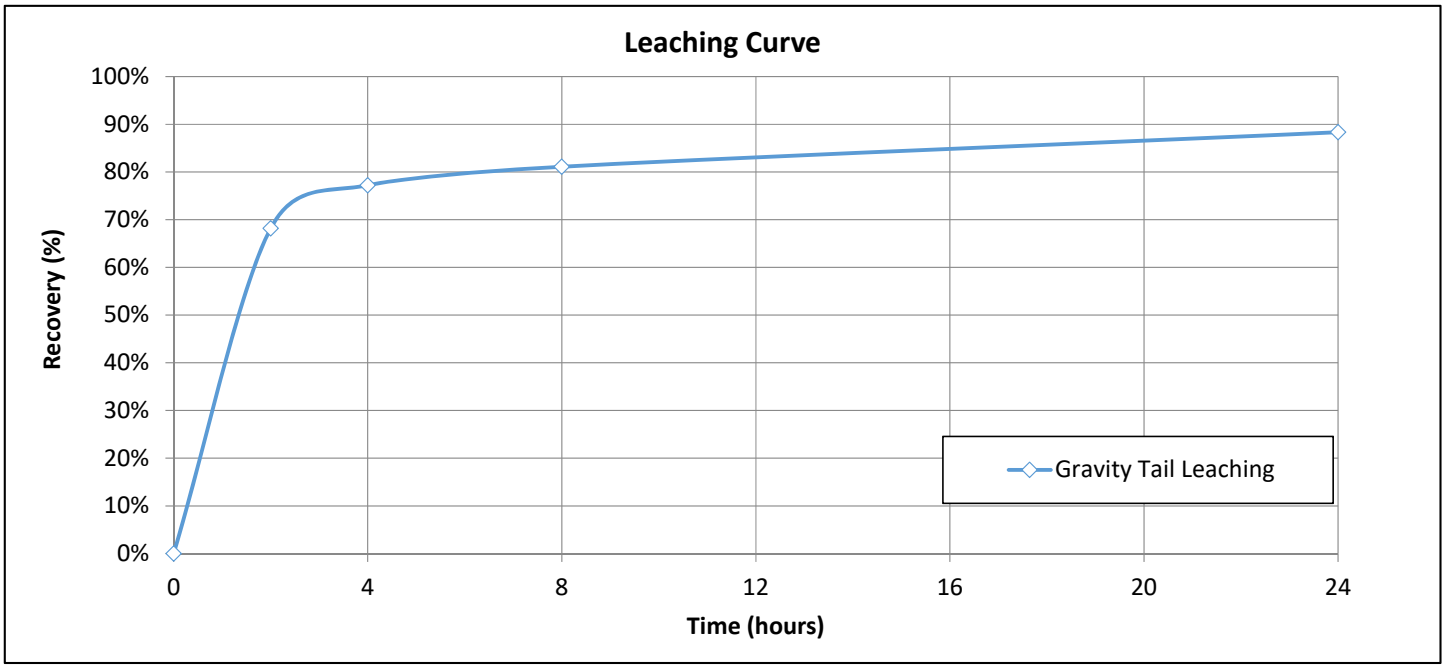
GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	1000,0	0,07	70	11,67%
Solution (mL)	750,0	0,54	407,25	67,89%
Sol. Sampling*			122,65	20,45%
Gravity Concentration				
(*) Au contained in sampled solutions during the test.				
Extration			599,90	
Recovery				**88,33%**
Calculated Grav. Tail		0,60		

COMMENTS

1. NaCN Addition	1500,00	(g/t)
2. NaCN effective consumption	939,00	(g/t)
3. Hydrated lime consumption	0,51	(kg/t)
4. Water	Tap water	
5. Initial weight of water	1000,0	(g)
6. P_{80}	106	µm
7. Solution Sampling	50	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 011
Sample	CERRADO - RG1 - CT1
Characteristics	P_{80} = 106 µm
	GRAVITY CONCENTRATION TAILING LEACHING
Water	NOVA LIMA WATER - MG - BRASIL
Date	02/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 106 µm - WITHOUT ACTIVATED CARBON

Time	Additions				Solution						Au Recovery (%)	
(hours)	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	Au (mg/L)	OD (mg/L)	eH mV	In the Leaching	
0	1000,0	1000,0	1,5	0,5		11,27	1500	0,00			0,00%	
2		950,0			50	11,39	832	0,443	7,26	-50	70,16%	
4		900,0			50	10,78	785	0,484	7,26	-41	76,33%	
8		850,0			50	11,19	774	0,530	7,19	-54	82,89%	
24		750,0			100	10,56	716	0,563	7,52	-35	87,33%	

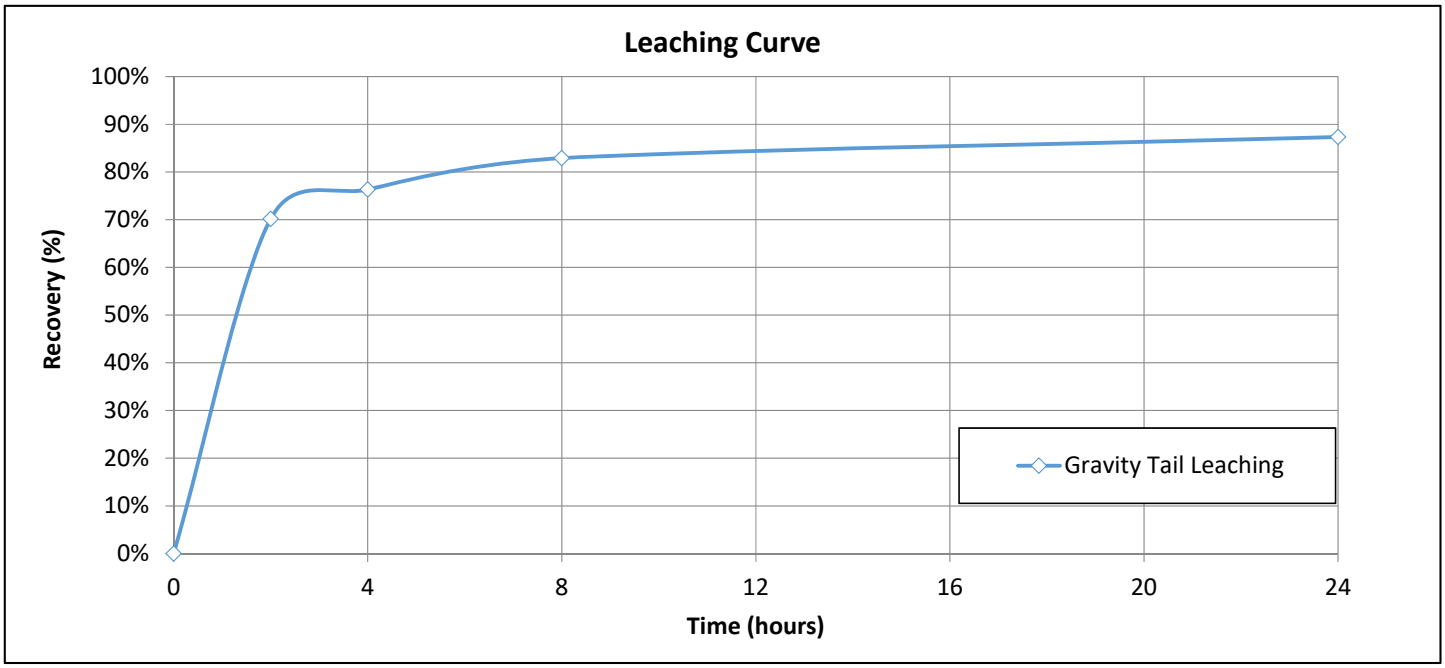
GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	1000,0	0,08	80	12,67%
Solution (mL)	750,0	0,56	422,25	66,88%
Sol. Sampling*			129,15	20,45%
Gravity Concentration				
(*) Au contained in sampled solutions during the test.				
Extration			631,40	
Recovery				**87,33%**
Calculated Grav. Tail		0,63		

