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**FORM 6-K**  
**UNITED STATES**  
**SECURITIES AND EXCHANGE COMMISSION**  
Washington, D.C. 20549

**Report of Foreign Private Issuer**

**Pursuant to Rule 13a-16 or 15d-16  
of the Securities Exchange Act of 1934**

**Date: March 9, 2009**  
**Commission File Number 001-31528**

**IAMGOLD Corporation**  
(Translation of registrant's name into English)

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Indicate by check mark whether the registrant files or will file annual reports under cover Form 20-F or Form 40-F.

Form 20-F     Form 40-F

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Description of Exhibit

<u>Exhibit</u>	<u>Description of Exhibit</u>
99.1	Quimsacocha Technical Report dated February, 2009

## Signatures

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

### IAMGOLD CORPORATION

Date: March 9, 2009

By: /s/ Paul B. Olmsted

Paul B. Olmsted  
Senior Vice-President, Corporate Development



**Quimsacocha Gold Project,  
Azuay Province, Ecuador  
NI-43-101 Technical Report**

Report prepared by  
**IAMGOLD Technical Services**  
**February 2009**

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## 1.0 SUMMARY

This Technical Report has been prepared by IAMGOLD Corporation, in compliance with the disclosure requirements of the Canadian Securities Administrators' National Instrument 43-101 (NI 43-101). The trigger for the preparation of this report is the completion of a Pre-feasibility Study (PFS) on the Quimsacocha Gold Project, located in the Azuay Province, Ecuador (Figure 1.1).

This report details the predicted economics of the Quimsacocha Project and identifies the sensitive and critical elements requiring further study if the project is to move forward to Full feasibility and ultimately construction and production.

The following groups have collaborated in the preparation of the Study under the supervision of IAMGOLD's Project Development Group:

- Exploration Group, IAMGOLD Ecuador S.A.-Quito
- Project and Construction Group – Longueuil
- Legal and Sustainability Groups – Toronto

Contractors and consultants were used in specific areas to perform technical assessments and support the evaluation of operating and capital costs. Among them were Golder Associates, SNC Lavalin, SGS Lakefield, PROMAS, Water Management Consultants, Caminosca and Kaehne Consulting.

Based on the level of detail involved in the actual Pre-feasibility Study, the following range estimation is anticipated:  $\pm 25\%$  operating costs and  $\pm 25\%$  capital costs. All costs and financial information are referenced to first quarter 2008 dollars of the United States of America (US\$).

The Pre-feasibility Study commissioned by IAMGOLD Corporation shows that the identified Mineral Resources are economic using the assumptions described and can be classified as Mineral Reserves. This Technical Report is based on a Pre-feasibility Study that was prepared by IAMGOLD Corporation Technical Services Group in July 2008 following general industry standard practices. Its main conclusions and recommendations are:

- Development of an underground mine extracting a total yearly average of 1,095,000 tonnes of ore, at a rate of 3,000 tonnes per day is profitable;
- A total of 8.1 Mt of ore at an average grade of 6.46 g Au/t for 1.7 M contained ounces Au, 36.44 g Ag/t for 9.5.M contained ounces Ag, and, 0.42% Cu for 74.9875 M lbs Cu will be extracted. The deposit could be mined over 8 years of mine life;

- The ore is amenable to flotation and pressure oxidation processes. The average overall recovery indicated is 90% for gold and 92% for copper.
- Further work must focus on scaling up the metallurgical tests to pilot plant size and perform tests on bond work and abrasion indices on larger samples.
- The small amount of waste (underground development) involved in the project (81,000 tonnes) can be reused as backfill; the remaining waste will be stored inside the tailings pond area.
- Environmental and social studies (EIA and SIA) are in progress.
- Capital expenditures of \$363 M and operating costs of \$690 M have been estimated and are deemed achievable by the author.
- Begin negotiations with copper refineries for a formal smelter contract.
- Continue to monitor the political situation and update the PFS after-tax cash flow once the new mining code and its related regulations has been adopted by the Ecuadorian Constituent Assembly (around mid-year 2009).
- Continue to monitor the implementation of the mine development legislation and participate as appropriate in the establishment of working regulations that will be used to development Quimsacocha as a responsible mining project.

## 1.1 General Summary

In November 2006, Roscoe Postle Associates Inc. (RPA), now Scott Wilson RPA, made the initial mineral resource estimate at Quimsacocha. The deposit was then estimated to have an indicated Mineral Resource of 33 Mt at an average grade of 3.2 g Au/t and 24 g Ag/t for 3.3 million ounces of gold and 25.3 million ounces of silver at a cut-off grade of 1.0 g Au/t.

Golder Associates Ltd were mandated to review past technical studies and conduct detailed engineering work for tailings disposal, water supply and other geotechnical aspects of the Project. A preliminary assessment produced by SRK Consultants in May 2006 indicated two economically viable options, one involving an open pit operation and the other an underground mine. The open pit option would have an annual production of approximately 281,000 ounces of gold, 810,000 ounces of silver and 3,400 tonnes of copper spread over eight years at a capital cost of \$264 million. An underground mine would have a capital cost of \$137 million and produce 203,000 ounces of gold, 588,000 ounces of silver and 2,300 tonnes of copper annually over a 7-year mine life. Whole ore pressure oxidation (POX) continues to be the most favourable processing method evaluated to date. The assessment was based on \$400/oz gold, \$1.25/lb copper and \$5.50/oz silver. The Quimsacocha deposit revealed itself to be perfect for open pit mining. The geographic situation associated with adverse political opinions about open pit mining in Ecuador which led to the choice of an underground mine scenario. The flat-lying nature of the deposit associated with poor surrounding ground quality and irregular ore geometry limited the choice of mining methods to Post-Pillar Cut & Fill (PPCF) as selected in the preliminary assessment done by SRK in 2006.

In 2008, a Pre-feasibility Study done by IAMGOLD Technical Services showed that during the first three years of production, Quimsacocha will produce on average 224,000 ounces of gold per year at a grade of 7.1 g/t Au and with cash costs averaging \$214 per ounce before royalties and profit sharing. The underground operation would generate over the first three years a pre-tax cash flow of \$352 million. Over a projected mine life of 7.5 years, the current deposit would produce an average of 202,000 ounces of gold per year at an average cash cost of \$272 per ounce (no royalties or profit sharing included), generating a pre-tax operating cash flow of \$669 million. The Study shows an Internal Rate of Return, using undiscounted cash flow, of 21.3% (pre-tax and net of government royalties) and has an estimated payback period of less than 35 months.

Capital expenditures leading up to commercial production, including all expenditures on development studies, are estimated at \$363 million. A contingency of \$45 million is included. In July 2008, IAMGOLD publicly released indicated and inferred resources of 2,107,000 and 61,000 ounces of gold respectively at a 3 g Au/t cut-off as part of its Mineral Resource and Reserve review. For the purposes of the Pre-feasibility Study only indicated resources within a 3.0 g Au/t envelope were considered. A gold price of

\$750 per ounce was assumed for the financial analysis and current market prices for all materials were applied.

The Study shows that the Quimsacocha deposit provides strong returns in the current economic environment and that it can be the base for future growth through exploration on our regional targets at Rio Falso, Quimsacocha West and the other surrounding properties. The capital requirement to develop the project has increased substantially, reflecting the increased cost pressures that have been facing all new mining projects. Over the next eighteen months, the Company will be working on the Feasibility Study while pursuing its work on the Environmental and Social Impact Assessments. The Company would begin construction activities early in 2010 and reach commercial production in the second half of 2011.

## **1.2 Summary of Geology and Mineralization**

The regional geological setting of Quimsacocha corresponds to the fault-bound continental area of Chaucha. Local Quimsacocha stratigraphy is confined to volcanoclastic rocks and lava flows belonging to the Turi, Turupamba, Quimsacocha and Tarqui formations which are in the form of radial flows towards a caldera zone. The Quimsacocha formations and upper levels of Turi are the main hosts of alteration and mineralization

The mineralization at Quimsacocha is associated with a NNE striking structural feature and is hosted by Upper Miocene, coarse grained tuffs. Alteration is typical of a high sulphidation epithermal system with vuggy and massive silica, alunite, kaolin, dickite, pyrophyllite, and argillic alteration represented by illite and smectite clays. The mineralized silica body has the form of a sub-horizontal mantle that is slightly dipping northeast and is better developed at the contact between tuffs and andesitic lava flows of the Quimsacocha formation, with greater thickness in the tuffs. The mineralization found on the surface of the northern part of the ore body (D1) mainly consists of pyrite, traces of enargite, barytine, and pyrite while only traces of cinnabar and pyrite are found to the North, in the Cerro Casco and Costillas areas.

## **1.3 Summary of Exploration Concept**

The methods employed during exploration phases were mainly conventional: geological mapping along with mapping of alterations as well as regional rock sampling over specific zones. Based on the exploration results the different targets were later drilled and interpretations were made. Furthermore, a magnetic regional survey followed by IP surveys was used to determine more specific targets.

The latest Mineral Resource was calculated from 280 holes drilled by IAMGOLD and previous owners Newmont and COGEMA. The drilling program totalled 65,117m within different campaigns and was

carried out over the mineralized body in a systematic manner on a grid located between D1 and Loma Larga, through oriented lines (Az of 120°). All lines were planned on a 25 m-spacing grid while all drill holes were approximately spaced 50 m. Most drill holes are oriented according to the lines (azimuth: 120° or 300°) with a plunge ranging between 60° and 90°, depending on where the ore body is expected to be hit.

Analytical Solutions Ltd conducted a review of the QC program in August 2005, reporting no evidence of systematic gold contamination based on the targets inserted with the samples. Gold assays were biased low by about 5% based on reported values for reference materials and comparisons with ALS-Chemex assays. A comparison of BSI and ALS-Chemex Ag and Cu assays demonstrated there were biases depending on grade. Analytical Solutions Ltd. recommended that analytical procedures at both laboratories should be investigated to determine the differences and QC program should be augmented by studies of the laboratory pulp duplicate assays as well as duplicate assaying of preparation and core samples. These recommendations were immediately implemented.

#### **1.4 Mineral Processing and Metallurgical Testing**

- A flotation process followed by an off-site pressure oxidation (“POX”) of the concentrate has been chosen as the most environmentally and economically favorable ore treatment option;
- Design is based on a 3,000 tonnes per day ore production during an 8-year mine life (1 095 000 tonnes per year);
- The chosen processes should ensure optimal recovery of several economic elements: 90% Au, 92% Cu and 77% Ag. Flotation of the sulphides will ensure removal of approximately 95% of the sulfur from the ore treated on-site.
- 78% of the ore to be milled at the mine site and the resulting tailings will remain there. This stream theoretically represents the less reactive material and should result in less reactive waste. 58% will be used as paste backfill underground and the remaining 20% will be deposited on surface in the form of thickened tails or paste tails in secured containment facilities.
- Due to its economic impacts, it is recommended to establish the location of the POX near a source of limestone.
- Recent testwork confirms that the ore is moderately hard but that its abrasion index is exceptionally high. A technical review of the grinding and milling circuits is warranted at the Feasibility stage for proper design of the mill media and liners.

- Capital costs for the flotation plant and associated processing and storage facilities at the mine site are estimated at \$61.2 M and at \$93.8 M at POX site. Total processing operating costs are estimated at \$ 31.72/tonne ore or \$ 145/oz Au (including copper credits).

## **1.5 Resource Estimation**

Grade interpolation for the Quimsacocha project was done by means of the block model using the inverse distance-squared weighting algorithm. The database includes 280 holes for a total of 65,117m. and 25,625 assays located within the mineralized zone.

### **1.5.1 Geological Modeling**

Geological modeling was undertaken in Gems Ver. 6.1 in order to build the main lithological units comprising Lavas – Tuffs – Plagioclase. Also, thirty-five faults were modeled in addition to a silica alteration solid.

### **1.5.2 Resource Estimation Methodology**

Resource estimation was previously made by RPA in 2006, using a cut-off of 0.8 g Au/t for a low grade envelope and a cut-off of 3.0 g Au/t for a high grade one. These two solids were then modified along the 17 drilled sections by the Ecuador Exploration Group and the Technical Services Team. Changes usually had to do with extensions of the high grade zone in some sectors and the division of the low grade solid (0.8 g Au/t) in two separate bodies, the main body (C1) and the creation of a new lower flat zone (C2) that appears between sections L-1200 and L-900. The 3 solids were based on Au grade from 2m-long composites All assay grades were previously capped using log-probability grade plots examination and decile analysis (see section 17)

Grade interpolation of Au, Ag, Cu, Zn, Pb, Mo, Hg, as and S was done using the 2m composites capped grades and an inverse distance-squared weighting method.

### **1.5.3 Resource Classification**

Two types of resources categories were defined based on the search range and on the minimum number of composites required to estimate a block. Because no ore has yet been exposed in workings, and resources have only been drill-defined, we concluded the level of confidence was not high enough to classify any resources as measured. The resources categories were saved in the CATEG block model

where each block was assigned either a code of 2 (Indicated) or 3 (Inferred). Resource classification meets the requirements of the CIM guidelines adopted in NI 43-101.

## **1.6 Mineral Resources and Mineral Reserves**

In 2008, IAMGOLD personnel completed a Mineral Resource Estimate. Quimsacocha's current Indicated Mineral Resource at a 3.0 g Au/t cutoff is 9.9 M tonnes grading 6.6 g Au/t for 2.1 million ounces of gold. Inferred Mineral Resource is 299 000 tonnes at a grade of 6.32 g Au/t for 61 000 oz of gold.

As a result of the current pre-feasibility study, Quimsacocha's diluted reserves are:

8.5 M tonnes grading 6.46g Au/t in the Probable Reserve category for 1.8 million contained oz of gold. Since none of the resource could be classified as measured, all the reserve stated above are classified as **probable**.

Details of these resources and reserves are shown on Table 1.1: to Table 1.4.

**Table 1.1: July 2008 Indicated Mineral Resource at 3.0 g Au/t grade cutoff**

ZONE	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
<b>High grade</b>	9,242.41	6.76	2,009	37.94	11,275	0.44	88,926,400
<b>Low grade</b>	692.93	4.40	98	26.31	586	0.47	7,182,800
<b>Total</b>	9,935.34	6.60	2,107	37.13	11,861	0.44	96,109,200

**Table 1.2: July 2008 Inferred Mineral Resource at 3.0 g Au/t grade cutoff**

ZONE	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
<b>High grade</b>	104.60	8.94	30	41.09	138	1.18	2,728,400
<b>Low grade</b>	194.60	4.91	31	47.48	297	0.85	3,629,700
<b>Total</b>	299.20	6.32	61	45.24	435	0.96	6,358,100

Available Resources after contouring the mineable resources is shown in Table 1.3.

**Table 1.3: Resource Status**

Resource status	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
<b>Mineral Resource - 3.0g/t cut-off</b>	<b>9,242</b>	<b>6.76</b>	<b>2,009</b>	<b>37.94</b>	<b>11,275</b>	<b>0.44</b>	<b>88,926,350</b>
<i>Inside and outside dilution (+)</i>	<i>754</i>	<i>2.72</i>	<i>66</i>	<i>16.95</i>	<i>411</i>	<i>0.20</i>	<i>3,283,825</i>
<b>Diluted resource</b>	<b>9,996</b>	<b>6.45</b>	<b>2,075</b>	<b>36.32</b>	<b>11,686</b>	<b>0.42</b>	<b>92,210,175</b>
<i>Resource left inside pillars (-)</i>	<i>1,479</i>	<i>6.42</i>	<i>306</i>	<i>36.00</i>	<i>1,713</i>	<i>0.41</i>	<i>13,347,743</i>
<b>Available Resource</b>	<b>8,517</b>	<b>6.46</b>	<b>1,769</b>	<b>36.42</b>	<b>9,973</b>	<b>0.42</b>	<b>78,862,432</b>

Table 1.4 shows the Probable Mineral Reserve after dilution, mining recovery and development were factored in.

**Table 1.4: Probable Mineral Reserve**

Reserve components	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
<b>Development</b>	<b>135</b>	<b>6.46</b>	<b>28</b>	<b>34.45</b>	<b>150</b>	<b>0.42</b>	<b>1,250,021</b>
<b>Mining Recovery (95%)</b>	<b>7,963</b>	<b>6.46</b>	<b>1,654</b>	<b>36.45</b>	<b>9,332</b>	<b>0.42</b>	<b>73,732,717</b>
<b>Probable Mineral Reserve</b>	<b>8,098</b>	<b>6.46</b>	<b>1,682</b>	<b>36.44</b>	<b>9,482</b>	<b>0.42</b>	<b>74,982,738</b>

## 1.7 Mining Operations

The Mine Division would consist of three departments under the supervision of the Mine Manager. These are Mine Operations, Mine Maintenance and Technical Services Departments.

The operating costs are developed on the basis that mining operations would be performed by Quimsacocha personnel with their own equipment except for the initial phase of ramping accesses as well as for ventilation raises. Maintenance for major and light equipment is also assumed to be performed on site by Quimsacocha personnel. Preference will be given to local suppliers for the majority of supplies and surface equipment required. Other Andean countries will be also be given preference to

North America and Europe for the supply of underground equipment and parts not presently available in Ecuador. The mine will operate on two eleven-hour shifts per day, seven days per week.

Mine Operations will encompass Production Drilling, Blasting, Muck Loading & Hauling and Ground Support activities. Total mining operating cost is estimated at \$299.2 M over the mine life or \$34.80 per tonne mined. Details of each operation are given in the section 17.5.6. Table 1.5 presents the Mine Production Schedule.

**Table 1.5: Mine Production Schedule**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
<b>EXTRACTION</b>										
Production ('000 tonnes)		460	1,142	1,144	1,142	1,142	1,142	1,140	1,071	8,382
Mucked ('000 tonnes)		437	1,085	1,086	1,085	1,085	1,085	1,083	1,017	7,963
<b>DEVELOPMENT</b>										
Vertical (m)	570	165	125	145						1,005
Horizontal (m)	2,297	2,435	1,821	861						7,414
Waste ('000 tonnes)	79		2							81
Ore ('000 tonnes)	52	53	24	7						135
Surface inventory ('000 tonnes)	52	41	55	53	43	33	23	11		

### 1.8 Capital and Operating Cost Estimates

The cash flow estimates for the Quimsacocha Project are based on the operating costs and capital expenditures. Estimated costs are in United States dollars as of the second quarter of 2008. No allowance is made for future price escalation and hence the financial analysis is expressed in constant dollars. Cash Flows have been estimated on a yearly basis and exclude any elements or impact on debt financing. The evaluation was conducted on the basis of a stand alone project, 100% equity financing. The standard discounted cash flow method to determine the net present value (NPV) and internal rate of return (IRR) were used to determine the economic viability of the project.

### **1.8.1 Assumptions**

A base case was prepared with the following key assumptions.

<u>Metal prices</u>	Gold: US\$750/oz Copper: US\$2.80/lb Silver: US\$11.50/oz
<u>Production</u>	Production rate of 3,000 tpd for the mine and the concentrator Production rate of 660 tpd for the pressure oxidation site
<u>Metallurgical Recoveries</u>	90% for gold 92% for copper
<u>Cementation</u> (Copper concentrate grade)	75%
<u>Realisation Costs</u>	\$5.00/oz
<u>Smelter Terms</u>	As described in section 18.0 Delayed payments: 69 days
Cogema royalty	5% NPI
<u>Working Capital</u>	US\$ 4M
<u>Value Added Tax</u>	Assumed 100% refund with no delay.
<u>Employee Participation</u>	15% of taxable income. US\$ 48M will be paid over the mine life
<u>Closure Costs</u>	US\$ 6M
<u>Taxation</u>	Not used in this Study; to be announced in mid-year 2009

### **1.8.2 Capital Expenditures**

A total of \$337M will be spent during the feasibility stage and Pre-production period. Sustaining capital of \$25.8M will be required during the Production period. Capital expenditures are summarized in Table 1.6Table 1.6.

**Table 1.6: Capital Expenditures**

<b>Capitalized</b>	<b>Pre-production</b>	<b>Production</b>	<b>Total (\$000)</b>
<b>Feasibility Study</b>	7,000		7,000
<b>Valuation Drilling</b>	7,000		7,000
<b>Deferred Development</b>	4,663	725	5,388
<b>Cogema</b>	2,365	1,183	3,548
<b>Surface Support Equipment</b>	3,605		3,605
<b>Mining</b>	26,237	2,850	29,087
<b>Infrastructure</b>	29,361		29,361
<b>Processing</b>	131,169		131,169
<b>Tailings &amp; Water Management</b>	12,510	21,000	33,510
<b>Indirect</b>	30,000		30,000
<b>Contingency</b>	45,000		45,000
<b>Pre-production</b>	38,215		38,215
<b>TOTAL</b>	<b>337,126</b>	<b>25,758</b>	<b>362,883</b>

### 1.8.3 Operating Costs

The following Table 1.7 summarizes the project's operating cost. Pre-production mine development costs are capitalized and include mine services, technical and administration costs.

**Table 1.7: Operating Costs**

	<b>Pre-Production Capitalized</b>	<b>Production</b>	<b>Total</b>	
<b>Definition Drilling</b>	\$ 0.3M	\$ 7.8M	\$ 8.1M	\$ 1.00 /t milled
<b>Stope Prep.</b>	\$ 5.4M	\$ 6.4M	\$ 11.8M	\$ 1.46 /t milled
<b>Extraction</b>	\$ 4.8M	\$ 159.4M	\$ 164.2M	\$ 20.27 /t milled
<b>Mine Services</b>	\$ 18.3M	\$ 125.6M	\$ 143.9M	\$ 17.77 /t milled
<b>Concentrate Transportation</b>	—	\$ 40.5M	\$ 40.5M	\$ 5.00 /t milled
<b>Processing</b>	\$ 0.4M	\$ 256.5M	\$ 256.9M	\$ 31.72 /t milled
<b>Administration</b>	\$ 8.4M	\$ 54.8M	\$ 63.2M	\$ 7.80 /t milled
<b>Environment</b>	\$ 0.3M	\$ 1.4M	\$ 1.7M	\$ 0.21 /t milled
<b>Total</b>	<b>\$ 37.9M</b>	<b>\$ 652.4M</b>	<b>\$ 690.2M</b>	<b>\$ 85.24 /t milled</b>

### 1.8.4 Sensitivity Analysis

The Project risks can be identified in both Economic and Non-Economic terms. Among the risks identified that could affect the results of the evaluation are:

1. Change in metal prices.
2. Unfavourable state regulations.
3. Change in Ecuador taxation regime.
4. Change in prices of consumables.
5. Project start-up date in relation to regulatory changes and the permitting process.
6. Delay in obtaining mobile and major fixed equipment. (Grinding Mills, Oxygen plant, Autoclave)
7. Acceptance of the project from the surrounding communities.
8. Access to water source at both mine site and POX site.

9. Unexpected ground conditions around mine workings.

All of these points will require further investigation during the Feasibility Study stage to reduce or otherwise mitigate these risks.

The gold price used in the sensitivity analysis ranges from \$550 to \$950 per ounce and is presented below in Table 1.8.

**Table 1.8: Project Sensitivity to Gold Price**

<b>GOLD</b>	<b>\$550</b>	<b>\$600</b>	<b>\$650</b>	<b>\$700</b>	<b>BASE \$750</b>	<b>\$800</b>	<b>\$850</b>	<b>\$900</b>	<b>\$950</b>
<b>0,0%</b>	54,648	118,417	182,359	244,037	306,588	369,674	432,760	495,905	559,079
<b>5,0%</b>	(7,244)	39,991	86,958	132,211	177,940	223,979	269,985	316,028	362,074
<b>7,5%</b>	(27,903)	13,075	53,689	92,807	132,271	171,966	211,619	251,301	290,977
<b>10,0%</b>	(43,715)	(7,989)	27,325	61,330	95,580	130,001	164,373	198,769	233,151
<b>IRR</b>	4.3%	9.0%	13.4%	17.5%	21.3%	25.1%	28.7%	32.2%	35.6%

**1.8.5 Cash Flow Summary**

A cash flow projection has been generated from the 8 years Mine Life production schedule and capital and operating cost estimates. The project has an undiscounted Net Present Value (NPV) of \$306.6M and an NPV of \$132.3M at a 7.5% discount rate and shows an Internal Rate of Return of 21.3%. Details are shown in section 18.0.

Because the regulations related to the new Mining Law have not been drafted, doing a cash flow study with the now outdated tax regime would have been irrelevant as the taxation framework will be certainly different once the new mining regulations have been adopted, sometime in mid 2009.

## **1.9 Environmental considerations**

Since 2007, IAMGOLD has selected specialized firms to assure monitoring of environmental impacts in order to provide a complete baseline study. The baseline program supplies regular information on meteorological data, hydrological as well as hydrogeological data and on water quality. Additional monitoring stations will be necessary in order to cover all aspects and obtain reliable data for the entire area of study.

An Environmental Management Plan (EMP) will be developed to prevent or mitigate the impact on the environment that could result from the operations (effluent discharges, solid residues, air emissions, etc). This plan should assure that the installations remain stable beyond the operation stage and ways to minimize the impact on the water resources. Geotechnical and seismological factors will be taken into consideration and incorporated in the different designs to assure the stability of the installations in conformity with the ISO 14001 standards of the company:

- The program will monitor water quality, dust, noise levels on regular basis and will compare the results with the environmental standards and baseline values.
- Drainage and runoff from the tailings will be monitored throughout the mine life and after closing. Base preparation of the tailings pads will be carefully engineered in order to avoid percolation into the subterranean waters. Effluent of the tailing pads will have to meet the standards for the quality of effluents dictated by the New Regulations of the Ministry of Environment and Mines prior being released into the environment.
- At the POX site, cyanide solution storage tanks, petroleum storage tanks and other reactive storage areas, emergency ponds and contention berms will be incorporated into the design of the installations to minimize the adverse effects that could result from spillage.
- The Project will be audited during operation by a registered qualified external auditor to review all Environmental policies and the monitoring plans implemented within the Project. The project will also be submitted to an internal audit to insure that the company's Environment Policy is applied.
- A Health and Safety program will be included in the EMP to identify, evaluate and control the conditions that could affect the health and physical welfare of the employees.
- A closure plan will be developed and included in the EIA. Its main objective is to establish compatibility with the surrounding areas. Only stable structures that are not a threat to the community or the environment will remain following the mine closure. The water capture and

treatment systems will be maintained as long as deemed necessary.

### **1.9.1 Permitting**

The Mines and Oil Ministry controls all mining activities, through the Environmental Protection Undersecretary, the National Environmental Protection Office, the Mines Undersecretary, the National Mining Office and its Regional Mining Offices.

In addition to the existing environmental laws and National Strategies (some of which may be superseded by the newly adopted Mining Law), holders of mining rights have the obligation to file the following environmental assessment and performance studies:

- A Preliminary Environmental Impact Assessment;
- An Environmental Impact Assessment when filing for a mining application,
- A yearly Environmental Audit.

All of these permits have either been applied for or granted for ongoing exploration work as will be permits for future work in the framework of the new mining code.

### **1.9.2 Mining Law**

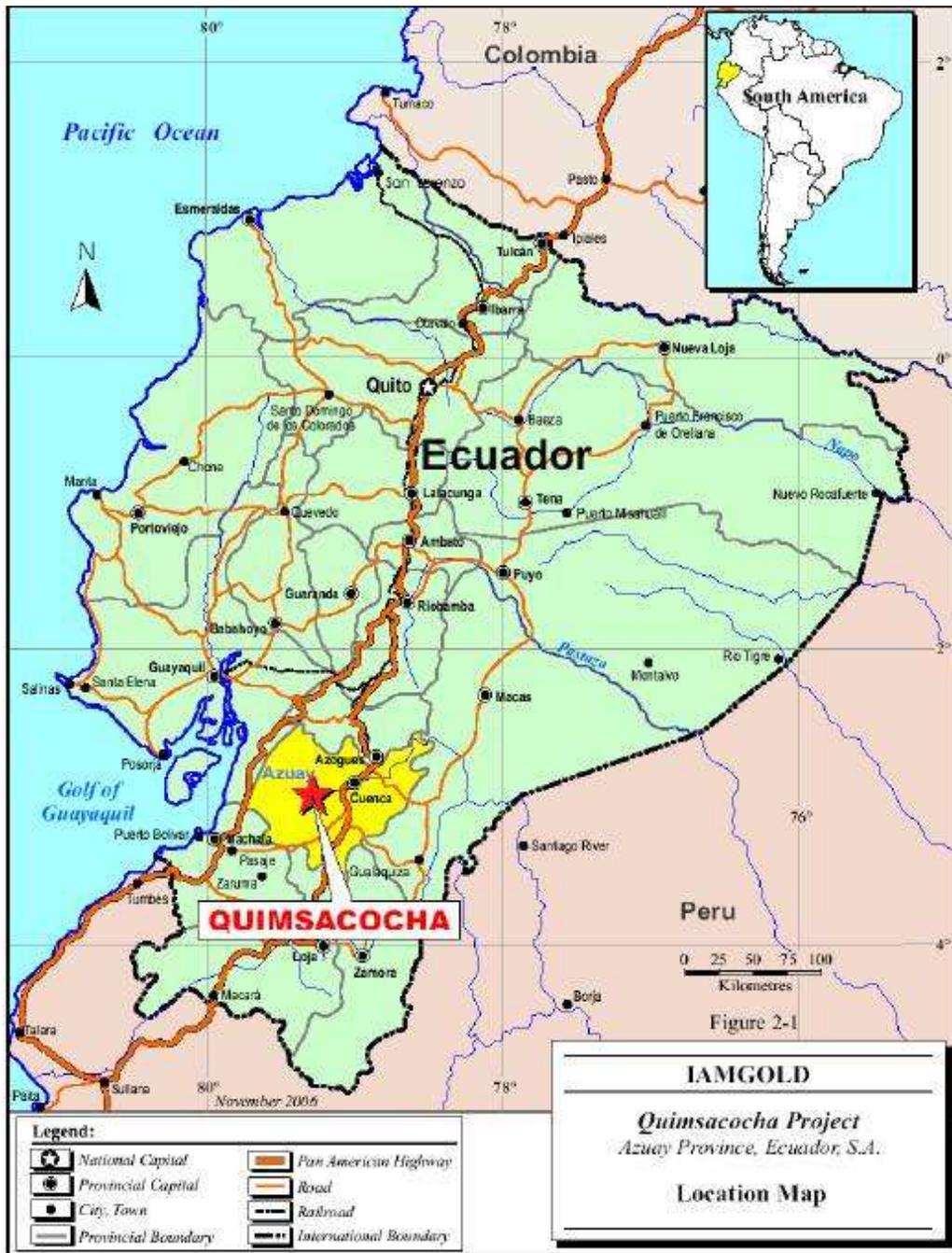
The current Ecuador legislation applicable to mining operations was first introduced in 1991. In 2000, this legal instrument was updated, maintaining the basic criteria of the current law and incorporating aspects such as:

- Elimination of royalties, to promote greater competition and transparency; and;
- Strong environmental control during all phases of mining operations and communication with the communities in order to assure social and environmental sustainability of the new investments.

In April 2008 Ecuador's Constitutional Assembly adopted a 180-day moratorium on all mining exploration activities while a new Mining Law was under review. The Government conducted a review of the policy recommendations of the Constituent Assembly and extensive consultations with international mining experts and representatives of international mining companies active in Ecuador, including IAMGOLD, with respect to the formulation of a progressive, competitive and environmentally and socially responsible mining law.

In late January 2009, President Rafael Correa officially ratified the new Mining Law which will form the framework of the new Mining Regulations, most of which are expected to be adopted by the Constitutional Assembly in mid year.

Figure 1.1: Location Map of Quimsacocha Project



## 2.0 INTRODUCTION

This Technical Report describes the Quimsacocha Gold Project (the “Project”) which is a highsulphidation epithermal gold-copper-silver deposit more than 1.5 kilometres in length and open in all directions. It is located in the Western Cordillera of the Andes, in the province of Azuay, 40 km southwest of the city of Cuenca. The project lies at elevations varying from 3,500m to 3,900m above sea level.

The property consists of four mining concessions (Cerro Casco, Rio Falso, Cristal and San Martín), covering an approximate area of 9,497 ha. In 1999, IAMGOLD acquired the property from COGEMA and conducted further exploration and diamond drilling. The resource lies totally within the Rio Falso concession and covers an area of approximately 120 ha. The project is 100%-owned by IAMGOLD Corporation, a medium-sized mining producer listed on the Toronto Stock Exchange, with an emphasis on gold projects.

This technical report results from the completion of a Pre-feasibility Study by IAMGOLD’s Project Development Group in July 2008. Its purpose was to allow the Directors of IAMGOLD to reach an informed decision regarding the economic viability of putting the Project into production, as well as identifying the sensitive and critical elements requiring further study as the project moves toward construction and production. It benefited from direct input and support from IAMGOLD’s Technical Services, Construction, Legal, and Sustainability groups and IAMGOLD S.A. Ecuador groups. Contractors and consultants were used in specific areas to perform technical assessments and support the evaluation of operating and capital costs. Among them were Golder Associates, SNC Lavalin, SGS Lakefield, PROMAS, Water Management Consultants, Caminosca and Kaehne Consulting.

The report also details the updated Mineral Resources associated with the March 2008 resource model which IAMGOLD announced on July 29, 2008.

The Project includes development of a 3,000 tonnes per day underground mine. The flat laying feature of the deposit combined with poor ground quality and irregular geometry reduced the choice of mining methods to Post-Pillar Cut & Fill (PPCF). The processing is divided in two phases: *Flotation* and *Pressure Oxidation* of the sulphide’s concentrate.

Currently, in addition to its mineral resource, the major assets and facilities associated with the Project are:

- Access road;
- Camps and associated facilities

Unless otherwise stated, information and data contained in this report or used in its preparation have been provided by IAMGOLD Corporation and all currencies are expressed in US dollars (US\$).

During the site visit and preparation of this report, discussions were held periodically with the following IAMGOLD personnel.

Michael Donnelly, Senior Vice President, Exploration

Jorge Barreno Cascante, President, IAMGOLD Ecuador S.A.

John McCombe Senior Vice President, Operating Strategy

Glenda Mantilla, Systems Manager

Particio Perez Salazar, Project Geologist

Franklin Viera, Project Geologist

July Montenegro, Project Geologist

## **2.1 QP's Qualifications**

The Mineral Resource and Mineral Reserve estimates contained in this report have been prepared in accordance with National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101"). The technical information, including the information that relates to geology, drilling, mineralization and mineral resource estimates at the Quimsacocha Project is based on information prepared under the supervision of, or has been reviewed by Mr. Francis Clouston, Eng., Manager - Project Evaluations Technical Services Group, an employee of IAMGOLD Corporation. The aforementioned person is a "Qualified Person" for the purposes of National Instrument 43-101 with respect to the mineralization being reported on. The technical information has been included herein with the consent and prior review of the above noted qualified person. The qualified person has verified the data disclosed. Mr. Clouston also supervised the overall preparation of this Technical Report.

Mr. Daniel Vallières, Eng., Manager - Underground Projects, carried out the design of mining operations, the estimate of Mineral Reserves and the cost estimates. He also supervised the preparation of the Pre-feasibility Study from which this Technical Report is sourced. Mr. Vallières is a "Qualified Person" for the purposes of the National Instrument 43-101 with respect to the reported Mineral Reserve.

Mr. Pierre Pelletier, Eng., Vice-President - Metallurgy supervised the metallurgical and processing testwork and design. Mr. Pelletier is a "Qualified Person" for the purposes of the National Instrument 43-101

## 2.2 List Of Abbreviations

The units of measurements used in this report conform to the metric system unless otherwise noted. All currency is in US dollars (US\$).

μ	micron
°C	degree Celsius
°F	degree Fahrenheit
μ g	microgram
A	ampere
a	annum
bbl	barrels
Btu	British thermal units
C\$	Canadian dollars
cal	calorie
cfm	cubic feet per minute
cm	centimetre
cm <sup>2</sup>	square centimetre
d	day
dia.	diameter
dmt	dry metric tonne
dwt	dead-weight ton
EIA	Environmental Impact Assessment
ft	foot
ft/s	foot per second
ft <sup>2</sup>	square foot
ft <sup>3</sup>	cubic foot
g	gram
G	giga (billion)
Gal	Imperial gallon
g/L	gram per litre
g/t	gram per tonne
gpm	Imperial gallons per minute
gr/ft <sup>3</sup>	grain per cubic foot
gr/m <sup>3</sup>	grain per cubic metre
hr	hour
ha	hectare
hp	horsepower
in	inch
in <sup>2</sup>	square inch
J	joule
k	kilo (thousand)
kcal	kilocalorie
kg	kilogram
km	kilometre
km/h	kilometre per hour
km <sup>2</sup>	square kilometre
kPa	kilopascal
kVA	kilovolt-amperes
kW	kilowatt
kWh	kilowatt-hour
L	litre
L/s l	litres per second
m	metre
M	mega (million)
m <sup>2</sup>	square metre
m <sup>3</sup>	cubic metre
min	minute
MASL	metres above sea level
mm	millimetre
mph	miles per hour
MVA	megavolt-amperes
MW	megawatt
MWh	megawatt-hour
m <sup>3</sup> /h	cubic metres per hour
oz/st	ounce per short ton
oz	Troy ounce (31.1035g)
oz/t	ounce per dry metric tonne

ppm	part per million
psia	pound per square inch absolute
psig	pound per square inch gauge
RL	relative elevation
s	second
st	short ton
stpa	short ton per year
stpd	short ton per day
t	metric tonne
tpa	metric tonne per year
tpd	metric tonne per day
US\$	United States dollar
USg	United States gallon
USgpm	US gallon per minute
V	volt
W	watt
wmt	wet metric tonne
yd <sup>3</sup>	cubic yard
yr	year

### **3.0 RELIANCE ON OTHER EXPERTS**

There has been no reliance on experts who are not Qualified Persons in the preparation of this report.

This report has been prepared by IAMGOLD employees and consultants firms. The information, conclusions, opinions, and estimates contained herein are based upon:

- Information available to IAMGOLD and its consultants at the time of preparation of this report;
- Assumptions, conditions, and qualifications as set forth in this report, and;
- Data, reports, and opinions supplied by IAMGOLD and other third party sources listed in Section 21 - References.

The author is of the opinion that conclusions and recommendations from third parties conveyed in this Technical Report can be relied upon.

#### 4.0 PROPERTY DESCRIPTION AND LOCATION

##### 4.1 Area

The property consists of four mining concessions, Cerro Casco, Rio Falso, Cristal, and San Martín, covering an area of approximately 9,497 ha. The project is 100% owned and registered by IAMGOLD Ecuador S.A. Figure 4.1: shows the approximate location of the Quimsacocha Project.

Property information is shown on Figure 4.3 and listed in Table 4.1.

**Table 4.1: Mining Concessions**

<u>Name</u>	<u>Code</u>	<u>Area (ha)</u>	<u>Registered</u>	<u>Expiry</u>
<b>Cerro Casco</b>	101 580	2 572	Nov 23, 2001	Jul, 1 2030
<b>Cristal</b>	102 195	2 250	Jun 5, 2003	Jul 12, 2032
<b>Rio Falso</b>	101 577	3 208	Nov 23, 2001	Jul 1, 2030
<b>San Martín</b>	102 196	1 467	May 6, 2003	Jul 12, 2032

The “Paramo” region, where exploration activities take place, is completely uninhabited. This land is used as a communal area dedicated to pasture livestock.

The nearest dwelling is located approximately 4 km from the mineralization site. The nearest town is Aguarongos, where IAMGOLD’S base camp is located. The closest populated centers are San Gerardo, 10 km south and Chumblin, 9 km southeast of the project.

Figure 4.1: Location Map of Quimsacocha Project



## 4.2 Location

Quimsacocha is located in the Western Cordillera of the Andes at elevations varying from 3,500 m to 3,900 m. The project is easily accessible by a partly-paved road leading from the main highway between Cuenca, the third-largest city in Ecuador, and Machala, the second largest port in the country.

The project is located in the protected forest and vegetation area of the Paute River Basin and the micro-basin of the Yanuncay and Irquis rivers.

The main gold mineralization area is centred on geographic coordinates:

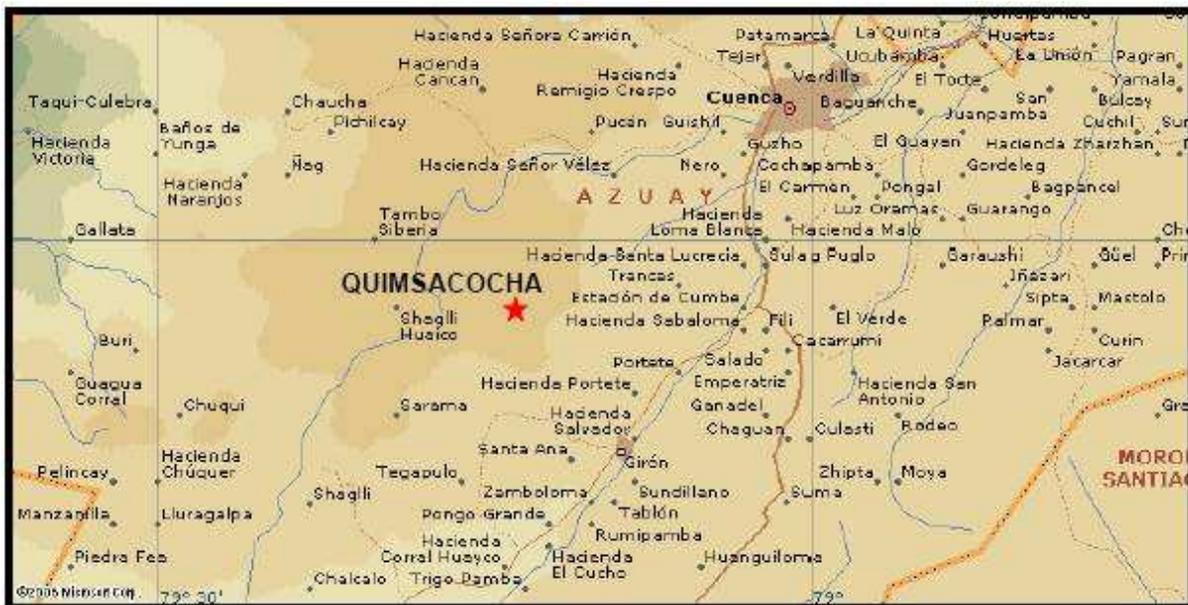
Latitude: 03° 03' S Longitude: 79° 13' W

The U.T.M. South America '56 coordinates are:

Northing: 9,663,400 N Easting: 698,750 E

The Quimsacocha Project is located near four parishes: Victoria de Portete of Cuenca canton, Girón and San Gerardo of Girón canton, Chumblín of San Fernando canton, in the Azuay province. Figure 4.2 shows the principal population centres that surround the Project.