COMMENTS

1. NaCN Addition	1500,00 (g/t)
2. NaCN effective consumption	963,00 (g/t)
3. Hydrated lime consumption	0,50 (kg/t)
4. Water	Tap water
5. Initial weight of water	1000,0 (g)
6. P_{80}	106 µm
7. Solution Sampling	50 mL

OBS: FERROCYANIDE FORMATION DURING TEST



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 012
Sample	CERRADO - RG1 - CT1
Characteristics	P_{80} = 106 µm
	GRAVITY TAILING LEACHING - WITH ACTIVATED CARBON
Water	NOVA LIMA WATER - MG - BRASIL
Date	02/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 106 µm - WITH ACTIVATED CARBON

Time (hours)	Additions				Solution						Tailing	Carbon			Recovery (%)
	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	OD (mg/L)	Eh mV	Au (mg/L)	Au (g/t)	Weight (g)	Au (g/tc)	Au (g/t ore)	Au
0	1000	1000	1,5	0,60		11,20	1500			0,00					
24					1000,0	10,68	634	7,96	-46	0,015	0,08	24,73	23,6	0,584	88,21%

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass (µg)	Distrib. (%)
Solids (g)	1000,0	0,08	80	11,79%
Solution (mL)	1000,0	0,015	15,0	2,21%
Carbon (g/tc)	24,73	23,60	583,6	86,00%
Conc Grav.				
Extration			678,63	
Recovery				**88,21%**
Calculated Grav. Tail		0,68		

COMMENTS		
1. NaCN Addition	1500,00	(g/t)
2. NaCN effective consumption	866,00	(g/t)
3. Hydrated lime consumption	0,60	(kg/t)
4. Water	Tap water	
5. Initial weight of water	1000	(g)
6. P_{80}	106	µm
7. Solution Sampling	100	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 013
Sample	CERRADO - RG1 - CT1
Characteristics	P_{80} = 106 µm
	GRAVITY TAILING LEACHING - WITH ACTIVATED CARBON
Water	NOVA LIMA WATER - MG - BRASIL
Date	02/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 106 µm - WITH ACTIVATED CARBON

Time (hours)	Additions				Solution						Tailing	Carbon			Recovery (%)
	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	OD (mg/L)	Eh mV	Au (mg/L)	Au (g/t)	Weight (g)	Au (g/tc)	Au (g/t ore)	Au
0	1000	1000	1,5	0,71		11,29	1500			0,00					
24					1000,0	10,63	667	7,80	-45	<0,01	0,07	24,72	21,3	0,527	88,46%

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	1000,0	0,07	70	11,54%
Solution (mL)	1000,0	0,01	10,0	1,65%
Carbon (g/tc)	24,72	21,30	526,5	86,81%
Conc Grav.				
Extration			606,54	
Recovery				**88,46%**
Calculated Grav. Tail		0,61		

COMMENTS		
1. NaCN Addition	1500,00	(g/t)
2. NaCN effective consumption	833,00	(g/t)
3. Hydrated lime consumption	0,71	(kg/t)
4. Water	Tap water	
5. Initial weight of water	1000	(g)
6. P_{80}	106	µm
7. Solution Sampling	100	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 014
Sample	CERRADO - RG1 - CT3
Characteristics	P_{80} = 75 µm
	GRAVITY CONCENTRATION TAILING LEACHING
Water	NOVA LIMA WATER - MG - BRASIL
Date	03/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 75 µm - WITHOUT ACTIVATED CARBON

Time	Additions				Solution						Au Recovery (%)	
(hours)	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	Au (mg/L)	OD (mg/L)	eH mV	In the Leaching	
0	930,0	985,0	1,5	0,33		11,19	1523	0,00			0,00%	
2		935,0			50	11,32	522	0,346	7,36	-80	82,80%	
4		885,0			50	11,02	502	0,39	7,21	-37	92,80%	
8		835,0			50	10,96	468	0,406	7,74	-34	96,24%	
24		735,0			100	10,52	463	0,38	7,60	31	90,96%	

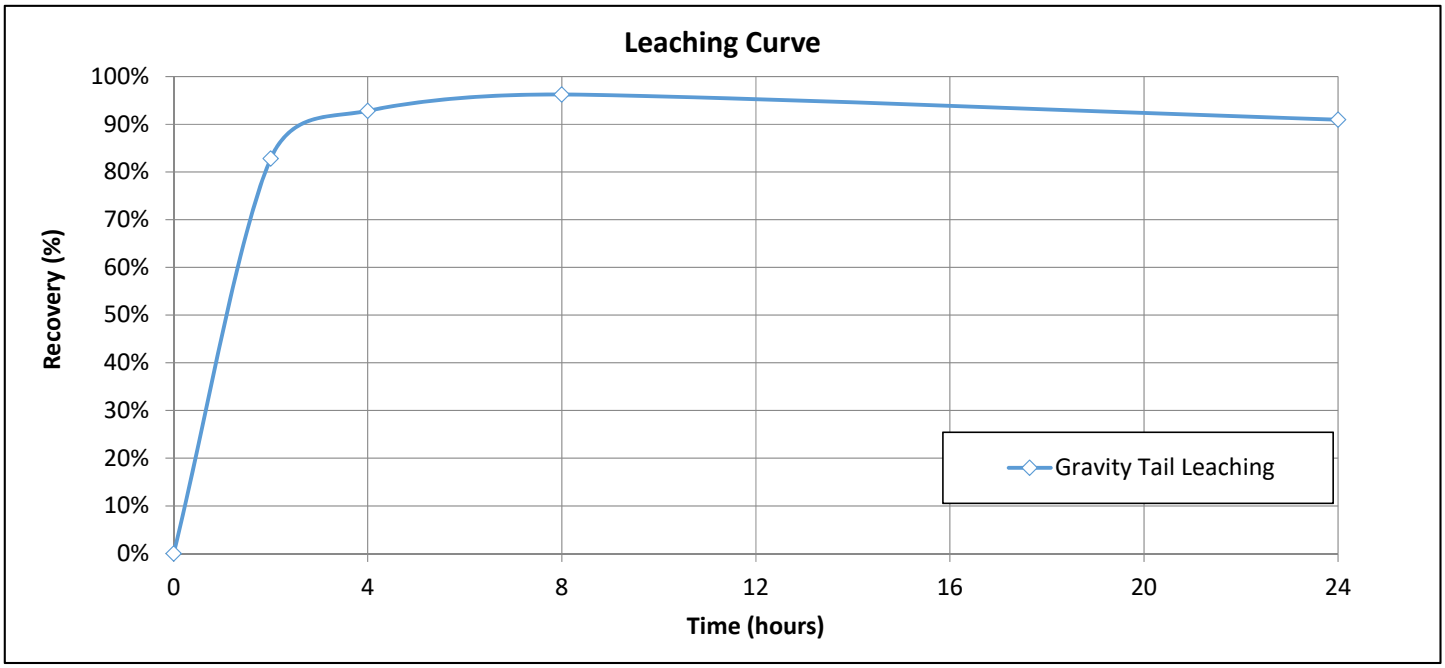
GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	930,0	0,04	37,2	9,04%
Solution (mL)	735,0	0,38	279,3	67,86%
Sol. Sampling*			95,1	23,10%
Gravity Concentration				
(*) Au contained in sampled solutions during the test.				
Extration			411,60	
Recovery				**90,96%**
Calculated Grav. Tail		0,44		

COMMENTS

1. NaCN Addition	1612,90	(g/t)
2. NaCN effective consumption	1246,98	(g/t)
3. Hydrated lime consumption	0,35	(kg/t)
4. Water	Tap water	
5. Initial weight of water	985,0	(g)
6. P_{80}	75	µm
7. Solution Sampling	50	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 015
Sample	CERRADO - RG1 - CT3
Characteristics	P_{80} = 75 µm
	GRAVITY CONCENTRATION TAILING LEACHING
Water	NOVA LIMA WATER - MG - BRASIL
Date	03/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 75 µm - WITHOUT ACTIVATED CARBON

Time	Additions				Solution						Au Recovery (%)	
(hours)	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	Au (mg/L)	OD (mg/L)	eH mV	In the Leaching	
0	940,0	965,0	1,5	0,29		11,15	1554	0,00			0,00%	
2		915,0			50	11,36	483	0,345	7,27	-89	77,00%	
4		865,0			50	11,06	477	0,402	7,25	-60	89,06%	
8		815,0			50	10,95	454	0,417	7,63	-23	92,06%	
24		715,0			100	10,46	427	0,413	7,65	2	91,30%	

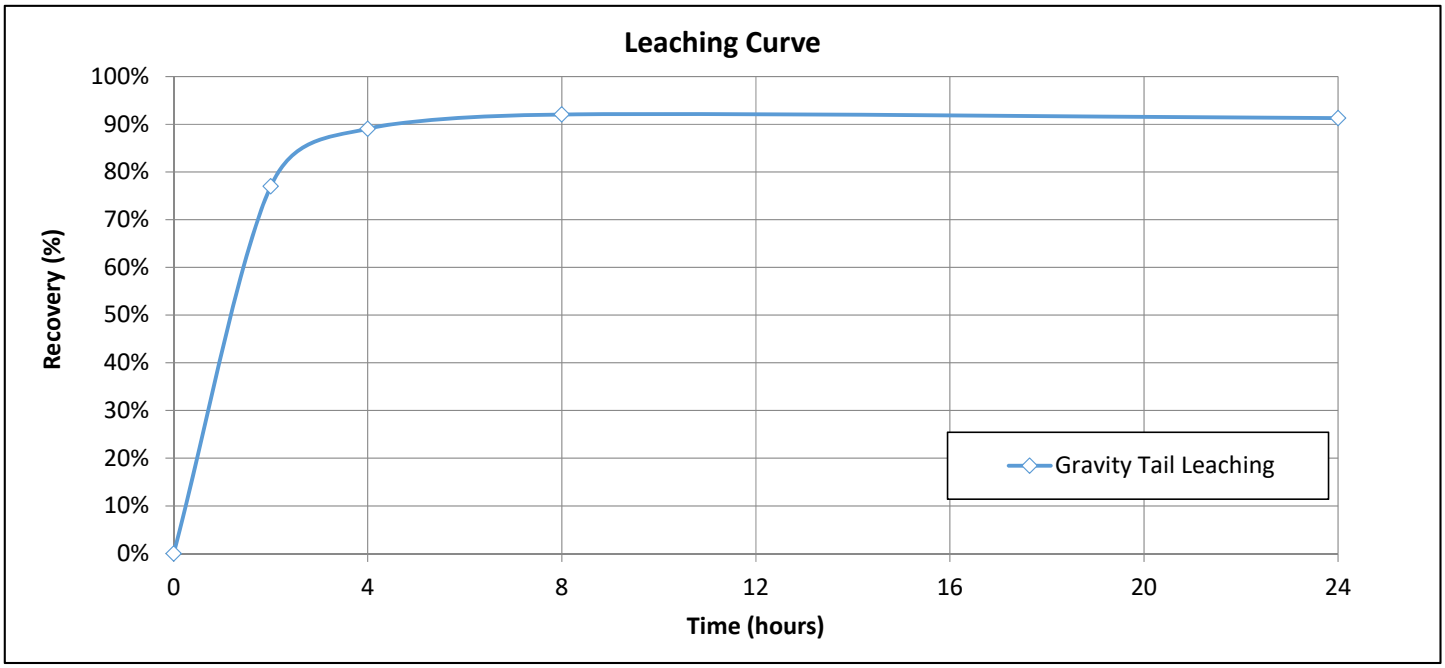
GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	940,0	0,04	37,6	8,70%
Solution (mL)	715,0	0,41	295,295	68,29%
Sol. Sampling*			99,5	23,01%
Gravity Concentration				
(*) Au contained in sampled solutions during the test.				
Extration			432,40	
Recovery				**91,30%**
Calculated Grav. Tail		0,46		

COMMENTS

1. NaCN Addition	1595,74	(g/t)
2. NaCN effective consumption	1270,95	(g/t)
3. Hydrated lime consumption	0,31	(kg/t)
4. Water	Tap water	
5. Initial weight of water	965,0	(g)
6. P_{80}	75	µm
7. Solution Sampling	50	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**



TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 016
Sample	CERRADO - RG1 - CT3
Characteristics	P_{80} = 75 µm
	GRAVITY TAILING LEACHING - WITH ACTIVATED CARBON
Water	NOVA LIMA WATER - MG - BRASIL
Date	03/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 75 µm - WITH ACTIVATED CARBON

Time (hours)	Additions				Solution						Tailing	Carbon			Recovery (%)
	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	OD (mg/L)	Eh mV	Au (mg/L)	Au (g/t)	Weight (g)	Au (g/tc)	Au (g/t ore)	Au
0	940	970	1,5	0,48		11,14	1546			0,00					
24					970,0	10,26	316	7,58	-15	<0,01	0,07	24,72	16,2	0,426	86,18%

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	940,0	0,07	65,8	13,82%
Solution (mL)	970,0	0,010	9,7	2,04%
Carbon (g/tc)	24,72	16,20	400,5	84,14%
Conc Grav.				
Extration			475,96	
Recovery				**86,18%**
Calculated Grav. Tail		0,51		

COMMENTS		
1. NaCN Addition	1595,74	(g/t)
2. NaCN effective consumption	1269,66	(g/t)
3. Hydrated lime consumption	0,51	(kg/t)
4. Water	Tap water	
5. Initial weight of water	970	(g)
6. P_{80}	75	µm
7. Solution Sampling	100	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 017
Sample	CERRADO - RG1 - CT3
Characteristics	P_{80} = 75 µm
	GRAVITY TAILING LEACHING - WITH ACTIVATED CARBON
Water	NOVA LIMA WATER - MG - BRASIL
Date	03/04/2018

GRAVITY TAILING LEACHING - ORE MILLED TO P_{80} = 75 µm - WITH ACTIVATED CARBON

Time (hours)	Additions				Solution						Tailing	Carbon			Recovery (%)
	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	OD (mg/L)	Eh mV	Au (mg/L)	Au (g/t)	Weight (g)	Au (g/tc)	Au (g/t ore)	Au
0	940	930	1,5	0,54		11,22	1613			0,00					
24					930,0	10,30	318	7,63	-17	<0,01	0,09	24,70	25,8	0,678	88,43%

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	940,0	0,09	84,6	11,57%
Solution (mL)	930,0	0,010	9,3	1,27%
Carbon (g/tc)	24,70	25,80	637,3	87,16%
Conc Grav.				
Extration			731,16	
Recovery				**88,43%**
Calculated Grav. Tail		0,78		

COMMENTS		
1. NaCN Addition	1595,74	(g/t)
2. NaCN effective consumption	1281,13	(g/t)
3. Hydrated lime consumption	0,57	(kg/t)
4. Water	Tap water	
5. Initial weight of water	930	(g)
6. P_{80}	75	µm
7. Solution Sampling	100	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRA ALTA
Customer	CERRADO GOLD
Test Number	LT - 018
Sample	CERRADO - CF1 - FT1
Characteristics	P_{80} = 75 µm
	FLOTATION CONCENTRATE LEACHING
Water	NOVA LIMA WATER- MG - BRASIL
Date	03/04/2018

FLOTATION CONCENTRATE LEACHING - ORE MILLED TO P_{80} = 75 µm - WITHOUT ACTIVATED CARBON

Time	Additions				Solution						Gold Recovery
(hours)	Ore (g)	Water (mL)	NaCN (g)	Lime (g)	Solution (mL)	pH	NaCN (mg/L)	Au (mg/L)	OD (mg/L)	eH mV	(%)
0	163,3	357,4	0,64	0,89		11,33	1791	0,00			
24					357,4	10,64	109	8,495	6,92	-57	35,80%

GOLD RECOVERY CALCULATION

Product	Quant.	Gold		
		Grade (ppm)	Mass Au (µg)	Distrib. (%)
Solids (g)	163,3	33,35	5445,39	64,20%
Solution (mL)	357,4	8,50	3035,94	35,80%
Extration			8481,33	
Recovery				**35,80%**
Calculated Feed		51,94		
Analysed Feed				

COMMENTS

1. NaCN Addition	3919,65	(g/t)
2. NaCN effective consumption	3681,07	(g/t)
3. Hydrated lime consumption	5,45	(kg/t)
4. Water	Tap water	
5. Initial weight of water	357,4	(g)
6. P_{80}	75	µm
7. Solution Sampling	100	mL

OBS: **FERROCYANIDE FORMATION DURING TEST**

APPENDIX 2

Flotation Control Sheet

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	CERRADO - RG1 - CT2			
Test n°	2			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	106	µm
	FLOTATION	P_{80} =	106	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	C5460 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	150				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	15,18	1,6%		40,2	76,18%	4
C2	8,23	0,9%		4,73	4,86%	4
C3	5,87	0,6%		2,43	1,78%	4
C4	6,51	0,7%		1,95	1,58%	4
C5	4,35	0,5%		1,68	0,91%	4
Tailing	905,00	95,8%		0,13	14,69%	
Total Mass	945,14					
Calculated Gravity Tail				0,85		
Analysed Feed						
Accumulated Data						
		0			0,0%	0
C1	15,18	1,6%		40,20	76,2%	4
C2	23,41	2,5%		27,73	81,0%	8
C3	29,28	3,1%		22,66	82,8%	12
C4	35,79	3,8%		18,89	84,4%	16
C5	40,14	4,2%		17,03	85,3%	20
Tailing	945,14	100%		0,13	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT2			
Test n°	3			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	106	µm
	FLOTATION	P_{80} =	106	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	C5460 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	-				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	14,01	1,5%		47,82	80,03%	4
C2	8,96	1,0%		4,61	4,93%	4
C3	8,1	0,9%		2,16	2,09%	4
C4	5,68	0,6%		1,76	1,19%	4
C5	5,93	0,6%		1,41	1,00%	4
Tailing	900,00	95,5%		0,10	10,75%	
Total Mass	942,68					
Calculated Gravity Tail				0,89		
Analysed Feed						

Accumulated Data

		0			0,0%	0
C1	14,01	1,5%		47,82	80,0%	4
C2	22,97	2,4%		30,96	85,0%	8
C3	31,07	3,3%		23,46	87,1%	12
C4	36,75	3,9%		20,10	88,3%	16
C5	42,68	4,5%		17,51	89,2%	20
Tailing	942,68	100%		0,10	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT2			
Test n°	4			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	106	µm
	FLOTATION	P_{80} =	106	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	C5460 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	150				
C1	1		100	-	40	4
C2	1		20	-		4
C3	1		20	-		4
C4	1		20	-		4
C5	1		20	-		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	12,39	1,3%		43,61	74,18%	4
C2	8,68	0,9%		5,2	6,20%	4
C3	8,9	0,9%		2,05	2,50%	4
C4	9,35	1,0%		1,66	2,13%	4
C5	11,66	1,2%		0,97	1,55%	4
Tailing	890,00	94,6%		0,11	13,44%	
Total Mass	940,98					
Calculated Gravity Tail				0,77		
Analysed Feed						