**Figure 4.2: Map of the surrounding cities and villages of the Quimsacocha Project**



The geographic locations of the concessions are listed in Table 4.2.

**Table 4.2: Geographic And Cartographic Project Location**

<b>CONCESSION</b>	<b>CARTOGRAPHIC LOCATION</b>		<b>GEOGRAPHIC LOCATION</b>		
<b>CERRO CASCO</b>	<b>Topographic Sheet</b>	CHAUCHA	CUENCA	<b>Province</b>	AZUAY
	<b>Code</b>	CT-NV-F3,378-III	CT-NV-F4,3785-II	<b>Canton</b>	Cuenca, Girón
	<b>Series</b>	J721	J721	<b>Parish</b>	Victoria del Portete, Girón, San Gerardo
	<b>Scale</b>	1:50.000	1:50.000	<b>Zone</b>	Quimsacocha
<b>RIO FALSO</b>	<b>Topographic Sheet</b>	SAN FERNANDO	GIRON	<b>Province</b>	AZUAY
	<b>Code</b>	CT-NV-B1,3784-IV	CT-NVI-B2,3784-I	<b>Canton</b>	San Feranado
	<b>Series</b>	J721	J721	<b>Parish</b>	Chumblín, San Fernando
	<b>Scale</b>	1:50.000	1:50.000	<b>Zone</b>	Quimsacocha
<b>CRISTAL</b>	<b>Topographic Sheet</b>	SAN FERNANDO	GIRON	<b>Province</b>	AZUAY
	<b>Code</b>	CT-NV-B1,3784-IV	CT-NVI-B2,3784-I	<b>Canton</b>	Girón, San Fernando
	<b>Series</b>	J721	J721	<b>Parish</b>	Girón, San Gerardo, San Fernando, Chumblín
	<b>Scale</b>	1:50.000	1:50.000	<b>Zone</b>	Cristal
<b>SAN MARTIN</b>	<b>Topographic Sheet</b>	GIRON		<b>Province</b>	AZUAY
	<b>Code</b>	CT-NVI-B2,3784-I		<b>Canton</b>	Girón, Cuenca
	<b>Series</b>	J721		<b>Parish</b>	Girón, San Gerardo, Victoria del Portete
	<b>Scale</b>	1:50.000		<b>Zone</b>	San Martín Chico

### **4.3 Type of Mineral Tenure**

IAMGOLD ECUADOR S.A is a legally constituted entity operating under the laws of the Ecuadorian Republic.

In November 2001, the Ministry of Oil and Mines, through the National Direction Office of Azuay, granted IAMGOLD ECUADOR S.A titles to the Cerro Casco and Rio Falso mining concessions. The term of the title is 30 years, expiring in July 2030. These concessions are located inside the protected forest and vegetation basin of the Paute River which forms the micro basin of the Yanuncay and Iquis rivers. As a result, there are a series of requirements, as per the Environmental rules for Mining activities in the Ecuadorian Republic (RAAM), Chapter V, and Articles 19 to 21, that must be fulfilled to maintain the titles.

On June 19, 2002, the Undersecretary of Environmental Protection (SPA) of the Ministry of Oil and Mines announced approval of the environmental impact study submitted for the advanced exploration of the

Cerro Casco and Rio Falso concessions, and on October 11, 2002, by means of resolution No 054, an Environmental permit was issued allowing drilling to begin.

In 2003, IAMGOLD ECUADOR S.A obtained titles to the Cristal and San Martin mining concessions. These concessions are located outside of the protected forest and vegetation areas and have terms of 30 years, expiring in 2032.

IAMGOLD ECUADOR S.A. owns a 200 ha tract of land in the Condor Coles – Quinuas area of the San Girardo Parrish and has the appropriate approvals for its use in support of an eventual mining operation.

In April 2008, a Constituent Assembly, formed to examine Ecuador’s Constitution, accepted a mandate to revise the mining laws. The Government of Ecuador, through the Ministry of Mines and Petroleum, issued a 180 day suspension of all mining and exploration activity while such laws were to be revised.

The Government completed a review of the policy recommendations of the Constituent Assembly and conducted extensive consultations with international mining experts and representatives of international mining companies active in Ecuador, including IAMGOLD, with respect to the formulation of a progressive, competitive and environmentally and socially responsible mining law.

On January 12, 2009, Ecuador’s interim legislature overwhelmingly approved a new draft mining law, lifting the previously imposed exploration moratorium while a new law was developed. The President of the Ecuadorean Republic, Rafael Correa, who has consistently maintained his support for responsible large scale mining that provides an equitable sharing of benefits, must endorse or ratify the law before it becomes effective and detailed regulations must be prepared and approved in order to implement the law. The new law calls for the negotiation between mining companies and the Government of project-specific mining contracts.

#### **4.4 Issuer’s Interest**

The company owns approximately 300 hectares of the Pinos Camp area and has several easement agreements with land owners (Table 4.3). The company also has an inter-institutional cooperation agreement with the Sombrereras Commune of the Chumblin Parish.

**Table 4.3: Status of Land Properties**

<u>Date</u>	<u>Document</u>	<u>Owner</u>
<b>March 17, 2006</b>	Purchase Sale Public Deed to Mr. J. Jarin	IAMGOLD ECUADOR S.A.
<b>December 6, 2006</b>	Easement Agreement	Mr. Leonardo Castro
<b>December 6, 2006</b>	Easement Agreement	Mr. Julio Cesar Ron
<b>June 27, 2007</b>	Easement Agreement	Mr. Juan José Mogroseejo
<b>February 7, 2006</b>	Inter-Institutional Cooperation Agreement	Sombrereras Commune (Chumblin)

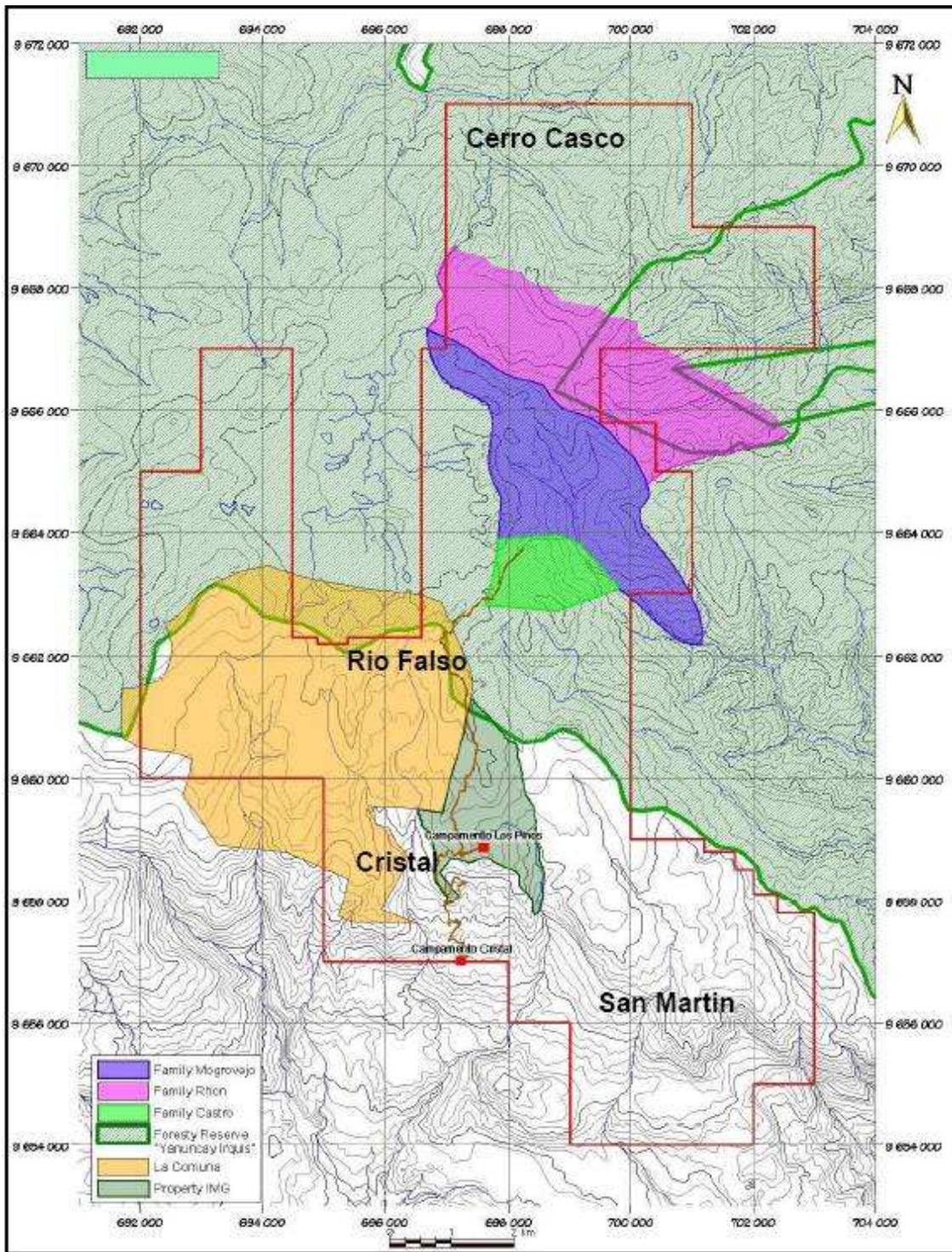
**4.5 Location of Property Boundaries**

See Figure 4.3.

**4.6 Royalties, Back-in rights, Payments, Agreements, Encumbrances**

Upon completion of a bankable feasibility study, IAMGOLD will have to pay COGEMA \$2.00 per ounce of gold in the proven and probable reserves plus the measured and indicated resources, as defined by the feasibility study. In addition, COGEMA will be entitled to a 5% net profits interest (NPI) in any mining operation on the property. The San Martin concession is not subject to the COGEMA agreement.

Figure 4.3: Map of the Quimsacocha concessions limits



#### 4.7 Environmental Liabilities

Article 79 of the mining law stipulates that the Environmental Protection Undersecretary has the authority to approve Environmental Impact Studies (EIA) and Environmental Management Plans (PMA) in all mining activities, as well as the general regulation substituting the general regulation of the mining law, published in Official Gazette 307 of April 17, 2001, stipulating that mining concessions may be granted in State Forestry Patrimony and protected forests and vegetation areas, by previous authorization from the Environmental Ministry, after passing through the special mining authorizations Commission established in the environmental regulation for mining activities in the Republic of Ecuador.

Under these laws and regulations, IAMGOLD ECUADOR S.A has been executing all the relevant paperwork, in accordance with the process for the presentation of technical reports to comply with the environmental laws and regulations administered by the State.

In the attached template (Exhibit 2.6.1), the legal procedure followed is summarized, beginning with the application for mining concessions, granting of the title, granting of the environmental license, payment of conservation patents, approval of studies and scopes of the environmental impact studies, approval of environmental audits, and the corresponding letters of presentation of the performance bond policy for Environmental Management Plans, and liability coverage.

Throughout the exploration program, IAMGOLD has produced EIA studies related to all its activities, as required by the Mines and Petroleum Ministry, and has operated in accordance with the various laws of the country. The Government has performed audits to verify our compliance as well (Table 4.4).

**Table 4.4: Status of Environmental Applications**

<u>Region</u>	<u>Appl. Type</u>	<u>Drilling Program 1</u>	<u>Drilling Program 2</u>	<u>Drilling Program 3</u>
CERRO CASCO & RIO FALSO	EIA SUBMITTED	19 Jun. 2002	7 Jun. 2004	26 Jan. 2006
	EIA APPROVED	29 Mar. 2004	24 Oct. 2005	14 Dec. 2007
	AUDIT SUBMITTED		8 Feb. 2007	25 Apr. 2008
CRISTAL	EIA SUBMITTED			22 Nov.2006
	AUDIT SUBMITTED (NO RESPONSE)			15 Jan. 2008

#### **4.7.1 Quarterly Reports**

In accordance with stipulations in the environmental license, quarterly reports must be submitted to the Environmental Ministry, Advanced Technical Activities Reports, water and soil monitoring, and cooperation and dissemination of activities carried out at the site and with the communities.

As a commitment with environmental preservation and social and human development, in accordance with the Mines and Petroleum Ministry, on January 8, 2008, in Cuenca, IAMGOLD ECUADOR S.A. submitted the Application for Partial Waiver of Mining Rights for the Cerro Casco and Rio Falso mining concessions.

On January 22, 2008, exercising the powers conferred by the mining law, the Regional Mining Office of Azuay decided to approve the PARTIAL Waiver of 992 hectares of the Rio Falso mining concession and 2,228 ha of the Cerro Casco concession. In total, IAMGOLD reduced its mining property by 3,220 ha and kept 9,497 ha in four concessions.

#### **4.7.2 Water Rights**

Concession grants have the implicit right of water use and the right to benefit from any necessary easements.

Water used during the exploration work is returned to the original river-bed from where it was taken, free of contamination, in compliance with stipulations in the environmental management plan.

With authorization from the Ecuadorian Institute of Hydraulic Resources, the holders of mining rights may modify the water course, as long as this does not cause any damage to third parties

#### **4.7.3 Surface Rights**

Exploration activities in the different areas have been performed with the explicit authorization of the owners of surface rights including agreements on road use priority and the application of traffic mitigation measures.

#### **4.7.4 Waste Management**

Management and treatment of waste generated by exploration activities as well as from company camps fulfill all governmental regulations and specifications established in the Environmental Management Plan (PMA), as approved by the Mines and Petroleum Ministry and the Environmental Ministry.

## 4.8 Permits

According to the old mining law, the mining activity phases are classified as prospecting, exploration, exploitation, smelting, casting, refining and commercialization.

Permits are divided into five categories with respect to the different mining operation stages and are enumerated as follow:

- Exploration
- Before Development / Construction
- Development / Construction
- Exploitation
- Governmental institutions related to permit and authorization processes

Entities with jurisdiction on management, use and conservation of mining resources are as follow:

- Environmental Ministry
- Mines and Petroleum Ministry
- Agriculture and Livestock Ministry
- Health Ministry
- Local governments: municipalities, parochial boards, among others.

Authorizations and Permits are required for the Development and Construction department prior to the expansion of the Quimsacocha Project. The most important ones are listed in Table 4.5.

Before initiating commercial production, the Mining Law of Ecuador stipulates that the concession owner must inform the competent Regional Mining Office regarding the starting date, through a written communication that will have the power of a sworn declaration. The start of commercial production shall be subject to approval of the environmental impact assessment study.

During commercial exploitation, the holders of mining concessions must submit, by March 31 of each year, at the competent Regional Mining Office, the production audited reports, according to the technical guidelines prepared by the National Mining Office. These reports shall be signed by the mining concession owner and by its technical consultant, who shall credit his/her professional capacity in the geological and/or mining areas.

**Table 4.5: Required Authorizations and Permits**

<b>Permit</b>	<b>Authority</b>	<b>Legal Body, Observations and Terms</b>
Mining Concession	Mines and Petroleum Ministry Environmental Ministry (Special Mining Authorizations Commission) Protected Forest Areas	Environmental Management Law. Environmental Regulation for Mining Activities in the Republic of Ecuador.
Environmental License	Mines and Petroleum Ministry	Environmental Impact Study
Water Concession	National Hydric Resources Council	Water Law
Discharge, emission, and dumping Permits	Mines and Petroleum Ministry (Regional Mining Offices)	Regulation of the Environmental Management Law
Exemption from the Discharge, emission and dumping Permit	Environmental Ministry	Regulation of the Environmental Management Law
Authorization for collection and transportation of hazardous or special waste or treatment of discharges, emissions and dumping	Mines and Petroleum Ministry (Regional Mining Offices)	During the first years of operation if it has Environmental License Regulation of the Environmental Management Law
Authorization for Management, Storage and Disposal of Hazardous Waste	Environmental Control Entity	Regulation of the Environmental Management Law. Unified Text of Secondary Environmental Legislation.
Authorization for construction of reservoirs	National Hydric Resource Council	Water Law
Underground Water Concession	National Hydric Resource Council	Water Law
Industrial establishment installation permit	Health Authority	Health Code
Potable water provision permit	Health Authority	Health Code
Explosive Transportation Permit	Armed Forces Joint Command Logistics Office	

## **5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURES AND PHYSIOGRAPHY**

### **5.1 Topography, elevation and vegetation**

The area of study is principally located between elevations 3,600 and 3,994 meters above sea level and is relatively flat throughout the whole region.

Most topographical forms that are observed in the surroundings of the Quimsacocha project are the product of Pliocene glacial action. Moraines and debris flows, which partially cover the volcanic and altered breccias of the substrate, increase in thickness in lower topographic areas.

The most outstanding topographic element in the study area is the Quimsacocha caldera with an approximate diameter of 4 km. The caldera was built by radial lava flows of gentle dip and is characterized by an extensive flooded flatland rimmed by a topographically higher boundary. The highest summit is at 3,969 m and is located in the Cerro Casco area, coordinates 698,400 E and 9,666,550N, 1.2 km to the north of the crater.

In the Quimsacocha Project area, there are three well-defined morphological areas:

- Areas with gentle slopes, between 5 and 12%, are considered to be relatively flat and include the Quimsacocha caldera and the resource area. The relief between the Alturas Pinos camp and the Project site is characterized by gentle hills with slopes no greater than 15° and some sharp peaks that project out of the Quimsacocha plain.
- Moderate sloping areas, between 12 and 25%, are found among the gentle hills and the valleys where the ravines originate. The area between Cerro Casco in the north to the Rio Falso has a regular morphology with slopes of up to 20° in the areas of fluvial erosion.
- Rough slope areas, between 25 and 50%, are found in the cliffs and slopes of ravines. Areas with rough slopes are located between the Alturas Pinos camp and the CristalAguarongos prairie, where the Base Camp is located, and in the “V” shaped valleys and canyons formed in the Cristal, Calluancay and Rio Irquis basins.

Most of the area is covered by typical high Andean waste land vegetation dominated by extensive natural coarse grasses (70%). In the lower areas, there are Polylepis and Achaeon arboreal species (4%). Flooded or marshy areas are covered by cushion type vegetation (20%). The remaining 6% comprises areas without any vegetation due to the presence of rock outcrops.

## 5.2 Access

The property is accessible by road from Quito:

<u>SEGMENT</u>	<u>DISTANCE &amp; ROAD TYPE</u>
Quito – Cuenca	459 km Pan-American Highway
Cuenca – Giron	40 km Paved highway; Cuenca-Machala
Girón – San Gerardo	11 km Paved road
San Gerardo-Quimsacocha Project	18 km Gravel road

Regularly scheduled commercial flights are available between Quito, Cuenca and Guayaquil. The duration of the flights ranges between 30 and 45 minutes. Driving time between Cuenca and the mine site is approximately one hour.

## 5.3 Proximity to population centre and transport

The area of social influence according to political division corresponds to three cantons and four parishes distributed in the following way:

The area of the mineralized body is located within the Victoria Del Portete's parish, canton of Cuenca. Chumblin is the closest town to the Quimsacocha Project area (6 km) and is part of the San Fernando canton. The San Gerardo town, located in the canton of Girón, is 8 km from the Project area.

Further information is found in Section 18.5: Environmental and Socio-Economic Aspects.

## 5.4 Climate and length of operating season

Due to its geographical location and topography, Ecuador has a diversified variety of climates, ranging from very arid to equatorial high mountainous. Corresponding to the COPOE classification, the Cerro Casco and Rio Falso mining concessions belong to the 'Cloudy Forest', with frequent drizzle and rain, and also with hail and frost. The average temperature is around 6°C and the maximum temperature does not exceed 15°C. Nevertheless, temperatures under 0 have been recorded with a minimum of -5.2°C in November.

Further information is found in Section 18.5: Environmental and Socio-Economic Aspects.

## 5.5 Infrastructure

The following items are discussed in section 18.

- Power: Section 18.3
- Water: Section 18.1
- Mining personnel: Section 18.4
- Tailings and waste storage areas: Section 18.1

## **6.0 HISTORY**

### **6.1 Prior Ownership and Ownership changes**

The first known systematic exploration in the Quimsacocha area was carried out by the United Nations which conducted a reconnaissance stream sediment survey in the late 1970's. The principal objective was to define base metal anomalies, in which the project was successful. Follow-up work resulted in the drilling of the Jordanita and Loma Tasqui targets, respectively 5 and 6 kilometres to the south of what has become known as the Quimsacocha deposit. The results appear not to have been sufficiently interesting to warrant a second round of drilling.

### **6.2 Previous Exploration and Development work**

Exploration activity began in the area in the late 1970s when a United Nations group identified a base metal anomaly during an exploration campaign.

In 1991, the property was acquired by COGEMA who completed 2,944 m of diamond drilling in 17 holes on vein and disseminated targets. Gold, Silver and Copper mineralization was intersected but, again, results were not sufficiently encouraging for COGEMA to continue exploration on its own and in 1993, Newmont Mining and TVX Gold became COGEMA's joint venture partners. Under Newmont's management, a further 7,581 m of diamond drilling in 82 holes was carried out. It has been reported that Newmont was seeking a Yanacocha-like deposit, and when this failed to materialize, Newmont and TVX withdrew from the joint venture. The best value reported in drilling by the joint venture was 83 g Au/t and 316 g Ag/t over 2 meters.

In 1999, IAMGOLD signed an option agreement with COGEMA whereby the Company could earn a 100% interest in the property by making payments to COGEMA and agreeing to a 5% net profit interest on any production from Quimsacocha. At the time of acquiring the Quimsacocha property, IAMGOLD was focusing its Ecuadorian exploration efforts on another gold district and, as a consequence, it was not until 2002 that the company began intensive exploration at Quimsacocha.

In 2003, after obtaining the required permitting, IAMGOLD ECUADOR S.A began drilling the Cerro Casco and Rio Falso concessions.

In 2004, IAMGOLD drilled an angled hole (IQD-122) which intersected 102 m averaging 9.1 g Au/t, 46.9 g Ag/t and 0.4 % copper and although other well-mineralized holes had been drilled earlier, it was this hole that gave the company the confidence to aggressively proceed with the drilling program.

The key to the Quimsacocha discovery was the use of Portable Infrared Spectral Mineral Analysers (“PIMA”). It gave the geologists the ability to vector towards the better mineralized parts of the system. Hole 122, as well as the majority of holes drilled in the Quimsacocha deposit, was drilled in an area covered by thin overburden, with few outcrops and with only a weak geophysical response. In spite of this, systematic drilling along northwest-southeast section lines quickly led to an understanding of the geometry of the deposit.

SRK Consulting was commissioned to perform a scoping study in 2006. Drilling continued during this period and by the end of December 2007, IAMGOLD had completed 65,117 m of diamond drilling in 280 holes at Quimsacocha. A Pre-feasibility Study began in the second quarter of 2008.

### **6.3 Historical Mineral Resource and Mineral Reserve Estimates**

In November 2005, Roscoe Postle Associates Inc. (now Scott Wilson RPA) made the initial mineral resource estimate at Quimsacocha. Indicated resources were estimated to be 22.5 Mt grading 3.9 g Au/t, 25 g Ag/t, and 0.16% Cu, with an additional inferred resource of 2.5 Mt grading 2.1 g Au/t, 15 g Ag/t, and 0.12 % Cu.

In September 2006, Scott Wilson RPA interpreted a set of sections and plans to construct grade-shell wireframe models at different cut-off values. The 0.8 g/t Au interpretation includes one large zone identified as the Main Zone Periphery (MZP) with several smaller zones. The Main Zone High Grade Core (MZHGC) interpretation is mainly located in the center of the MZP, and includes grades higher than 3.0 g Au/t. The RPA mineral resource estimate used drill hole data up to hole number IQD-354. Grades were interpolated using the ordinary kriging method for gold and inverse distance squared for silver and copper. The grade-shell wireframes were used to constrain the grade interpolation.

At a 1.0 g Au/t cut-off, indicated mineral resources were estimated to be 33.0 Mt grading 3.2 g Au/t, 24 g Ag /t, and 0.15% Cu. Inferred mineral resources were estimated to be 4.0 Mt grading 1.9 g Au /t, 15 g Ag/t, and 0.14% Cu. No Mineral Reserve estimates were established at Quimsacocha at that time. The September 2006 estimated mineral resource, at incremental cut-off values, is listed in Table 6.1 (Scott Wilson RPA, 2006).

In 2008, IAMGOLD personnel updated the Mineral Resource estimate based on drilling information collected up to December 2007. This new resource was then used as the basis of a first Mineral Reserve estimate. Details are given in Section 17.

Table 6.1: Mineral Resources – September 2006

TABLE 1-1 MINERAL RESOURCES-SEPTEMBER 2006  
IAMGOLD Corporation – Quimsacocha Project

Incremental Cut-off Grade (g/t Au)	Tonnage (Millions)	Au (g/t)	Ag (g/t)	Cu (%)
<b>INDICATED</b>				
5	4.9	8.7	49	0.37
4	7.0	7.4	43	0.32
3	9.6	6.3	38	0.28
2	17.5	4.6	30	0.21
1	33.0	3.2	24	0.15
<b>INFERRED</b>				
5	—	—	—	—
4	0.1	5.7	109	0.56
3	0.2	4.0	53	0.35
2	1.4	2.6	23	0.17
1	4.0	1.9	15	0.14

Notes:

1. CIM Definitions were followed for mineral resources.
2. Grade-shell wireframes at 0.8 g/t Au and 3.0 g/t Au were used to constrain the grade interpolation.
3. Wireframes were constructed with a minimum vertical thickness of 1.5 m
4. Gold grades were cut to 60 g/t in the Main Zone High Grade Core and 35 g/t elsewhere. Silver grades were cut to 800 g/t in all zones. Copper grades were cut to 8% in the Main Zone High Grade Core and 4% elsewhere.
5. Blocks are 5 m by 10 m by 5 m. Gold values were interpolated by Kriging. Silver and copper values were interpolated by inverse distance squared.
6. Classification is based on drill hole spacing and apparent continuity of the mineralization.
7. Gemcom Software International Inc. Resource Evaluation Edition Version GEMS 6.02 was used.

## **7.0 GEOLOGICAL SETTING**

The Quimsacocha project is located in the western Cordillera of the Andes, southwest part of Ecuador. The geological information is based on a joint regional survey carried out in 1997 by the Ecuadorian State through CODIGEM (Geological-Mining-Metallurgical Development and Investigation Corporation) and the British Geological Survey (Litherland *et al.* , 1994).

### **7.1 Regional Geology**

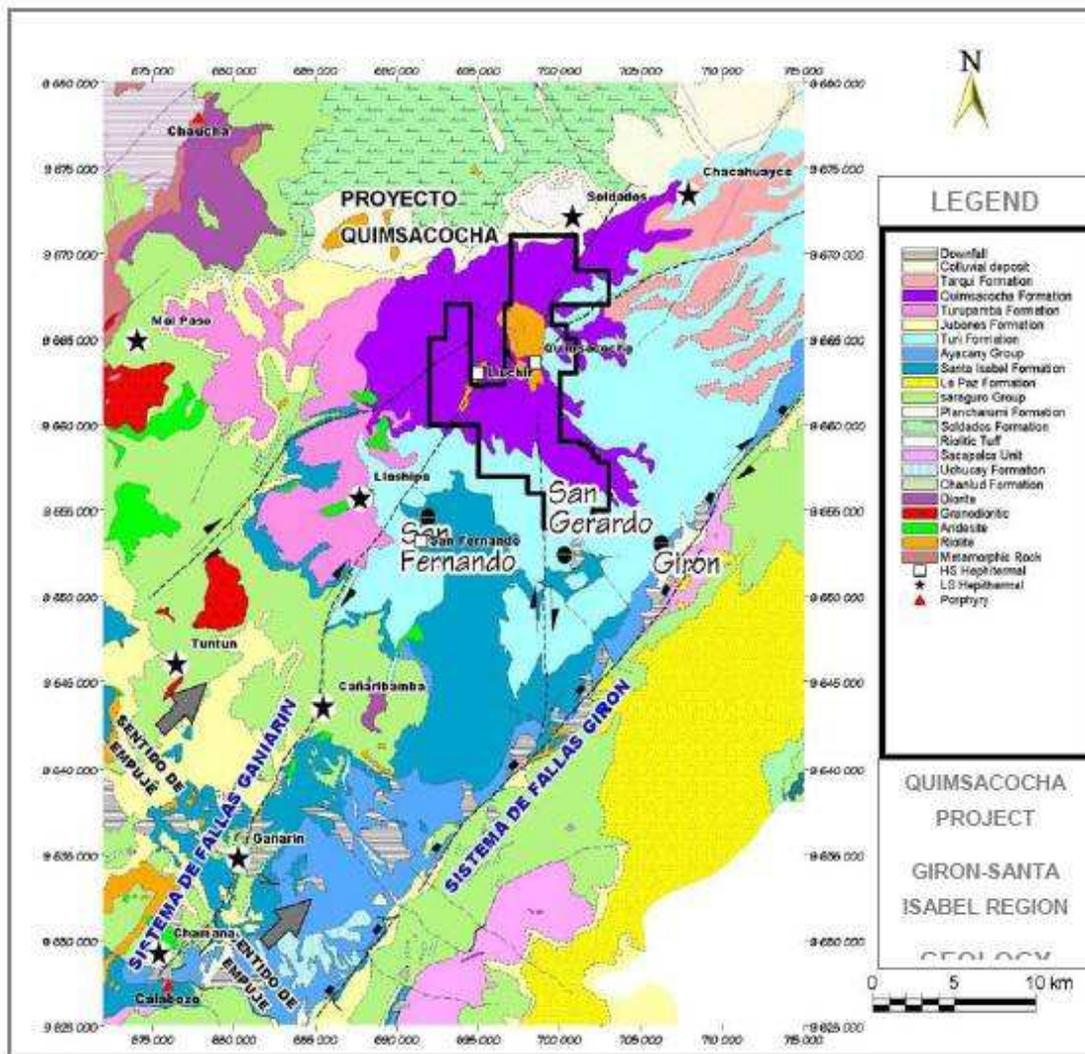
Ecuador is characterized by five distinct physiographic provinces, which are named in accordance with their bounding faults and broadly coincide with the subdivision of the Ecuadorian crust into several terranes. The terranes, formed during the separation of the Central and South American plates and were accreted onto the Amazon Craton from Late Jurassic to Eocene (Chiaradia *et al.* , 2004). Most of the terranes extend for several hundreds of kilometres in a NNE direction and are only a few tens of kilometres wide. They are separated by deep NNE trending faults. The Quimsacocha project is located in the western Cordillera of the Andes, in the southwest part of Chaucha terrane. The regional geological setting of Quimsacocha, shown in Figure 7.1, corresponds to the continental area of Chaucha that is bound by the Bulubulo fault system to the north, the Giron fault to the southeast and the Jubones fault to the southwest.

These fault zones are interpreted to have been active during the entire evolution of the basin (Figure 7.2). During each reactivation phase, fault movements influenced the location of some intrusive and sub-volcanic bodies while some acted as channels for the mineralizing hydrothermal fluids.

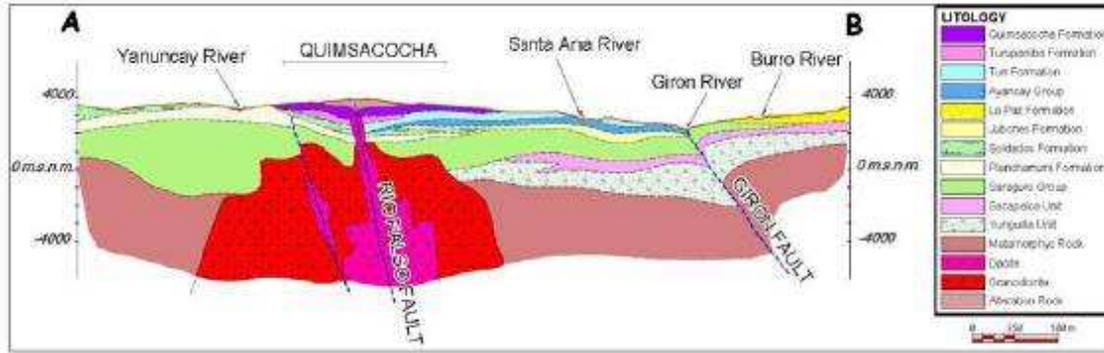
Most of the area is underlain by a mix of metamorphic rocks (schist and semipelitic gneisses) and thick volcanic/volcaniclastic rock packages. The latter comprises intercalations of lava and tuff of andesitic and rhyolitic composition that correspond to the Saraguro group. Towards the south of Quimsacocha are the Plancharrumi, Jubones, La Fortuna and La Paz Formations that are thought to be the upper part of the Saraguro group. These consist of rhyolitic and dacitic tuffs containing biotite, plagioclase and quartz. The volcano-sedimentary formations of early and middle Miocene (post-Saraguro) were deposited in the Santa Isabel basin. Towards the north, the late Miocene Turi, Quimsacocha and Tarqui Formations are encountered. The entire stratigraphic sequence is illustrated on Figure 7.3.

Quaternary alluvial sediments deposited in the Giron valleys (northern part of Manu) cover wide areas along the main drainage channels. These alluvial fills cover some formations of the Saraguro group.

Figure 7.1: Regional Geological Map



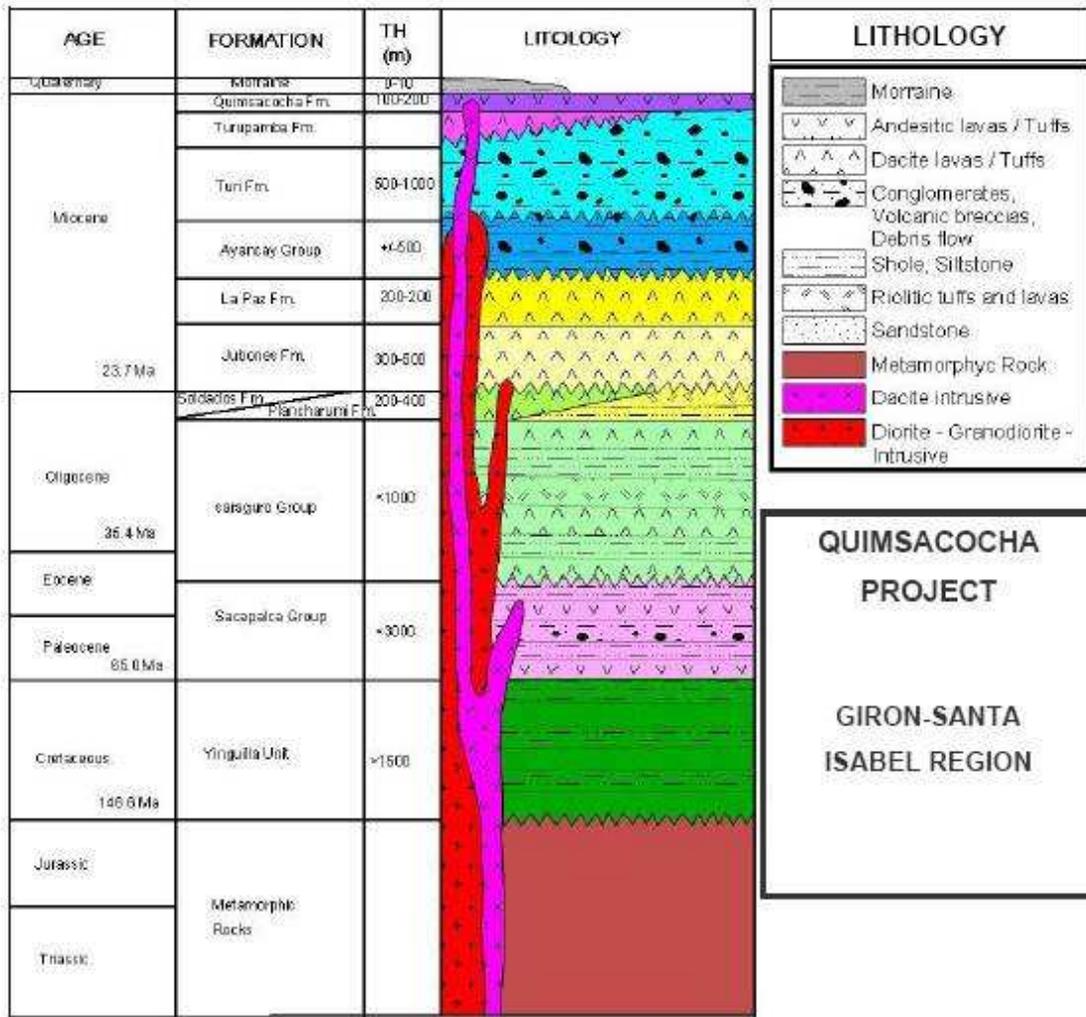
**Figure 7.2: Geological Cross Section**  
**GEOLOGICAL CROSS SECTION A-B**



Gabbroic bodies of the Pallatanga Unit cross-cut the above-mentioned formations. Quartz diorites and granodiorites/tonalites intrude the metamorphic rocks of the Sacapalca Unit, Cretaceous and the lower part of the Saraguro Group.

The granites are usually medium to coarse-grained, showing evidence of a sudden cooling event. Some of them are typical of sub-volcanic (high level) intrusions, such as the one from Shangli (679300mE, 9651800mN), and are part of the complexes that include micro-granodiorites and micro-diorites. The Paccha intrusive, aged  $16.89 \pm 0.16$  Ma (K/Ar), is the largest intrusive with an exposed area of  $150 \text{ km}^2$ . The quartz-diorite, aged  $9.92 \pm 0.18$  Ma (K/Ar) and the Shangli granodiorite, aged  $17.64 \pm 0.61$  Ma (K/Ar) are located to the northeast of Uzhcurrumi. Figure 7.3 shows the relation between formations and intrusions.

Figure 7.3: Stratigraphic Column



## **7.2 Local Geology**

The local Quimsacocha stratigraphy comprises Upper Miocene volcanic and volcanoclastic rocks flows of the Turi, Turupamba, Quimsacocha and Tarqui Formations. These were deposited as a series of radial flows associated with a central caldera zone (Figure 7.4).

The Turi Formation of late Miocene age (8-9 Ma) is characterized by tuffaceous breccias, conglomerates and sandstones with a high content of andesitic and tuffaceous breccia clasts. Basal layers of the Turi Formation comprise massive conglomerate and boulders that unconformably overlie the Ayancay Group. The outcrops define a radial pattern with shallow dips to the south and east, away from the caldera.

The Turupamba Formation underlies the Quimsacocha Formation and is mainly composed of rhyolitic to dacitic tuff and minor lapilli tuff. It outcrops in the desert, west of the town of San Fernando. The unit appears to be the product of numerous minor ash falls with alternation of fluvial and lacustrine sedimentation periods.

The Quimsacocha Formation is characterized by banded lava flows with phenocrysts of unaltered plagioclase as well as andesite tuffs and breccias. The Quimsacocha Formation and upper parts of the Turi Formation are the main hosts of alteration and mineralization at Quimsacocha.

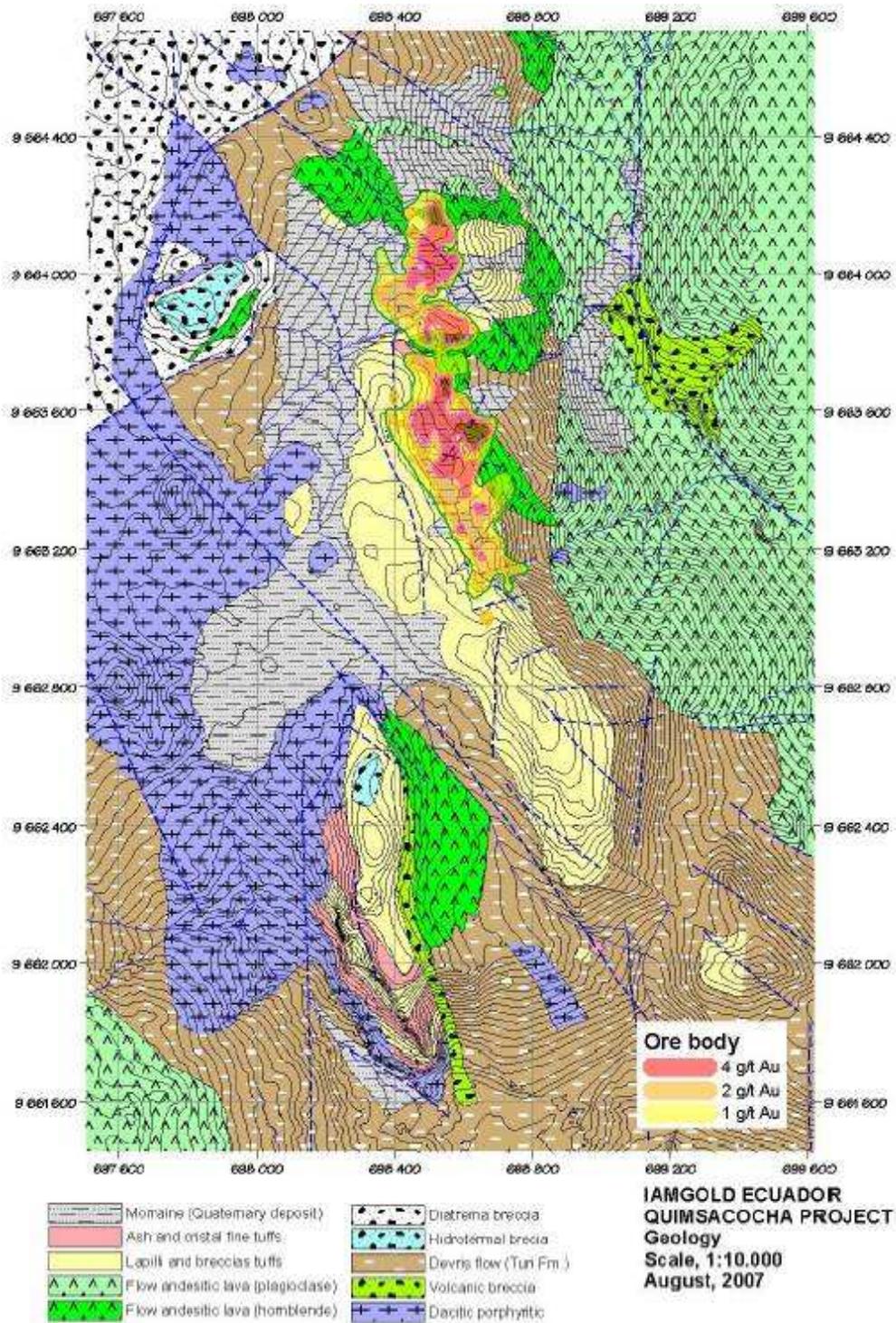
The Tarqui Formation is the youngest recognized stratigraphic formation. Its maximum thickness is 400m and mainly consists of weathered tuffs in the vicinity of the Quimsacocha Deposit. It outcrops mainly on the eastern flank of the caldera where it, overlies the Turi Formation. Further north, the formation is mostly composed of thinly banded tuffs, tuffaceous sandstones, and conglomerates.