Accumulated Data

		0			0,0%	0
C1	12,39	1,3%		43,61	74,2%	4
C2	21,07	2,2%		27,79	80,4%	8
C3	29,97	3,2%		20,14	82,9%	12
C4	39,32	4,2%		15,75	85,0%	16
C5	50,98	5,4%		12,37	86,6%	20
Tailing	940,98	100%		0,11	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT2			
Test n°	5			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	106	µm
	FLOTATION	P_{80} =	106	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	A208 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	150				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	11,91	1,3%		46,16	75,54%	4
C2	6,56	0,7%		5,67	5,11%	4
C3	6,47	0,7%		3,54	3,15%	4
C4	4,55	0,5%		2,43	1,52%	4
C5	5,31	0,6%		1,68	1,23%	4
Tailing	890,00	96,2%		0,11	13,45%	
Total Mass	924,8					
Calculated Gravity Tail				0,79		
Analysed Feed						

Accumulated Data

		0			0,0%	0
C1	11,91	1,3%		46,16	75,5%	4
C2	18,47	2,0%		31,78	80,7%	8
C3	24,94	2,7%		24,45	83,8%	12
C4	29,49	3,2%		21,06	85,3%	16
C5	34,8	3,8%		18,10	86,5%	20
Tailing	924,8	100%		0,11	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT2			
Test n°	6			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	106	µm
	FLOTATION	P_{80} =	106	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	A208 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	-				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	13,13	1,4%		42,96	71,92%	4
C2	7,18	0,8%		4,91	4,49%	4
C3	6,86	0,7%		2,87	2,51%	4
C4	6,89	0,7%		1,57	1,38%	4
C5	6,91	0,7%		1,75	1,54%	4
Tailing	890,00	95,6%		0,16	18,16%	
Total Mass	930,97					
Calculated Gravity Tail				0,84		
Analysed Feed						

Accumulated Data

		0			0,0%	0
C1	13,13	1,4%		42,96	71,9%	4
C2	20,31	2,2%		29,51	76,4%	8
C3	27,17	2,9%		22,78	78,9%	12
C4	34,06	3,7%		18,49	80,3%	16
C5	40,97	4,4%		15,67	81,8%	20
Tailing	930,97	100%		0,16	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT4			
Test n°	7			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	75	µm
	FLOTATION	P_{80} =	75	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	C5460 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	150				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	18,85	2,0%		18,87	66,79%	4
C2	10,11	1,1%		4,01	7,61%	4
C3	12,92	1,4%		4,05	9,83%	4
C4	6,03	0,6%		1,19	1,35%	4
C5	5,84	0,6%		1,03	1,13%	4
Tailing	885,00	94,3%		0,08	13,29%	
Total Mass	938,75					
Calculated Gravity Tail				0,57		
Analysed Feed						

Accumulated Data

		0			0,0%	0
C1	18,85	2,0%		18,87	66,8%	4
C2	28,96	3,1%		13,68	74,4%	8
C3	41,88	4,5%		10,71	84,2%	12
C4	47,91	5,1%		9,51	85,6%	16
C5	53,75	5,7%		8,59	86,7%	20
Tailing	938,75	100%		0,08	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT4			
Test n°	8			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	75	µm
	FLOTATION	P_{80} =	75	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	C5460 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	-				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	24,43	2,6%		14,24	73,47%	4
C2	8,79	0,9%		3,51	6,52%	4
C3	7,39	0,8%		2,41	3,76%	4
C4	6,69	0,7%		1,37	1,94%	4
C5	6,36	0,7%		0,81	1,09%	4
Tailing	895,00	94,3%		0,07	13,23%	
Total Mass	948,66					
Calculated Gravity Tail				0,50		
Analysed Feed						

Accumulated Data

		0			0,0%	0
C1	24,43	2,6%		14,24	73,5%	4
C2	33,22	3,5%		11,40	80,0%	8
C3	40,61	4,3%		9,76	83,7%	12
C4	47,3	5,0%		8,58	85,7%	16
C5	53,66	5,7%		7,66	86,8%	20
Tailing	948,66	100%		0,07	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT4			
Test n°	9			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	75	µm
	FLOTATION	P_{80} =	75	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	C5460 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	150				
C1	1		100	-	40	4
C2	1		20	-		4
C3	1		20	-		4
C4	1		20	-		4
C5	1		20	-		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	13,79	1,5%		21,91	63,02%	4
C2	9,55	1,0%		4,35	8,67%	4
C3	10,6	1,1%		1,99	4,40%	4
C4	14,78	1,6%		1,12	3,45%	4
C5	10,7	1,1%		0,99	2,21%	4
Tailing	875,00	93,6%		0,1	18,25%	
Total Mass	934,42					
Calculated Gravity Tail				0,51		
Analysed Feed						
Accumulated Data						
		0			0,0%	0
C1	13,79	1,5%		21,91	63,0%	4
C2	23,34	2,5%		14,72	71,7%	8
C3	33,94	3,6%		10,75	76,1%	12
C4	48,72	5,2%		7,83	79,5%	16
C5	59,42	6,4%		6,60	81,7%	20
Tailing	934,42	100%		0,10	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	SERRADO - RG1 - CT4			
Test n°	10			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	75	µm
	FLOTATION	P_{80} =	75	µm
% Solids	33			

REAGENTS

Operation	Condicion. (min)	CuSO4 (g/t)	A208 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	150				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

RESULTS

Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	20,25	2,1%		16,74	71,40%	4
C2	11,47	1,2%		2,88	6,96%	4
C3	7,99	0,8%		1,93	3,25%	4
C4	7,79	0,8%		1,23	2,02%	4
C5	9,65	1,0%		0,72	1,46%	4
Tailing	885,00	93,9%		0,08	14,91%	
Total Mass	942,15					
Calculated Gravity Tail				0,50		
Analysed Feed						

Accumulated Data

		0			0,0%	0
C1	20,25	2,1%		16,74	71,4%	4
C2	31,72	3,4%		11,73	78,4%	8
C3	39,71	4,2%		9,76	81,6%	12
C4	47,5	5,0%		8,36	83,6%	16
C5	57,15	6,1%		7,07	85,1%	20
Tailing	942,15	100%		0,08	100,0%	

CONTROL SHEET - FLOTATION TEST

Project	SERRA ALTA			
Customer	CERRADO GOLD			
Sample	CERRADO - RG1 - CT4			
Test n°	11			
Water	NOVA LIMA WATER - MG - BRAZIL			
P_{80}	GRATIVY CONCENTRATION TAIL	P_{80} =	75	µm
	FLOTATION	P_{80} =	75	µm
% Solids	33			

REAGENTS

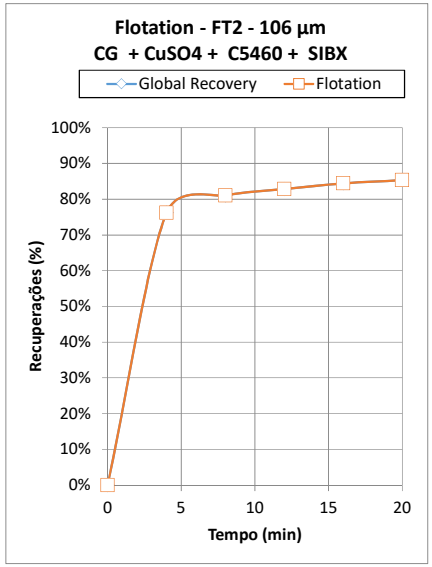
Operation	Condicion. (min)	CuSO4 (g/t)	A208 (g/t)	SIBX (3430) (g/t)	MBCOL (g/t)	Flotation (min)
Conditioning	5	-				
C1	1		100	100	40	4
C2	1		20	20		4
C3	1		20	20		4
C4	1		20	20		4
C5	1		20	20		4

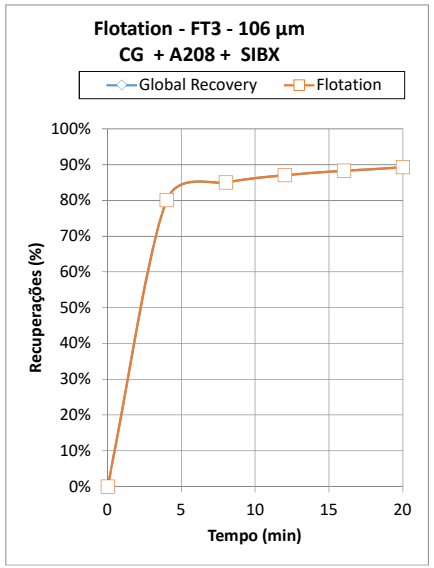
RESULTS

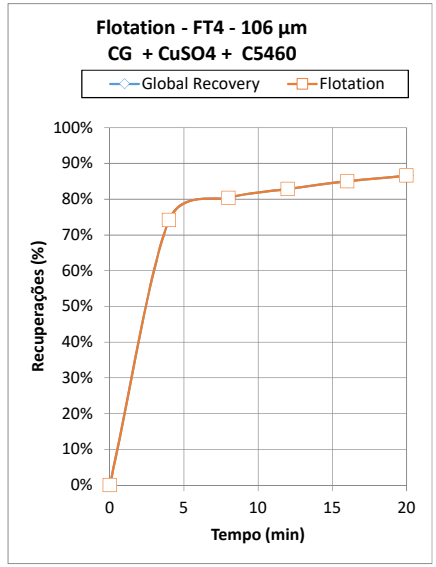
Products	Weight		Gold			Time
	(g)	(%)	(µg)	(g/t)	Recov. (%)	(min)
C1	18,51	2,0%		20,66	64,92%	4
C2	13,39	1,4%		2,35	5,34%	4
C3	10,65	1,1%		2,02	3,65%	4
C4	10,7	1,1%		1,65	3,00%	4
C5	7,69	0,8%		3,96	5,17%	4
Tailing	880,00	93,5%		0,12	17,93%	
Total Mass	940,94					
Calculated Gravity Tail				0,63		
Analysed Feed						

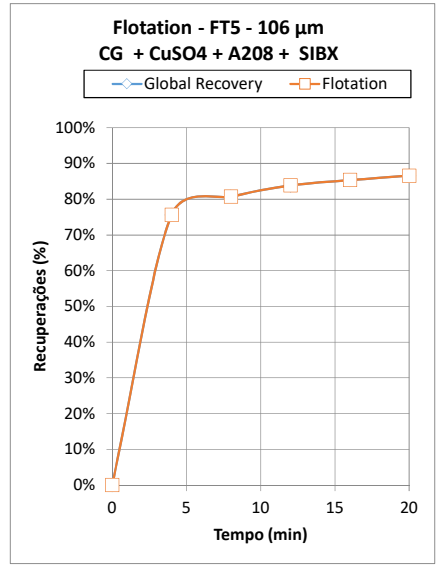
Accumulated Data

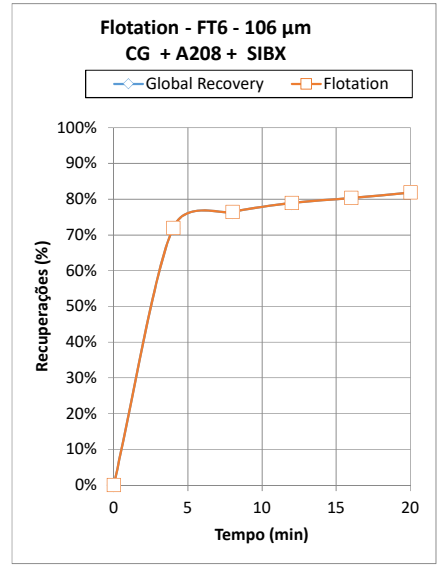
		0			0,0%	0
C1	18,51	2,0%		20,66	64,9%	4
C2	31,9	3,4%		12,97	70,3%	8
C3	42,55	4,5%		10,23	73,9%	12
C4	53,25	5,7%		8,51	76,9%	16
C5	60,94	6,5%		7,93	82,1%	20
Tailing	940,94	100%		0,12	100,0%	

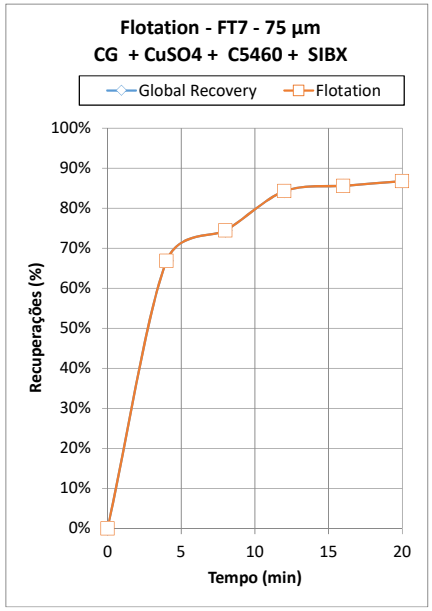

Flotation - FT2 - 106 µm
CG + CuSO4 + C5460 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)