## **7.3 Property Geology**

A late, post-mineralization volcanic event has taken place in the area and consists of dacitic domes and dykes. Its texture is porphyritic with quartz phenocrysts and is relatively unaltered. Most outcrops are located around the caldera and are associated with diatreme breccia bodies containing rounded clastic, tuff, lava and ore-bearing clasts. The main lithological units of Quimsacocha are visible in the vicinity of the caldera.

The formations are flat lying and most do not outcrop on the property. Diamond drilling starts in the porphyritic andesite flows and subsequently intersects lapilli and breccia tuffs, ash and crystal tuffs and usually ends in the dacitic porphyry dyke.

Figure 7.4: Geological map showing outcrops of the Quimsacocha Area and Au grade



## **8.0 DEPOSIT TYPES**

This geology of Ecuador is characterized by the presence of very important regional sub-parallel structures (Giron, Gañarín and Jubones fault systems) which have the same orientation as the Andes Cordillera (NS-NE). These structures have controlled the deposition of volcanoclastic formations in the Giron-Santa Isabel Basin as well as the orientation of associated intrusive bodies. Many of these intrusives can easily be recognized in the field.

These fault zones are interpreted to have been active during the entire evolution of the basin. During each reactivation phase, particular fault movements influenced the location of some intrusive and sub-volcanic bodies while some acted as channels for the mineralizing hydrothermal fluids.

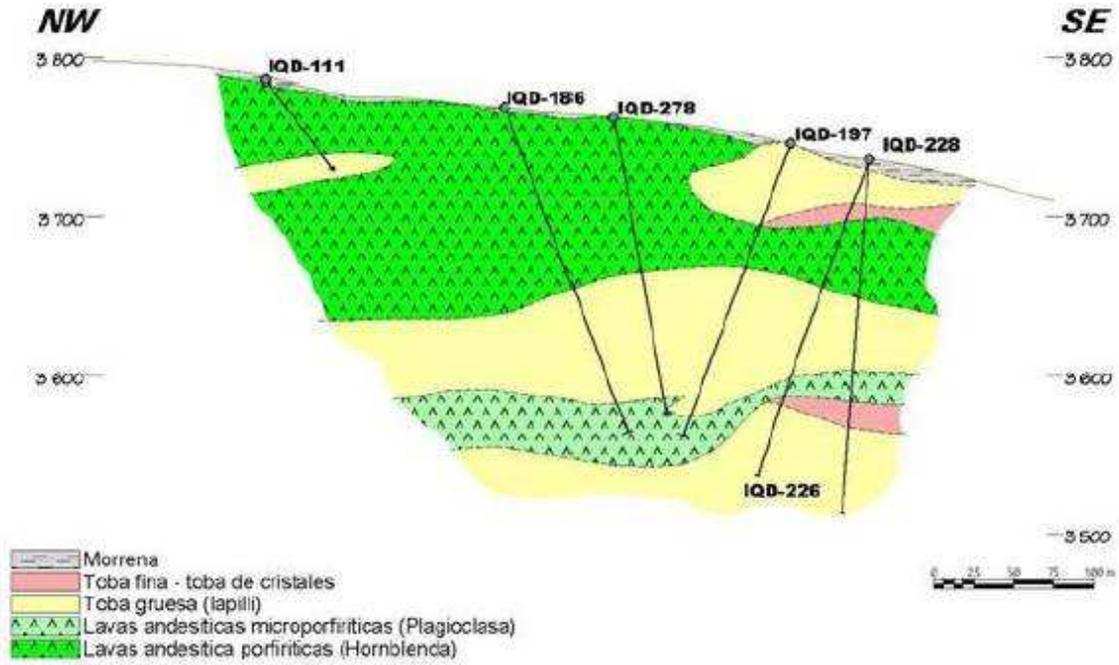
The local Quimsacocha stratigraphy comprises Upper Miocene volcanic and volcanoclastic rocks of the Turi, Turupamba, Quimsacocha and Tarqui Formations. These were deposited as a series of radial flows associated with a central caldera zone. The Quimsacocha Formation and upper parts of the Turi Formation are the main hosts of alteration and mineralization at Quimsacocha.

The Quimsacocha Formation consists of lapilli and crystal tuff alternating with greenish-gray andesitic lava flows deposited in sub-horizontal layers that dip shallowly (10-15°) to the northwest (Figure 8.1). This rock package was deposited on rubble and mud flows of the Turi Formation. The age of these formations is approximately 7 Ma (late Miocene).

A late, post-mineralization volcanic event has taken place in the area and consists of dacitic domes and dykes. Its texture is porphyritic with quartz phenocrysts and is relatively unaltered. Most outcrops are located around the caldera and are associated with diatreme breccia bodies containing rounded clastic, tuff, lava and ore-bearing clasts, representing the main lithological units found in Quimsacocha.

Quimsacocha is an epithermal high sulphidation system with Au-Ag-Cu mineralization, formed by multi-phase fluid injections associated with lithological and structural controls. The hydrothermal event is characterized by an early alteration phase caused by a strong inflow of volatile, acidic fluids which cooled progressively and were neutralized by their reaction with country rock, leading to the formation of silicified layers surrounded by alteration halos (kaolin, illite, dickite, pyrophyllite, alunite, etc.), while the sulfides and gangue minerals associated with the mineralization were deposited by late fluids inside the silicified bodies (Figure 8.2).

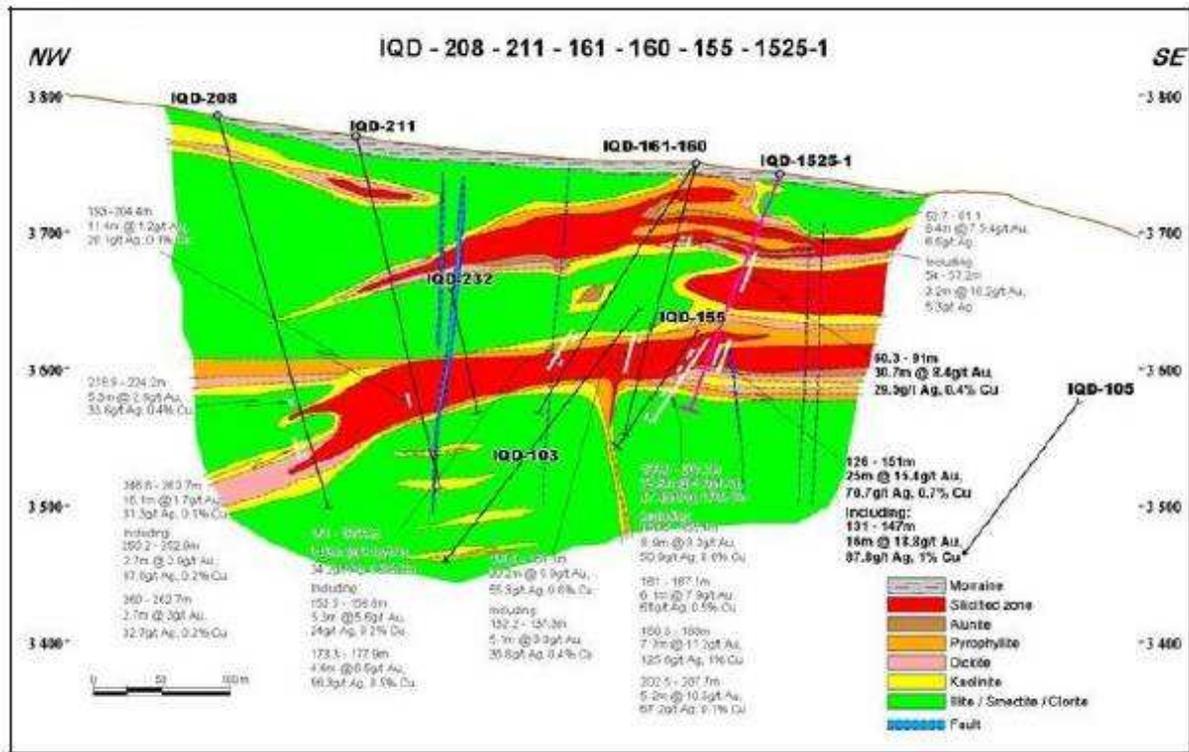
Figure 8.1: Stratigraphic Layers



Mineralization in the Quimsacocha ore body mainly consists of pyrite, enargite, barytine and gold. The mineralized silica body has the form of a sub horizontal mantle that dips slightly towards the northeast and has dimensions of 1300 m north-south by 200 m east-west. It is better developed at the contact between tuffs and andesitic lava flows of the Quimsacocha formation, reaching greater thickness in the tuffs.

The alteration system covers an area of 12 km N-S by 6 km E-W along structural zones and is typical of high sulphidation systems with a nucleus of vuggy and massive silica, and more laterally, alunite, kaolin, dickite, pyrophyllite all surrounded by a halo of argillic alteration represented by illite and smectite clays.

Figure 8.2: Section view showing Silicified layers surrounded by alteration halos



## **9.0**     **MINERALIZATION**

### **9.1**     **General Description**

Quimsacocha is an epithermal high sulphidation (HS) system with Au-Ag-Cu mineralization; formed by multi-phase fluid injections associated with lithological and structural controls.

Mineralization found on the surface of D1 zone (northern part of the Quimsacocha ore body), mainly consists of pyrite, traces of enargite, barytine and gold. To the south, in the Rio Falso area, it is common to find traces of cinnabar, stibnite, barytine, and pyrite while only traces of cinnabar and pyrite are found to the north, in the Cerro Casco and Costillas areas.

A recent mineralogical study (Subías, 2007) was performed on typical Quimsacocha ore types and consisted of 20 polished sections of rock samples, which were analyzed by means of reflected light microscopy and scanning electronic microscopy (SEM) in order to classify mineral species and determine paragenesis.

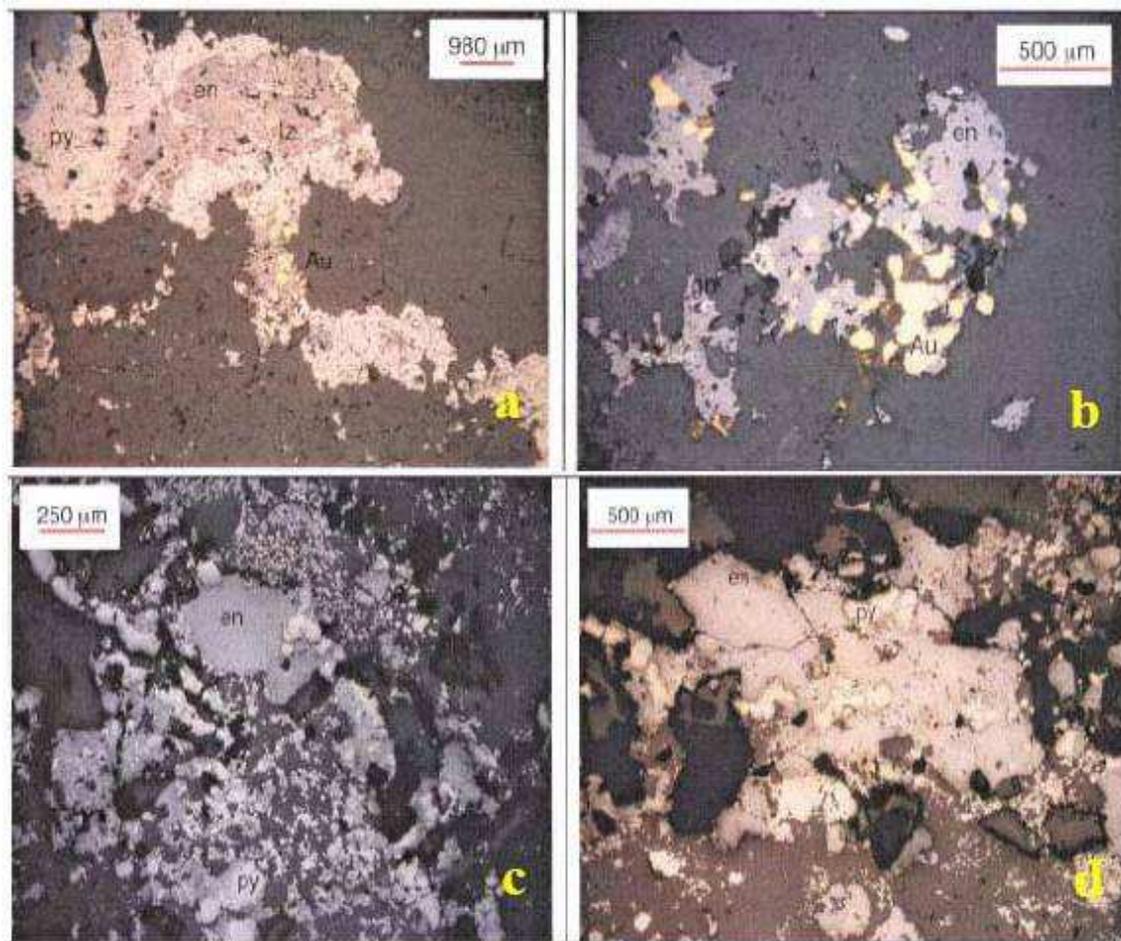
### **9.2**     **Gold Department**

Two generations of pyrite are observed, the first generation (Py<sub>1</sub>), of a grain size < 50-60 microns (μm), is disseminated form in the silicified rock and the second (Py<sub>2</sub>), > 400 μm occupies fractures and cavities. The pyrite is found in its massive form or, in some samples, is replaced by enargite.

Enargite clearly occupies cavities and fractures, occasionally together with barytine and follows both pyrite generations. In some cases, there is evidence of pyrite partially replaced by enargite (see Figure 9.1).

Within enargite, inclusions of native gold, sometimes galena, sphalerite, argentite, hessite, luzonite, barytine, tetrahedrite and tennantite are observed. It must be noted that covelite appears next to enargite which is typically a hypogenous mineral. The initial gold precipitation is probably contemporaneous with enargite and covelite after the Py<sub>1</sub> event. There is the possibility of other late gold mineralization events but current knowledge of mineral paragenesis is insufficient to have a clear understanding of their timing.

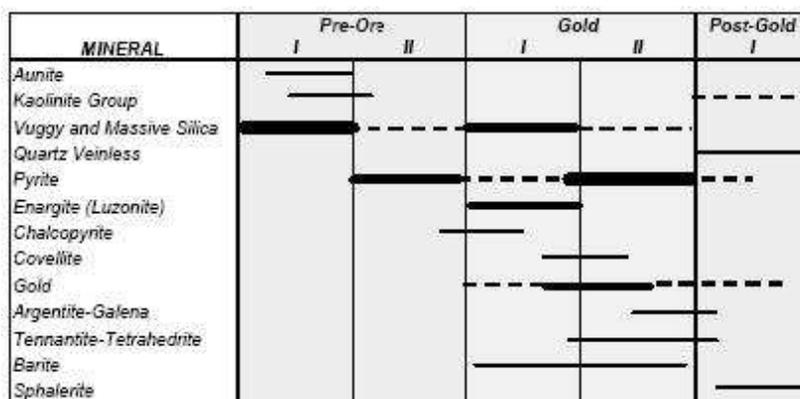
Figure 9.1: Photomicrographs of typical Ore Samples



In photographs *a* and *b*, it is clear that enargite and, partially, luzonite, replaced all types of Py; Au appears in the form of individual crystals within enargite. In *c* and *d*, enargite is subsequent and replaced all types of Py. One can also observe that there was prior fracturing facilitating its

It is still difficult to establish where galena and sphalerite fit in the Quimsacocha paragenesis. These are typically often found on the margins of the ore body, mainly in fractures and cavities, sometimes coexisting with kaolinite. Corbett (2006) has established a correlation with a marginal progression of the system evolving from high to low sulphidation. Using a combination of petrographic analysis and macroscopic observations, the following paragenetic sequence has been proposed (see Figure 9.2).

**Figure 9.2: Paragenetic Sequence**



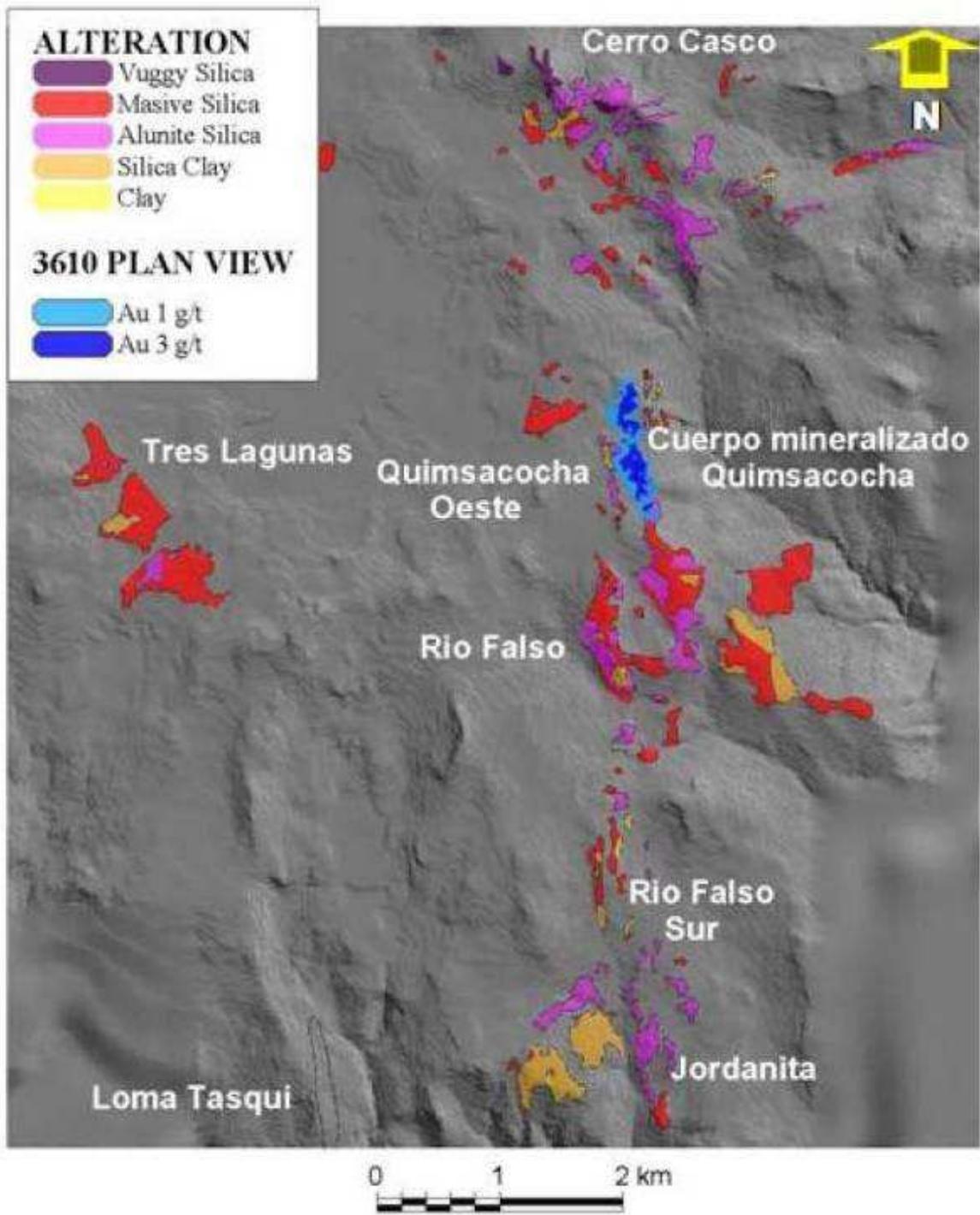
### 9.3 Structural Control Over Gold Mineralization

At Quimsacocha, like in most typical high sulphidation epithermal systems, alteration is characterized by multiphase injections of hydrothermal fluids that were subject to structural and stratigraphic controls. This event is characterized by an early alteration phase caused by a strong inflow of volatile, acidic fluids which cooled progressively and were neutralized by their reaction with country rock, leading to the formation of silicified layers surrounded by alteration halos made of kaolin, illite, dickite, pyrophyllite and alunite minerals while the sulfides and gangue minerals associated with the mineralization were deposited by late fluids inside the silicified bodies (Corbett and Leach, 1998; and Corbett, 2006).

Surface alteration covers an area of 12 km north-south and 6 km east-west (Figure 9.3). Some outcrops preserve a typical steam-heated type of alteration (Loma Larga) and are usually sterile. In some places there are high mercury anomalies along with occurrences of granular silica, alunite crystals with kaolin and traces of pyrite. It is also common to find locally massive silicification with weak development of vuggy texture (D1 sector). Towards the South (Jordanita sector) low temperature opaline or chalcedonic silica is observed.

Mineralization events and geochemical anomalies due to hydrothermal activity have been generated during the evolution of the basin in association with the Giron, Gañarín and Jubones regional fault systems. It is therefore possible that prospective zones for Cu±Au porphyry (Calabozo, Caucha), high sulphidation epithermal systems with Au, Cu and Ag (similar to Quimsacocha: San Fernando, Lluchir) and low sulphidation systems (Au, Ag veins in Gañarín, Cañaribamba, Soldados, etc.), which probably continued appearing along the late Oligocene-Miocene, may also occur within the Caucha area.

Figure 9.3: Alteration Map



## 10.0 EXPLORATION

Initial exploration work was carried out by the United Nations in the 1970s. A stream sediment geochemical survey was successful at identifying gold and base metal anomalies that were further investigated by geological mapping and diamond drilling.

During 1994-1996, the Newmont exploration program comprised geological mapping as well as geochemical and geophysical surveys (magnetometer, MEP, IP, and SP) over the main areas of hydrothermal alteration. Magnetometer surveys identified several lineaments (NNW-SSE and N-S) marginal to the caldera. Clear magnetic lows are associated with the silica alteration in the vicinity of the mineralized zones. IP surveys identified areas of low chargeability, likely associated with silicification, as well as high chargeability anomalies associated with sulfides. Some of the electromagnetic survey results are missing but available reports indicate that no significant anomalies were identified. The CogemaNewmont joint venture conducted a rock geochemical sampling program over the property but the specific methodology of the sampling is not known. Potentially economic values of Au-Cu-Ag mineralization were associated with silicification.

IAMGOLD carried out drilling on 120° oriented lines over the mineralized body in a systematic manner between D1 and Loma Larga. Lines are spaced 25 m apart with drill holes spaced at 50 m along the lines. Most drill holes are oriented along the lines (azimuths of 120° or 300°) with a plunge ranging between 60° and 90°, depending on where the ore body was expected to be hit. Table 10.1 summarizes the number of holes completed at the Quimsacocha Project.

**Table 10.1: Drilling Summary Table**

Company	Project Targets	Campaign (years)	No. of Holes	No. Meters drilled
<b>COGEMA</b>	D1, 3815	1992-1993	10	1,869
<b>NEWMONT</b>	D1, Loma Larga, 3815, Cerro Casco, Rio Falso, Aguarongos, Gulag	1994-1996	82	7,581
<b>IAMGOLD</b>	D1, Loma Larga	2002-2008	294	68,204
<b>IAMGOLD</b>	Rio Falso, Jordanita, Tasqui	2006-2008	44	6,421
<b>Total</b>	All targets	1992-2008	430	84,075

## **10.1 Exploration Methods**

The methods employed during exploration phases were mainly conventional: regional geological mapping (1:25,000 and 10,000), detailed mapping (scales of 1:2,500 and 1,000). Alteration mapping was carried out concurrently at similar scales (through the use of the Portable Infrared Spectral Mineral Analyser, "PIMA"). Regional rock sampling was also carried out over specific zones. Identified targets were later drilled and interpretations were made.

Geophysical methods used to delineate additional targets included a magnetic survey at regional scale (1:10,000) and IP-Resistivity follow-up surveys.

## 11.0 DRILLING

Table 11.1 shows the approximate percentage of meters drilled at the Quimsacocha Project in each drill core diameter.

**Table 11.1: Approx. percentage drilled in each specific Core Diameter**

<b>Diameter</b>	<b>% Drilled</b>
<b>NT</b>	34
<b>BT</b>	30
<b>HQ</b>	28
<b>NQ</b>	8
<b>Total meters drilled:</b>	74,625m

### 11.1 Diamond Drilling Procedures

IAMGOLD contracted two companies: Kluane and Paragon (now Major), to carry out drilling. All work was done by diamond core drilling and the diameters used were HQ (63.5 mm core diameter) and NQ (47.6 mm) for Paragon and NT (56 mm) and BT (42 mm) for Kluane. All collars were surveyed and prior to July 2004, approximately 50% of the holes had down-hole surveys. Subsequently, about 90% have been surveyed using a Sperry Sun down-hole instrument.

The Quimsacocha mineralization is essentially flat-lying and drill hole orientation should preferably be vertical. However, drilling vertical holes was problematic as the terrain is generally boggy. Most of the holes are thus drilled at  $-55^{\circ}$  to  $-65^{\circ}$  but can range from  $-45^{\circ}$  to  $-90^{\circ}$ . Hence the true thickness of mineralization is approximately 85% (range of 70% to 100%) of the intersected core length.

Construction of a 5m x 5m drilling platforms was necessary to set up the machinery with the aim of minimizing the environmental impact. All core obtained from the drilling was placed in wooden boxes and transferred to the logging room at the field camp for logging and sampling for assay.

Core diameter depended on the drill type used by each company. On several occasions hole diameter had to be reduced when bad ground was encountered. Priority was given to intersect the mineralized zones with the largest core diameter in order to obtain enough sample material to carry out all required tests (geochemical, geotechnical).

## **12.0 SAMPLING METHODS AND APPROACH**

### **12.1 Sample Preparation and Assay Protocols**

The collection of samples for geochemical analyses was mainly carried out in mineralized zones. Sample length was chosen according to geological criteria (feeders, hydrothermal breccias, mineralization styles and percentages, etc.) with a maximum length of 2 meters. For intervals where core loss was recorded, the sample length may be more than 2 m. After logging and tagging, all selected samples were cut in half with a diamond saw. One half was sent for geochemical analysis and the other is transferred to a secured warehouse at the exploration office in the city of Cuenca. The stored core as well as samples submitted to the assay laboratory received special care during crating and transportation (Quimsacocha - Cuenca by IAMGOLD, and Cuenca - Quito by shipping contractor Flota Imbabura) in order to prevent contamination, accidental swapping or loss.

### **12.2 Core Handling and Logging**

The logging work is done at the camp located in the Aguarongos sector by Technical Personnel. A short description of the methodology is presented below:

- Each core is marked every meter from the collar down to the bottom of the hole to check and correct driller's marks;
- A digital file is created for every hole and all core boxes are photographed and identified by their from and to in meters;
- Geotechnical followed by geological logging is carried out and then saved in a dedicated data base (Maxwell GeoService's DataShed).
- Sampling, within the target intervals, is done by cutting the core in half using a Boart diamond saw with an 8-inch blade.
- Samples are tagged for geochemical, metallurgical and geotechnical tests.
- Samples are crated and shipped to the Cuenca regional office where they are numbered and control samples (standards and blanks) are introduced into the sample stream at set frequencies.
- Four to five sample bags are grouped into rice bags that are sealed with tie-wraps and shipped to the assay laboratory. A copy of the sample checklist held inside each rice bag is also forwarded to the assay laboratory. A laboratory employee cross-checks the list upon reception and faxes the list to IAMGOLD's Quito office where it is reviewed for inconsistencies.

- All pulps and rejects are kept at the laboratory's yard. Only check assay pulps and rejects are discarded.

Core handling and tagging procedures have been reviewed by the project Qualified Person, Mr. Francis Clouston, who judged them as acceptable.

## **13.0 SAMPLE PREPARATION, ANALYSES AND SECURITY**

### **13.1 Sample Preparation and QA/QC Flowsheet**

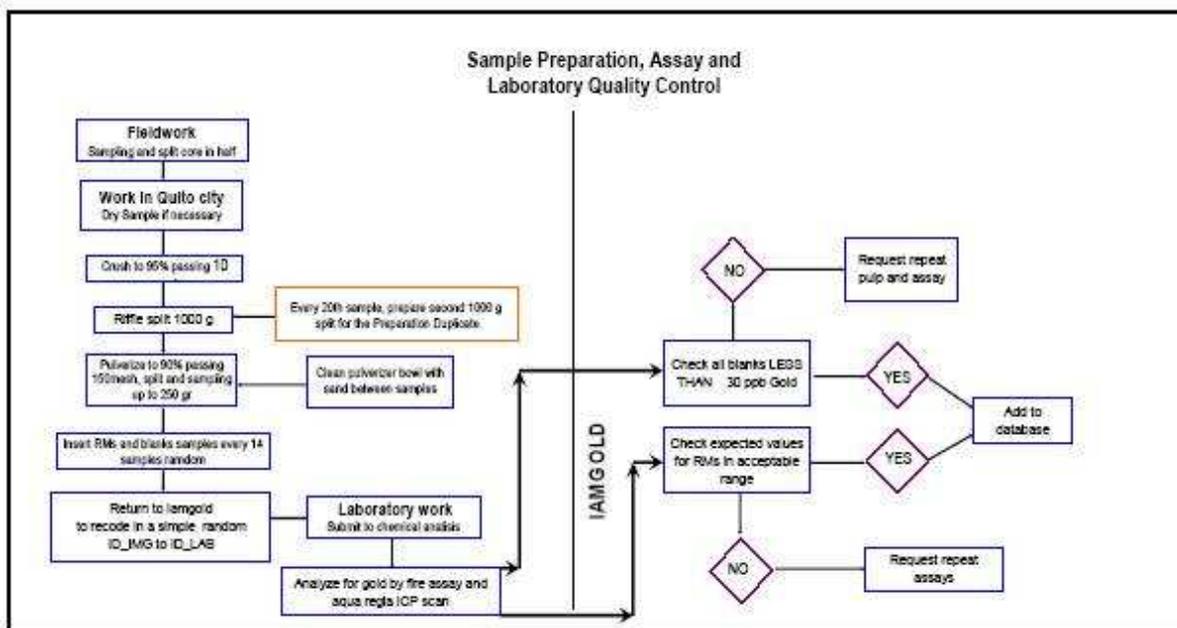
The “QA/QC” program (quality control) of the samples was implemented early in the exploration work and consisted of systematically inserting standard and duplicate samples. In addition, 10% of the pulp samples were sent to a second laboratory to ensure quality control of the primary laboratory. Until September 2004, samples were prepared in Quito by ALS-Chemex and assayed by their laboratory in Canada. From October 2004, samples were prepared by Inspectorate in Quito and analyzed by BSI Laboratories in Lima, Peru.

The sample preparation procedures, insertion of QC samples and assay procedures are summarized below:

1. Samples are dried, if necessary;
2. The entire sample is crushed to 95% passing 10 mesh;
3. 1,000 g is riffle-split and pulverized to 90% passing 150 mesh. For every 20 samples, a 1,000g pulp duplicate is collected;
4. 250 g of each sample is returned to IAMGOLD and recoded in a simple random way as follows: ID\_IMG to ID\_LAB code;
5. Reference materials and blanks are inserted in the sampling stream at the rate of 1 every 15 samples;
6. Each sample is analyzed for Au by fire assay and for a multi-element package using an aqua regia digestion with ICP finish;
7. Finally, assay data are returned to IAMGOLD by email followed by a hard copy.

Figure 13.1 shows the path followed in the QA/QC program.

Figure 13.1: Sample Preparation, Assay and Quality Control Flowsheet



Results are imported into the database and plotted. If certified standard limits are exceeded or significantly different duplicated values are returned, the following procedures are followed:

Standard's limits of confidence exceeded:

- A memo is sent to Technical Management;
- A new analysis is requested from the laboratory including 5 samples upstream and 5 samples downstream from the reference sample;
- When the new analyses are received, the original data is replaced by the new results.

Different values in duplicate samples

- A memo is sent to Technical Management
- A new analysis is requested on the first, second and third pulp.
- The source of the problem is identified.
- A new analysis on the batch is requested;
- Results in the certificate are verified, and the results are submitted to the project.

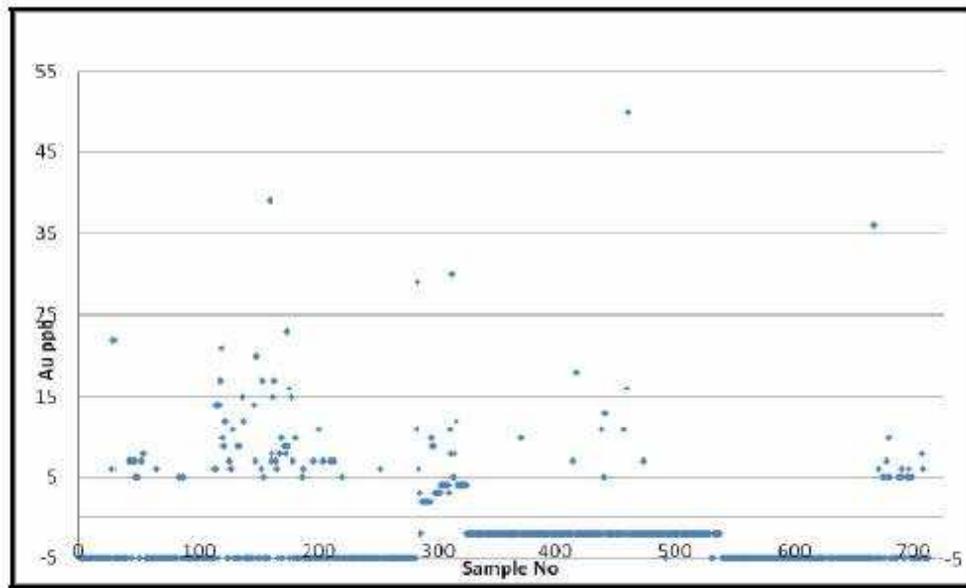
### 13.2 Blank Sample Control

A total of, 713 blank samples have been inserted into the Quimsacocha sample stream. A graphical representation of blank sample assay results is illustrated on Figure 13.2.

**Table 13.1: QC Failures for Fire AU Assays**

Report	Sample-ID	ID-Lab	Au ppb
098GEO-4353	IQD-161-060-1	24,808	36
QU04069940	IQD-139-020-1	21,323	39
256GEO-081	IQD-210-140-1	29,689	50

**Figure 13.2: Control chart of Au Assay Blanks**

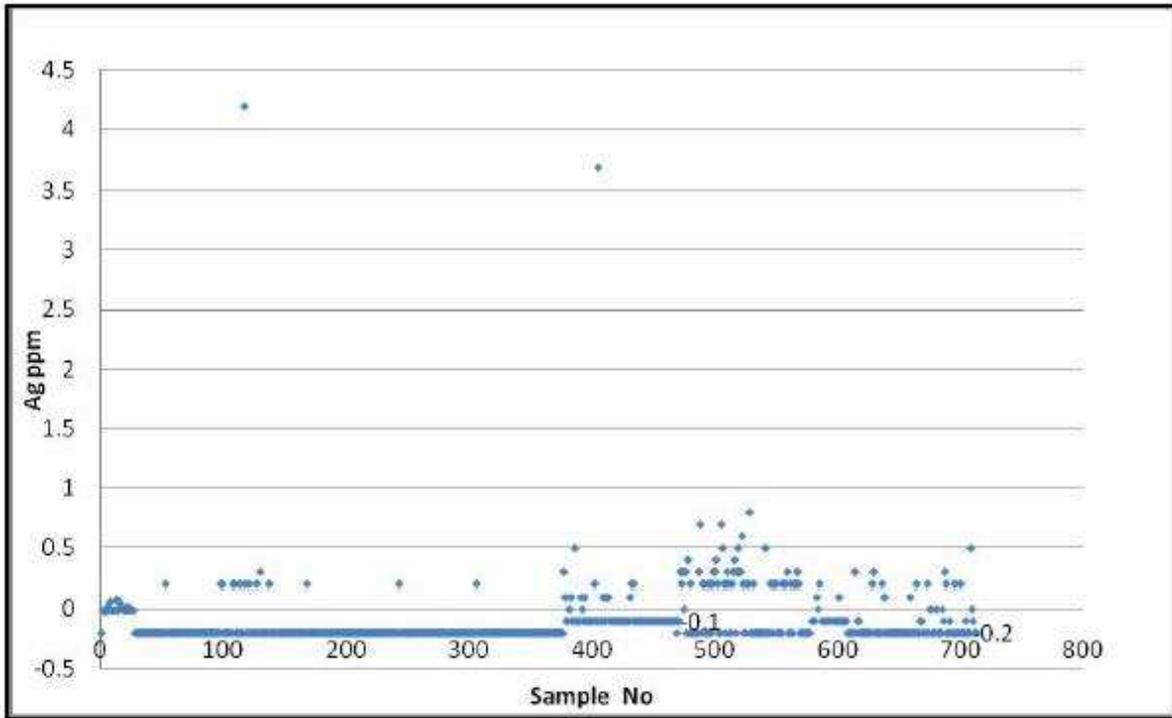


The results of the final certificate are saved in the project data base following internal procedures. Behavior of silver and copper standards in ICP Aqua Regia digestion are shown in Table 13.2 and Figure 13.3.

Table 13.2: QC Failures for Fire AG - CU Assays - ICP Aqua Regia Digestion

Report	Sample-ID	ID-Lab	Ag ppm	Cu ppm
164GEO-020	IQD-181-180-1	26,868	3.7	418
QUO04049235	IQD-124-100-1	18,355	4.2	484
200GEO-062	IQD-193-020-1	28,220	0.2	446

Figure 13.3: Control chart of Ag Assay blanks



Analytical Solutions Ltd has conducted a review of the QC program in August 2005 and concluded that there was no evidence of systematic gold contamination based on the standard reference materials inserted with the samples. Gold assays were biased about 5% lower from reported values for reference materials and after comparisons with ALS-Chemex assays. A comparison of BSI and ALS-Chemex Ag and Cu assays demonstrated that the biases depended on the grade. Analytical Solutions Ltd recommended an investigation of all analytical procedures at both laboratories to identify the sources of errors. They also advised the insertion of laboratory pulp duplicate samples as well as duplicate

assaying of preparation and core samples in order to improve the quality of results. These recommendations were immediately implemented.

In September 2006 Scott Wilson RPA's conducted a small separate due diligence check assay program on seven quartered core samples. Even though too small to draw meaningful conclusions, the results found reasonable agreement and confirmed the presence of gold.

In the 2007 drilling phase, IAMGOLD submitted 42 blank samples to the BSI laboratory to check for contamination. One out of the 42 samples (representing 2 % of the total samples) returned a value greater than the detection limit of 5 ppb Au with a value of 10 ppb Au. The conclusion was that there was no evidence of gold contamination.

### **13.3 Standard Reference Material**

The standard reference samples are purchased from Rock Labs in New Zealand and are representative of the grade expected at the Project. Table 13.3 lists the standards used in the project:

**Table 13.3: Types of Reference Material Standards used**

<u>RMS</u>	<u>Max Value (ppb)</u>	<u>Mean (ppb)</u>	<u>Low Value (ppb)</u>
<b>SN16</b>	<b>9,018</b>	<b>8,367</b>	<b>7,716</b>
<b>SG14</b>	<b>1,075</b>	<b>989</b>	<b>915</b>
<b>SI15</b>	<b>1,930</b>	<b>1,805</b>	<b>1,685</b>
<b>SH13</b>	<b>1,723</b>	<b>1,315</b>	<b>1,213</b>
<b>SJ10</b>	<b>2,550</b>	<b>2,643</b>	<b>2,750</b>

A total of 1015 standards were inserted in the course of drilling. Table 13.4 shows the total number of each type of standard reference sample used. The behavior of the different standard types are displayed graphically on Figure 13.4, Figure 13.5, Figure 13.6 and Figure 13.7.

Table 13.4: Number of Reference Material Standards used in each category

RMS	No
SN16	294
SG14	289
SI15	278
SH13	45
SJ10	109

Figure 13.4: Au Fire Assay, Standard SN16

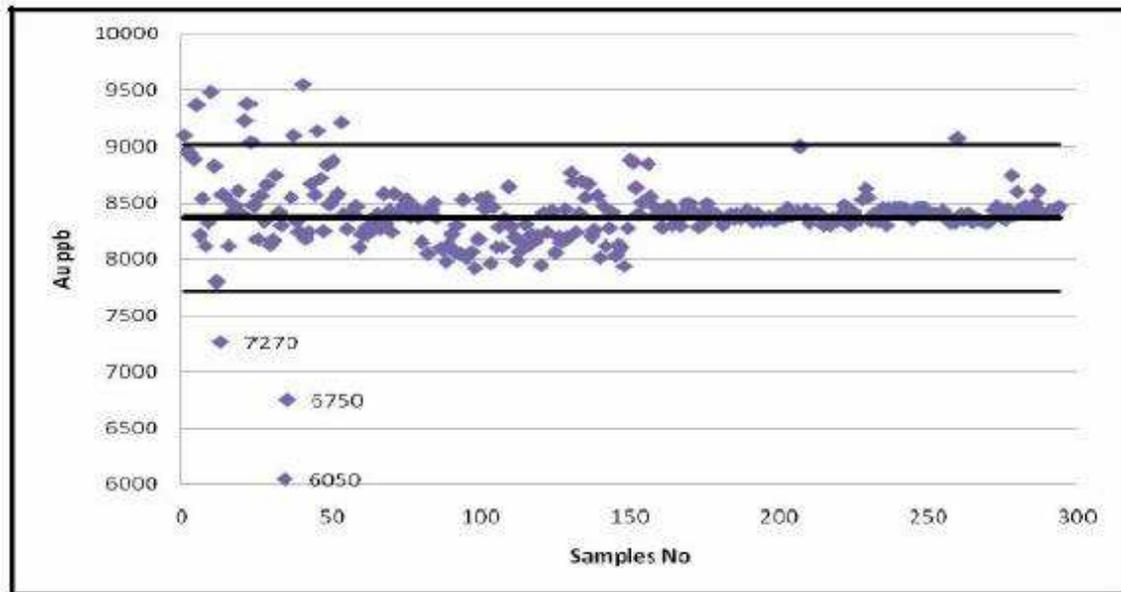


Figure 13.5: Au Fire Assay, Standard SG14

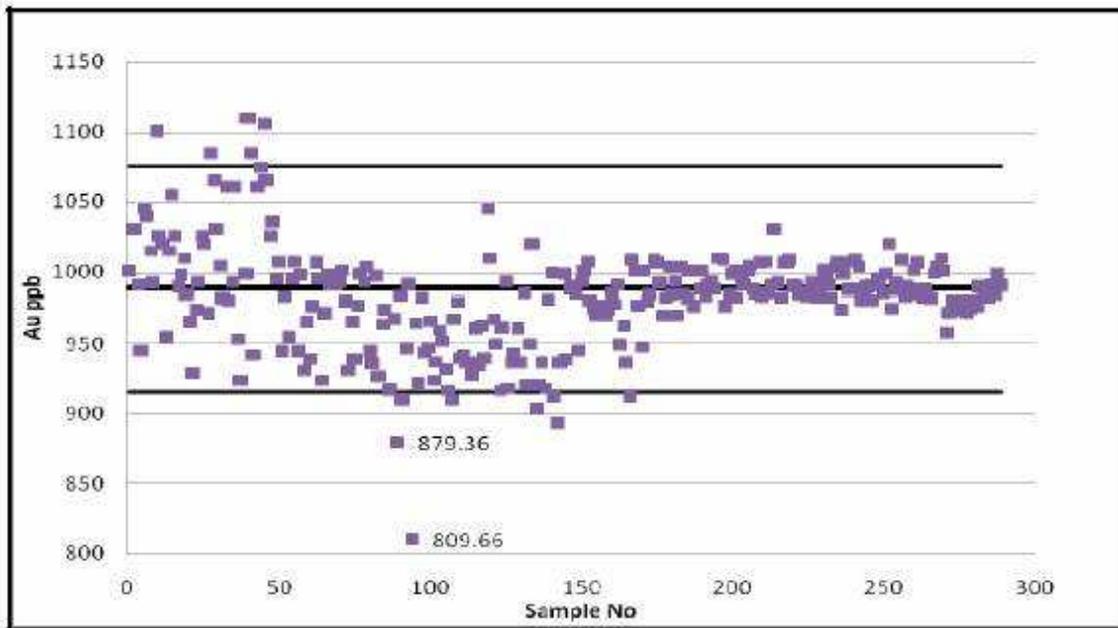


Figure 13.6: Au Fire Assay, Standard SI15

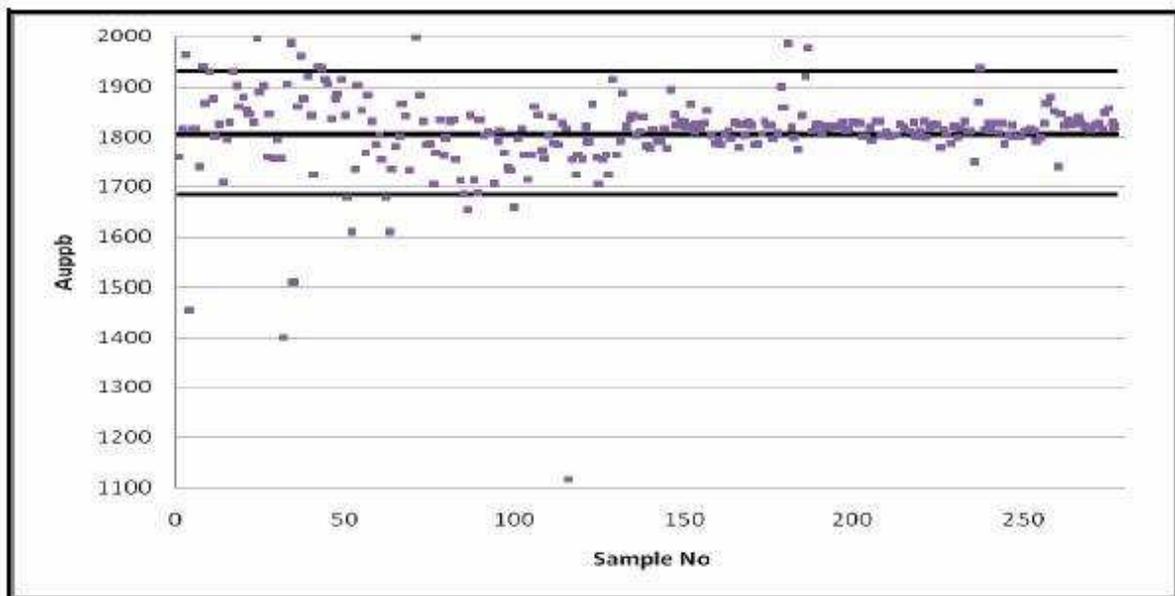
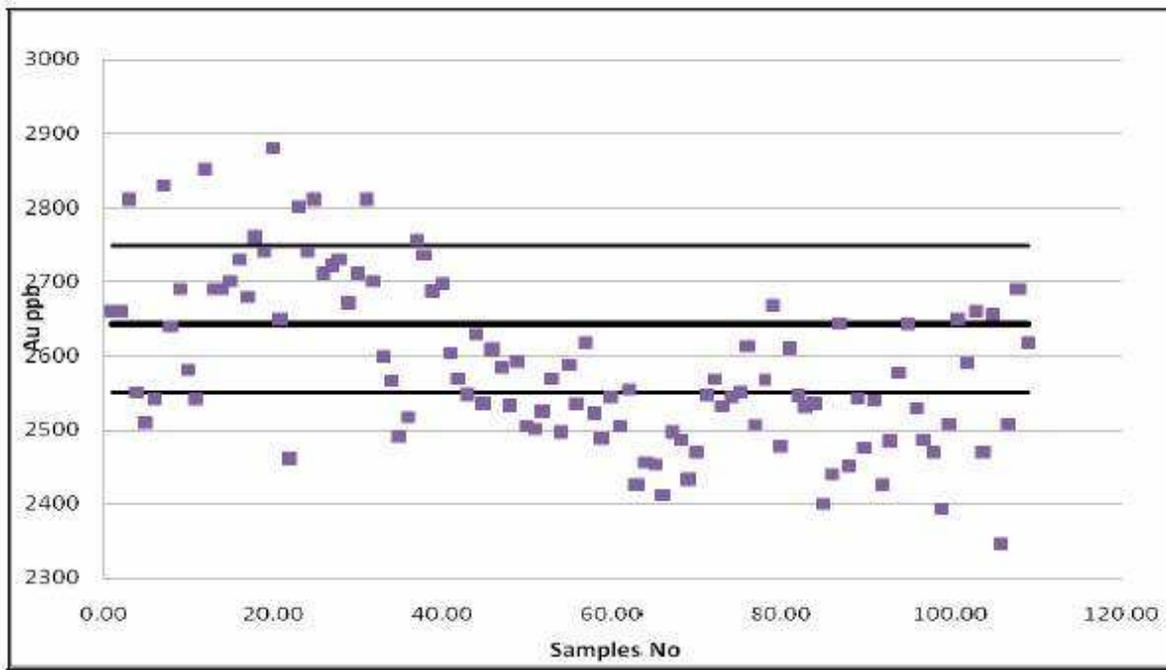


Figure 13.7: Au Fire Assay, Standard SJ10



Sample numbers on the above charts are sorted in chronological order. The period of greatest inconsistency coincides with the earliest drilling campaigns. This was the main reason for changing laboratories from ALS Chemex to BSI in late 2004.

Analytical Solutions Ltd. (Bloom, 2005) reported that the occurrence of QC failures, i.e. results differing at greater than 3% from the expected standard assay value, is within the 95% expected range of confidence used.

In Scott Wilson RPA's opinion, the results demonstrate a high degree of accuracy (RPA, 2006).

In the 2007 drilling phase, a total of 48 reference material samples using three different standard types were inserted into the sample stream (SN16, SG14, SI15). There were no failed batches.

#### 13.4 Check Assay Program

In 2005, IAMGOLD sent 180 pulps from 4 selected holes, originally assayed by Inspectorate, to be reanalyzed by ALS Chemex. Analytical Solutions Ltd. reviewed the comparative results and concluded that the tests are generally conclusive, within  $\pm 20\%$ .

From 2005, starting from hole IWD-224 onward, 10% of all samples were chosen randomly the end of each quarter to be reanalyzed in a second laboratory (ALS Chemex) as part of the QA/QC program. A

total of 1,046 samples have been re-analyzed. Basic statistics of the results from each laboratory are listed on Table 13.5. Scatter-plots comparing both laboratories for Au fire assay, Ag ICP and Cu ICP analyses are displayed in Figures 13-8, 13-9 and 13-10 respectively. Results show excellent correlations between the laboratories.

**Table 13.5: Total of the samples analyzed by each laboratories**

	Au_Als Chemex	Au_BSI
No Samples	1,046	1,046
Mean ppb	3,654.83	3,780.56
Max ppb	371,000	431,650
Min ppb	2,50	1,00

**Figure 13.8: Au Fire Assay, ALS Chemex vs BSI**

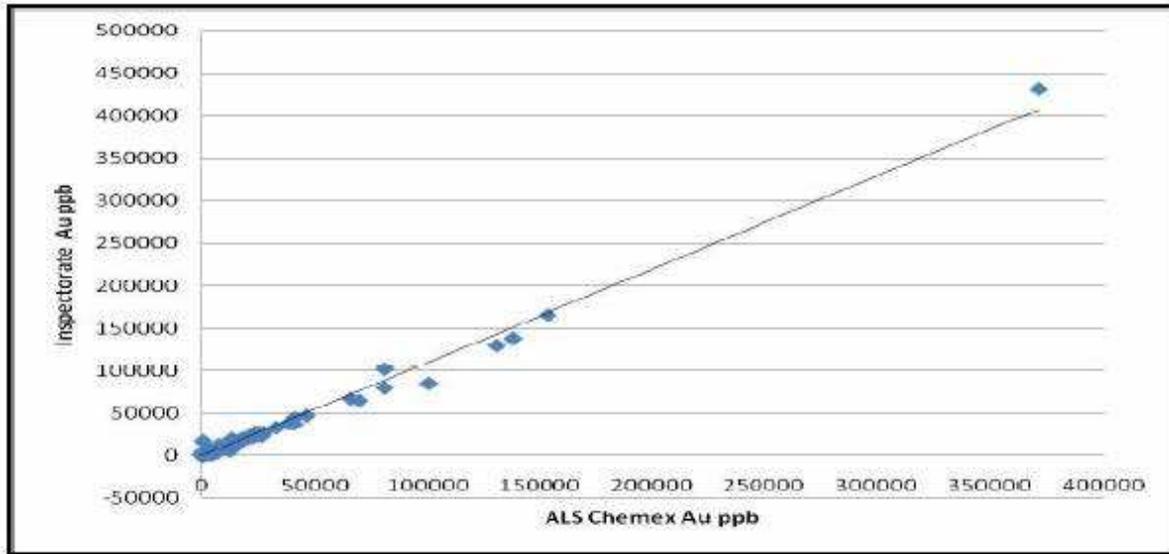


Figure 13.9: Ag ICP, ALS Chemex vs BSI

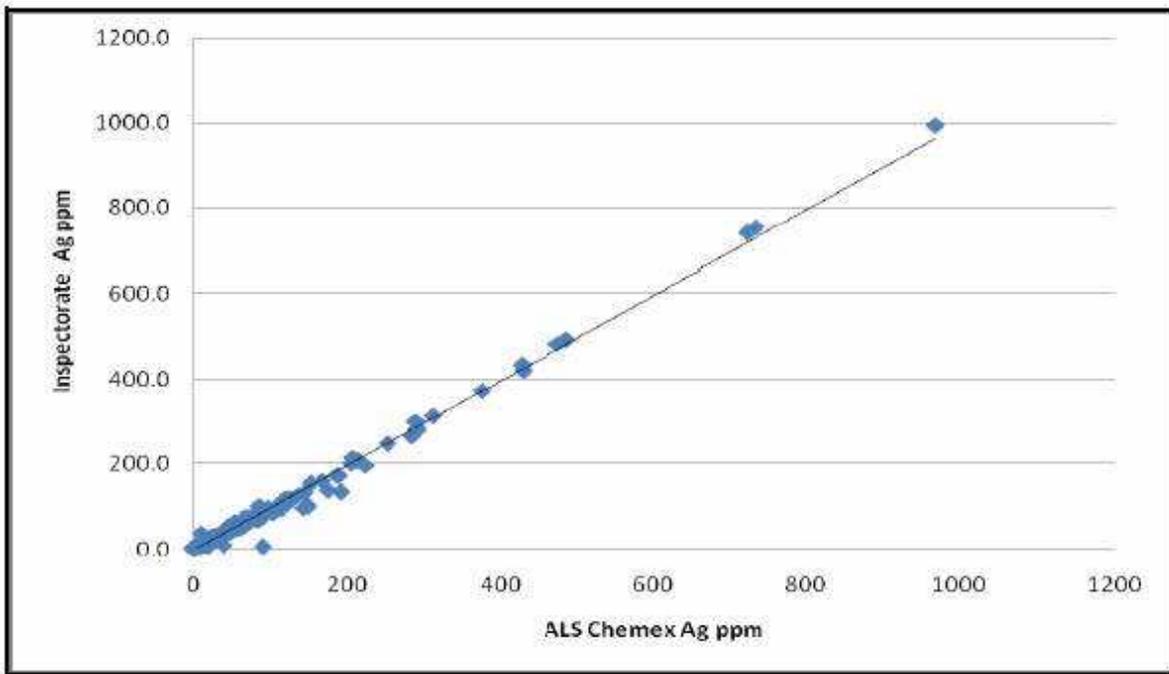
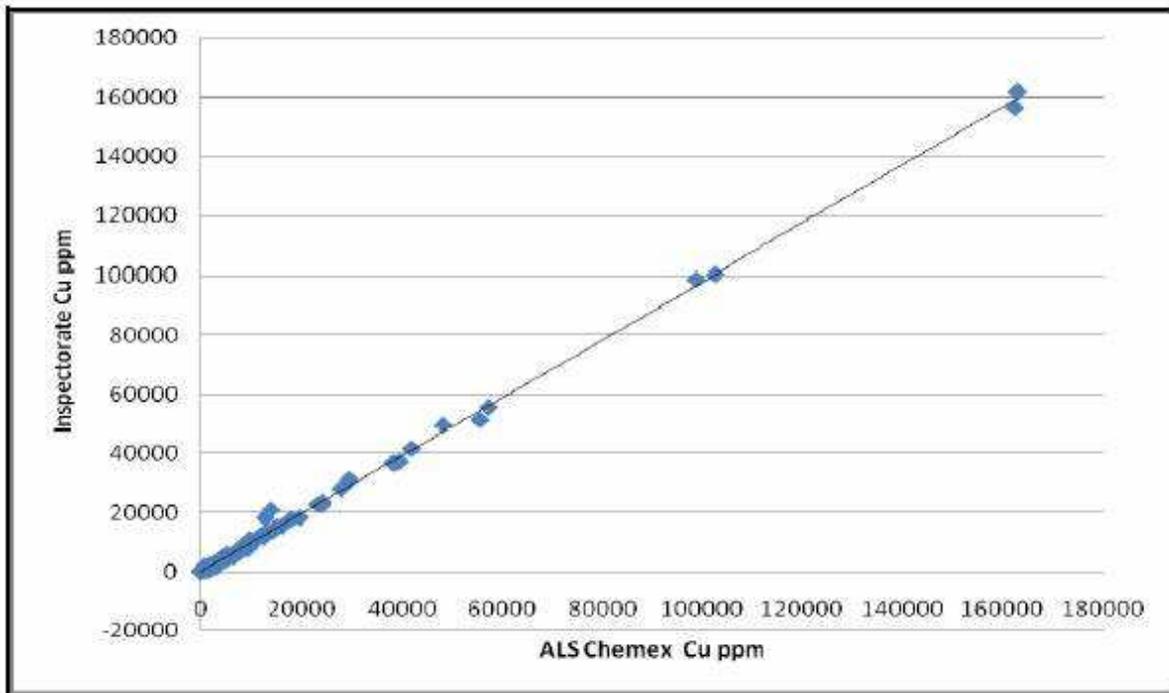


Figure 13.10: Cu ICP, ALS Chemex vs BSI



### 13.5 Check Duplicate Samples

Throughout the program, 456 duplicate and 263 triplicate samples were submitted to BSI for control. Results were conclusive, increasing confidence that BSI's results were consistent throughout the assaying program.

A summary of the results for the Au check duplicate sampling is provided in Table 13.6.

**Table 13.6: Comparative results for Au Fire Assay Tests**

	Original	Duplicate	Triplicate
<b>Total Samples</b>	456	456	263
<b>Mean Au ppb</b>	2,171	2,189	2,104
<b>Max Au ppb</b>	22,900	29,980	20,300
<b>Min Au ppb</b>	0	0	0
<b>Deviation Std</b>	2.7	2.8	2.5

**Figure 13.11: Au Fire Assay, Original vs Duplicate Sample**

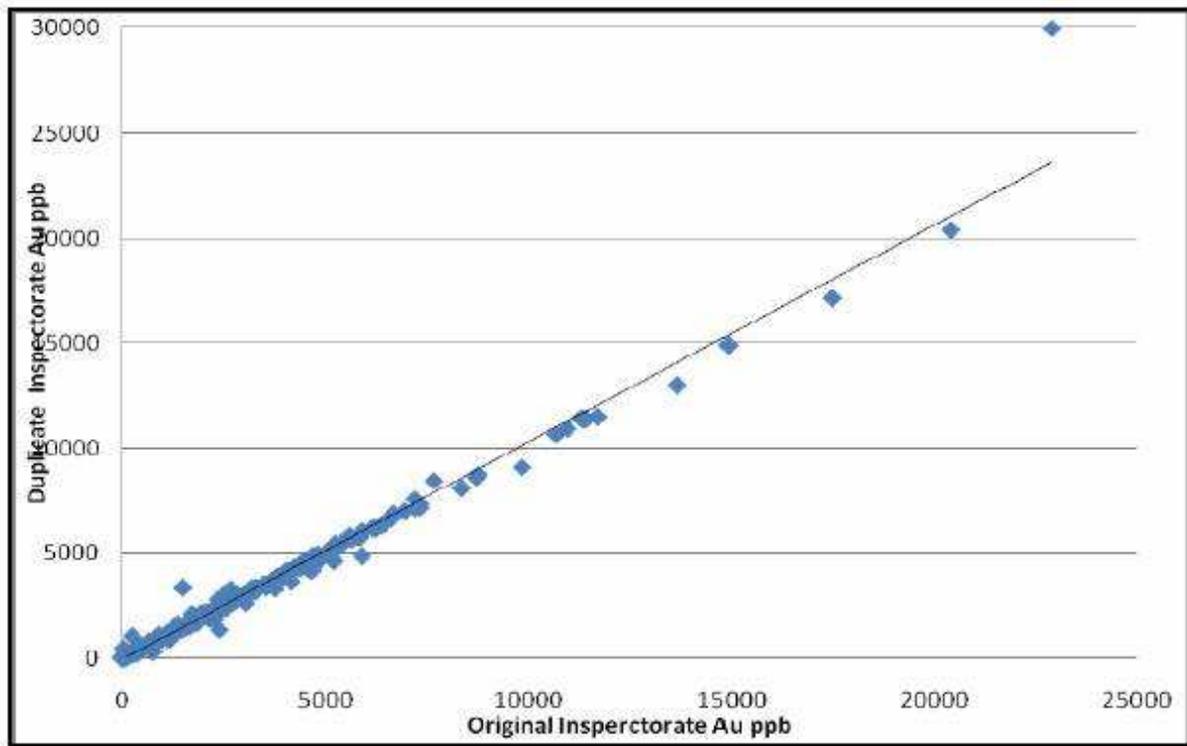
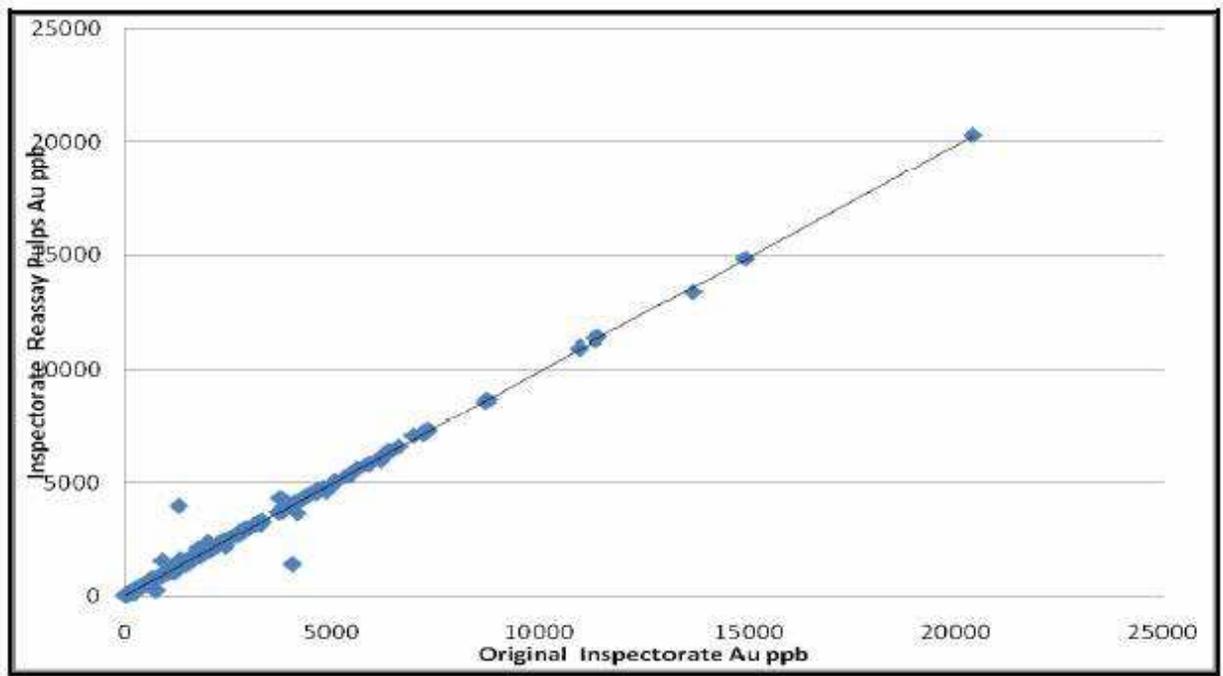


Figure 13.12: Au Fire Assay, Original Sample vs Triplicate Pulp



## **14.0 DATA VERIFICATION**

The data verification (QC) protocol includes several steps among which the most important are:

- Checking the drill rig location and direction during set-up by the geologists using a GPS
- Verification of the sample length marked by drillers by the geologists during logging
- Cross-validation of the assay stored in the database with the assay certificate
- About 5% of the assay database has been spot-checked by the QP in 2007 and only 11 data entry discrepancies were found, mostly rounding errors.
- Monthly checks by the systems manager to ensure that each assay has been associated with the proper drill hole and that no assays are missing.

The IAMGOLD quality control QC program included the submission of standard reference samples and blank samples with the pulverized samples of diamond drill core. In addition, a second laboratory was mandated to conduct a check sample program. The Datashed QA/QC management program also has custom routines to check missing assay or control results.

See Section 13 for an exhaustive description of the QA/QC program, including conclusions.

**15.0**    **ADJACENT PROPERTIES**

There are no adjacent properties as defined in Item 17 of Form 43-101F1

## **16.0 MINERAL PROCESSING AND METALLURGICAL TESTING**

### **16.1 Summary**

- A flotation process followed by an off-site pressure oxidation (“POX”) of the concentrate process has been selected as the most environmentally and economically favorable ore treatment option;
- Design is based on a 3,000 tonnes per day ore production during an 8-year mine life (1,095,000 tonnes per year);
- The chosen processes should ensure optimal recovery of several economic elements: 90% Au, 92% Cu and 77% Ag. Flotation of the sulfides will ensure removal of approximately 95% of the sulphur from the ore treated on-site.
- 78% of the total planned ore to be milled at the mine site and the resulting tailings will remain there. This stream theoretically represents the less reactive material and should result in less reactive waste. 58% will be used as paste backfill underground and the remaining 20% will be deposited on surface in the form of thickened tails or paste tails in secured containment facilities.
- For economic reasons, the POX will be ideally be located near a source of limestone.
- Recent testwork confirms that the ore is moderately hard but that its abrasion index is exceptionally high. A technical review of the grinding and milling circuits is warranted at the Feasibility Stage for proper design of the mill media and liners.
- Capital costs for the flotation plant and associated processing and storage facilities at the mine site are estimated at US\$61.2 M and at \$93.8 M at POX site. Total processing operating costs are estimated at \$31.72/tonne ore or \$145/oz Au (including copper credits).

### **16.2 General Overview**

Quimsacocho is a high-sulfidation epithermal gold/silver deposit with significant amounts of copper, mostly in the form of enargite. The refractory nature of the ore makes the metallurgy complex. Numerous metallurgical tests were conducted and several potential processing methods have been identified. An economic potential study was undertaken in 2006 by SRK Consulting on the basis of a SGS Lakefield scoping study. Four types of processing plants were

considered for both underground and open pit operations and taken to the economic analysis stage. These options are described in Table 16.1.

**Table 16.1: Possible Processes and Selection**

<b>Process possibility</b>	<b>Comments</b>
<b>Whole ore pressure oxidation (POX)</b>	Less available water and environmental issues at the mill site.
<b>Concentrate by flotation then ship to a smelter/refinery (Conc.)</b>	Not interesting due to of penalties on arsenic content in the final concentrate, Low concentration ratio requested related to association of gold with the pyrite.
<b>Concentrate pressure oxydation (Conc. POX)</b>	Best alternative in terms of “off site treatment”. With flotation at mill site and oxidation at POX site.
<b>Concentrate roasting (Conc. Roast)</b>	Lower global gold recovery and environmental issues related to the arsenic content in the ore.

Each option have been studied for both underground and open pit mining scenarios which present different feed rates and head grades. The plant feed conditions, recovery, and notional revenue (not allowing for transportation, smelting, refining costs, etc.) for each of the four process options are summarized in SRK Consulting’s report of May 2006. From the economic and preliminary sustainability development analysis, it was concluded that an underground mine scenario with onsite flotation of sulfides with gold, followed by concentrate pressure oxidation (“POX”) was the preferred route. POX will be followed by copper recovery by cementation and barren solution neutralization by limestone. Other oxidation processing technologies are currently being reviewed and could be introduced at the Feasibility Study stage if deemed viable.

The summary of Quimsacocha metallurgical test results presented herein are more thoroughly discussed in SGS Lakefield reports. All results of the selected scenario (UG-F-CPOX: Underground-Flotation-Concentrate Pressure Oxidation) are presented below and described in subsequent sections.

The capital and operating costs and production data for the profitable scenario are summarized in Table 16.2 and detailed in later sections of this report.

**Table 16.2: Summary of capital and operating costs**

Item	Units	Concentrate POX		
<b>Underground Mine</b>				
Processing 1,095,000 t/y ore containing 6,46 g Au /t, 36,41 g Ag /t, 0.42% Cu and 6.69% S				
<b>Capital cost</b>	\$'000's	Mill Site 61,236	POX Site 93,816	Total 155,052
<b>Operating costs</b>	\$/t ore	10.60	21.12	31.72
<b>Production</b>	Form Au, oz/a Ag, oz/a Cu, lb/a		Dore and Cu Cement 204,685 986,999 9,330	

### 16.3 Testwork Programs

**Test samples:** Between 2005 and 2008, three groups of Quimsacocha ore samples were shipped to SGS Lakefield and tested as individual samples and in composites. Results from the first SGS report in 2006 are summarized below. Recent data and conclusions will also be discussed in the following paragraphs.

- **Mineralogy:** Mineralogical studies, elemental analyses, and diagnostic tests show that most of the gold is associated with pyrite ( $\text{FeS}_2$ ) and enargite ( $\text{Cu}_3\text{AsS}_4$ ).
- In one sample that was examined in detail, approximately 72% of the gold was dissolved in pyrite and 12% was present in enargite as colloidal gold.
- **Comminution:** A composite made up from 17 samples of Quimsacocha ore gave a Bond ball mill work index of 17.6 (metric) indicating a moderately hard ore. From recent laboratory tests at Lakefield, grindability characterization on a master composite confirmed this work index. JKSimMet software was used to simulate the grinding circuit and shows that Quimsacocha ore could be processed by SAG milling followed by ball milling.
- The high abrasion index for this ore is exceptional and must be considered in the design of mills, media and liners. A technical review should be undertaken on existing circuits operating with ores at such high abrasion indexes. Adjustments to the grinding circuit design will be made during the Feasibility Study to reduce costs associated with ore grinding.

- **Gravity Concentration:** Gravity concentration using a Knelson concentrator generally recovered less than 10% of the gold. Recent results showed an E-GRG (Extended Gravity- Recoverable Gold) recovery of 12% on the master composite. From these results this process method is considered inappropriate for Quimsacocha ore. However, further work is required to validate this conclusion since flotation is very sensitive to coarse gold or the presence of nuggets.
- **Cyanidation:** Direct cyanidation only dissolves the gold that is free or associated with enargite, leading to low overall recoveries (average 30%) and very high cyanide consumptions (average 17 kg NaCN /t). Direct cyanidation is clearly not effective on Quimsacocha ore.
- **Whole Ore Pressure Oxidation :** Diagnostic tests and whole ore pressure oxidation (POX) tests show that near complete oxidation of the sulfides in the ore will render the ore highly amenable to cyanidation. In the pressure oxidation process, the copper goes into solution from which it can later be recovered. The gold remains with the pressure oxidation residue from which it can be leached with low cyanide consumption. In three tests on whole ore composites from which near complete oxidation of sulfide was obtained, 99% of the copper was extracted and subsequent cyanidation recovered between 93 and 99% of the gold. Cyanide consumption was in the 2 to 4 kg NaCN/t range and less than 3 kg NaCN/t under stronger oxidizing conditions.
- **Flotation:** Quimsacocha ore was found to be quite amenable to flotation recovery of the pyrite and enargite. Although only partially explored, it appears that some separation of pyrite and enargite can be obtained which would lead to the production of a high-copper, high-gold concentrate (containing around 10% of the total gold output), and a high-pyrite, lower gold grade concentrate. There does not appear to be much incentive to follow this route and so it was not examined in detail.
- Flotation of a cleaned bulk sulphide concentrate was examined. Gold recoveries of about 90% to a concentrate containing about 30 g Au/t were demonstrated. The copper content of the feed to the flotation tests was slightly elevated at 0.6% and the observed copper recoveries of about 95% would be lower with the planned mill feed grades.
- **Concentrate Pressure Oxidation:** Two pressure oxidation tests were carried out on flotation concentrate. Both tests achieved 99% sulphur oxidation, 96% or greater dissolution of the copper in the concentrate and 98% or greater extraction of the gold in the concentrate by cyanidation of the washed residue. Clearly, the flotation concentrates are very amenable to pressure oxidation.

- Copper was recovered from a pressure oxidation solution by partial neutralization followed by iron cementation. The cementation barren solution was neutralized with limestone and iron. Copper recovery was efficient and both waste precipitates were shown to meet leachate tests with respect to arsenic.
- **Concentrate Roasting:** Two roasting tests were done on flotation concentrate. Both tests achieved very high levels of sulphur and arsenic elimination with the more aggressive test showing 90% arsenic and 96% sulphur elimination. Acid leaching of the calcine removed 87% of the copper in a solution amenable to copper recovery. Cyanidation of the washed residue gave 92% gold recovery and low cyanide consumption.

### **16.3.1 Possible Process Plants and Their Performance**

As mentioned earlier, four processes were studied. Based on the test work summarized above, very preliminary plant designs have been generated for each process option and are described briefly below:

**Whole Ore Pressure Oxidation:** ore is ground, pumped into a continuous high-pressure autoclave to dissolve copper and oxidize pyrite, copper is recovered by counter-current-washing and cementation, and gold is recovered from the washed residue by cyanidation and carbon-in-leach (CIL). The acidic solutions generated during pressure oxidation are neutralized with limestone and lime.

**Flotation and Concentrate Shipment:** ore is ground and a gold-copper-sulphur concentrate produced by flotation is shipped to a custom smelter for metal recovery.

**Concentrate Pressure Oxidation:** ore is ground and a bulk sulphide concentrate containing gold and copper is produced by flotation. The concentrate is pumped into a continuous high-pressure autoclave to dissolve copper and oxidize pyrite, copper is recovered by counter-current-washing and cementation, and gold is recovered from the washed residue by CIL. The acidic solutions generated during pressure oxidation are neutralized with limestone and lime.

**Concentrate Roasting:** ore is ground and a bulk sulphide concentrate containing gold and copper is produced by flotation. The concentrate is roasted to produce a calcine suitable for the recovery of copper by acid leaching and washing, and the subsequent recovery of gold by CIL. The sulphur dioxide produced during roasting is converted to sulphuric acid. The acid is transported to market.

### 16.3.2 Conclusions and Retained Scenario

Based on the preliminary assessment, location and site sensitivity, the underground alternative with flotation and pressure oxidation on the sulfide concentrate have been retained. The crushing, grinding and sulfide mineral flotation will be carried out at a mill site located close to the mine site at an elevation of 3,750 m. The sulfide concentrate will be filtered and truck to the POX site for pre-treatment and valuable metal (gold and copper) extraction. The POX plant will be located near Guayaquil, 300 km from the mill site at an elevation of 4 m. The performances of the retained scenario are presented in Table 16.3.

**Table 16.3: Plant Performance Summary**

Item	Units	Concentrate POX				
<b>Throughput</b>	t/a	1,095,000				
<b>Feed grades</b>	Au g/t	6.46				
	Ag g/t	36.41				
	Cu %	0.42				
	S %	6.69				
<b>Products</b>	Gold	Au-Ag bullion				
	Silver	Au-Ag bullion				
	Copper	Cu cement				
	Acid	None				
<b>Recovery</b>		<b>Flotation</b>	<b>POX</b>	<b>CIL</b>	<b>Cementation</b>	<b>Total</b>
	Au %	93.00	97.00			90.00
	Ag %	91.00	85.00			77.00
	Cu %	96.00	98.00		98.00	92.00
	S %	95.00	98.00			93.00
<b>Recovery to products</b>	Au oz/a	204,685				
	Ag oz/a	987,014				
	Cu t/a	9,330				

### 16.3.3 Future work

More test work is required to better define the selected process route and size the associated capital and operating costs. Tests will provide better definition of comminution, flotation and concentrate pressure oxidation parameters. Two parts of the program are scheduled to proceed or are on-going at SGS Lakefield:

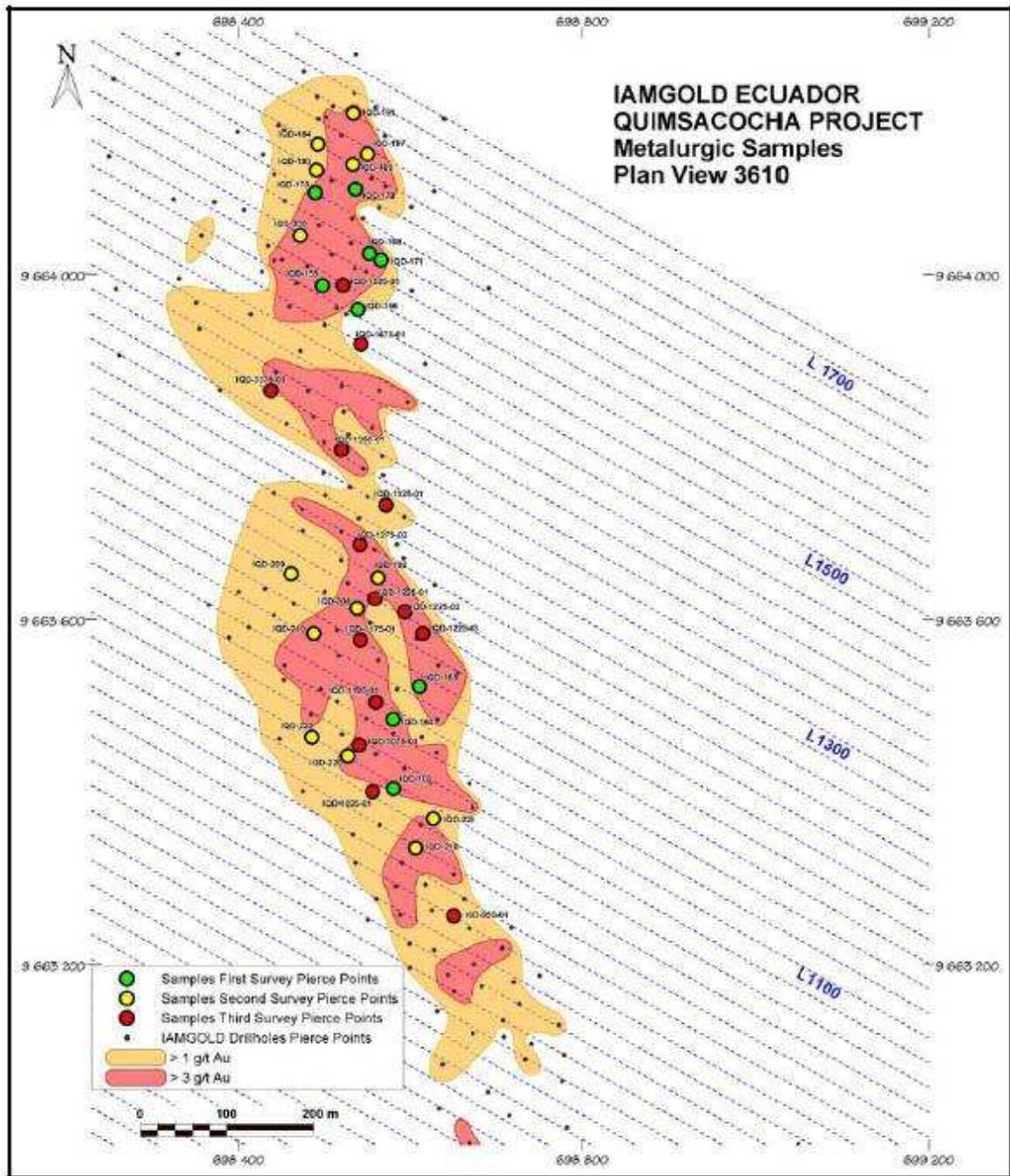
1. Further lab tests on different ore pre-treatment processes
  - **Oxidation:** Alternative oxidation process tests have been performed using other techniques (Activox, Albion, and Bio-oxidation). The results were not good and these alternatives have been discarded.
  - **Neutralization and Cementation:** Perform neutralization of the pregnant solution and cementation tests then explore other processes such as Ion Exchange (IX) and Electrowinning (EW) to recover copper. Carry out more tests to optimize arsenic precipitation.
  - Perform other tests to finalize the flow sheet.
2. Pilot plant tests have been launched to simulate the flow sheet of the chosen scenario with a focus on the following:
  - SAG mill test to confirm the grindability of the ore.
  - Flotation pilot plant to validate conditions for design and sizing and to produce enough concentrate for oxidation tests.
  - Oxidation experimentation to test the amenability of a continuous process and set up the design criteria for recirculation mode.
  - Treatment and tailings management: initial tests show that arsenic can be precipitated in a stable form but further test work of this important aspect is required.

## 16.4 Metallurgy Testwork

### 16.4.1 Sampling Surveys and Preparation

Three major drilling campaigns of the ore body were undertaken between 2005 and 2008 to produce representative samples of the ore body. Drill surveys are shown on Figure 16.1.

Figure 16.1: Sampling Campaigns (Quimsacocho at 3200 mRL)



#### 16.4.2 Mineralogy Study

This section describes a mineralogical test program conducted on a master composite sample using High Definition Mineralogy, including QEMSCAN technology (Quantitative Evaluation of Material by Scanning Electron Microscopy). The aim was to examine the liberation characteristics of copper bearing minerals. This program was conducted recently along with a gold deportment study. Results are presented in following paragraphs.

**Mineralogy Ore Description:** Twenty-five samples (taken from drill core) were prepared as polished or thin sections and examined in reflected and transmitted light. Although pyrite generally predominates, various other ore minerals were identified, including enargite, native gold, tetrahedrite, covellite, galena, barite, argentite and hessite (a silver telluride). Most of these phases were confirmed by EDS analyses made by SEM.