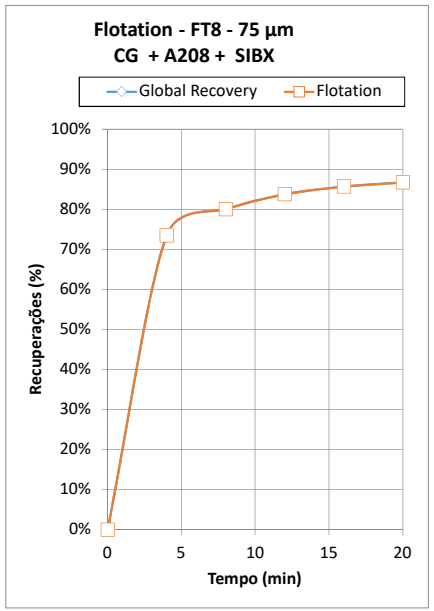

Flotation - FT3 - 106 µm
CG + A208 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)

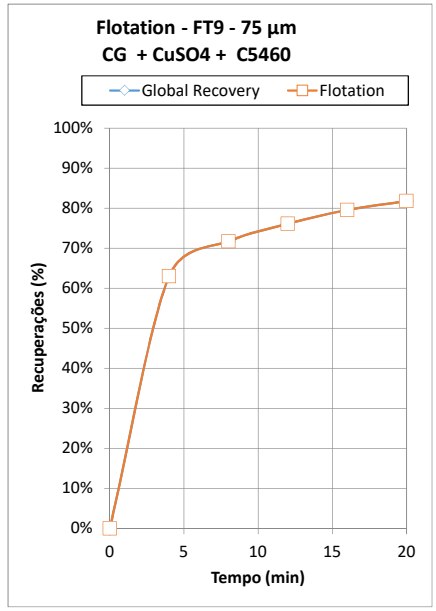

Flotation - FT4 - 106 µm
CG + CuSO4 + C5460
Global Recovery
Flotation
Recuperações (%)
Tempo (min)

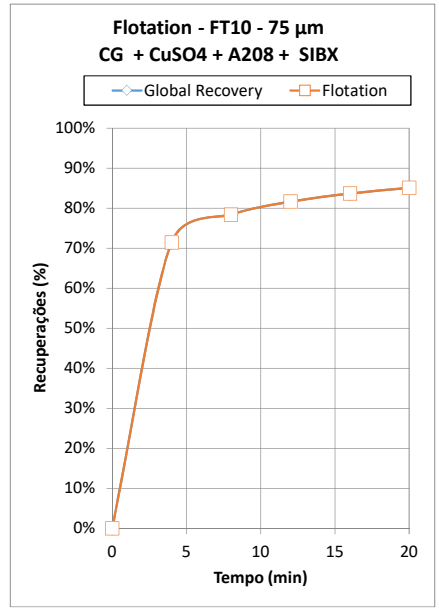

Flotation - FT5 - 106 µm
CG + CuSO4 + A208 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)

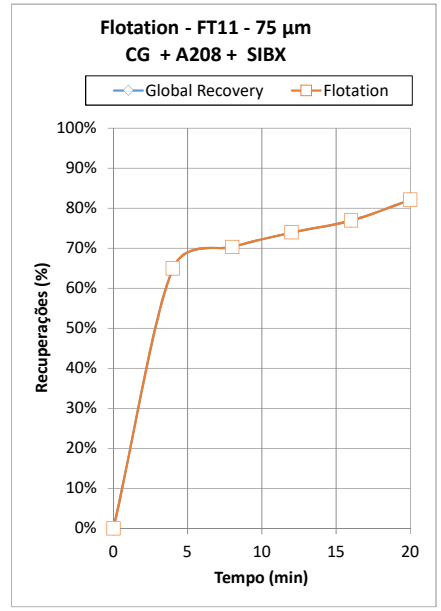

Flotation - FT6 - 106 µm
CG + A208 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)


Flotation - FT7 - 75 µm
CG + CuSO4 + C5460 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)


Flotation - FT8 - 75 µm
CG + A208 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)


Flotation - FT9 - 75 µm
CG + CuSO4 + C5460
Global Recovery
Flotation
Recuperações (%)
Tempo (min)


Flotation - FT10 - 75 µm
CG + CuSO4 + A208 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)


Flotation - FT11 - 75 µm
CG + A208 + SIBX
Global Recovery
Flotation
Recuperações (%)
Tempo (min)

APPENDIX 3

Recoverable Gold by Fraction
Control Sheet

TESTWORK Desenvolvimento de Processo Ltda

Project	SERRADO
Customer	KURT
Test ID	LT - 009
Sample	TOTAL FEED
Size	RECOVERABLE BY FRACTION - P_{80} = 106µm
Water	NOVA LIMA WATER
Date	28/03/2018

RECOVERABLE GOLD BY FRACTION - ORE MILLED TO P80 = 106 µm

Mesh	Additions							Final Information				
	Bottle (g)	Ore (g)	Water (mL)	Total Weight (g)	Initial pH	NaCN (ppm)	Lime (g)	Final Weight (g)	Solution (mL)	pH Final	NaCN (mg/L)	Au (mg/L)
65#	493,23	8,95	320,56	822,74	11,92	9983	0,26	823,59	321,4	11,05	88	2,41
100#	516,98	314,42	320,58	1151,98	11,60	9982	0,15	1154,43	323,0	11,24	8377	5,59
150#	474,77	394,00	512,18	1380,95	11,45	9762	0,10	1384,96	516,2	11,57	8336	4,41
200#	463,35	579,00	600,17	1642,52	11,59	9997	0,16	1647,78	605,4	11,52	8629	3,59
325#	461,06	536,23	549,95	1547,24	11,46	10001	0,18	1548,00	550,7	11,09	7931	4,37
<325#	810,00	980,00	1000,00	2790,00	11,35	10000	0,81	2800,00	1010,0	11,12	7932	3,06

Recoverable Gold by Fractions

Mesh	Size (µm)	Tailing (g/t)	Solution (g/t)	Recalculated Feed (g/t)	Recovery (%)
65#	212	0,14	86,475	86,615	99,8%
100#	150	0,13	5,743	5,873	97,8%
150#	106	0,13	5,778	5,908	97,8%
200#	75	0,10	3,750	3,850	97,4%
325#	45	0,07	4,488	4,558	98,5%
<325#	<45	0,05	3,151	3,201	98,4%