Pyrite is the major sulphide in the silicified rock occurring as both fine (<0.05 mm) equant to subequant crystals and medium to large grain size subhedral, sometimes colloform aggregates. It is sparse in some areas and very common in others, and this variation appears to reflect the variations in porosity. Recrystallization processes affecting pyrite aggregates were often seen. Enargite often occurs as anhedral aggregates, enclosing pyrite euhedral inclusions and occasionally giving rise to a complex textural relationship. Nevertheless, pyrite nearly always shows textural evidences of having been replaced by enargite. Like pyrite, enargite is also related to vugs and fractures, although its formation clearly postdates pyrite. On rare occasions enargite also encloses galena, argentite, hessite and barite. The relative timing with sulfides is unclear but barite generally seems to be contemporaneous to enargite.

Where gold was observed, it mostly formed inclusions in enargite always smaller than 10  $\mu$  m. These textural relations, together with the yellow colour (which suggests the gold is of high fineness; an observation confirmed later by SEM), indicates a primary, hypogene origin. Occasionally covellite occurs within enargite without evidence of being an alteration phase (hypogene covellite). Sometimes, gold is spatially related to covellite. The relative timing of gold and sulfide minerals is clear in most samples: it is formed post-pyrite and it is enclosed in enargite, suggesting contemporaneous deposition of gold and enargite (+/- covellite). As gangue minerals, quartz is ubiquitous showing two generations on the basis of grain size. The fine grained (<25  $\mu$  m) generation is characterized by subhedral crystals with undulose extinction. The coarse-grained (200  $\mu$  m) generation contains two fluid inclusion types: aqueous and CO<sub>2</sub>-rich fluids.

Most of the secondary minerals, alteration and vein textures, fluid inclusion data and geochemistry attest to the presence of an epithermal mineralizing system. Epithermal minerals

including abundant quartz with textures such as open space veining are common in these systems. The mineralogy and textures, particularly the association of gold with enargite, hydrothermal fracturing, the presence of adularia and a rare silver-base metals association indicate that the deposit can be classified as an intermediate case between high-sulfidation and low sulfidation.

Twenty-six additional samples were submitted for mineralogy. Mineralogical studies, elemental analyses and diagnostic tests indicated that most of the gold was associated with the pyrite ( $\text{FeS}_2$ ) and enargite ( $\text{Cu}_3\text{AsS}_4$ ). In one sample approximately 72 % of the gold was present in pyrite as sub-microscopic gold, and 12 % was present in enargite as colloidal gold. Direct whole ore cyanidation resulted in low gold recoveries of 16-30 % as direct cyanidation only dissolved the gold that was free or associated with enargite. The cyanide consumptions were very high and ranged from 3 to 18 kg/t. These results showed that the ore is refractory to conventional direct cyanidation and requires a sulfide pre-oxidation step prior to gold leaching.

**Element deportment and Grain Size Distribution:** The bulk model analysis of the Quimsacocha ore Master Composite, illustrating mineral distributions in the whole sample, is presented in Table 16.4.

**Table 16.4: Bulk Modal Analyses**

Sample Fraction	Name	Master Comp.				
		Global	+75	-75/+38	-38/+20	-20
<b>Mineral Mass (%)</b>	Pyrite	15,1	10,2	16,6	18,2	15,1
	Enargite/Tennantite*	0,9	0,4	0,6	0,7	1,6
	Other Sulphides	0,3	0,2	0,1	0,2	0,6
	Quartz**	80,9	86,7	80,2	78,4	79,4
	Phyllosilicates	1,0	1,1	1,4	1,1	0,6
	Oxides	0,6	1,1	0,4	0,4	0,5
	Sulphates	1,2	0,3	0,6	0,9	2,1
	Other	0,1	0,0	0,1	0,0	0,1
	<b>Total</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>

The Quimsacocha Master Composite is comprised of 79.7 wt% quartz. Other silicates include trace feldspars, amphiboles, clays, micas and chlorites. Sulphates (mostly barite, alunite and gypsum) account for 1.1 wt%. All other non-sulphide minerals including oxides, carbonates, phosphates and zircon, occur in trace amounts.

As mentioned previously, copper mainly reports as enargite, accounting for 93.3 % of the copper in the sample (Figure 16.2). Other minerals observed were covellite ( $\text{CuS}$ ), bornite ( $\text{Cu}_5\text{FeS}_4$ ),

chalcopyrite ( $\text{CuFeS}_2$ ), chalcocite ( $\text{Cu}_2\text{S}$ ), digenite ( $\text{Cu}_9\text{S}_5$ ) and tetrahedrite ( $(\text{CuFe})_{12}\text{Sb}_4\text{S}_{13}$ ). Those minerals have similar behaviours in flotation.

**Figure 16.2: Elemental Cu Department - Master Composite**

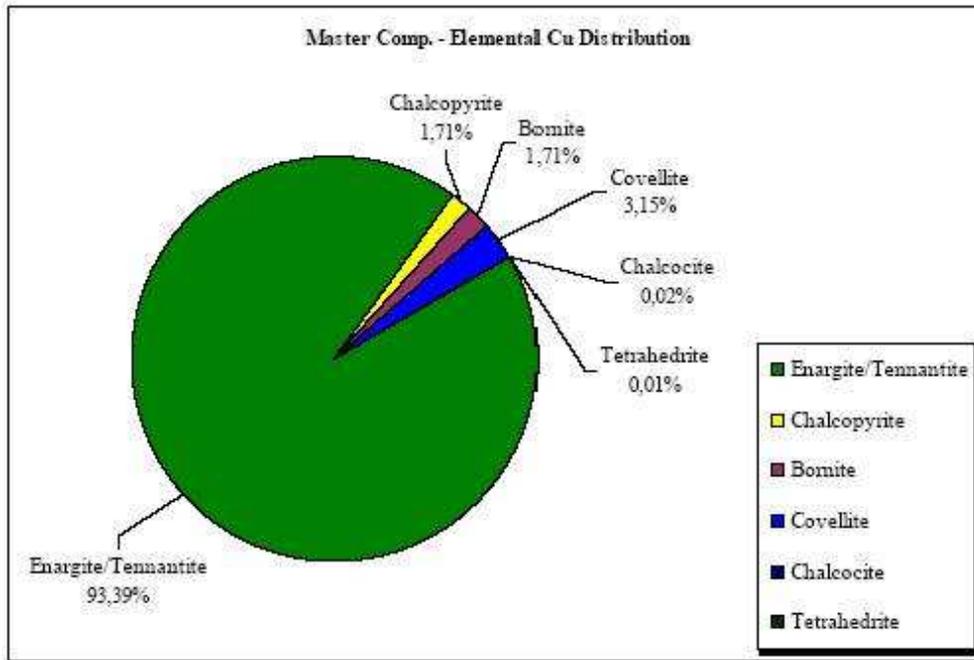
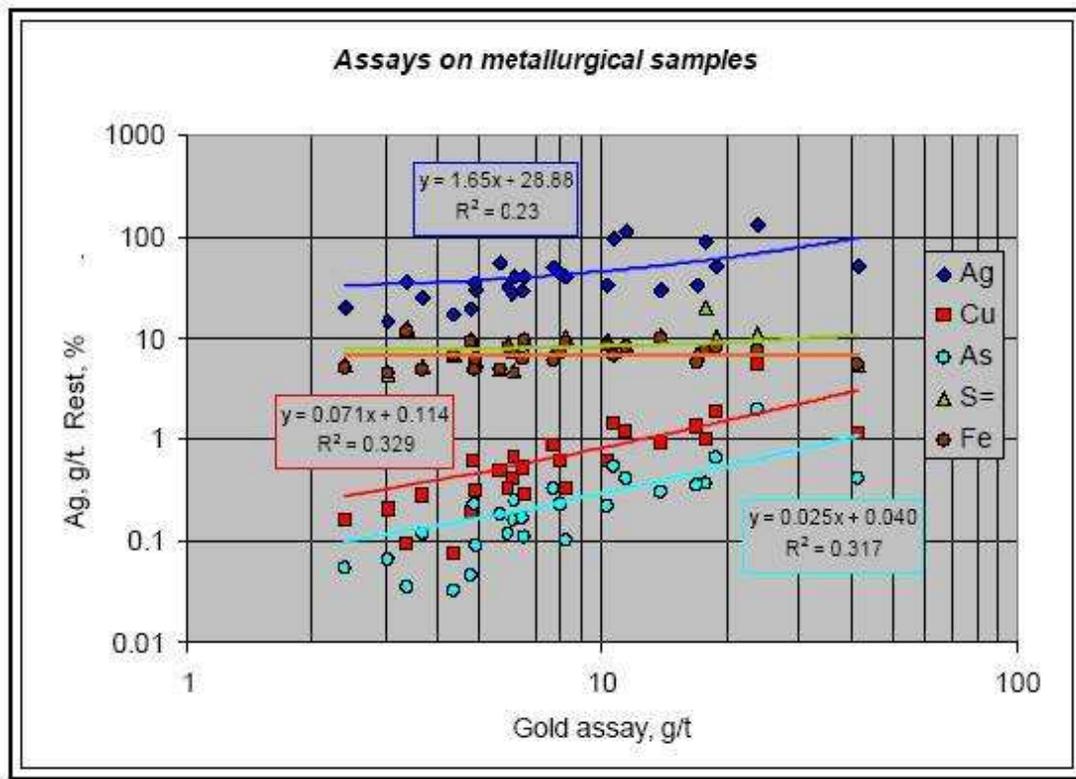


Figure 16.3 shows the relationships between the assays for the various individual samples. Note the strong relationship between gold grade on one hand, silver and arsenic on the other hand.

Sulphide sulphur is an important parameter that largely determines the process plant capital and operating costs. Statistical analysis of the head assays for the Quimsacocha metallurgical samples shows that iron and copper assays are generally a good predictor of sulphur grade. The relationship between the parameters (with just one data set culled out of 26) has an  $R^2$  of 0.97 and is expressed as:

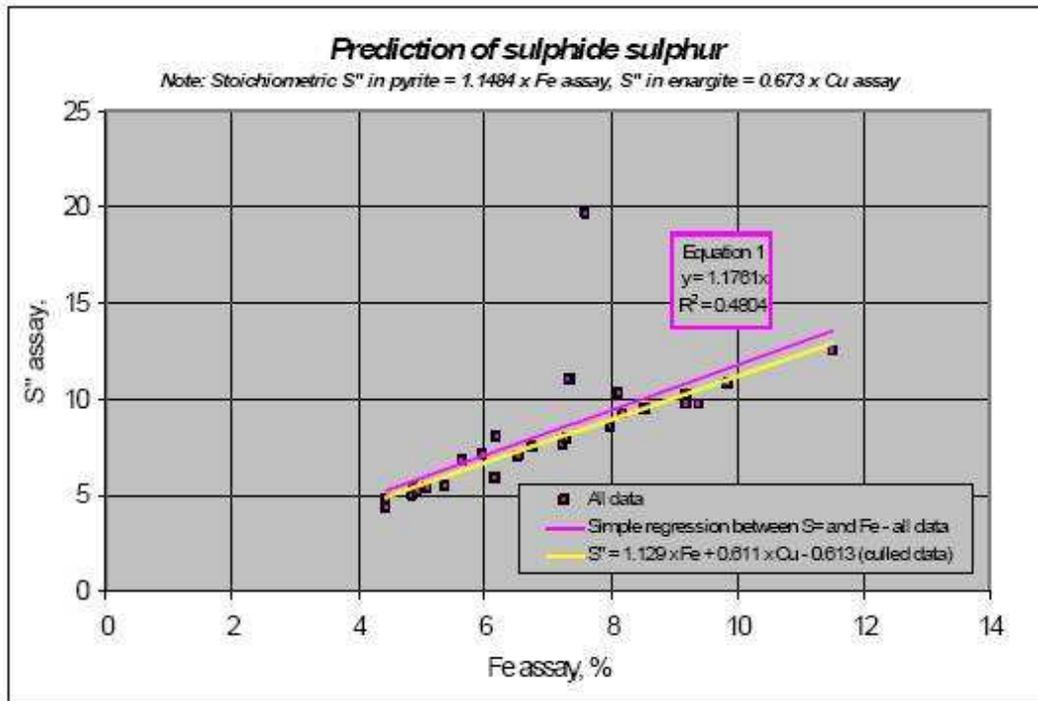
$$\text{Sulphide sulphur (in \%)} = 1.129 \times \text{Iron assay (in \%)} + 0.611 \times \text{Copper assay (in \%)} - 0.613$$

Figure 16.3: Relationship between Gold and Other Elements



The actual and predicted sulfide sulphur assays for the Quimsacocha metallurgical samples are presented in Figure 16.4. This frame shows two regression lines, a simple regression based on iron assays only and a more rigorous analysis including copper analyses. Note that the coefficients for iron and copper are very similar to the values expected assuming copper is present as enargite and iron as pyrite.

Figure 16.4: Prediction of Sulphide Sulphur from Metal Assays



SRK estimated the reserve grade for iron at various cut-off grades. A logarithmic relationship between the iron and the gold content of the indicated reserve (between gold grades of 4 and 8 g/t) shows an  $R^2$  value of 0.998 and takes the form:

$$\text{Iron assay (in \%)} = 2.4064 \times \ln(\text{Gold assay in g/t}) + 1.6112$$

Since much of the gold is associated with pyrite, the high correlation between iron and gold is not surprising. Using this relationship, the iron content of the open pit and underground resources (presented in Section 17) are estimated to be 5.5% and 5.9% respectively. The relationship between sulphur, iron and copper allows estimation of the sulphur reserve grades, which are 5.66% and 6.19% for open pit and underground respectively. These values have been used in considering plant design and in estimating capital and operating costs.

### 16.4.3 Comminution

In 2005, SGS MinnovEX measured the SAG (Semi-Autogenous Grinding) Power Index (SPI) on the first nine samples of Quimsacocha ore. The tests returned values ranging from 95 minutes for *Met Quim 9* to 182 minutes for *Met Quim 7*. The ore can be regarded as relatively hard from a SAG grinding perspective.

In 2006, a composite made from equal amounts of the second batch of samples ( *MET2 #1 to #17* ) was subjected to a standard Bond ball mill work index test using a 100 mesh (150  $\mu$  m) closing screen. The Bond work index was measured as 17.6 (metric). This is a moderately elevated level indicating that the Quimsacocha ore is rather harder to grind than other ores.

From the third survey done in 2008, grindability characterization was performed on five composite samples. SMC, Rod Mill and Ball Mill Work Indices and Abrasion Index were determined. Results for each test are discussed below and summarized in Table 16.5.

- **SMC Test:** a simplified Drop weight test conducted on five Master Composite samples show a competency index  $A_{xb}$  between 36.1 and 43. Therefore Quimsacocha ore could be ground in a SAG mill. This assumption will be confirmed at Feasibility Study stage. These parameters were used to design the primary grinding circuit using JKSimMet steady state simulator. The required SAG mill is 22'x10' and 2,500 HP.
- **Ball and Rod Mill Work Indices :** were conducted on the five composites and show an average of 17 and 16.6 kWh/t respectively. The ball mill required for secondary grinding is 14.5'x23' and 2,500 HP.
- **Abrasion Test:** Five abrasion tests were carried out on Quimsacocha ore at SGS Lakefield and showed a very high abrasion index ("AI"). These results strongly indicate a high rate of consumption for grinding media and liners. Abrasion test results show that Quimsacocha ore is highly abrasive with AI at 1.3 and 100 as cumulative percentile of abrasivity. The high abrasive nature of the ore will have to be considered during Feasibility and detailed design work as it relates to the selection of liners for pumps, mills and crushers, and grinding media.

In conclusion and from recent ore characterization and simulations using JKSimMet, Quimsacocha ore will respond well in a SAG-ball milling circuit albeit with a slightly elevated power demand.

Principal results from grindability tests conducted on three campaign samples between 2005 and 2008 are summarized in Table 16.5.

**Table 16.5: Summary of Grindability Determinations**

Year	Sample ID	SPI (min)	SMC Parameters			Work Indices (kWh/t)		AI (g)	Ore density (t/m <sup>3</sup> )	Source
			Axb	DWI	Mia	BWI	RWI			
May 2005	Met Quim 1-9	95 - 182	—	—	—	—	—	—	—	SGS – Rpt 11035-001
Oct. 2005	Comp Met2 1- 17	—	—	—	—	17.6	—	—	—	SGS – Rpt 11035-002
2008	GDT – Comp. 1	—	36.3	8.0	21.0	15.2	16.7	1.37	2.89	SGS – Rpt 11035-003
	GDT – Comp. 2	—	40.7	6.5	19.3	17.0	17.3	1.27	2.65	
	GDT – Comp. 3	—	40.5	6.7	19.4	18.0	16.1	1.23	2.70	
	GDT – Comp. 4	—	39.9	6.9	19.6	16.7	16.6	1.26	2.73	
	GDT – Comp. 5	—	43.4	6.2	18.3	17.6	16.5	1.28	2.70	
	Master Composite	—	—	—	—	16.3	17.0	—	—	
	Limestone	—	—	—	—	13.8	14.4	0.18	—	

#### 16.4.4 Gravity Recovery

Gravity concentration tests were performed on the *Met Quim #1* to *#9* samples. In the tests, 4 kg of ore ground to a nominal P<sub>80</sub> of 80 µ m was fed through a pilot Knelson concentrator. The concentrate was upgraded on a Mozley table.

The gold gravity concentration data show generally poor results with less than 10% of the gold recovered to a high grade concentrate. The results are in accordance with the pulp and metallica assays which indicated the absence of coarse metallic gold. The exception is the very high grade sample *Met Quim 4* which gave 33% gold recovery to a high grade concentrate.

At the mineable grade of about 5 g Au/t, the results suggest that less than 5% gold would be recovered by gravity concentration. This is an uneconomic recovery level and further investigations of gravity concentration were dropped after the initial series of tests.

In 2008, an extended Gravity Gold Recovery (“GRG”) test was conducted on the Master Composite sample from the third survey. It showed a GRG value of 12%. In practice, we expect gold recovery to be below this value and that it will depend on the amount of material rerouted from cyclone underflow.

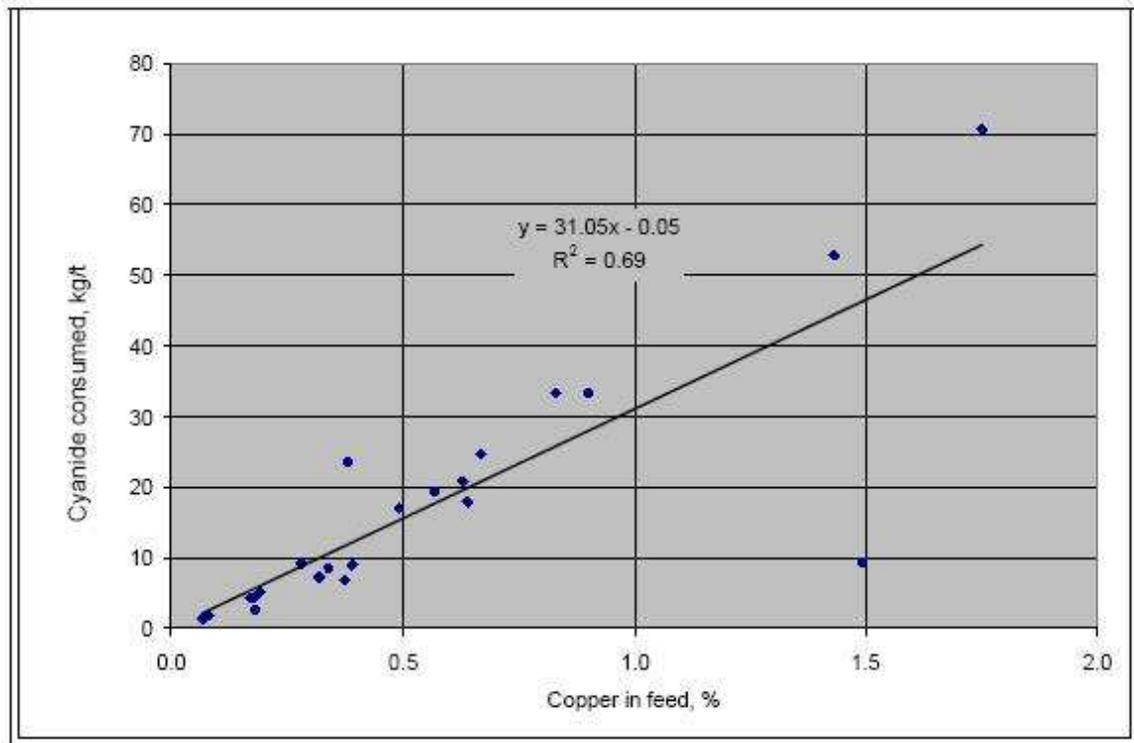
These results confirmed that gold recovery using gravity separation for Quimsacocha ore is not profitable. However, gravity separation could be a safety stage prior to flotation to recover coarse gold in the grinding circuit.

#### 16.4.5 Whole Ore Leaching

Whole ore cyanide leach tests have been performed on Quimsacocha metallurgical samples and composites. The results of leaching confirm the mineralogical findings. If sufficient cyanide was added to react with all of the enargite, then the gold associated with enargite was dissolved. Even with an excess of cyanide, gold extraction was low because the balance of the gold was dissolved in pyrite.

Cyanide consumptions are closely related to the copper content and are approximately 3 kg of NaCN for every kg of copper in the ore. This is the value that would be expected given that most of the copper is present as enargite. At the reserve grade of about 0.42% Cu, the cyanide consumption would be in the order of 10 to 15 kg/t which is an extremely high consumption rate, especially given that gold recovery is, with a few exceptions, less than 40% (Figure 16.5).

Figure 16.5: Cyanide Consumption and Copper Content in Leach Feed



Given the low gold extraction levels using simple cyanidation and the very high cyanide consumption, it is clear that direct cyanide leaching of Quimsacocha ore is not viable.

#### **16.4.6 Flotation and Pressure oxidation process**

*Of the three options, concentrate pressure oxidation is the retained route. This process will be described in the following paragraphs.*

Flotation and pressure oxidation for the treatment of refractory gold ore is done at several sites including the Campbell Red Lake Mine, Lihir (recent operations), and Porgera. These plants do not recover metals from the autoclave liquors, as is proposed for Quimsacocha, but a very similar system has been extensively tested and is included in the proposed 2 Mt/a Chelopech expansion project in Bulgaria planned by Dundee Precious Metals (Chelopech) BV.

At about 6% sulphide sulphur in Quimsacocha ore, the proposed autoclave is thermally autogenous and does not need any external heat supply. However, heat recovery and recycling are needed which means that heat is recovered from the autoclave discharge and applied to the autoclave feed in the normal “flash and splash” system of heat exchange. A single stage of preheat would be sufficient.

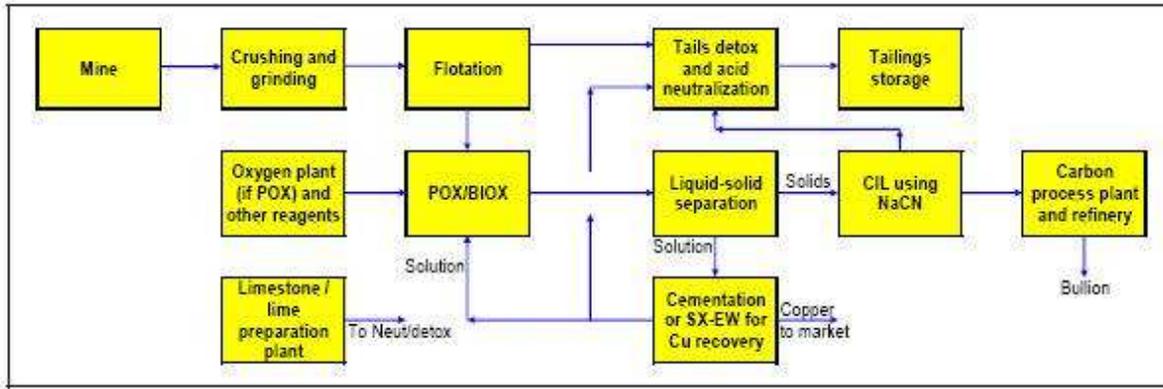
In the proposed plant, the autoclave discharge is cooled then subjected to washing in a countercurrent-decantation (CCD) circuit. The copper-bearing solution is treated for copper recovery by cementation and the washed solids cyanide leached for gold recovery in the normal way.

Ancillary plant and operations include an oxygen plant, a grinding plant to prepare limestone to neutralize the products of oxidation, a lime slaking plant to provide lime for pH control, neutralization circuits, tailings detoxification and storage facilities.

The products of the proposed whole ore pressure oxidation operation are gold-silver doré bars and copper in the form of cemented copper granules or LME grade cathodes. In the case considered in this Study, it is assumed that copper is recovered by cementation.

The flow sheet is simple and includes a flotation plant like that described above and an autoclave plant similar to that described for the whole ore autoclave option described earlier. The flow sheet is summarized in Figure 16.6.

**Figure 16.6: Flotation and POX Block Process Diagram**



Compared to the whole ore pressure oxidation case, the inclusion of a flotation stage ahead of the pressure oxidation facility means that sulphur grades are higher (30% sulphide sulphur instead of 6%) so the autoclave process is autothermal. Additionally, the facilities for processing the autoclave discharge are smaller than for the whole ore POX case since the mass to be handled is about 20% of the original ore mass. Interestingly, the autoclave size and operating costs are not changed radically since these are determined primarily by the sulphur oxidation rate which does not change very much with flotation.

Bacterial oxidation of the concentrate could likely be used instead of pressure oxidation. It is quite commonly used to process simple refractory gold ore concentrates and several plants are in operation, e.g., Sansu and Obuasi in Ghana. Bacterial oxidation is being developed for copper ores with high enargite content and is being demonstrated at a large scale in Chile.

However, bacterial oxidation for the treatment of a gold ore containing enargite and gold-bearing pyrite has yet to be developed.

**16.4.7 Process Flowsheet Mill and POX sites**

The ore will be processed at two sites: a Mill and a POX plant. The process flowsheet is based on metallurgical test work results and experience gained at other sites. During the mine life of approximately 8 years, 3,000 tonnes per day (1,095,000 tonnes per year) of underground ore will be processed. The main elements of the process flow sheet are listed below:

- The ore is trucked from the mine and discharged into a fixed grizzly to break coarse blocks; the ore is then fed to a Jaw Crusher (0.9 m x 1.2 m). The crushed ore will be stored in two 1,500 tonnes silos. Ore is extracted by two Apron feeders. The crusher will run for two shifts (14 hours per day), 7 days a week. Maintenance will be done on the

day shift. The ore could be stored in a temporary stockpile ahead of the crusher if necessary.

- A SAG (6.7 m x 3 m) mill was selected for primary grinding. SAG overflow is discharged to a screen, with the screen oversize reporting back to the SAG mill feed. The screen undersize is pumped to the secondary grinding circuit.
- A ball mill (4.6 m x 5.8 m) was selected for the secondary grinding unit. The ball mill is in closed circuit with cyclones to produce a final grind size of 80% minus 70  $\mu\text{m}$ . Cyclone underflow reports to the ball mill. Cyclone overflow is fed to the flotation circuit at a 35 % solids density.
- A gravity concentration circuit is considered in spite of low recovery results during GRG tests, to prevent loss of nuggets in the flotation circuit. Space will be provided in the design to allow for future installation.
- In both SAG and Ball mills, screens are used to remove trash that would cause blinding of the next units;
- The flotation circuit is simple and consists of rougher and cleaner circuits designed to reduce tonnage to be transported to the POX site. The rougher flotation will be done in 7 tank cells in series with a retention time of 60 minutes to allow for optimum sulphide mineral recovery. The two step cleaning stage will be done in ten five cubic meter cells for the first cleaner and six five cubic meter cells for the second cleaner. The objective of those cleaners is the rejection of the entrained silica gangue collected at the rougher flotation. The cleaner concentrate is pumped to a thickener. The thickener overflow is recycled as process water in the grinding circuit. A regrind circuit is needed to achieve a final grind size of 80% minus 40  $\mu\text{m}$  in cleaning circuit.
- Make-up water at the Mill site is obtained from the thickener overflow, reclaim water (remaining water and precipitation), fresh water pumping station (river) and from underground if possible. At the POX site, the makeup will be supplied in the form of fresh water from the river and reclaim water from the tailings pond.
- Flotation tailings are sent to a paste backfill plant. 58% of the flotation tailing is planned to be used for underground backfill. The other 20% will be disposed of by pumping it as high density slurry to a tailings disposal area.
- Concentrate is trucked from Mill site to POX site. The number of trucks will be calculated depending on the shipment schedule. This operation could be performed by local contractors.

- For the pressure oxidation circuit, an autoclave (3.6 m x 26 m) was selected to leach sulphides (iron and copper sulfides) and liberate gold and silver. The concentrate received at the POX site is re-pulped and fed to the autoclave. A CCD (6 thickeners) circuit is designed to separate pregnant solution and leached solid containing precious metals. The solution is sent to copper cementation and the slurry from CCD underflow containing precious metals to CIL.
- From the CIL circuit, loaded carbon is pumped to the stripping circuit to extract gold. The pregnant solution is sent to a refinery unit equipped with electro-winning and smelting. This final step results in the production of bullions with high precious metals content.
- At the POX site, a limestone plant is designed to prepare and distribute limestone slurry required to increase the slurry's pH and for neutralization of pregnant solution before cementation or barren solution. Production of lime at the POX site could be an opportunity to reduce operating costs and will be explored in the Feasibility Study.

## **16.5 Plant Operating And Capital Cost Estimates**

The following sections give a summary of the processing plant capital and operating costs as estimated in IAMGOLD's July 2008 Pre-feasibility Study.

### **16.5.1 Plant Capital Costs**

Capital expenditures for the selected scenario total US\$ 155M: \$ 61M for the Mill plant and \$94M for the POX plant. These costs include \$ 30M for construction management.

### **16.5.2 Product shipment costs**

The concentrate will be transported from Mill site to POX site. The cost is estimated to be 25\$/t of dry concentrate and will be reported in processing plant operating costs. Shipping cost for transportation of copper cement to a refinery smelter is included in the NSR calculation.

### **16.5.3 Manpower Requirement and Costs**

The mill will process 8,098,000 tonnes of ore over a period of 7.5 years. The average total production rate will remain steady at 3,000 tonnes per day for the life of mine at an average grade is 6.46 g Au/t and an annual production of gold is 204 685 ounces. Commercial production would begin in 2011.

This type of process is new to Ecuador, necessitating the use of a number of expatriates for the first few years of operation. As a result, an intensive modular training program will begin in advance of mill production. It will be supported by local training agencies and consultants.

Overlapping of responsibilities in key areas will also be required to minimize manpower.

Equipment and systems will be sized adequately, where possible, to allow for one shift per day operation (reagent mixing and laboratory assays are typical examples).

Automation and remote monitoring and control will be used where ever possible to maximize efficiencies and minimize workforce.

A total workforce of 155 employees is planned for the Mill, POX and assay laboratory areas. Of this total, 113 are directly involved with the operation. The maintenance and electrical group consists of 10 persons at the Mill site and 26 persons at the POX site. Another 11 are required for management and the metallurgical groups at both sites. The assay laboratory personnel ,labour cost will be distributed to all user departments.

#### **16.5.4 Plant Power Consumption and Cost**

The power demand for the various process plant areas has been estimated at \$3.18/t milled for the Milling plant and \$5.50/t for the POX plant. Assumed power costs are \$0.062/kWh at the Mill site and \$0.06/kWh at the POX site.

#### **16.5.5 Plant Consumables Consumption Costs**

Consumables include items such as mill liners, grinding balls, flotation frothers and collectors at the Mill and oxygen, cyanide, activated carbon, scrap iron for cementation, limestone and various reagents for detoxification and neutralization of the pregnant solution at the POX plant.

The cost of consumables is estimated at \$5.99/t at the Mill and \$18.81 /t at the POX plant.

#### **16.5.6 Plant Operating Costs**

Operating costs for the Mill and POX plants total \$10.60/t and \$21.12/t respectively (Table 16.6). Concentrate shipment from Mill site to POX site is estimated at \$5.00/t.

Assay laboratory supply costs for the process plant have been estimated following a review of the probable number of assays required. An assay lab is planned to be constructed at the POX site and will carry out chemical analysis for both Mill and POX Plants.

Maintenance is based on previous studies such as Camp Caiman for the Mill site and published costs for POX site. Maintenance labor is included in general labor costs.

A General and Administration (G&A) cost allowance for the process plant was provided to cover insurance, office and training supplies, travel, consultants and other costs of this type that are attributable to the process plant.

**Table 16.6: Process plants operating costs**

Area	Concentrate POX		Total (\$/t)
	Mill Site (\$/t)	POX Site (\$/t)	
Labour and Administration	1.25	2.37	3.62
Electrical power	3.18	5.50	8.62
Liners	1.01	0.02	1.03
Grinding Media	3.31	0.13	3.44
Process Reagents	1.23	12.05	13.28
General and Maintenance parts	0.55	0.89	1.67
Lab Assays	0.07	0.16	0.23
<b>Grand total</b>	<b>10.60</b>	<b>21.12</b>	<b>31.72</b>
Concentrate Shipment from Mill to POX Site	5.00	(*)	5.00

(\*) Cement shipment is included in NSR calculation

## 17.0 MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES

### 17.1 Cautionary Statement

In April 2008, a Constituent Assembly, formed to examine Ecuador's Constitution, accepted a mandate to revise the country's mining laws. While Ecuador's interim legislature overwhelmingly approved a new draft mining law in January 2009, it is still not known how the new regulations and taxation regime will affect the profitability of new mining projects in the country. Consequently, IAMGOLD has used the previous legislation and taxation framework to define its Mineral Reserve for Quimsacocha. A new Mineral Reserve will be published as soon as the new regulations regarding the operation and taxation of mining operations in Ecuador are adopted.

### 17.2 Mineral Resource Inventory

Current Quimsacocha's Indicated and Inferred Mineral Resource at a 3.0 g Au/t cutoff are shown on Table 17.1 and Table 17.2:

**Table 17.1: July 2008 Indicated Mineral Resource at 3.0 g Au/t grade cutoff**

ZONE	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
High grade	9,242.41	6.76	2,009	37.94	11,275	0.44	88,926,400
Low grade	692.93	4.40	98	26.31	586	0.47	7,182,800
<b>Total</b>	<b>9,935.34</b>	<b>6.60</b>	<b>2,107</b>	<b>37.13</b>	<b>11,861</b>	<b>0.44</b>	<b>96,109,200</b>

**Table 17.2: July 2008 Inferred Mineral Resource at 3.0 g Au/t grade cutoff**

ZONE	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
High grade	104.60	8.94	30	41.09	138	1.18	2,728,400
Low grade	194.60	4.91	31	47.48	297	0.85	3,629,700
<b>Total</b>	<b>299.20</b>	<b>6.32</b>	<b>61</b>	<b>45.24</b>	<b>435</b>	<b>0.96</b>	<b>6,358,100</b>

### 17.3 Mineral Reserve Inventory

Current diluted Mineral Reserve is listed in Table 17.3. Details of the calculation are given in Section 17.6. Note that because of the lack of Measured Resource, all the Mineral Reserve is classified as Probable.

**Table 17.3: Quimsacocha Probable Mineral Reserve**

	<u>Tonnage</u>	<u>AU</u>		<u>AG</u>		<u>CU</u>	
	<u>000 t</u>	<u>g/t</u>	<u>000 oz</u>	<u>g/t</u>	<u>000 oz</u>	<u>%</u>	<u>CU lbs</u>
<b>Probable Mineral Reserve</b>	8,098	6.46	1,682	36.44	9,482	0.42	74,982,738

### 17.4 Assumptions, methods and parameters - Mineral Resource Estimates

The basis of the Mineral Resource estimate for the Quimsacocha Deposit is discussed herein.

The following steps were used:

- Data validation: This was undertaken by Mr. Jorge Barreno, Project Manager, IAMGOLD Ecuador S.A. and Mr. Francis Clouston, Manager, Project Evaluations, IAMGOLD.
- Geological Interpretation and modeling was undertaken by Ms Glenda Mantilla, Mr. Marco Camino and Mr. Jorge Barreno of IAMGOLD-Ecuador S.A. and reviewed by Mr. Francis Clouston, IAMGOLD.
- Block model construction was done by Mr. Clouston, using a block size approaching the expected selective mining unit (“SMU”) of a post-pillar cut-and-fill underground operation (i.e. 5m x 10m x 5m vert.).
- Statistical analysis of the sample set was undertaken to establish mineralization domaining from which two domains were retained: a high-grade zone where samples grading above 3.0 g Au/t dominate surrounded by a low grade halo defined by a grade cutoff of 0.8 g Au/t. Major faults mapped from drillhole intercepts were used to further refine the solid modeling.
- Grade capping was performed on raw assays of Au, Ag, Cu, As, Fe, Hg, Mo, Pb, Zn and S<sub>tot</sub> using the log-probability graph test and the decile analysis (Parrish, 1997). Only capped grade assays were then used for compositing and mineral resource estimation.

- Drillhole compositing was done on two meter intervals starting from the toe of each drillhole and respecting the mineralization solid-drillhole intersection intervals. All residual composites less than 0.5m were discarded. Missing intervals were not included in the compositing process.
- Variography was performed on the two-meter gold, silver, copper and specific gravity composites from the main mineralized units using correlograms and a nugget plus two nested spherical structures were used to model the anisotropy. Ranges from half to full distance of the second spherical structure were used to size the search radii for the grade interpolation.
- Block grades were estimated with the inverse distance squared weighting method with search ellipses based on variography and the orientation of the main geological units. Resource categorization was based on the search range and the minimum number of composites required. Because resources have only been drill-defined and data has a high level of skewness, we concluded the level of confidence was not high enough to classify any resource as measured.
- Block grade validation was achieved by visually comparing the Au, Ag and Cu estimates with the drillhole composites on both sections and plans. The final selection of interpolation parameters was made only after the comparison yielded satisfactory results.

## **17.5 Resource Estimation**

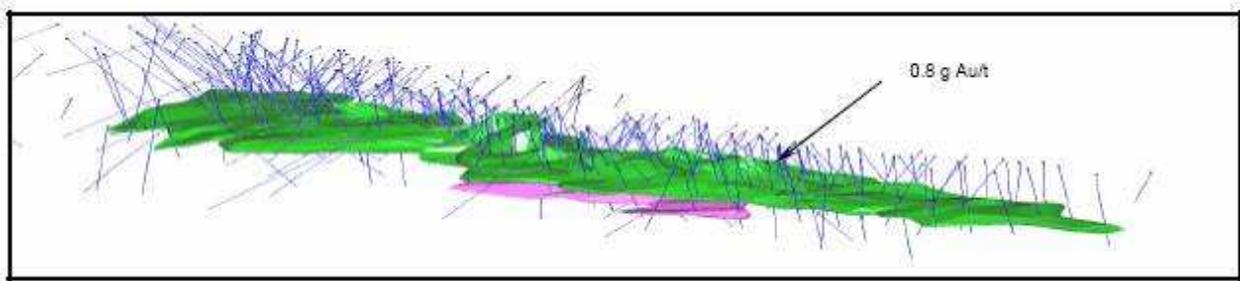
Resource calculation for the Quimsacocha Project was carried out by means of the block model method with the aid of Gemcom Software. This study is based on 280 holes totaling 65, 117m, located within the mineralized zone. This includes 21 infill holes, drilled up to December 2007 (for 4,228.9 m of core).

### **17.5.1 Rock Type Modeling**

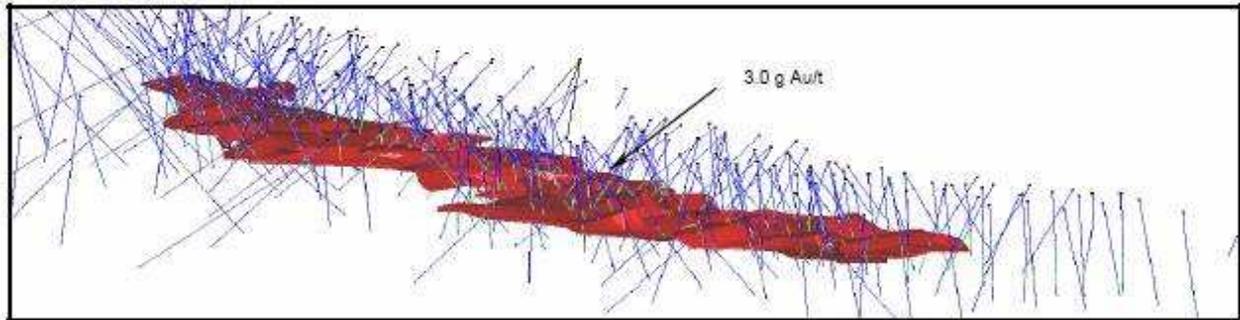
Based on assay results, solids were generated by first drawing polylines on sections using drillhole intervals cut-offs of 0.8 g Au/t and 3.0 g Au/t over a minimum downhole length of 5 meters. Their consistency was then validated by redrawing the outlines on 10m-spaced plans where the possibility of offsets (<10m) near steeply-dipping faults was taken into account.

Solids were generated in Gemcom using a final set of 3D rings on vertical cross-sections (Figure 17.1 and Figure 17.2).

**Figure 17.1: Isometric view (looking NE) of low-grade envelopes**



**Figure 17.2: Isometric view (looking NE) of high-grade envelope**



A review of the assay statistics revealed a number of moderate and high grade Au and Cu intercepts thicker than 3m that were not modeled in either high grade or low grade zones (particularly near section 1,525 NE in the northern portion of Quimsacocha). See the assay statistics on Table 17.6 and the Au, Ag and Cu lognormal probability plots on Figure 17.3, Figure 17.4 and Figure 17.5 respectively. A preliminary evaluation of these intercepts highlights a potential gain of over 235,000 tonnes at 6 g Au/t (for 45,000 oz of gold) at a 3 g Au/t cutoff. This oversight will be corrected in the updated resource estimation scheduled for the Feasibility Study (Figure 17.6).

Figure 17.3: Au lognormal cumulative distribution function (host rocks)

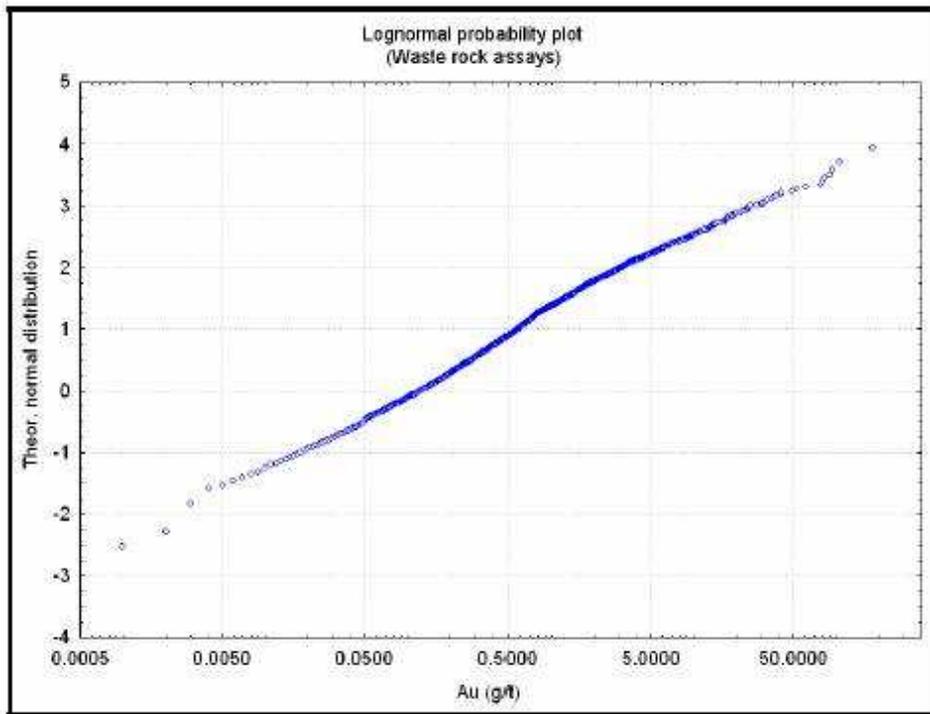


Figure 17.4: Ag lognormal cumulative distribution function (host rocks)

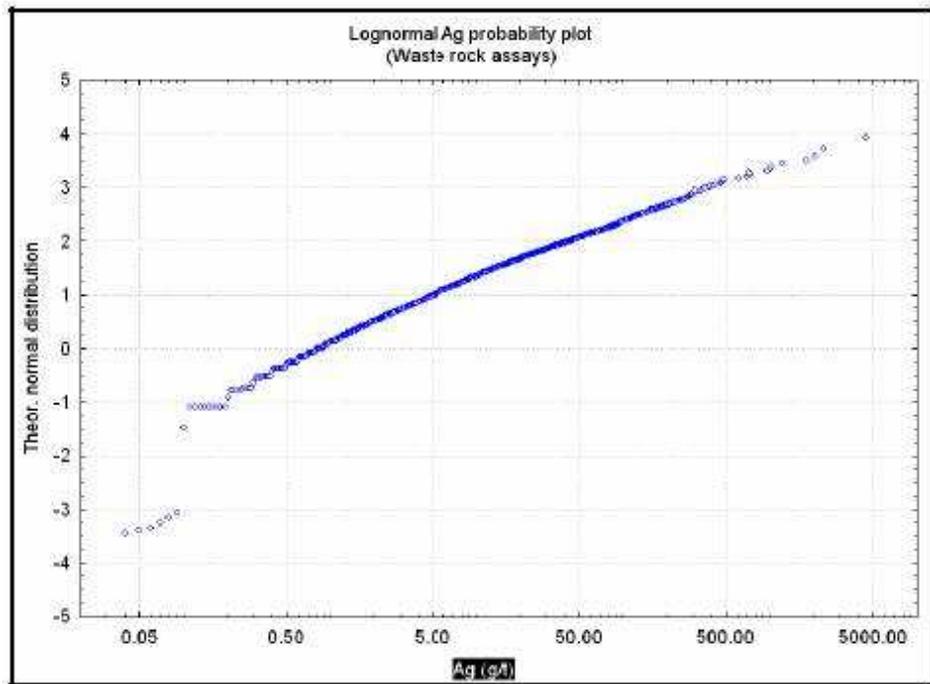


Figure 17.5: Cu lognormal cumulative distribution function (host rocks)

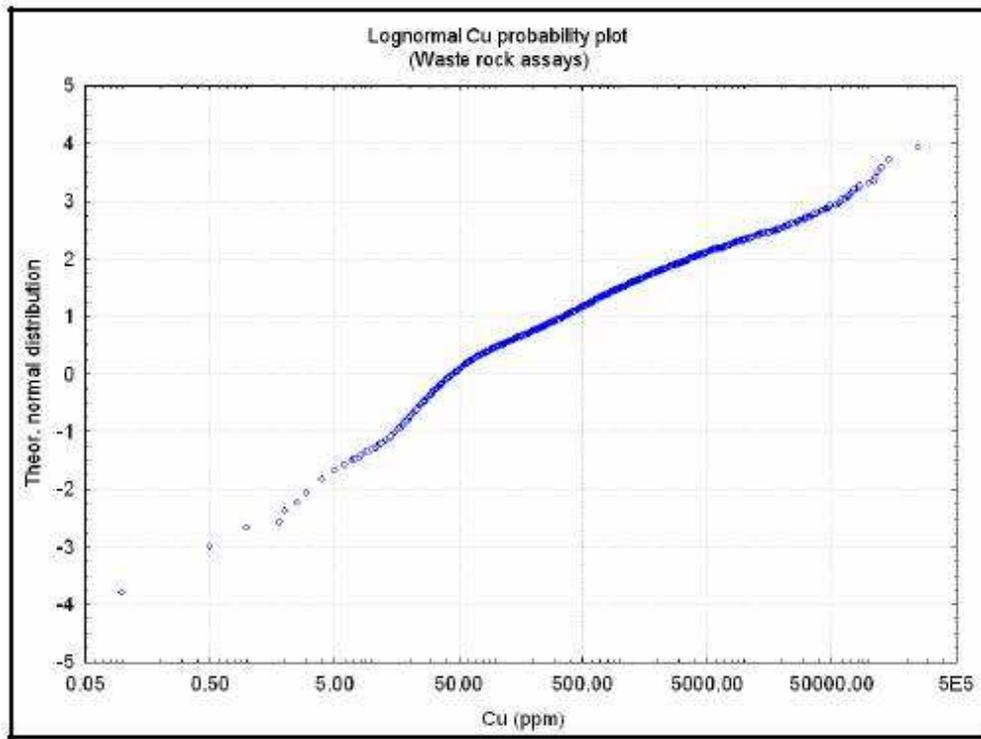
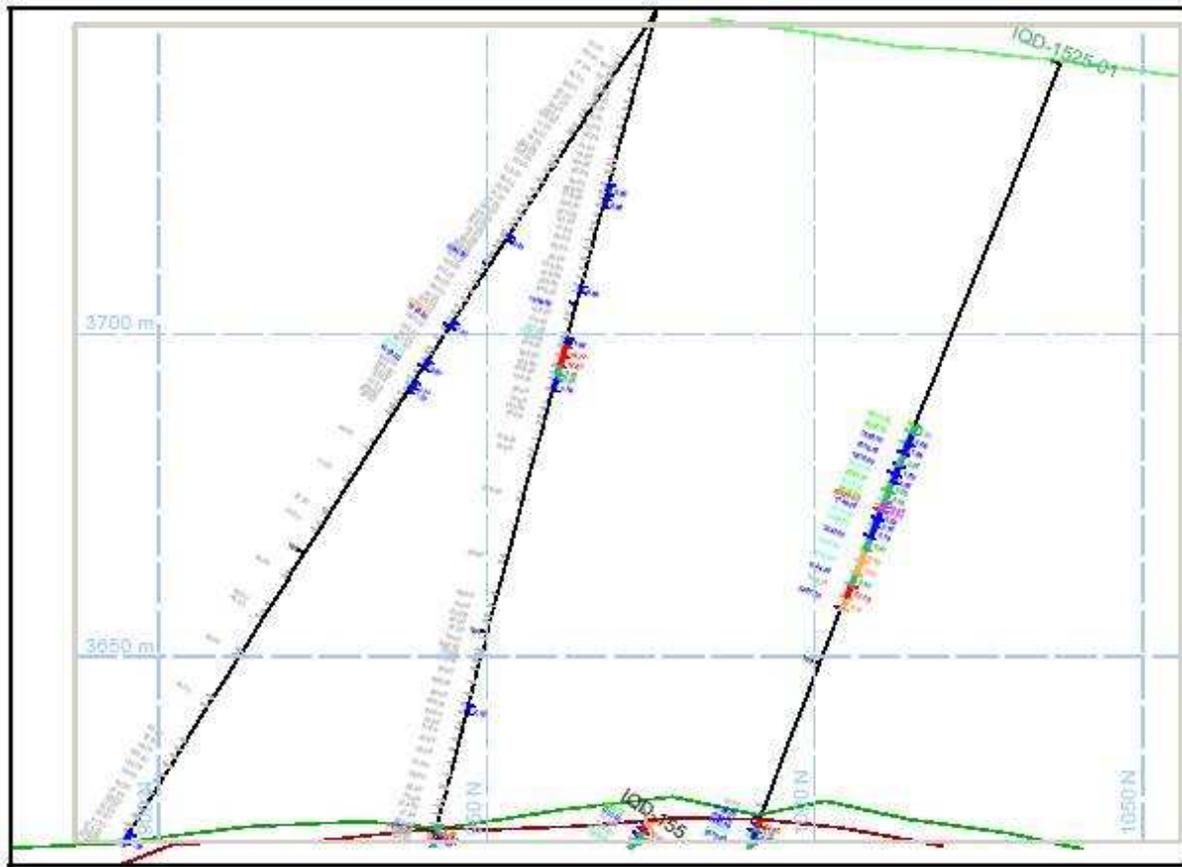


Figure 17.6: High grade intercepts that have not been included in 3D solids



Once the solids had been checked for errors, they were categorized according to the following table:

Table.17.4: Quimsacocha Rock Codes

Mineralization unit	Solid name	Rock Code	Solid Precedence
<b>Host rocks</b>	Lit modelo/ Esteril	99	3
<b>Low grade mineralization</b>	08 gpt/ C1 / 11-04-2008		
	08 gpt/ C2 / 11-04-2008	108	2
<b>High grade mineralization</b>	3 gpt/ 30 / 11-04-2008	130	1

### 17.5.2 Block Model Limits

Limits and dimensions of the block model are listed in Table 17.5:

**Table 17.5: Quimsacocha Block Model**

Description	Origin	Minimum	Maximum	Block Size (m)	Number
<b>Easting</b>	697,993	697,449	699,225	5	255
<b>Northing</b>	9, 662.486	9, 662.486	9, 664 844	10	210
<b>Elevation</b>	3,850	3,400	3,850	5	90
<b>Rotation</b>			15° (counter-clockwise)		

### 17.5.3 Topographic DTM Surface Construction

Topographic data was obtained from detailed field surveys carried out by IAMGOLD employees or contractors. In 2002, GPS control points were established and tied to the National Geographic Grid established by the Military Geographic Institute for use as reference points. Iso-contour maps with lines spaced every meter were generated in AutoCAD and dxf formats. These were imported into the software in the form of status lines and a surface was created corresponding to the limits of the block model. The blocks lying entirely above this surface were given an air code (code 500).

### 17.5.4 Assay samples

A total of 25,624 samples were used for the study. Sampling lengths vary from 0.20m to a maximum of 2m, and exceptionally 3m where there are core losses. Sample statistics for gold, silver and copper by zones are shown on Table 17.6.

### 17.5.5 Grade capping

Assay values for Au, Ag, Cu, As, Fe, Hg, Mo, Pb, Zn,  $S_{tot}$  (Table 17.7) were subjected to a probability grade test (log scale) and to the decile analysis (Parrish, 1997) in order to determine the appropriate capping level for each element. For Au, this level was determined at 75 g/t in the high grade ore zone, affecting a total of 49 samples which corresponds to 1.15% of the samples treated. The capping value for Ag was determined at 500 g/t with 44 affected samples; and 100,000 ppm (10%) for Cu with 38 samples capped. All capping was performed on the samples before the compositing procedure.

**Table 17.6: Sample Statistics by Rock Code**

Zone	Code	n	Au			Ag			Cu		
			Min (g/t)	Max (g/t)	Mean (g/t)	Min (g/t)	Max (g/t)	Mean (g/t)	Min (ppm)	Max (ppm)	Mean (ppm)
<b>High grade</b>	130	4,086	0.003	768.67	8.29	0.5	2,295.6	39.86	1.0	216,000	5,121
<b>Low grade</b>	108	6,026	0.003	67.17	1.83	0.0	1,743.0	16.98	0.5	214,200	1,238
<b>Host rocks</b>	99	16,964	0.00	180.80	0.51	0.0	4,494.0	6.16	0.0	249,000	601

**Table 17.7: Capped Grade Values Used**

Element	Code	Log. Probability plot	Decile analysis	Value used
<b>Au (g/t)</b>	108 & 99	50	20	35
	130	200	75	75
<b>Ag (g/t)</b>	108 & 99	500	175	250
	130	600	375	500
<b>Cu (ppm)</b>	108 & 99	100,000	—	100,000
	130	100,000	—	100,000
<b>As (ppm)</b>	108 & 99	4,000	—	4,000
	130	10,000	—	10,000
<b>Fe (%)</b>	108 & 99	15	—	15
	130	15	—	15
<b>Hg (ppm)</b>	108 & 99	60	—	60
	130	50	—	50
<b>Mo (ppm)</b>	108 & 99	175	—	175
	130	250	—	250
<b>Pb (ppm)</b>	108 & 99	2,000	—	2,000
	130	2,000	—	2,000
<b>Zn (ppm)</b>	108 & 99	7,000	—	7,000
	130	8,000	—	8,000
<b>Sb (ppm)</b>	108 & 99	2,500	—	2,500
	130	2,500	—	2,500
<b>S<sub>tot</sub> (%)</b>	108 & 99	15	—	15
	130	15	—	15

#### **17.5.6 Composite Statistics**

Two meter-long composites were generated along each drill hole starting from the toe and respecting the solid-drill hole intersection intervals by starting a new composite every time one such interval was encountered (Table 17.8 , Table 17.9 and Table 17.10). All “residual” composites (i.e. last composite generated at the end of a solid-drill hole interval) of less than 0.5 m long were discarded.

**Table 17.8: 2-meter Au Composite Statistics**

Rock type	Code	n >0	Max.	Mean (g/t)	Var.	C.V.*	Median	Capped grade		
								Cap	Mean	% metal removed
Host rock	99	11,679	75,77	0,39	2,72	4,20	0,11	35	0,37	5,6
Low- grade zone	108	3,735	62,60	1,74	3,69	1,10	1,45	35	1,73	1,0
High-grade zone	130	2,252	348,2	7,33	253	2,17	4,29	75	6,58	10,4

\* Coefficient of variance

**Table 17.9: 2-meter Ag Composite Statistics**

Rock type	Code	n >0	Max.	Mean (g/t)	Var.	C.V.	Median	Capped grade		
								Cap	Mean	% metal removed
Host rock	99	11,777	3,019	4,83	1,520	8,07	0,80	250	4,05	16,1
Low- grade zone	108	3,735	1,385	15,38	1,746	2,71	7,80	250	14,12	8,2
High-grade zone	130	2,252	1,422	36,6	3,580	1,63	20,94	500	35,42	3,2

**Table 17.10: 2-meter Cu Composite Statistics**

Rock type	Code	n >0	Max.	Mean (%)	Var.	C.V.	Median	Capped grade		
								Cap	Mean	% metal removed
Host rock	99	10,924	6,95	0,038	0,04	5,44	0,004	10	0,037	1,6
Low- grade zone	108	3,735	21,2	0,11	0,31	5,07	0,004	10	0,10	6,1
High-grade zone	130	2,252	14,5	0,44	1,00	0,23	0,15	10	0,43	2,5

### 17.5.7 Specific Gravity

To estimate densities, representative samples of typical lithology, alteration and mineralization styles were collected (approximately 3 cm in length). Specific gravity was determined by the Archimedes principle. The procedure is listed below:

- Locate a representative zone based on lithology and grade and collect a 3 cm-long sample.
- Dry-weigh sample G (suspended from a string).
- Immerse the sample in melted paraffin (the purpose is to cover all the pores)
- Weigh the sample covered with paraffin (G1)
- Weigh the sample covered with paraffin and submerged in water (G2)

$$\rho = \frac{G}{\frac{G1 - G2}{1 \text{ g/cm}^3} - \frac{G1 - G}{0.89 \text{ g/cm}^3}}$$

- where:

$\rho$  = volumetric density

0.89 g/cm<sup>3</sup> = specific weight of paraffin

1.00 g/cm<sup>3</sup> = specific weight of water at 20°C

Density measurements were taken from 10,794 samples collected throughout the orebody, thereby covering a good variation of lithology, mineralization and alteration types. Average density was estimated at 2.80 t/m<sup>3</sup> and ranging from 2.64 t/m<sup>3</sup> to 3 t/m<sup>3</sup> (Table 17.11, Table 17.12):

Table 17.11: Average Density (t/m<sup>3</sup>) by Lithology

Alteration	Fine tuffs	Coarse tuffs	Lavas In.	Lavas Hbl
<b>Smc</b>	2.33	2.41	2.37	2.52
<b>Kaol</b>	2.42	2.38	2.37	2.32
<b>Piro-Dick</b>	2.49	2.51	2.54	2.45
<b>Sil-Alun</b>	2.59	2.56	2.64	2.64

**Table 17.12: Average Density by Sulphide Content**

<u>% Sulphide</u>	<u>Density (t/m<sup>3</sup>)</u>
<5	<2.4
5-20	2.4 to 2.8
20-35	2.8 to 3.2
35-50	3.2 to 3.6
50-65	3.6 to 4.0
65-75	4.0 to 4.4
>75	4.4 to 4.8

These density values were inserted into the block model after initializing each rock code with the mean value shown in Table 17.13. Its local spatial variability was determined, through variograms, in order to assign density values to the individual blocks through interpolation.

**Table 17.13: Specific Gravity Statistics**

<u>Rock type</u>	<u>Code</u>	<u>n &gt;0</u>	<u>Max.</u>	<u>Mean (t/m<sup>3</sup>)</u>	<u>Var.</u>	<u>C.V.*</u>	<u>Median</u>	<u>Value used</u>
<b>Host rock</b>	99	1,038	4.21	2.56	0.06	0.10	2.55	<b>2.55</b>
<b>Low-grade zone</b>	108	4,283	4.44	2.63	0.05	0.09	2.60	<b>2.60</b>
<b>High-grade zone</b>	130	3,426	4.75	2.79	0.13	0.13	2.67	<b>2.67</b>

### 17.5.8 Variography

A variographic study using correlograms was performed on two-meter gold, silver, copper and specific gravity composites from the main mineralized units. Nested spherical and nugget models were used to fit with empirical data built with lags of 2 m down-hole and 5 m in other directions. Depending on the data density, a minimum of 35 or 350 pairs was usually required to fit the correlogram models to the data. The following Figure 17.7 and Figure 17.8 show the Au correlograms in the low grade zone to illustrate the modeled structures.

Figure 17.7: Downhole Au Correlogram in 0.8 g Au/t envelope

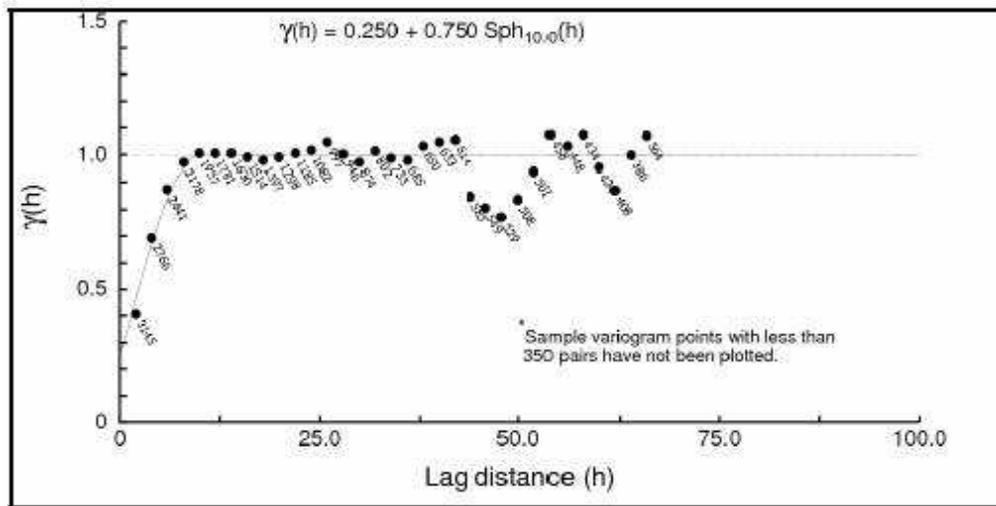
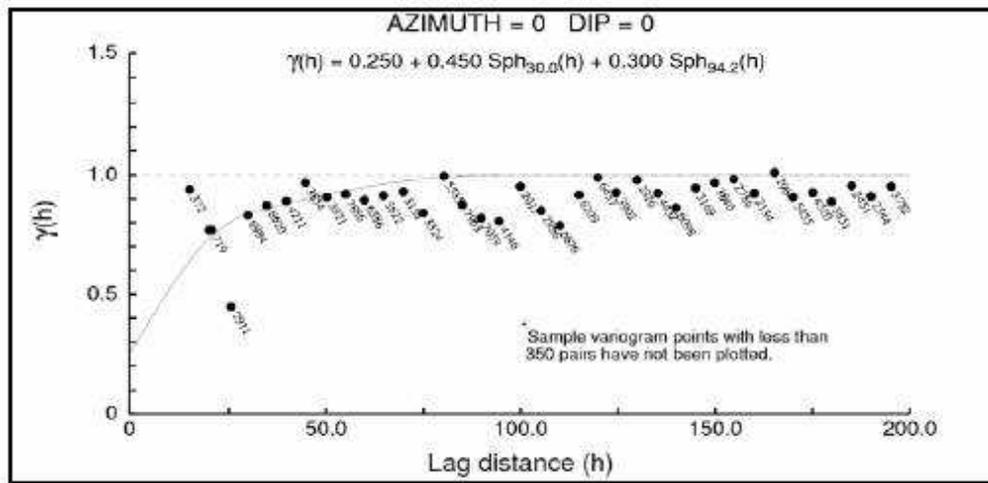


Figure 17.8: North-South Au Correlogram in 0.8 and 3.0 g Au/t envelopes



### 17.5.9 Interpolation Parameters

The interpolation was performed using inverse distance squared weighting method with search ellipse and interpolation profiles described in Table 17.14. The profiles were based on the orientation of the main geological units on the ranges defined by the correlograms. Hard boundaries were used.

**Table 17.14: Quimsacocha Search Ellipse Profiles**

Profile name	Target codes	Search ellipse radii	Number of composites			Orientation*		
			Min.	Max.	Max/hole	Z	Y	Z
<b>IND</b>	108, 130	X: 50m Y: 50m Z: 15m	4	15	3	+15°	-10°	0°
<b>INF</b>	108, 130	X: 120m Y: 120m Z: 30m	3	15	3	+15°	-10°	0°
<b>DENSITY</b>	108, 130	X: 65m Y: 80m Z: 40m	3	15	3	+15°	-15°	0°

\* Rotation around each axis (+ve is counter-clockwise)

### 17.5.10 Categorization

Two types of resources categories were defined based on the search range and on the minimum number of composites required to estimate a block. The resource categories were saved in the CATEG block model where each block was assigned either a code of 2 (Indicated) or 3 (Inferred). Because the resources have only been drill-defined and data has shown a high level of skewness which may result in increased imprecision in the higher grade ranges, the level of confidence is not considered high enough to classify any resource as measured.

### **17.5.10.1 Indicated Resource Definition**

From the CIM Standards on Mineral Resources and Reserves (CIM, 2005):

*An 'Indicated Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics, can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit.*

At Quimsacocha, indicated resources are defined for all blocks that have been estimated by at least two separate sources of information within a 50 m x 50 m x 15 m (vertical) search ellipse. The maximum number of composites per hole was limited to three and maximum number of five holes was used to estimate a block (see parameters on Table 17.14 and inventory on Table 17.15).

### **17.5.10.2 Inferred Resource Definition**

From the CIM Standards on Mineral Resources and Reserves (CIM, 2005):

*An 'Inferred Mineral Resource' is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.*

To qualify as Inferred Resource, only those blocks lying within a mineralized domain that were not estimated by the previous pass and which could be estimated by at least one source of information were used. Moreover, these blocks had to be within distances to the nearest drill hole equal to the full variograms range. The maximum number of composites per hole was limited to three and a maximum number of five holes were used to estimate a block (see parameters on Table 17.14 and inventory on Table 17.16).

### 17.5.11 Geological Resource Tabulations

Table 17.15 and Table 17.16 respectively list the most recent Quimsacocha indicated and inferred in-situ resources at different gold grade cutoffs.

**Table 17.15: Quimsacocha's Indicated Mineral Resource**

ZONE	Cutoff g Au/t	Tonnage 000 t	AU		AG		CU	
			g/t	000 oz	g/t	000 oz	%	lbs
<b>High Grade Zone</b>	<b>5</b>	5,003.61	9.12	1,467	47.48	7,638	0.62	68,816,400
	<b>4</b>	7,063.74	7.76	1,763	42.11	9,564	0.51	79,569,200
	<b>3</b>	<b>9,242.41</b>	<b>6.76</b>	<b>2,009</b>	<b>37.94</b>	<b>11,275</b>	<b>0.44</b>	<b>88,926,400</b>
	<b>2</b>	10,185.47	6.38	2,089	36.20	11,855	0.41	92,408,700
	<b>1</b>	10,271.09	6.34	2,094	36.05	11,906	0.41	92,770,300
<b>Low Grade Zone</b>	<b>5</b>	89.97	9.98	29	66.79	193	2.11	4,180,100
	<b>4</b>	207.62	6.80	45	42.01	280	1.11	5,076,200
	<b>3</b>	<b>692.93</b>	<b>4.40</b>	<b>98</b>	<b>26.31</b>	<b>586</b>	<b>0.47</b>	<b>7,182,800</b>
	<b>2</b>	4,746.67	2.61	399	19.76	3,015	0.18	19,021,500
	<b>1</b>	20,981.54	1.76	1,187	15.62	10,535	0.11	49,472,000
<b>Total</b>	<b>5</b>	5,093.59	9.13	1,495	47.82	7,831	0.65	72,996,500
	<b>4</b>	7,271.37	7.74	1,808	42.11	9,844	0.53	84,645,400
	<b>3</b>	<b>9,935.34</b>	<b>6.60</b>	<b>2,107</b>	<b>37.13</b>	<b>11,861</b>	<b>0.44</b>	<b>96,109,200</b>
	<b>2</b>	14,932.14	5.18	2,488	30.97	14,870	0.34	111,430,200
	<b>1</b>	31,252.62	3.26	3,281	22.33	22,441	0.21	142,242,300

Table 17.16: Quimsacocho's Inferred Mineral Resource

ZONE	Cutoff g Au/t	Tonnage 000 t	AU		AG		CU	
			g/t	000 oz	g/t	000 oz	%	lbs
<b>High Grade Zone</b>	<b>5</b>	49.70	14.58	23	65.41	105	2.26	2,472,300
	<b>4</b>	68.09	11.78	26	51.66	113	1.70	2,557,700
	<b>3</b>	<b>104.60</b>	<b>8.94</b>	<b>30</b>	<b>41.09</b>	<b>138</b>	<b>1.18</b>	<b>2,728,400</b>
	<b>2</b>	113.31	8.46	31	39.35	143	1.10	2,755,700
	<b>1</b>	116.06	8.30	31	38.53	144	1.08	2,764,000
<b>Low Grade Zone</b>	<b>5</b>	42.24	9.79	13	83.94	114	2.81	2,613,300
	<b>4</b>	71.60	7.57	17	64.45	148	1.98	3,121,300
	<b>3</b>	<b>194.60</b>	<b>4.91</b>	<b>31</b>	<b>47.48</b>	<b>297</b>	<b>0.85</b>	<b>3,629,700</b>
	<b>2</b>	792.78	2.96	75	32.35	824	0.31	5,456,800
	<b>1</b>	2,861.64	1.93	178	25.28	2,326	0.16	10,395,700
<b>Total</b>	<b>5</b>	91.94	12.38	37	73.92	219	2.51	5,085,60
	<b>4</b>	139.69	9.62	43	58.22	261	1.84	5,679,000
	<b>3</b>	<b>299.20</b>	<b>6.32</b>	<b>61</b>	<b>45.24</b>	<b>435</b>	<b>0.96</b>	<b>6,358,100</b>
	<b>2</b>	906.09	3.64	106	33.22	968	0.41	8,212,500
	<b>1</b>	2,977.70	2.18	209	25.80	2,470	0.20	13,159,700

## **17.6 Assumptions, methods and parameters - Mineral Reserve Estimate**

As mentioned in Section 17.1, Ecuador's Mining Law and its related regulations are currently under review by Ecuador's legislature. Consequently, IAMGOLD used the previous legislation and taxation framework to define its current Mineral Reserve for Quimsacocha. There will be a new estimate of Mineral Reserve when all regulations and taxes related to mining operations are known.

### **17.6.1 Mine Design Criteria**

- Mine design, scheduling and fleet sizing was produced by IAMGOLD personnel under the supervision of Mr Daniel Vallières, Manager, Underground Mining Projects, IAMGOLD; Preliminary geomechanical characterization were performed by Golder Associates of Montreal, Québec, Canada (Golder) and on criteria developed by IAMGOLD personnel on mines of similar sizes.
- Engineering and cost estimates were generated by IAMGOLD personnel under the supervision of Mr Vallières based on their experience and knowledge of comparable operations.
- The Quimsacocha deposit is ideal for open pit mining. However, considering the large volumes of waste rock with acid generating potential that would be required to be stored on surface, the geographic location, the adverse political opinion on open pit mining in Ecuador and the marginal differences in the economics of mining underground versus open pit, an underground mine scenario was selected. The flat laying nature of the deposit combined with poor surrounding ground quality and irregular geometry reduced the choice of mining methods to Post-Pillar Cut & Fill (PPCF) as selected in the preliminary assessment done by SRK in 2006.
- Mine cut-off, mine plan and equipment selection are based on the assumption that the Quimsacocha would be operated and supported by its own personnel (no contract mining). This same concept was also used in developing the economic parameters and operating costs.
- Total operation targets were designed to meet the processing requirement of 3,000 tonnes per day (tpd) of ore.

### **17.6.2 Stability Analysis**

IAMGOLD retained the services of Golder to determine, on a preliminary basis, the underground operating parameters. The main factors in stability controls and the basic geomechanical parameters were established.

Structural discontinuity systems were examined throughout the deposit. The influence of these structures is not well determined at this time. The entire drill core was logged and extensive geomechanical mapping was done. Golder created a geotechnical model using the key geotechnical parameters, RMR, Strength, RQD and Water, superimposed with mining contours and faults traces. The objectives of this model are to validate preliminary design criteria and orient future geomechanical-purpose drilling. These sections were provided to IAMGOLD to assist with the planning of mine accesses and portals.

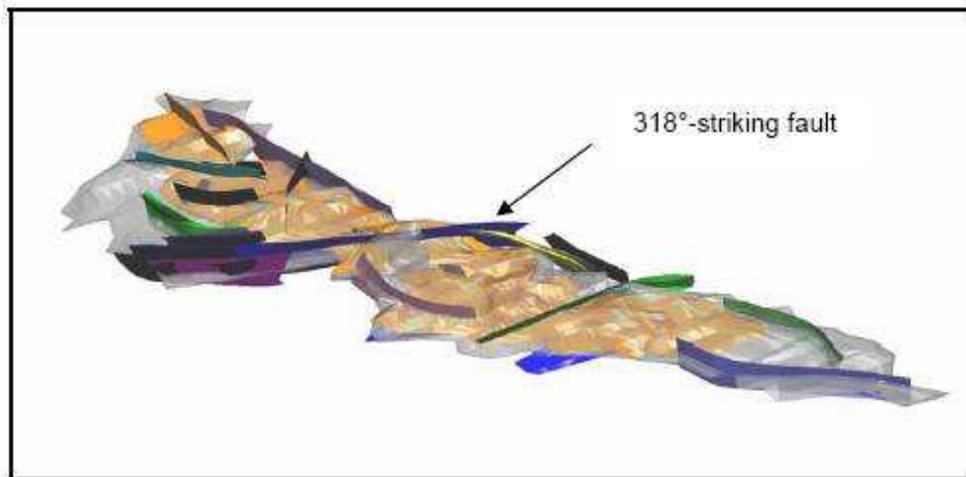
#### **17.6.2.1 Geological Description**

The Quimsacocha mineralization is hydrothermal and occurs within sub-horizontal lava flows and tuff layers, both of andesitic composition. The target mineralization is located via an approximately 40 m thick, sub-horizontal, silicified zone located approximately 100 to 200 m below ground surface. The mineralization is surrounded by a clayey alteration halo and weaker rocks. Gold mineralization is associated with silicified andesites, in both lava and tuff.

#### **17.6.2.2 Major Structures**

Based on the information available, it appears that the Quimsacocha deposit is cut by multiple sub vertical faults. Most of these faults extend NW to SE (azimuth of 318°) and have been included in the 3D Engineering Geology Model. Figure 17.9 shows the interpreted major fault systems at Quimsacocha. Low RQD zones also appear to be related to the presence of fault zones, although further investigation will be required to verify this interpretation.

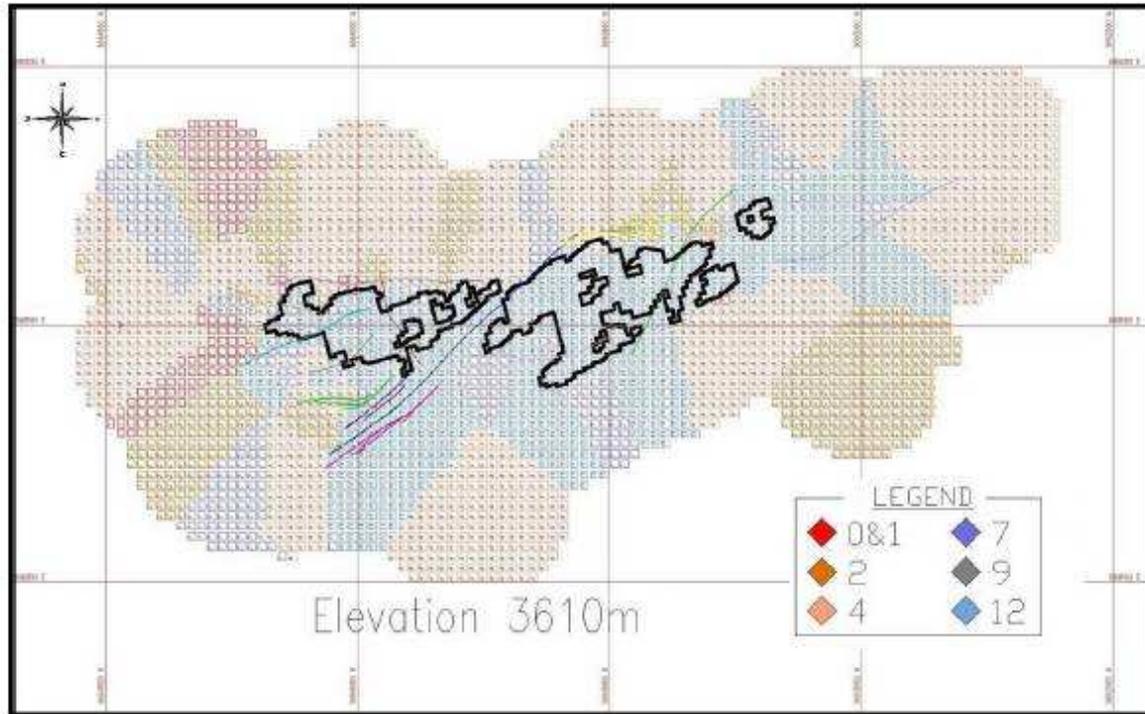
**Figure 17.9: 3D Model of Major Faults**



### 17.6.2.3 Alteration and Strength

The relationship between alteration and rock strength is well defined at Quimsacocha. Currently IAMGOLD has prepared alteration cross sections which illustrate the general distribution of silicified rocks and the halos of surrounding, weaker and potentially degradable rocks. Field observations suggest that weak to moderately clay-altered rocks with no silicification will behave much more adversely, with potential to degrade, while moderately clay-altered rocks with some silicification will not. The issue of rock mass degradation with time and in presence of water is highly relevant to the mine design. Mining contours performed by IAMGOLD are all inside the 3 g Au/t envelope and therefore the surrounding rock should still be in the lower grade silicified halo. Development should follow the same rule and stay inside the high silicification area as much as possible. In cases where development work needs to be performed outside the high silicification area, special ground support involving shotcrete will be required. Further work on distribution and the relationship between grade and degree of silicification would be required for detailed design. Figure 17.10 illustrates the rock strength model developed by Golder at elevation 3610m. In this figure, the location of mining contours (in black) surrounded by weaker rock is obvious, particularly on the west side. The range of rock strengths lower than 7 should be interpreted as potentially unstable.

Figure 17.10: Rock Strength Model (3610m RL)



### 17.6.2.4 Tests

To estimate the rock mass strength parameters, a series of tests were carried out on the different samples, representing each structural domain. To obtain the unconfined compressive strength values for intact rock, point load tests were carried out by IAMGOLD during geotechnical mapping work on the diamond drill core. Uniaxial, triaxial compressive and direct shear tests are currently being performed at Ecole Polytechnique's rock mechanics laboratory in Montreal. Table 17.17 and Table 17.18 list the tests results obtained to date.

**Table 17.17: Statistics of Point Load Tests ("PLT") Results**

Rank	Description	# Tests	Average Is (50) (Mpa)	Standard Deviation	CV*	Maximum Is (50) (Mpa)	Minimum Is (50) (Mpa)
<b>So</b>	<b>No silicification</b>	452	1.4	1.3	89%	6.7	0.0
<b>S1</b>	<b>Low grade silicific.</b>	54	2.6	1.4	54%	5.6	0.4
<b>S2</b>	<b>Medium grade silicific.</b>	87	3.1	1.5	50%	7.4	0.8
<b>SG</b>	<b>Granular Silica</b>	15	4.4	1.6	36%	6.9	2.0
<b>S3</b>	<b>High grade silicification</b>	37	5.9	2.4	41%	10.2	1.3
<b>SV*</b>	<b>Vuggy Silica</b>	139	7.4	2.8	39%	12.2	1.2
<b>SM*</b>	<b>Massive Silica</b>	117	8.7	2.6	30%	13.2	2.1

\* SV and SM represent the ore body; CV = Coefficient of Variance

**Table 17.18: Statistics of Uniaxial Compressive Strength ("UCS") Test Results**

Rank	# Tests	Average UCS (Mpa)	Standard Deviation	CV	Maximum UCS (Mpa)	Minimum UCS (Mpa)
<b>So</b>	21	49	29	58%	134	15
<b>S1</b>	7	64	16	25%	91	43
<b>S2</b>	20	90	35	39%	180	38
<b>SV</b>	9	168	100.3	60%	302	54
<b>SM</b>	10	190	108	57%	341	46

The results indicate that the higher the degree of silicification, the stronger the rock. Low UCS values, less than 50 MPa, were observed in rock samples where no silicification was recorded (S<sub>0</sub>). S<sub>1</sub> and S<sub>2</sub> rock samples were typically strong, with average UCS values of 64 and 90 MPa, respectively. The SV

and SM rock samples were classified as very strong rock, with average UCS values of 168 MPa and 190 MPa.

A summary of PLT and UCS testing results is presented in Table 17.19. In terms of the silicification ranking system, the data indicates that high grade silicified rock samples (SV and SM) require correlation factors of 22 to 23. A correlation factor of 35, 24 and 30 would be adequate for rocks identified respectively as unsilicified ( $S_0$ ), low grade silicification ( $S_1$ ), and medium grade silicification ( $S_2$ ), respectively.

**Table 17.19: Correlation factors between Silicification and Rock Strengths**

<b>Rank</b>	<b>Description</b>	<b>Average Is (50) (Mpa)</b>	<b>Average UCS (Mpa)</b>	<b>Correlation Factor</b>
<b>So</b>	<b>No silicification</b>	1.4	49.3	35
<b>S1</b>	<b>Low grade silicific.</b>	2.6	63.9	24
<b>S2</b>	<b>Medium grade silicific.</b>	3.1	90.1	30
<b>SG</b>	<b>Granular Silica</b>	4.4	—	—
<b>S3</b>	<b>High grade silicification</b>	5.9	—	—
<b>SV</b>	<b>Vuggy Silica</b>	7.4	168.2	23
<b>SM</b>	<b>Massive Silica</b>	8.7	190.2	22

With respect to the correlation factor for unsilicified ( $S_0$ ) rocks, more work is required to assess the degree and types of clay alteration. The correlation factor of 35 is preliminary. Actual data on specific lithologies, alteration style and intensity will be obtained for unsilicified rocks. These studies shall be included with the remaining testwork performed at École Polytechnique. Silicification and alteration models will be generated to delineate areas of potentially weak and/or degradable rock with respect to the planned development.