Size Distribution

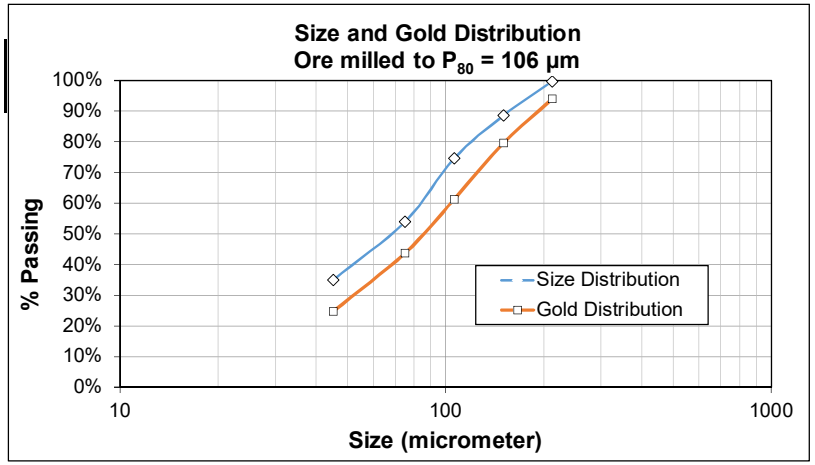
Mesh	Size (µm)	Mass (g)	% Retained	% Retained Accumulated	% Passing
65#	212	8,95	0,3%	0,3%	99,7%
100#	150	314,42	11,2%	11,5%	88,5%
150#	106	394,00	14,0%	25,5%	**74,5%**
200#	75	579,00	20,6%	46,1%	53,9%
325#	45	536,23	19,1%	65,2%	34,8%
<325#	<45	980,00	34,8%	100,0%	0,0%
	TOTAL	2812,60			

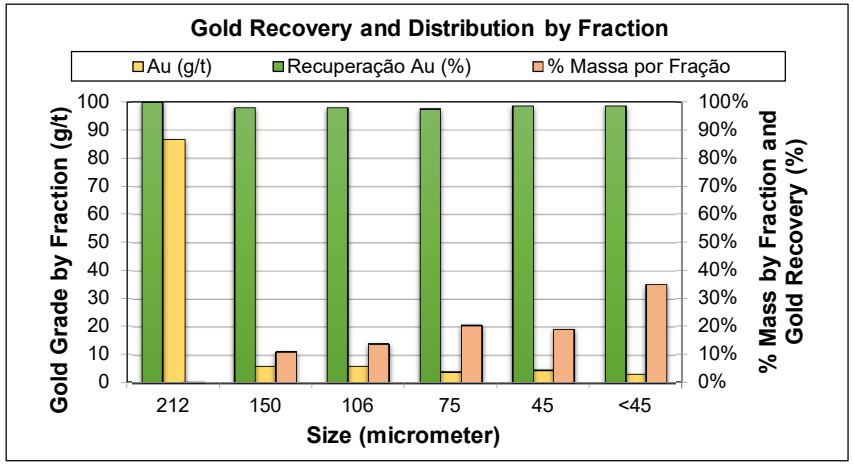
Gold Grade by Fraction and Distribution

Mesh	Size (µm)	Au (g/t)	Au (µg)	% Au Retained	% Au Retained Accumulated	% Au Passing Accumulated
65#	212	86,62	775,21	6,1%	6,1%	93,9%
100#	150	5,87	1846,61	14,5%	20,5%	79,5%
150#	106	5,91	2327,62	18,2%	38,8%	61,2%
200#	75	3,85	2228,97	17,5%	56,3%	43,7%
325#	45	4,56	2444,14	19,2%	75,4%	24,6%
<325#	<45	3,20	3136,57	24,6%	100,0%	0,0%
Recalculated Feed		**4,54**	12759,12			

Recoverable Gold by Fraction related to Feed

Mesh	Size (µm)	Au (g/t)	Au (g/t) Leaching Tailing	Recoverable Au by fraction (%)	Gold Recovery related to the Feed	
					Au (%) Simple	Au (%) Accum.
65#	212	86,62	0,14	99,8%	6,1%	6,1%
100#	150	5,87	0,13	97,8%	14,2%	20,2%
150#	106	5,91	0,13	97,8%	17,8%	38,1%
200#	75	3,85	0,10	97,4%	17,0%	55,1%
325#	45	4,56	0,07	98,5%	18,9%	73,9%
<325#	<45	3,20	0,05	98,4%	24,2%	**98,1%**
Recalculated Feed		**4,54**	0,08			





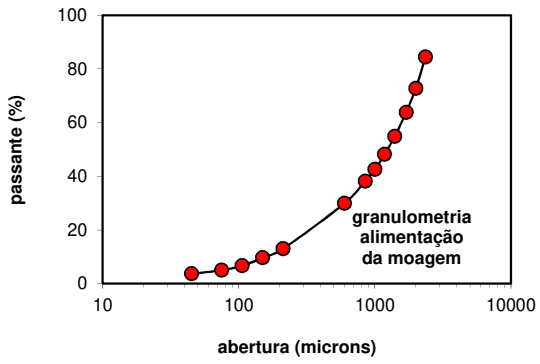
APPENDIX 4

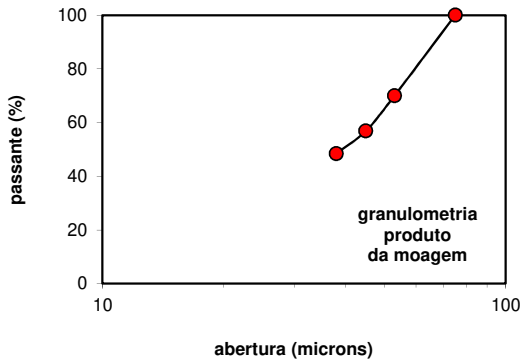
Bond Work Index
Determination by SGS Geosol

TESTWORK

CERRADO	BOND Wi BOLAS	22/03/2018
massa compactada em 700 mililitros (gramas)		
1240	1235	1245
passante ideal (gramas)		354
distribuição granulométrica da alimentação		
A80 (microns)		2208
peneira de referência (microns)		75
passante na peneira de referência (%)		5,0
moagem		
numero total de ciclos		10
passante no ultimo ciclo (gramas)		352
moabilidade (gramas de produto por rotação)		0,8
carga circulante (%)		252
distribuição granulométrica do produto		
P80 (microns)		55
resultados em tonelada curta		
indice de trabalho (KWh / short ton)		16,8
indice de trabalho (KWh / ton)		18,5

ciclo	massa alimentação nova	número de rotações	massa retida final do ciclo	massa passante final do ciclo	massa passante inicio do ciclo	produto gerado no ciclo	Mob gramas por rotação	diferença três ultimos ciclos
1	1240	50	1157	83	62	21	0,42	-
2	83	830	682	558	4	554	0,67	-
3	558	489	850	390	28	362	0,74	52%
4	390	452	866	374	20	355	0,78	16%
5	374	428	875	365	19	346	0,81	9%
6	365	415	899	341	18	323	0,78	4%
7	341	434	855	385	17	368	0,85	9%
8	385	395	886	354	19	335	0,85	9%
9	354	397	888	352	18	334	0,84	1%





microns	retido %	passante %
2360	16	84
2000	12	73
1700	9	64
1400	9	55
1180	7	48
1000	6	43
850	4	38
600	8	30
212	17	13
150	3	10
106	3	7
75	2	5
45	1	4
fundo	4	0

microns	retido %	passante %
75	0	100
53	30	70
45	13	57
38	8	48
fundo	48	0
TOTAL	100	-