#### **17.6.2.5 Groundwater**

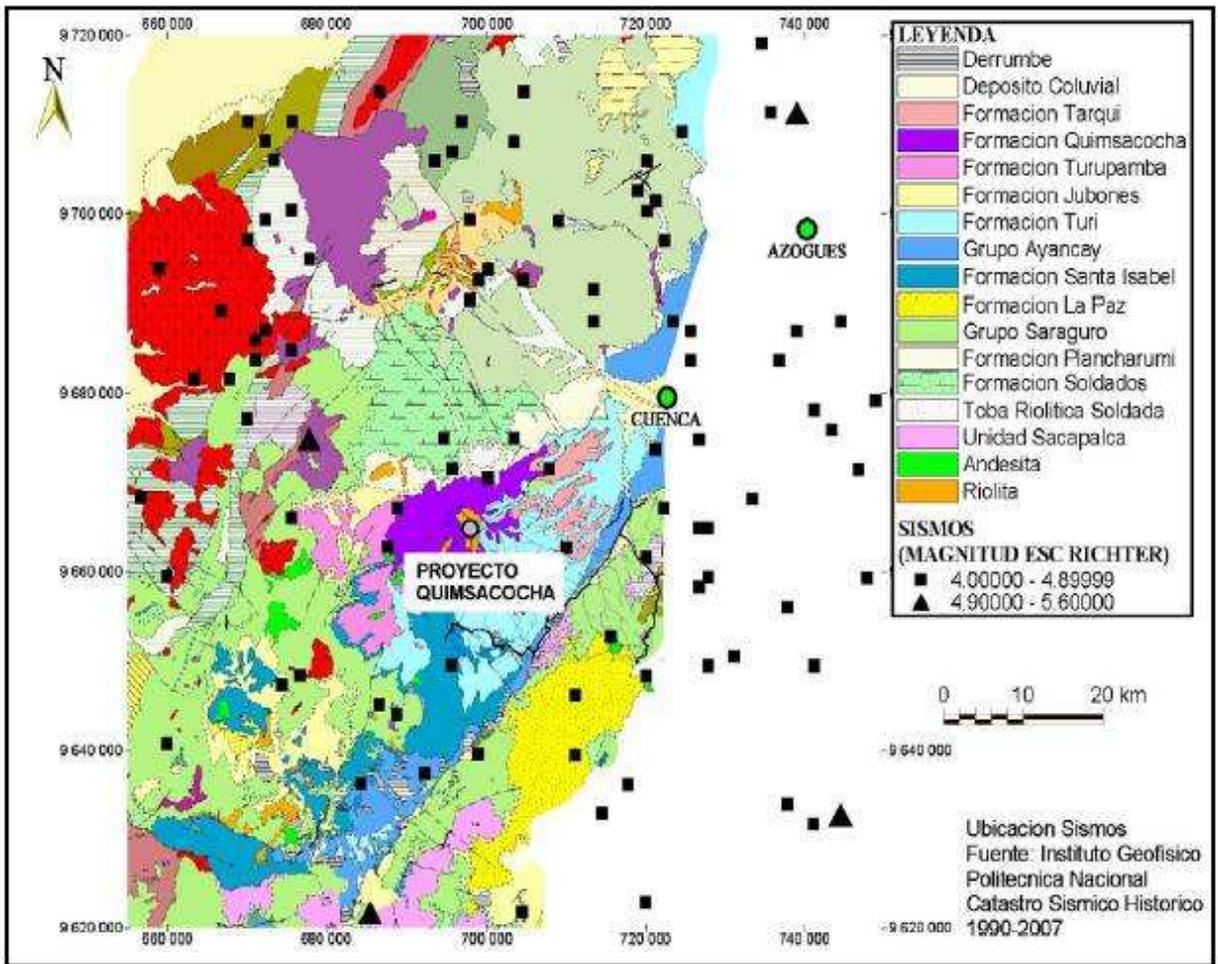
An assessment of critical hydrogeological issues was performed by Golder. The groundwater conditions were estimated using data generated from installed piezometers. Four simulations were carried out to address the range of hydraulic conductivity and recharge values. Conclusions are that mine water inflows under steady-state conditions might be in the order of 0.5 to 0.9 Mm<sup>3</sup>/year. In the present study, an inflow

rate of 0,9 Mm<sup>3</sup>/year was used for pumping design. The groundwater model suggests that intercepted mine water seepage is likely to significantly reduce the local base flow in the Quinuahuaycu River, given the extent of the mine and its depth relative to the adjacent valley. Based on the geological and mineral information, mine water is expected to require chemical treatment prior to discharge. Further work is required to better define the potential impacts of the underground mine on the regional water regime.

#### **17.6.2.6 Seismicity**

A map of regional seismicity in the Quimsacocha area from 1990 to 2007 suggests that the Quimsacocha area is subject to earthquakes of magnitude less than 5 on the Richter scale. . The impact of seismicity on mine development was not addressed in this study. Figure 17.11 presents the regional seismicity in the vicinity of Quimsacocha.

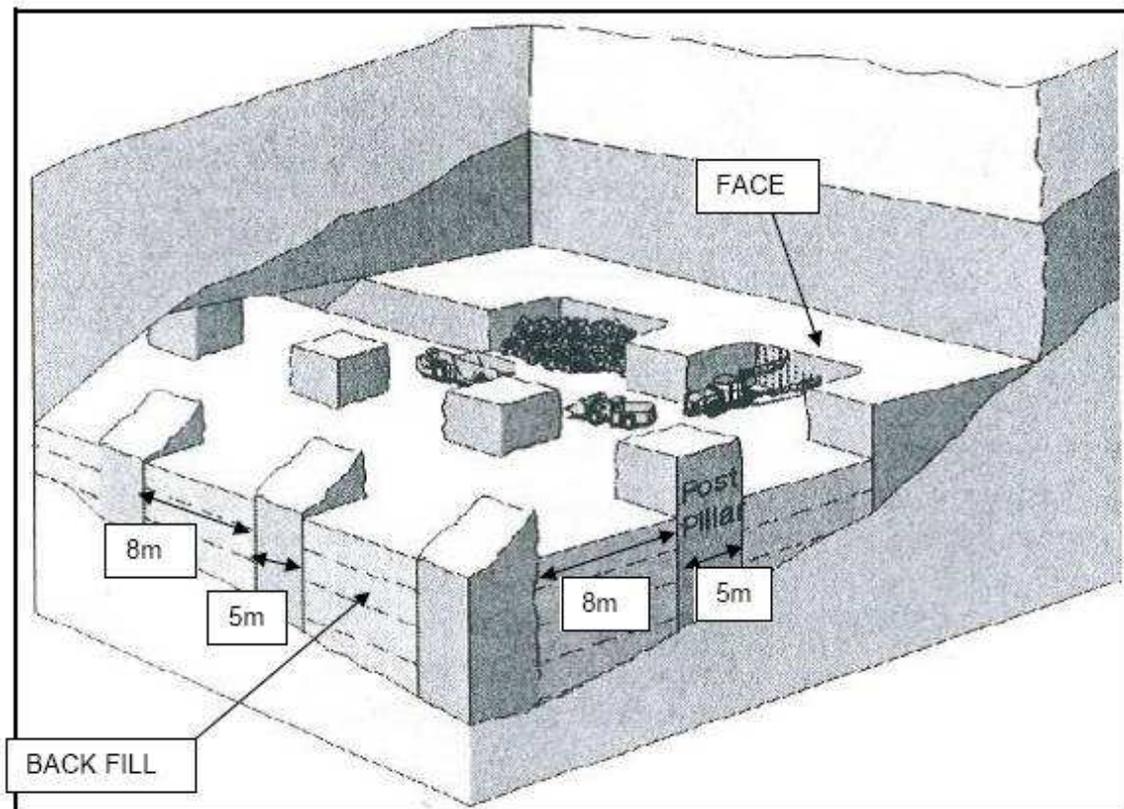
Figure 17.11: Seismicity Readings near Quimsacocha



### 17.6.3 Underground Mine Design

As stated earlier, the selected mining method remained unchanged from the Scoping Study. The preferred method is called “post-pillar cut-and-fill” and is a cross between “room and pillar” and “cut and fill stoping”. Post pillar mining allows recovery of the mineralization in horizontal slices, starting from a bottom slice and advancing upwards. Pillars are left inside the stope to support the roof. The mined-out stopes are backfilled with paste tailings and the next slices are mined. Pillars extend through several layers of fill which contribute to the pillar’s support ability and yield while the level is backfilled. A grid was developed based on 5mx5m geometric pillars spaced by 8mx8m rooms. The pattern used for the purpose of this study allows for extraction of 85% of the ore with 15% remaining behind in regular, checker-board patterned pillars. The grid was positioned over the zones without any consideration of the height of the pillars and the location of high grade zones. This will be optimized during the Feasibility stage. Figure 17.12 shows a typical production level.

Figure 17.12: Post-pillar Cut-and-Fill Method Schematic



Two options are considered to address rock weakness in some areas: use of larger pillars or drift and fill method. Further work on mine design at Feasibility stage could positively impact on overall mine recovery. Conversely, mining cost and productivity could be affected by the use of drift and fill method.

The underground mine will be accessed by two 5mx5m portals located on the east side of the hill near mine grid coordinates 699,017 E and 9,663,532 N for the southern level portal (South ramp) and grid coordinates 698,905 E and 9,663,819 N for the northern level portal (North ramp). These two ramps start at 3,653m elevation and end at the 3,610 level. Development from the southern portal will be 396 meters long straight down to the 3,610 level with an 11% slope. Development from the northern portal will be 372 meters to reach the main level with a 12% slope. Both ramps will be connected to level 3,610. These two ramps are planned to be developed one after the other with an advancement rate of 7 meters per day. An extra 20% on development length was added to cover all the required safety bays, re-muck bays (every 150m) and truck passing points (every 200m). Once the first ramp reaches the 3610 level a ventilation raise will be developed by raise boring to facilitate development work. During this period the second ramp access will be developed. The 3610 level will be completed afterwards to give access to the beginning of internal ramps required to reach the lower and the higher parts of the ore body. Figure 17.13 and Figure 17.14 show two different views of the mine design.

Figure 17.13: Overall Mine Design (planview)

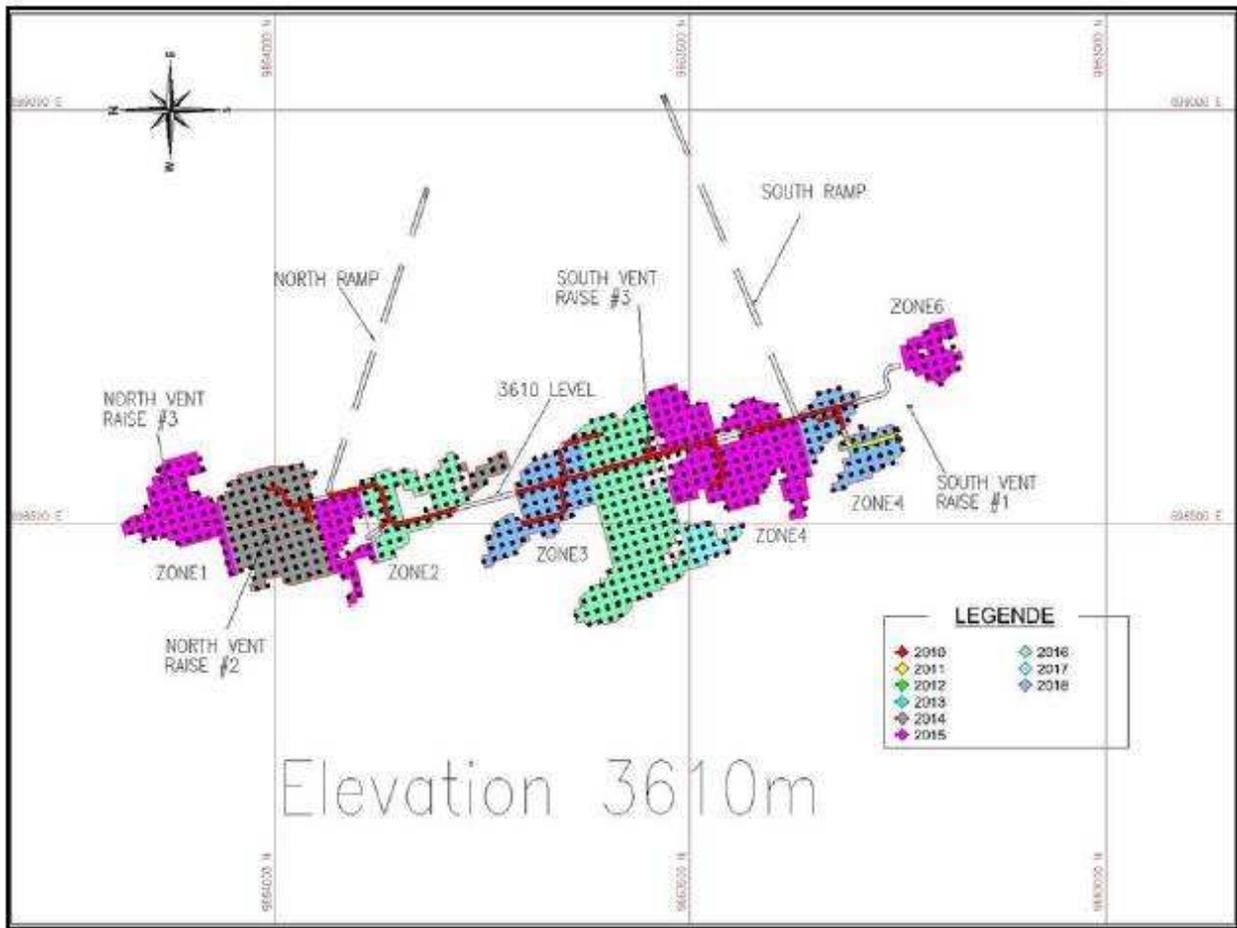
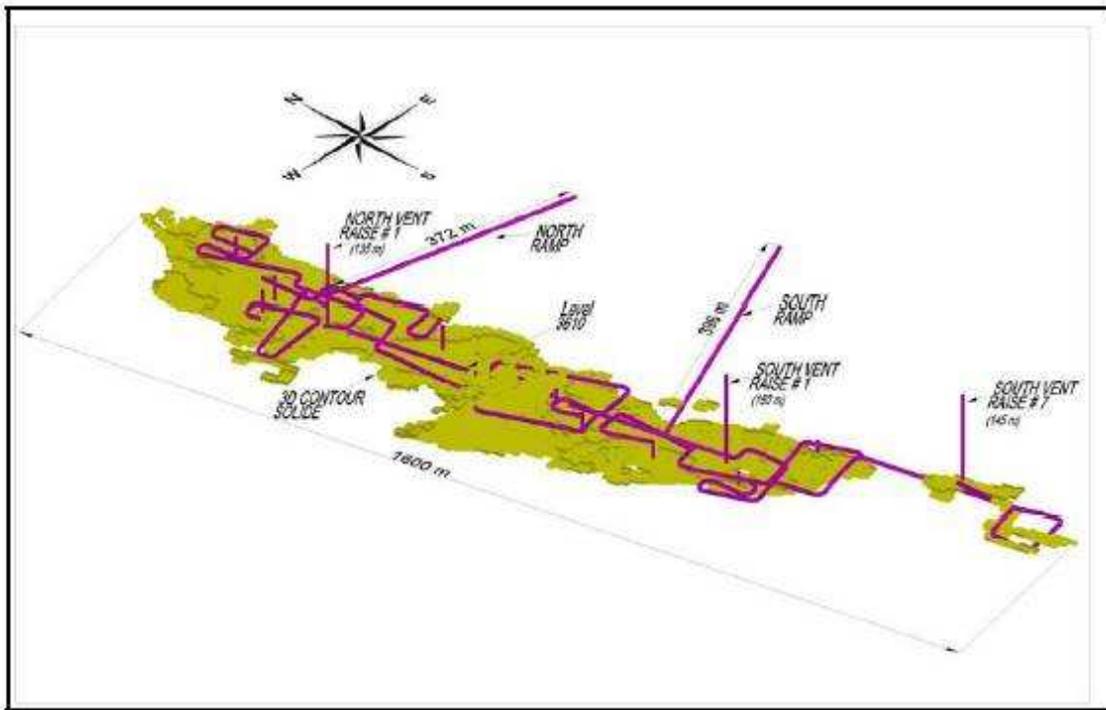


Figure 17.14: Mine Design Model (Isometric View)

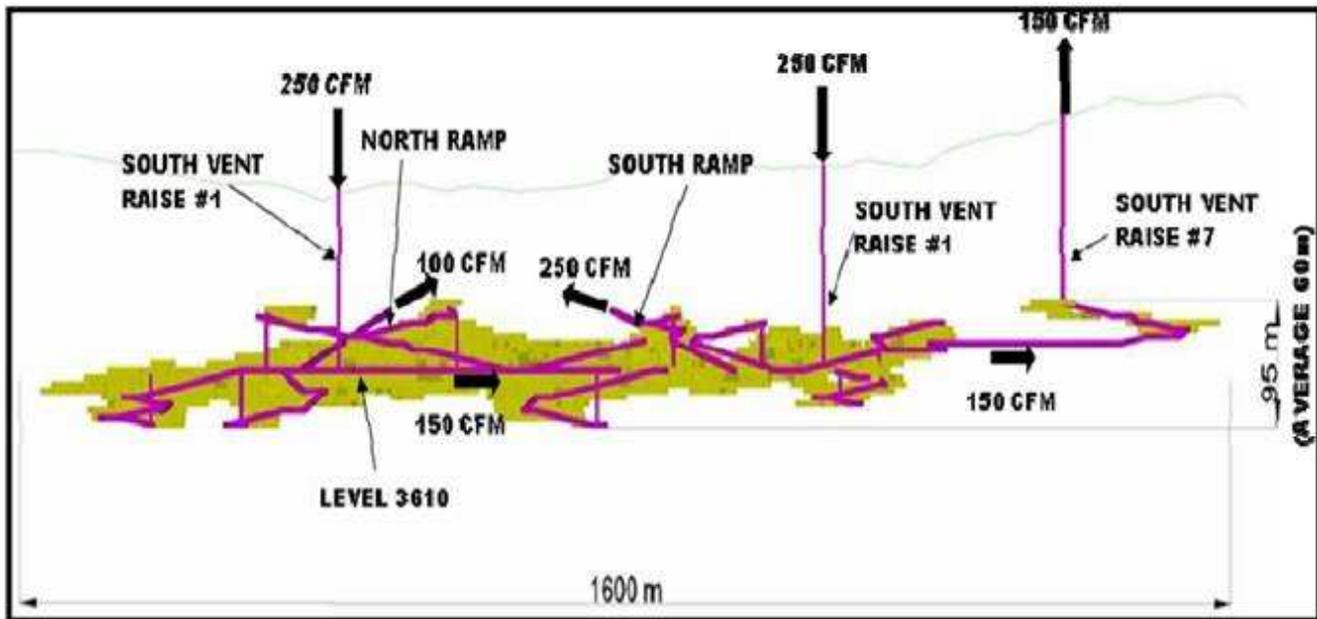


### 17.6.3.1 Ventilation

The north ventilation raise (North raise #1) will be located at grid coordinates 698,487 E and 9,663,884 N from elevation 3,615 to 3,750 meters and will be 135 vertical meters (90°). The south ventilation raise (#1 South raise) will be located at grid coordinates 698,640 E and 9,663,260 N from level 3,615 to level 3,765 and will be 150 vertical meters (90°). The extreme south raise (South raise #7) will be located at grid coordinates 698,792 E and 9,662,949 N with a length of 145 vertical meters (90°) and will be used to ventilate levels 3,665 to 3,810. The three ventilation raises will be developed by raise boring. Four and five internal 5m by 5m drop raises, of various lengths (from 20 to 40 meters), will be developed respectively in the northern and the southern sector to allow ventilation of all the mining workplaces.

As shown in Figure 17.15, 500,000 CFM are planned to ventilate the mine. The low oxygen content at this elevation (3,600mRL), the high silica content of the ore, the backfill heat and the use of large equipment were all considered in this estimate. Fresh air will be introduced by the two main ventilation raises and exhausted by the two ramp accesses and the south ventilation raise #7.

Figure 17.15: Ventilation Circuit



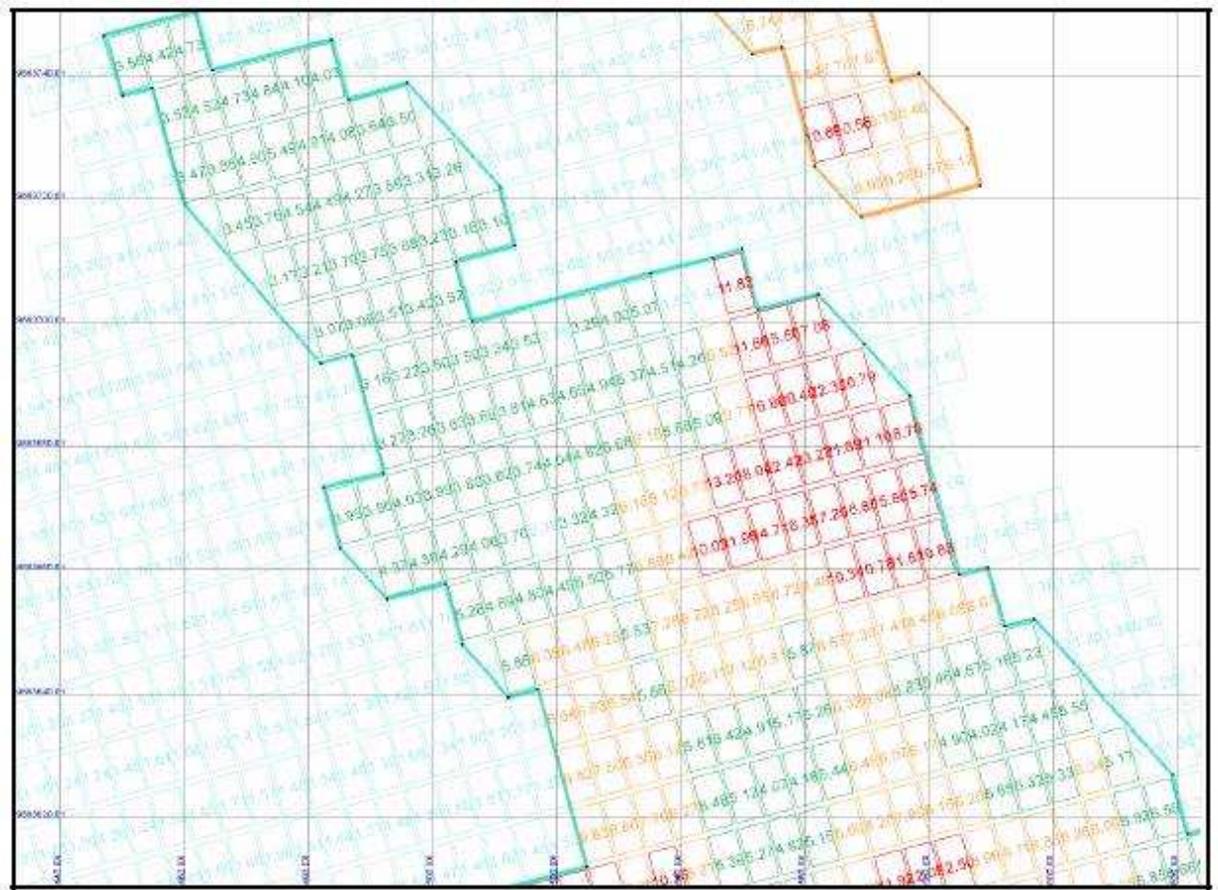
### 17.6.3.2 Backfill

The PPCF mining method can use waste rock fill or cemented backfill. There is not sufficient waste rock generated from development mining to make waste rock backfill an option other than using minor amounts as it becomes available. Cemented backfill could be either hydraulic or thickened tailings. Also, the use of large amounts of water at Quimsacocha could lead to ground stability problems. This is particularly true with the potential deterioration of unsilicified kaolinite. Another concern is the availability of water at the mine site. The use of thickened tailings in both backfill and surface tailing disposal can maximize the reuse of process water.

### 17.6.3.3 Mineral Reserve Estimates

The reserve estimate optimization was done internally using 5 meter plan views and contouring Au blocks greater than 3.0g Au/t from the Au block model resulting from the interpolation runs. From the resource model, a reserve model was generated using contoured zones. All indicated blocks with a gold value equal or greater than 3.0 g Au/t were contoured in order to define mining excavation zones. However, during the contouring process, a few blocks with a gold value less than 3.0 g/t were included to facilitate the contouring (Figure 17.16). As a result of the contouring process, inside dilution was considered in the reserve calculation.

Figure 17.16: Example of Mine Lift Contouring



The mine excavations are mostly located inside the 3.0 g Au/t grade envelope; however, the extremities of a few zones can extend beyond the limits and be located inside the 0.8 g/t grade envelope where the block values are still greater than the 3.0 g/t cut-off. See Figure 17.17. The later results in what we called “outside dilution” (Table 17.21).

Low grade block groups were also modeled to delimit waste areas inside the excavation zones (Figure 17.17). Therefore, a total of 327,000 tonnes of waste were subtracted from the reserve. Overall, 754,000 tonnes of inside and outside dilution were added to the mineral reserve (Table 17.20). Note that because of the lack of Measured Resource, all the Mineral Reserve is classified as **Probable**.

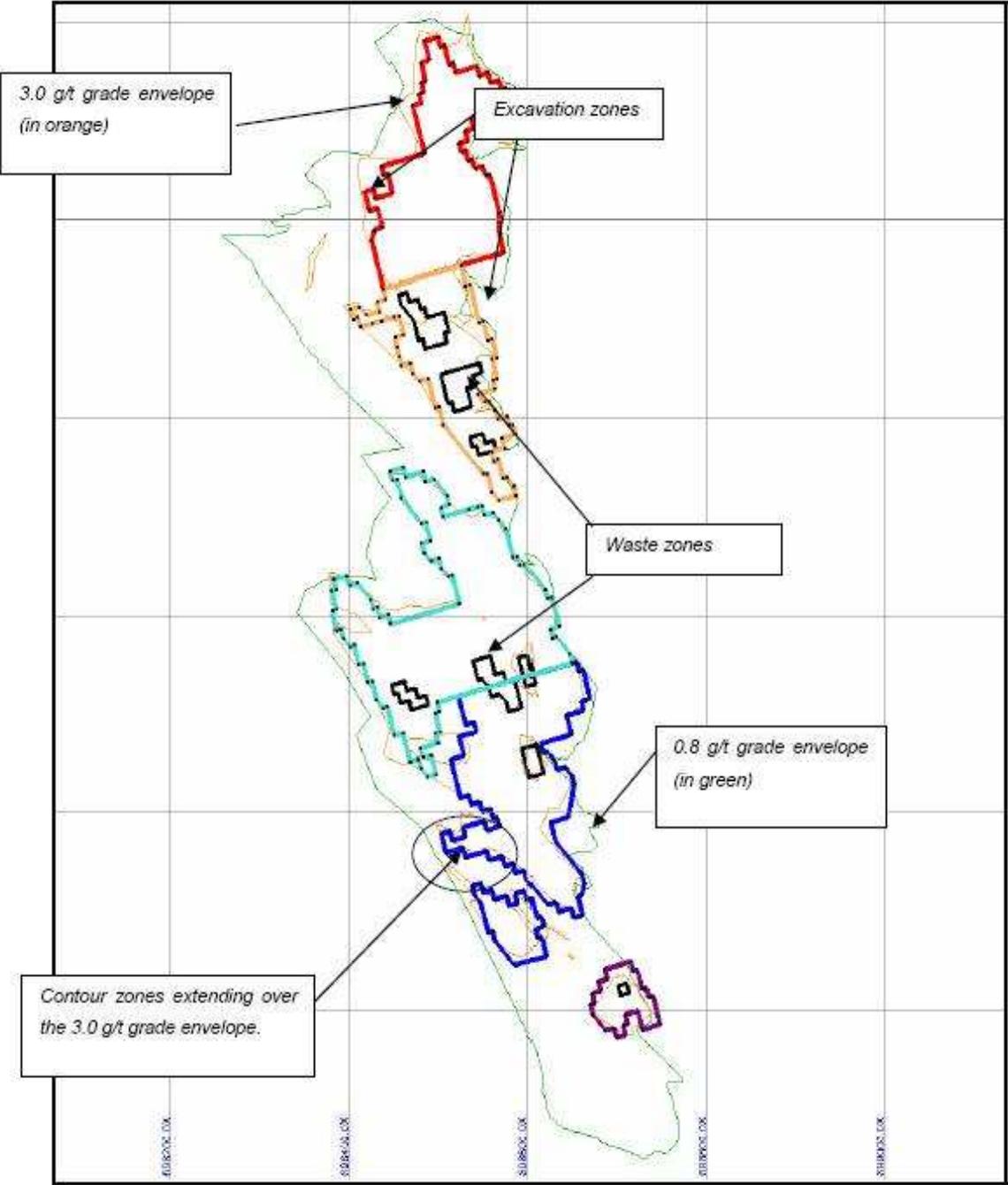
**Table 17.20: Waste Inside Mine Excavations**

	<u>Tonnage</u>	<u>AU</u>		<u>AG</u>		<u>CU</u>	
	<u>000 t</u>	<u>g/t</u>	<u>000 oz</u>	<u>g/t</u>	<u>000 oz</u>	<u>%</u>	<u>lbs</u>
<b>Waste</b>	327	2.0	21	14.6	154	0.13	946,975

**Notes:**

- 1. *Outside dilution*** is due to the inclusion of a minor amount of resources (Au blocks) from the 0.8 grade envelope which are located near the 3.0 grade envelope limits and which have a grade value > 3.0g/t.
- 2. *Inside dilution*** is due to the subtraction of waste zones located inside the mining excavation zones as well as the inclusion of Au blocks with grade value < 3.0g/t. This is due to mining equipment specifications.

Figure 17.17 : Mining and Waste Outlines



**Table 17.21: Resource Status**

Resource status	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
<b>Mineral Resource - 3.0g/t cut-off</b>	<b>9,242</b>	<b>6.76</b>	<b>2,009</b>	<b>37.94</b>	<b>11,275</b>	<b>0.44</b>	<b>88,926,350</b>
<i>Inside and outside dilution (+)</i>	<i>754</i>	<i>2.72</i>	<i>66</i>	<i>16.95</i>	<i>411</i>	<i>0.20</i>	<i>3,283,825</i>
<b>Diluted resource</b>	<b>9,996</b>	<b>6.45</b>	<b>2,075</b>	<b>36.32</b>	<b>11,686</b>	<b>0.42</b>	<b>92,210,175</b>
<i>Resource left inside pillars (-)</i>	<i>1,479</i>	<i>6.42</i>	<i>306</i>	<i>36.00</i>	<i>1,713</i>	<i>0.41</i>	<i>13,347,743</i>
<b>Available Resource</b>	<b>8,517</b>	<b>6.46</b>	<b>1,769</b>	<b>36.42</b>	<b>9,973</b>	<b>0.42</b>	<b>78,862,432</b>

**Table 17.22: Probable Mineral Reserve**

Source	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
<b>Development</b>	<b>135</b>	<b>6.46</b>	<b>28</b>	<b>34.45</b>	<b>150</b>	<b>0.42</b>	<b>1,250,021</b>
<i>Mining Recovery (95%)</i>	<i>7,963</i>	<i>6.46</i>	<i>1,654</i>	<i>36.45</i>	<i>9,332</i>	<i>0.42</i>	<i>73,732,717</i>
<b>Probable Mineral Reserve</b>	<b>8,098</b>	<b>6.46</b>	<b>1,682</b>	<b>36.44</b>	<b>9,482</b>	<b>0.42</b>	<b>74,982,738</b>

The mine production schedule is shown on Table 17.23.

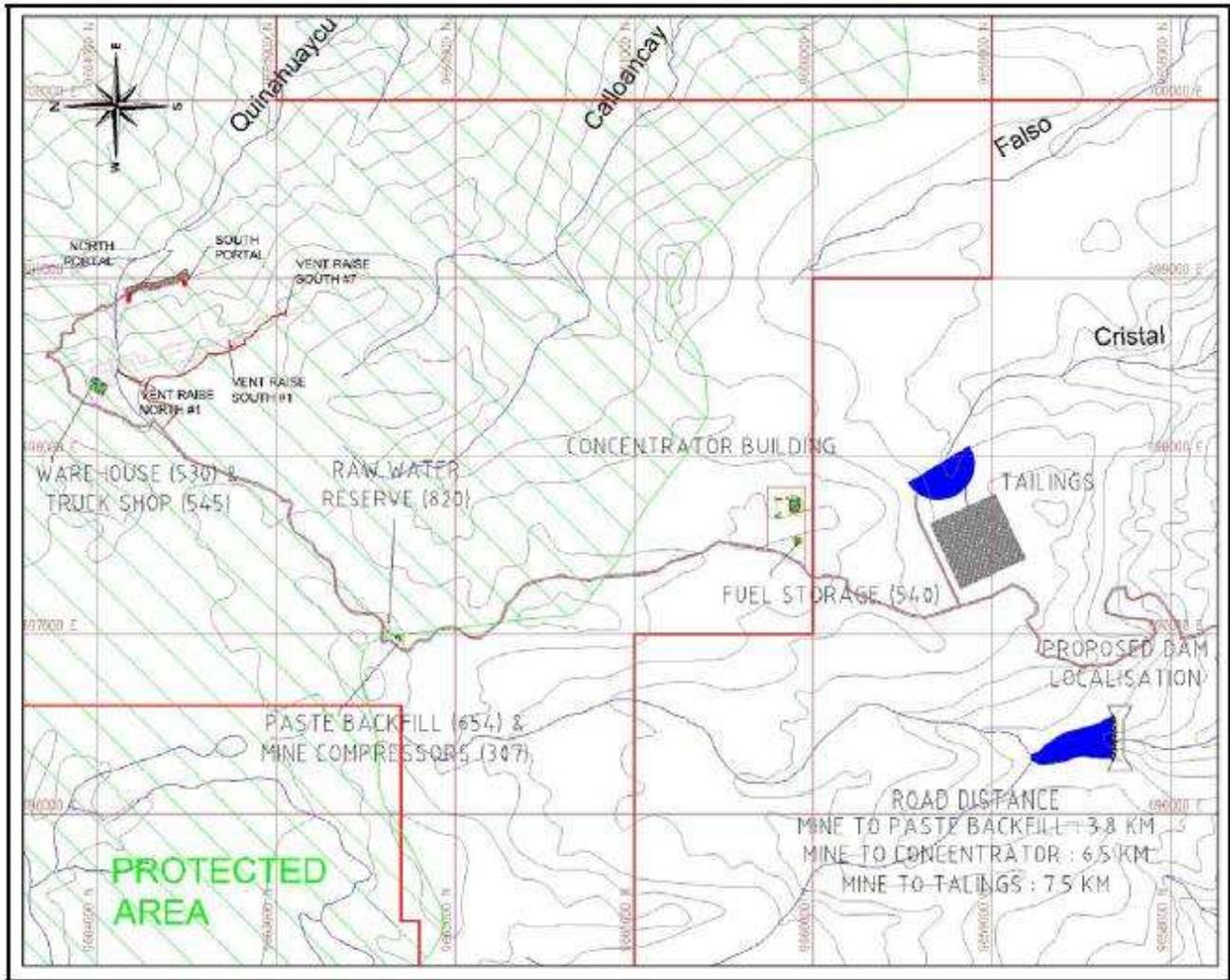
**Table 17.23: Mine Production Schedule**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
<b>EXTRACTION</b>										
Production ('000 tonnes)		460	1,142	1,144	1,142	1,142	1,142	1,140	1,071	8,382
Mucked ('000 tonnes)		437	1,085	1,086	1,085	1,085	1,085	1,083	1,017	7,963
<b>DEVELOPMENT</b>										
Vertical (m)	570	165	125	145						1,005
Horizontal (m)	2,297	2,435	1,821	861						7,414
Waste ('000 tonnes)	79		2							81
Ore ('000 tonnes)	52	53	24	7						135
Surface inventory ('000 tonnes)	52	41	55	53	43	33	23	11		

#### 17.6.4 Mine Roads and Waste Dumps

There are six kilometers of surface roads from the mine to the mill. This distance could be decreased if the mill was located closer to the mine. For the purpose of this study the mill is located outside the boundaries of the protected forest area. This assumption may be revised after approval of the new mining law. The average haul distance estimate from the mine to the mill is a 13km roundtrip (Figure 17.18). The longest distance is estimated at 13.5km, which is the distance used in the cycle time. With the small amount of waste involved in the project (81,000 tonnes), it was decided to reuse the waste material as backfill as much as possible and dispose the remaining inside the tailings pond area.

Figure 17.18: Mine Infrastructure



## **17.6.5 Mine Division**

The Mine Division consists of three departments under the supervision of the Mine Manager. These are Mine Operations, Mine Maintenance and Technical Services Departments.

The operating costs are developed on the basis that mining operations would be performed by Quimsacocha personnel with their own equipment except for the initial phase of ramping accesses as well as for ventilation raises. Maintenance for major and light equipment is also assumed to be performed on site by Quimsacocha personnel. Preference will be given to local suppliers for the necessary supplies and surface equipment. Other Andean countries will be also be given preference over North America and Europe for the supply of underground equipment and parts not presently available in Ecuador. The mine will operate on two eleven-hour shifts per day, seven days per week.

Mine Operations will encompass Production Drilling, Blasting, Muck Loading & Hauling and Ground Support activities. Total mining operating costs are estimated at \$ 299.2 M over the mine life or \$34.80 per tonne mined. Details of each operation are given in the following sections.

### **17.6.5.1 Drilling**

Drilling will be performed using two boom jumbos. A total of three jumbos are required for the operation of the mine. One will be used for development and the two others will be used for production. The selected Jumbo has a 4.9m (16ft) drilling capacity. With the high silica content of the ore, penetrating rate was estimated at 2 meters per minute. For this study, an average powder factor of 1.29 kg of explosives per tonne blasted was used

### **17.6.5.2 Loading**

Mucking will be carried out using three 7m<sup>3</sup> (9.2 yd<sup>3</sup>) scooptrams with tramming capacities of 17,200 kg each. The 470 tonnes generated by each blasted round will be mucked in 28 buckets with a loading time of 2.78 min per bucket. Tramming distance should remain under 100 meters to accomplish the cycle. With the mining method selected it will be easy to use mined out room as re-muck to maintain the mucking distance within 100 meters.

### **17.6.5.3 Hauling**

Five Dumpers, each with a 50 tonne payload capacity, will haul out the ore. The dumpers will be loaded from the back. Mined out rooms and cross-cuts will be used as re-muck bays to store ore as required to keep face advance moving without delay. Loaded haul trucks will transport the ore up the main access ramp out of the mine to the crushing area. Cycle time to load, travel, dump and return is estimated at 70 min per trip. Considering a fleet of six trucks including one spare, every truck should carry 600 tpd for a total of 3,000 tpd. 18 operating hours per day were considered in the calculation.

### **17.6.5.4 Roof Bolting**

Roof bolting will be performed using a combination of Roof bolter and conventional stoper bolting on a scissor lift platform. Standard ground support will consist of 2.4m (8ft) rebar. A regular 1.2mx1.2m (4ftx4ft) pattern with welded mesh will be applied on the roof. For the walls, 2.4m (8ft) rebar will be installed with straps to prevent scaling and pillar deterioration. In poor ground area, bolters and shotcrete will be the preferred ground control method used to minimize risk.

### **17.6.5.5 Backfill**

Maximum stability of the backfill must be reached in a timely manner to allow equipment back on top of the fill with minimal sinking of equipment and loss of ore in the fill. The total forecast price of fill is \$11.48 per tonne of fill. Potential savings are possible with optimization of the binder quantity added to the fill. Further work should be undertaken at the Feasibility stage. A positive displacement pump will be required to carry the fill to the underground openings as well as in the tailings pond area. Physical attributes and pumpability of the fill should be addressed at the Feasibility Stage.

### **17.6.5.6 Mine Services**

The main function of the mine services department is to provide administration, supervision and assistance to the production units. Road maintenance, mine dewatering, underground rehabilitation and mine maintenance are part of their duties. Supply costs to support their activities, office supplies, travel expenses and safety equipment are included in their budget.

### **17.6.5.7 Mine Maintenance**

The function of the Mine Maintenance department is to provide maintenance for all mining related equipment. Electrical power as well as diesel used in the mine is also accounted in this department.

### **17.6.5.8 Technical Services**

The technical services include both engineering and geology departments. Their duties cover short and long range planning, production drilling and blasting designs, surveying, grade control, sampling, and compilation, estimation of the resources and reserves as well as supervision of the mine exploration programs.

### **17.6.6 Mine Capital Expenditures**

A summary of mine capital expenditures is given in section 18.6.

#### **17.6.6.1 Mine Equipment**

Based on the production requirements, equipment productivity and the hauling profiles, the major equipment requirements were evaluated and forecasted to total \$21 M. The cost of each piece of major production equipment is derived from vendor's quotations. Considering the current market for used equipment, it was assumed that all the equipment will be new.

The cost of tires, tax, freight, insurances, duties and re-assembly are included in the capital expenditures. Considering the relatively short life of the project (7 years) it is not anticipated to renew the fleet. No residual value was assumed for the equipment at the end of the project as most of the equipment will have reached its expected life.

#### **17.6.6.2 Other Capital Expenditures**

An amount of \$19.1 M is allocated for valuation drilling, deferred development, underground stationary equipment, construction, accessories, and technical equipment.

### **17.6.6.3 Pre-Production Costs**

During the pre-production period, costs for access development, stope preparation, mine services, mine maintenance and technical services are capitalized. This amounts to \$28.8 M

## 18.0 OTHER RELEVANT DATA AND INFORMATION

### 18.1 Water Management

#### 18.1.1 Hydrology

Quimsacocha is located in the headwaters of several river systems that drain to the southeast, to the north and to the south (Figure 18.1). Their geomorphological characteristics are listed on Table 18.1. Three main drainage systems near Quimsacocha were identified (Golder, 2005):

- Drainage to the southeast: Rio Irquiz starting at the headwater as Quebrada Quinuahuaycu, and Rio Portete starting at headwater Calluancay,
- Drainage to the south: Rio Zhurucay, Qda. Falso, and Qda. Cristal,
- Drainage to the north: Rio Bermejos.

The Quinuahuaycu River, which drains the Quimsacocha deposit area, is the watershed that is most likely to be impacted by the project. A hydrograph separation stream flow recorded at this station was performed by Golder and a histogram of Quinuahuaycu showing the base flow line in orange is presented in Figure 18.2. The upper flowrate was estimated at 37 L/s (1.2 Mm<sup>3</sup>/year) and a lower value of 20 L/s.

**Table 18.1: Drainage Basins Geomorphological Characteristics**

PARAMETERS	BERJEMOS	PORTETE	IRQUIZ	ZHURUCAY BAJO	QUINUA- HUAYCU	CALLUAN- CAY	ZHURUCAY
Surface (Km <sup>2</sup> )	21.64	21.62	35.95	12.58	5.01	4.39	1.34
Perimeter (km)	28.02	37.94	45.72	26.44	13.50	10.78	6.68
Min. elevation from sea level (m)	3,708	2,800	2,760	2,920	3,590	3,589	3,680
Max. elevation from sea level (m)	3,960	3,770	3,850	3,910	3,883	3,870	3,900
Avg. altitude (m)	3,781	3,323	3,358	3,515	3,739	3,744	3,785
Unevenness (m)	252	970	1,090	990	293	281	220
Slope gradient (%)	19	35	37	26	19	18	18
Compactness index	1.7	2.3	2.1	2.1	1.7	1.4	1.6

Figure 18.1: Hydrographic Basins

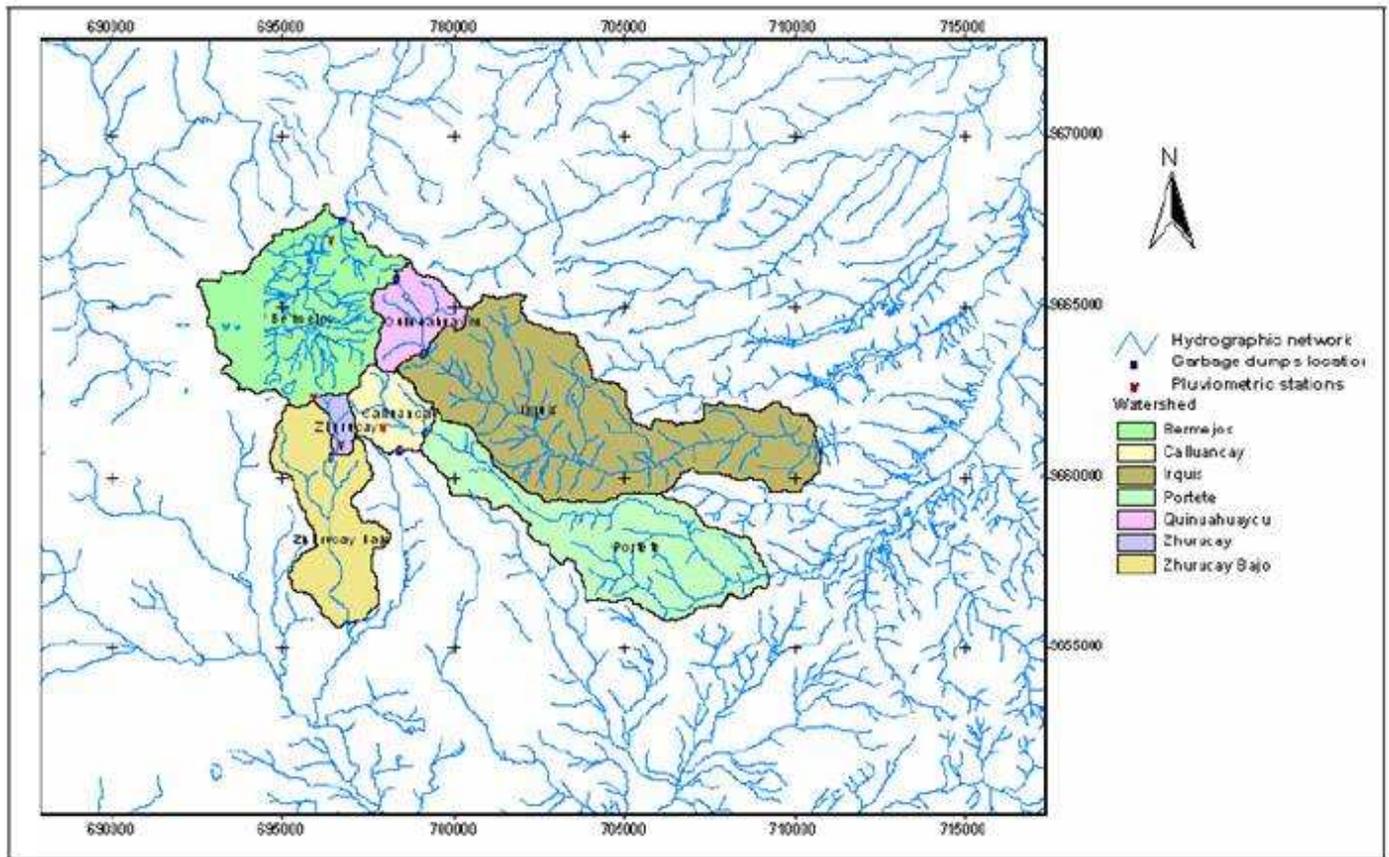




Table 18.2 lists the amount of precipitation in mm for three stations near the Quimsacocha project. Note how the registered precipitation can be highly variable from one station to another. For the survey period Zhurucay station recorded 41% more precipitation than Berjemos Alto station, located less than three kilometres away.

**Table 18.2: Precipitation records (mm) at some stations in the Quimsacocha area**

<b>MONTHS</b>	<b>CALLUANCA STATION</b>	<b>BERJEMOS ALTO STN</b>	<b>ZHURUCAY STATION</b>
<b>November 06</b>	117.6	102.6	113
<b>December 06</b>	104.2	91.2	108.2
<b>January 07</b>	76.4	68.4	82.6
<b>February 07</b>	31.6	35.2	40.2
<b>March 07</b>	117.8	109.8	134.8
<b>April 07</b>	145.2	132.6	181.2
<b>May 07</b>	92.3	70.6	103.8
<b>June 07</b>	206.7	108.6	232
<b>July 07</b>	27.5	28.8	29.6
<b>August 07</b>	66.2	37.4	82

### **18.1.2 Local Hydrogeology**

The Quimsacocha Project is near three primary catchments. The south-west catchment serves a large number of communities that actively use the surface and groundwater for every day activities. Therefore, special effort should be taken to minimize any development that would impact this basin. Preliminary data from five piezometers installed near the potential mine area suggest a moderately deep water table (from 20m to 99.8m below surface) and the host rock shows moderately high conductivity ( $1.4 \times 10^{-8}$  m/s to  $6.5 \times 10^{-7}$  m/s).

### 18.1.3 Mine Water Hydraulic and Geochemical Characteristics

There is currently no available data on the geochemistry of the groundwater. A laboratory program is underway to test waste rock for Acid Base Accounting, chemical composition and leaching testing.

Seepage around the mine was estimated by defining a polygon around the mine openings and calculating the specific discharge flowing through the polygon (i.e. into the modeled underground mine).

Table 18.3 summarizes the combination of hydraulic parameters used for the simulations and the estimated seepage rates for each of them.

**Table 18.3: Mine seepage simulations**

<b>SIMULATION NO.</b>	<b>RECHARGE VALUE (M/S)</b>	<b>HYDRAULIC CONDUCTIVITY (M/S)</b>	<b>LENGTH (SPECIFIC DISCHARGE (M))</b>	<b>ESTIMATED SEEPAGE (M<sup>2</sup>/S)</b>	<b>ESTIMATED SEEPAGE (L/S)</b>
<b>1</b>	$7.1 \times 10^{-9}$	$2 \times 10^{-7}$	1 800	$1.4 \times 10^{-5}$	25
<b>2</b>	$7.1 \times 10^{-9}$	$6 \times 10^{-7}$	1 800	$1.6 \times 10^{-5}$	19
<b>3</b>	$3.9 \times 10^{-9}$	$2 \times 10^{-7}$	1 800	$8.2 \times 10^{-5}$	15
<b>4</b>	$3.9 \times 10^{-9}$	$6 \times 10^{-7}$	1 800	$1.0 \times 10^{-5}$	29

The model shows that drawdown extends on both sides of the valley (west and east) for all simulations. Further modeling will be carried out during the Feasibility Study to address this issue.

A review of the available data and modeling carried out to date suggests that mine water inflows might be in the order of 0.5 to 0.9 Mm<sup>3</sup>/year (15 to 29 L/s).

Based on the available geological and mineralogical information, mine water quality is expected to require chemical treatment prior to discharge into the environment in order to meet the discharge criteria. Water balance modeling must also be carried out to address this issue.

### 18.1.4 Potable Water

Potable water supply will be obtained from fresh water tanks and chlorinated before being stored in a small distribution tank for use at the surface facilities. Alternatively, depending on the superficial water quality and the presence of a suitable aquifer, separate water wells may supply potable water if treatment can be avoided.

### **18.1.5 Water Balance**

At this time, the water balance of the entire site has not been completed. The current level of knowledge of the amount of precipitation and evaporation can be used to start the preliminary fresh water pond design, effluent treatment process and to determine the source of the process water. The complete water balance of the new footprint will be performed during the Feasibility stage and the EIA.

Since the total flow and precipitation are estimated at 741 mm/year and 1,061 mm/year respectively, actual evapo-transpiration is estimated at 320 mm/year.

### **18.1.6 Tailings at the Mill Site**

For the purpose of the Pre-feasibility Study, IAMGOLD has mandated Golder Associates Ltd. to produce a Limited Scoping Study on tailings, waste rock and water management. The following information and assumptions are based upon the above-mentioned report.

#### **18.1.6.1 Tailings and Waste Management**

According to the Preliminary Assessment Report (SRK, May 2006), it is assumed that all types of waste e.g. tailings and waste rock, are highly reactive and will be acid generating. Moreover, the tailings production will be divided in two major streams:

- 80% of the total planned ore to be milled at the mine site and the resulting tailings will remain there. This stream theoretically represents the less reactive material and should result in less reactive waste. 50% will be used as paste backfill underground and the remaining 30% will be deposited on surface in the form of thickened tails or paste tails in tailings containment facilities. The paste backfill plant will be located approximately halfway between the mine and the mill locations. Cement will be added to the paste backfill to create a strong working floor for the mine equipment.

- 20% of the total planned ore production will be sent to the Pressure Oxidation Plant (POX) located in a different, less environmentally sensitive area. Tailings discharged from the POX are not expected to be acid generating. However, neutral drainage as well as the total tonnage of waste generated from the POX plant will have to be considered and will necessitate further study at the Feasibility Study stage.
- The waste rock produced will also be reactive and will be re-used as backfill or be disposed of in secure tailings containment facilities at the mine site.

The assumptions used by Golder Associates Ltd. are presented in Table 18.4. These assumptions were set at an early stage of the study and should be re-evaluated as the level of planning details is increased.

#### **18.1.6.2 Tailings and Waste Rock Management at the Mine Site**

The option selected by Golder is based on paste backfill tailings which would be thickened to reach a solid content less than 80% in order to obtain a paste that can be pumped through a pipeline system. This type of system requires confining structures to collect the runoff, ex-filtrations and tailings confinement.

Given the fact that the waste rock and tailings are expected to be acid generating, the plan is to dispose of the waste rock and tailings in a single cell underlined with a bituminous liner on a reworked clayed foundation. Raising dykes (used as confinement barriers for the tailings) will be built using waste rock and blasted rock. The waste rock will be generating acid from the beginning of the operation; therefore double handling will be necessary in order to build the impoundment. Figure 18.3 presents the paste fill method chosen.

Consideration must be given to control the oxidation process that will occur on the material that will remain exposed. This deposition scheme would allow mixing paste tailings with limestone at fill production plant. Further work would be required to investigate the potential benefit of such mixture to tailing management as well as final reclaiming.

#### **18.1.6.3 Water Management for filtered and paste backfill option**

The local watershed, where the tailings and waste rock containment is located has an area of approximately of 1.35 Mm<sup>2</sup>. For the purpose of this study, a runoff factor of 80% was used considering

that the soil is already saturated. It is assumed that the waste rock and tailings containment will release only minor quantities of water and will not affect the water balance.

#### **18.1.6.4 Closure and Rehabilitation (Paste Backfill Option)**

A bituminous liner will cover the entire cell. A one meter thick topsoil layer will be spread over the bituminous layer. The topsoil used will come from material stockpiled during the construction stage. This type of closure plan limits water infiltrations and seepage. It is believed to be a robust long term confinement solution.

#### **18.1.6.5 Effluent Treatment Plant**

Two different approaches will be evaluated during the Feasibility stage: *1) Active treatment and, 2) Passive treatment* .

#### **18.1.6.6 Water Management and Tailings Operating Costs**

A budget of \$33.51 M was estimated for the construction of the tailings facilities.

#### **18.1.6.7 Tailings and Waste at the POX Location**

A total storage volume of 4.6 Mt is necessary for the development of the tailings and waste management facilities at the POX site. At an average dry density of  $1.2 \text{ t/m}^3$  factored by 1.2 for design the resulting capacity is  $4.6 \text{ Mm}^3$  . At the mine site, no valley or natural depression can accommodate the required volumes considering that the ratio of gained capacity versus construction volume would be in order of 1 or higher. The POX tailings should be non acid generating, however, neutral drainage issues are foreseen. Therefore, tailings and waste will require additional thickening.

Preliminary studies highlighted the fact that the topography surrounding Quimsacocha project is not adequate to support the establishment of a POX plant and its tailings. For economic reasons, it is recommended to establish the location of the POX near a source of limestone.

**Table 18.4: Tailings and Waste Management Design Criteria**

<b>ITEM</b>	<b>INFORMATION</b>	<b>QUANTITY</b>	<b>COMMENTS</b>
<b>Ore</b>	Daily production	3,000 t/day	As per SRK report
	Mine life	7 years	
	Total ore treated	8.09 Mt	
	Solids specific gravity	2.8 t/m <sup>3</sup>	
<b>Tailings</b>	<b>Mine Past Backfill:</b>		
	Flotation tails to Backfill	4.0 Mt	50% of total ore extracted
	<b>Mill site tailings pond:</b>		
	Flotation tails to tailing pond	2.4 Mt	30% of the total treated ore
	Dry density	1.6 t/m <sup>3</sup>	As provided by Iamgold. Based on D <sub>R</sub> of 2.8, this corresponds to a void ratio of 0.75
	Total required storage volume	1.5 Mm <sup>3</sup>	Total volume of solids.
	% of solids for surface disposal	80%	This value suggests some kind of filtering technique is applied after thickening.
	<b>POX tailings pond:</b>		
	CIL Tails	1.6 Mt	20% of total tailings production
	Acid Neutralization Tails	3.0 Mt	Acid neutralization by Limestone and Lime
	Total Tails produced	4.6 Mt	
Dry density	1.2 t/m <sup>3</sup>	SRK report suggests initial void ratio of 1.15 and final void ratio of 0.85 for slurry. 1.2 t/m <sup>3</sup> and DR=2.8 suggests slightly higher void ratio of 1.33 (the most conservative option).	
Total required storage volume	3.8 Mm <sup>3</sup>		
Design Factor	1.2	Safety factor for possible capacity increasing	
Total designed storage volume	4.6 Mm <sup>3</sup>		
<b>Waste rock</b>	Total waste rock production	0.5 Mt	As per SRK report
	Excavated density	1.65 t/m <sup>3</sup>	
	Total volume	0.3 Mm <sup>3</sup>	

#### **18.1.6.8 Flotation Tailings**

The sulphur content of rougher flotation tailings produced by SGS (2006) is generally below 1%. However, the anticipated lack of carbonate mineral neutralisation potential suggests that the resulting amount of sulphur in tailings will be high enough to generate ARD. Further tests are required to draw conclusions.

#### **18.1.6.9 POX CIL Tailings**

The total content of sulphur in the POX tailings is very high at 8.26% wt. However, with 8.12% wt already in the oxidized sulphate form, the potential acid generation for this stream flow is therefore very low and no ARD potential is expected.

#### **18.1.6.10 Neutralization Sludge**

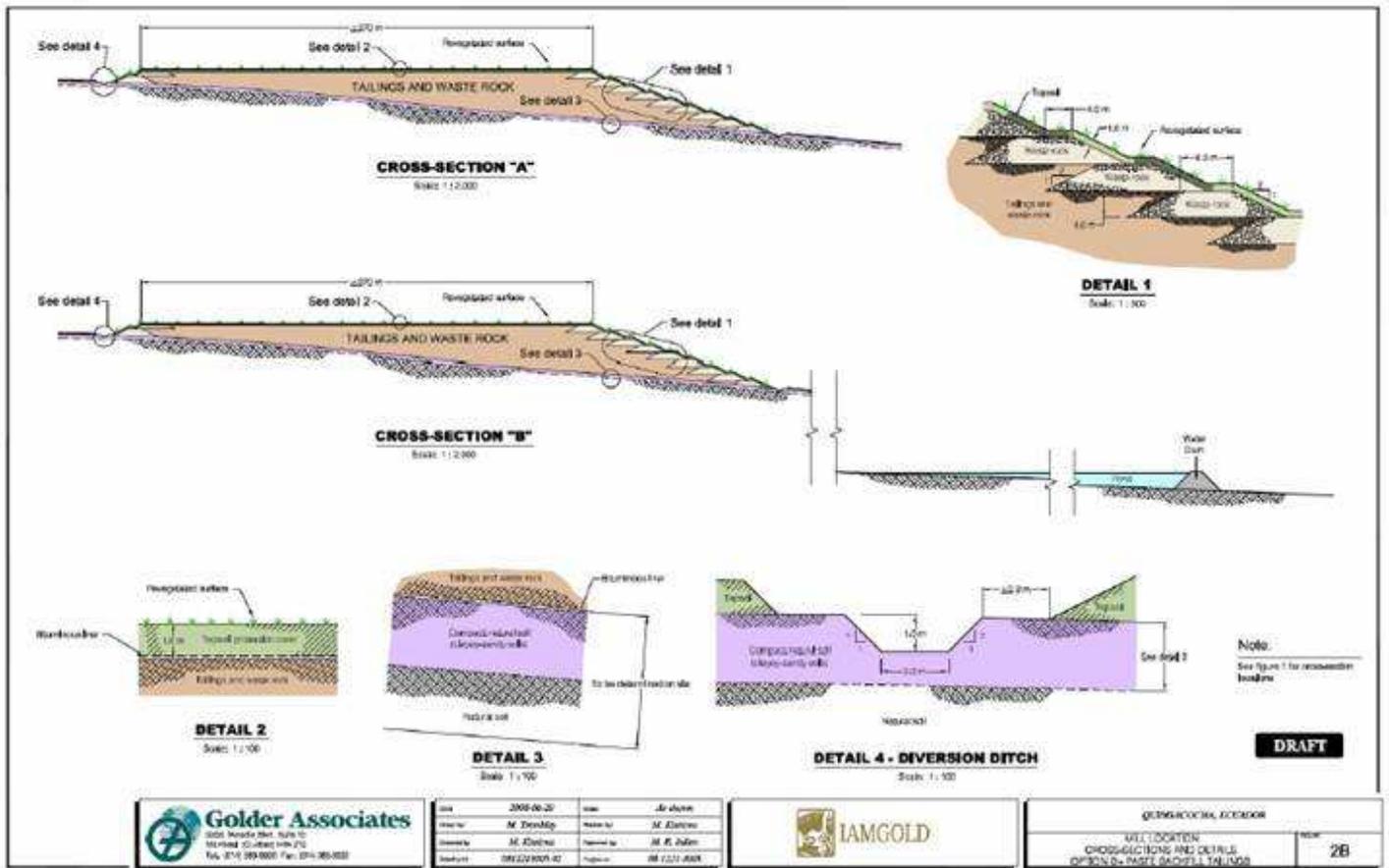
The neutralization sludge, mainly consisting of gypsum and minor metal oxides or hydroxides, is expected to exceed the Ecuador surface water quality guidelines and therefore, represent a source of leachable metals to the receiving environment for the following metals: aluminum, cadmium, cobalt, copper, manganese, nickel and zinc. This conclusion was drawn from Acid-Leach TCLP results from neutralization process testing performed by SGS in 2006.

#### **18.1.6.11 Neutralization Process Water**

A previous study from SGS suggests that the neutralization water will exceed Ecuador surface water quality for copper, iron and manganese. The neutralization process will either have to be improved or process water will need to be captured and treated before discharge to the environment.

The process water pond capacity will be sufficient to hold all process and rainwater and to permit water quality monitoring and treatment, if necessary, prior to discharge or its reuse in the mill circuit.

Figure 18.3: Paste Backfill Tailing Disposal



Date	2008-06-20	Issue	As shown
Drawn by	M. Dooling	Checked by	M. Dooling
Designed by	M. Dooling	Reviewed by	M. E. Jahn
Approved by	M. Dooling	Project	08-022-0001-02



QUINACRYNA, EXXONOR	
WELT DORTEN CROSS-SECTIONS AND DETAILS OPEN-PIT PASTE BACKFILL TAILINGS	
Sheet	28

## **18.2 Fuel Supply**

As the project will be connected to the Ecuador National grid, fuel will be used only for underground and surface equipment.

### **18.2.1 Fuel Storage and Distribution**

A fuel storage facility is planned near the concentrator and another near the POX plant at a combined cost of \$1 .05M. Each fuel storage capacity is designed for 20,000 liters for diesel and 10,000 liters for gasoline. This will provide for approximately one week of production. The tank farm is totally enclosed and sized to hold 110 percent of the volume of the largest tank. Lube oils, coolants, and greases will also be stored.

### **18.2.2 Fuel Pricing**

A \$3.10/USG fuel price was used in the 2008 Pre-feasibility study. This represents the price paid by industries in the first quarter of 2008 in Ecuador.

## **18.3 Power Supply**

The projected total power demand for the Quimsacocha project will be in the order of 27MW. Of this, the Quimsacocha site will demand 13.8MW and the balance will be required at the POX site. Evaluation studies of economical power supply were performed. The first considered diesel generating sets and the second, a tie-in to the Ecuadorian National grid. Also considered was the fact that the mine/mill and POX operations will be in different locations. Tie-in to the grid was selected for both the Quimsacocha site and the POX plant. Electrical supply will be delivered by means of high-voltage (138kV) transmission lines.

### **18.3.1 Emergency Power**

Two generators will be installed at the Quimsacocha site to provide emergency power for critical equipment in the mine, mill, backfill plant and administration building. One generator will be connected to the mill distribution system and the second will be connected to the paste backfill and mine distribution system.

One generator will be installed at the POX plant site for the same purpose.

### 18.3.2 Power Distribution

A 138kV line will feed an indoor substation located near the mill at the Quimsacocha site. The substation will contain two transformers. One will step the voltage down to 4.16kV for supply to the mill distribution system. The other will step the voltage down to 12kV and feed an overhead line that will carry the power to a transformer located near the paste backfill and underground mine distribution system.

Power is delivered from the main electrical room in the mill to drives within the mill, ore handling and tailings areas. Large motors are fed directly at 4.16kV while smaller drives require the voltage to be stepped down to 480 volts. This is typical at both the Quimsacocha and POX sites.

Figure 18.4 shows a simplified power supply and distribution arrangement at the Quimsacocha site.

**Figure 18.4: Power Supply and Distribution (Mine Site)**

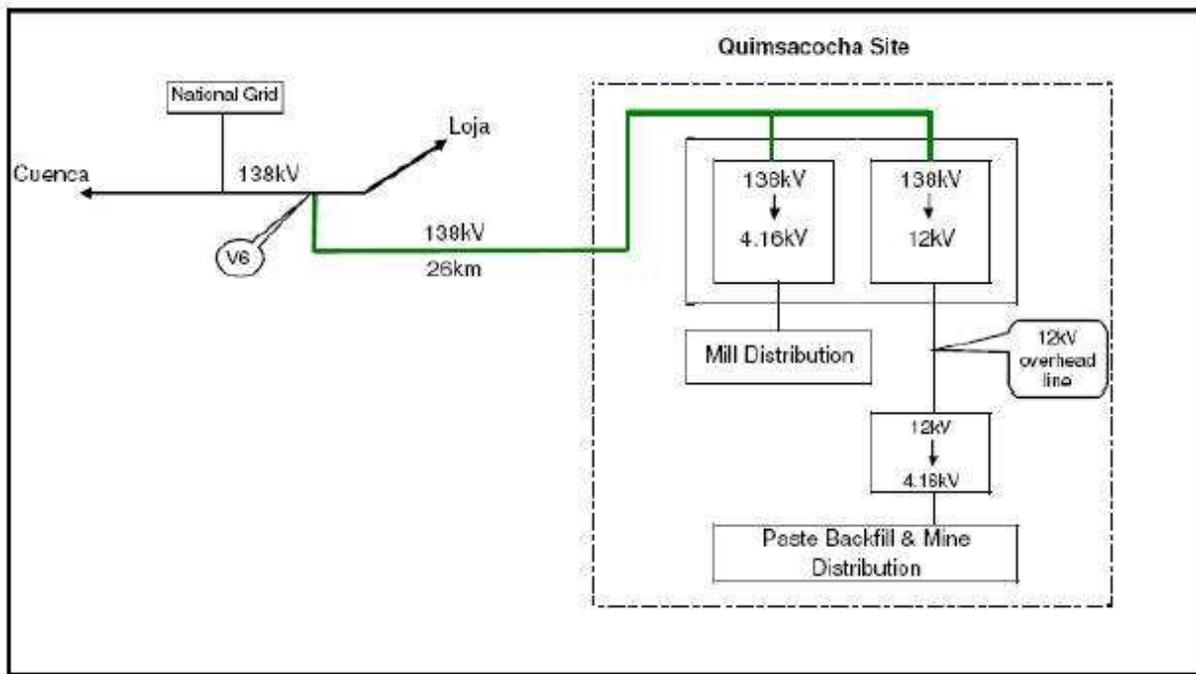
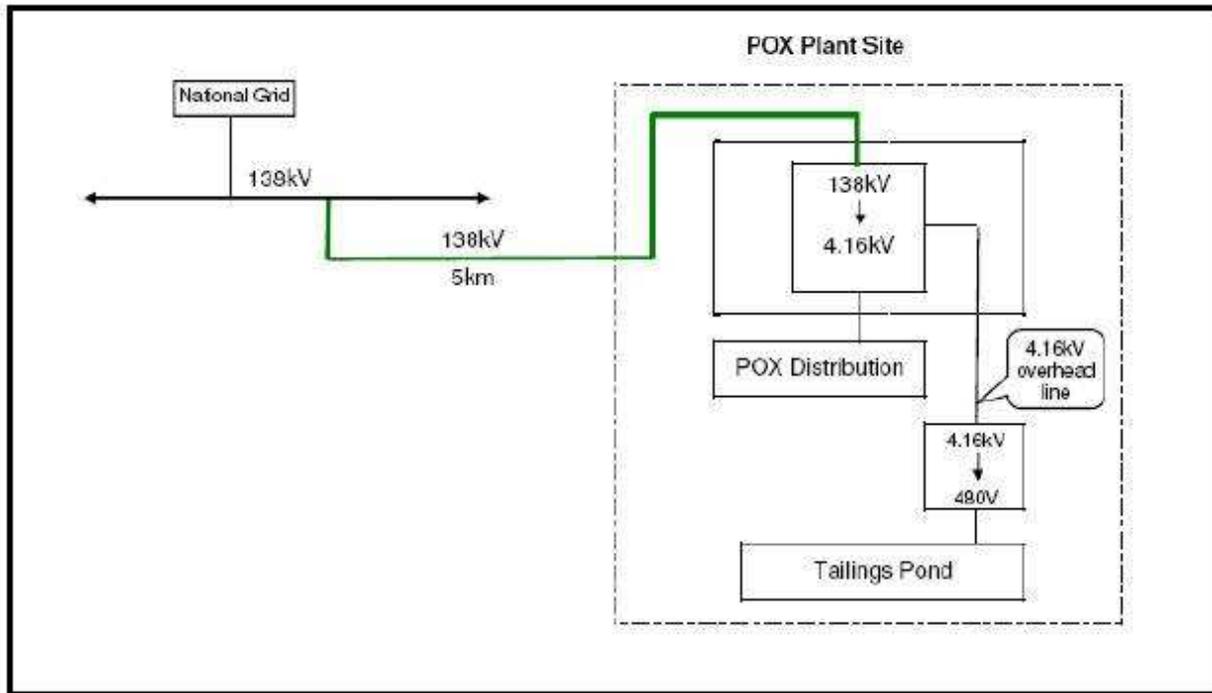


Figure 18.5 shows the assumed simplified power supply and distribution arrangement at the POX plant site.

Figure 18.5: Power Supply and Distribution (POX Site)



## 18.4 General Services

### 18.4.1 Infrastructure

The infrastructure required to support the Quimsacocha Project includes the following:

- **At the mine and concentrator sites:** - site access roads, administration building, warehouse, truck workshop, fuel and lubrication storage and dispensing, municipal works including potable water, fire water, sewage treatment, solid waste disposal, power distribution and gate house.
- **At the POX plant site:** - dock installations, access roads, administration building, warehouse, municipal works, fire water, solid disposal, power distribution and gate house.

#### **18.4.1.1 Site Access Road**

The mine and concentrator locations will be accessible from Guayaquil via the existing national paved road network ( $\pm$  320 km) and using a new site access road starting near El Descenso ( $\pm$  24 km) up to the site. The new access road will require road drainage, slope stabilization and surface treatment.

A detailed survey and study will be required for the design of the new road. The construction of this road will eliminate the need for a camp at the mine site.

#### **18.4.1.2 Site Roads**

The site roads include access from the main gate to the concentrator and the mine locations, truckshop, paste backfill and tailings.

The site roads are typically 15 meters wide and built from materials on site. Adequate drainage work is also required. A total of 7.5 km of site roads were included in the Study.

#### **18.4.1.3 Site Preparation**

At both the concentrator and POX plant site preparation will necessitate minimum excavation and backfill. The required work for the concentrator site preparation will be performed by the mining fleet. Major process equipment such as crushing, grinding and flotation will be on cut elevations. The general layout of the mine site is shown on Figure 17.18.

The required work at the POX site will be performed by local contractor. The major process equipment includes a lime crushing plant, oxidation plant, oxygen plant and gold recovery room.

#### **18.4.1.4 Concentrator**

The concentrator will sit on relatively flat to gently sloping terrain and on an elevated level away from natural drainage. An emergency containment pond will capture all site drainage. It is located at an approximate elevation of 3,600 meters while the paste backfill plant is at 3,800 meters. The latter is approximately half way between the mining site and the concentrator while the tailings containment, with a capacity of 2,000,000 tonnes, will be located south of the concentrator at an elevation of 3,600 meters. Fresh water will be sourced from a dammed stream south of the concentrator and pumped to a storage tank located at an elevated point near the paste backfill plant.

At the same location there will also be the fuel bay, a truck shop for surface and underground mobile equipment maintenance, a warehouse and the mill offices.

#### **18.4.1.5 POX Plant**

The POX plant will be located near Guayaquil in the area of the limestone quarry operations north-west of the city. Located here will be the lime grinding mill, leaching circuit, oxidation plant, and final ore treatment circuits and tailings disposal. The tailings containment capacity at the POX plant is 6,500,000 tonnes. An oxygen plant with a production capacity of 500 tonnes per day is required for the oxidation plant (autoclave).

Administration offices, the assay laboratory, mill workshop and a warehouse will also be constructed in the vicinity.

#### **18.4.1.6 Administration Building**

The administration office will span 375 m<sup>2</sup> and includes office spaces, open work stations and training, conference, reproduction and service rooms. Mine and concentrator site security offices and the changing rooms will also be located on this building's single floor.

#### **18.4.1.7 Laboratory**

The laboratory will be situated adjacent to the POX plant in a 30m by 16m building and will be equipped to process and analyse samples for the exploration group, mining and milling operations and environmental as well as health and hygiene control. The laboratory will be integrated with the workshop, the changing room, the warehouse and the administration building.

#### **18.4.1.8 Truckshop**

The truckshop, located at the mine site, will be a structural steel building 40 meters by 50 meters in size, covered by pre-painted metal siding and roofing. The building will sit at elevation 3,600 meters. It will include the following services:

- Heavy truck maintenance
- Heavy welding shop
- Haul truck tire change

- Jumbo / Scoop bay
- Mine auxiliary equipment maintenance and repair
- Maintenance personnel offices

Based on the building's configuration, the truckshop will be equipped with one 15-tonne electrical overhead crane and one 5-tonne auxiliary hoist capable of handling dump boxes. All bays will be serviced by the overhead cranes.

#### **18.4.1.9 Warehouses**

At the concentrator site, the warehouse will be adjacent to the truckshop at elevation 3,600 meters and will also be a structural steel building. The building will be 20 meters in width by 30 meters in length and will be completely clad with pre-painted siding. The building will also include offices for the procurement and warehouse personnel.

At the POX site, the warehouse will be adjacent to the administration offices, the laboratory and the workshop. The dimensions of this building are 100 meters long by 15 meters wide. The area occupied by the warehouse is 275 m<sup>2</sup>.

Also located at the POX site will be a reagents storage building with overall dimensions of 60 meters by 10 meters.

#### **18.4.1.10 Infrastructure Capital Cost Estimates**

Direct capital costs are estimated at \$ 6.9M (exclusive of value added tax (VAT)). Additional cost was added to all pre-fabricated buildings to cover indirect costs such as mobilization and demobilization, workers travel allowance, rental of tools and equipment required for the erection of the building and contractor overheads.

## **18.5 Environmental and Social Aspects**

### **18.5.1 Environmental Legal Framework**

The political constitution of Ecuador, with respect to natural resources, establishes the duties and responsibilities, individual and collective, regarding conservation and use of the country's natural patrimony. It recognizes the right of the population to live in a healthy environment that guarantees sustainable development and nature conservation; declaring biodiversity conservation and sustainable management of natural resources a matter of public interest.

The constitution establishes that non renewable natural resources are the inalienable property of the State and so are any underground products, minerals and substances with a different nature than the soil, including those found in areas covered with water within territorial limits.

The National Strategy for Sustainable Development in Ecuador adopted in November 1999 contains principles and policies related to the regulatory framework of mining activities.

In addition to the National Strategy, the following laws regulate environmental issues:

- **Law for the Prevention and Control of Environmental Contamination** . 1976.
- **Law on Forestry, Natural Areas and Wildlife Conservation**. Law No. 74. RO/ 64 of August 24, 1981
- **Environmental Management Law** , published in Official Gazette 2 of January 25, 2000.
- **Provincial and Municipal Regime Laws ; Biodiversity Law** , 1996.
- **Water Law** , Supreme Decree 369. RO/ 69 of May 30, 1972.
- **Agrarian Development Law, Farming & Cattle Promotion and Development** .

Under these laws (some of which may be superseded by the newly adopted Mining Law), holders of mining rights have the obligation to file the following environmental assessment and performance studies:

- A Preliminary Environmental Impact Assessment;
- An Environmental Impact Assessment when filing for a mining application,
- A yearly Environmental Audit.

All of these permits have either been applied for or granted for ongoing exploration work as will be permits for future work in the framework of the new mining code.

## **18.5.2 Mining Law**

The current Ecuador legislation applicable to mining operations was first introduced in 1991. In 2000, this legal instrument was updated, maintaining the basic criteria of the current law and incorporating aspects such as:

- Elimination of royalties, to promote greater competition and transparency; and;
- Strong environmental control during all phases of mining operations and communication with the communities in order to assure social and environmental sustainability of the new investments.

In April 2008 Ecuador's Constitutional Assembly adopted a 180-day moratorium on all mining exploration activities while a new Mining Law was under review. The Government conducted a review of the policy recommendations of the Constituent Assembly and extensive consultations with international mining experts and representatives of international mining companies active in Ecuador, including IAMGOLD, with respect to the formulation of a progressive, competitive and environmentally and socially responsible mining law.

In early February 2009, President Rafael Correa officially ratified the new Mining Law which will form the framework of the new Mining Regulations, most of which are expected to be adopted by the Constitutional Assembly in mid year. The new law calls for the negotiation between mining companies and the Government on project-specific mining contracts.

## 18.6 Project Economics

The cash flow estimates of the Quimsacocha Project are based on the operating costs and capital expenditures presented in the Pre-feasibility Study. Estimated costs are in United States dollars as of the second quarter of 2008. No allowance is made for future price escalation of inflation and hence the financial analysis is expressed in constant dollars. Cash Flows have been estimated on a yearly basis and exclude any elements or impact of debt financing. The evaluation was conducted on the basis of a stand alone project, 100% equity financing. The standard discounted cash flow method to determine the net present value (NPV) and internal rate of return (IRR) were used to determine the economic viability of the project.

### 18.6.1 Assumptions

A base case was prepared with the following key assumptions.

- **Metal prices**
  - Gold: \$750/oz
  - Copper: \$2.80/lb
  - Silver \$11.50/oz
- **Production** Production rate of 3,000 tpd for the mine and the concentrator  
Production rate of 660 tpd for the pressure oxidation site
- **Metallurgical Recoveries** 90% for gold  
92% for copper
- **Cementation**  
(Copper concentrate grade) 75%
- **Realization Costs** \$5.00/oz
- **Smelter Terms** Details given in the next section  
Delayed payments: 69 days
- **Cogema Royalty** 5% NPI
- **Working Capital** \$ 4M
- **Value Added Tax** Assumed 100% refund with no delay.
- **Employee Participation** 15% of taxable income. \$ 48M will be paid over the mine life
- **Closure Costs** \$ 6M
- **Taxation** To be announced in mid year 2009; not used in this study.

### **18.6.2 General**

Gold, copper and silver will be produced from the Quimsacocha project. A pressure oxidation (POX) process will allow the production of copper precipitate from cementation. Doré bars will be produced and sent to a refinery. A charge of \$5.00 per Au ounce recovered is included in the evaluation to cover the costs of transportation and refining. Due to the pressure oxidation and copper recovery processes, neither gold nor silver will be present in the copper precipitate that will be sent to smelter.

IAMGOLD used the three-years-average rule for base metal price forecast. Current marketing and commercial key data were extracted from a Neil S. Seldon and Associates Ltd (NSA) study in order to guide in the evaluation of charges associated with the production and sale of copper concentrates.

For the purpose of this study, a scenario wherein concentrate and doré bars will be produced at the POX site was selected. Doré bars will be sent to a gold refinery by air. Copper cement will be bagged and placed in containers and transported by road to the port of Guayaquil where it would be stored before being transferred onto a ship for delivery to a smelter. For the purpose of this study, the assumptions presented reflect this alternative.

### **18.6.3 Copper Smelter Terms**

The processing method at Quimsacocha assumes production of copper cement. This product is 75% copper. Current testwork clearly demonstrates that the copper precipitate can be considered clean and readily marketable. Table 18.5 below presents NSA's evaluation of copper smelter charges we can expect getting for Quimsacocha's concentrate.

**Table 18.5: Copper Smelter Charge Assumptions**

**PAYABLE METALS**

**Copper** Deduct 1% and pay for balance

**REFINING CHARGES**

**Copper** \$0.095 per pound

**DEDUCTIONS**

**Treatment Charge Price Participation Penalties** CIFFO main Asian or European port parity, \$95 per dmt

Included

Arsenic	\$5 per 0.1% over 0.1%
Antimony	\$3 per 0.1% over 0.1%
Lead	\$2 to \$3 per 1% over 0.5%
Zinc	\$2 to \$3 per 1% over 2% to 3%
Mercury	\$10 to \$0.20 per ppm over 10 to 20 ppm
Bismuth	\$3 to \$5 per 0.01% over 0.03 to 0.05%

**PAYMENT**

**Provisional** 90 % on average, 60 days after production

**Final** 10% balance when all facts known deemed to be 150 days after production

A Freight & Marketing rate of \$ 263 per dmt was used in the study. This includes the transportation of concentrate by container from the POX plant to the port of Guayaquil and all the costs related to container shipment overseas (load out, handling, etc).

Handling losses are likely to be negligible as the concentrate will be transported in containers.

The seller usually pays for the shipping insurance charges. IAMGOLD has not undertaken any specific research on this concern as the final destination of the concentrate is still unknown. Insurances are included in the freight allowance.

**18.6.4 Capital Expenditures**

Capital expenditures for the life of mine have been estimated at \$ 362.9M of which \$ 76M have been earmarked for mine-related equipment, infrastructure and activities and \$ 164M for processing, tailings

and water management. Other capital expenditures include the Feasibility Study, indirect costs, working capital and 15% contingency (Table 18.6).

**Table 18.6: Capital Expenditures**

Capitalized	Pre-production	Production	Total (\$000)
<b>Feasibility Study</b>	7,000		7,000
<b>Valuation Drilling</b>	7,000		7,000
<b>Deferred Development</b>	4,663	725	5,388
<b>Cogema</b>	2,365	1,183	3,548
<b>Surface Support Equipment</b>	3,605		3,605
<b>Mining</b>	26,237	2,850	29,087
<b>Infrastructure</b>	29,361		29,361
<b>Processing</b>	131,169		131,169
<b>Tailings &amp; Water Management</b>	12,510	21,000	33,510
<b>Indirect</b>	30,000		30,000
<b>Contingency</b>	45,000		45,000
<b>Pre-production</b>	38,215		38,215
<b>TOTAL</b>	<b>337,126</b>	<b>25,758</b>	<b>362,883</b>

### 18.6.5 Operating Costs

Mine operating costs have been estimated at \$ 12.90/tonne. Plant Operating costs at \$10.60/tonne of ore and \$26.12/tonne of concentrate at the Mill and POX plant respectively.

Over the life of mine, the total operating costs (not including capitalized pre-production expenditures) are estimated to total \$652.4M or \$80.52/tonne of ore milled. Once the by-product revenues are credited, the operating costs will be \$411.5M or \$50.82/tonne of ore milled (Table 18.7).

**Table 18.7: Operating Costs**

Item	Pre- Production (Capitalized)	Production	Total	
<b>Definition Drilling</b>	\$ 0.3M	\$ 7.8M	\$ 8.1M	\$ 1.00/t milled
<b>Stope Preparation</b>	\$ 5.4M	\$ 6.4M	\$ 11.8M	\$ 1.46/t milled
<b>Extraction</b>	\$ 4.8M	\$ 159.4M	\$ 164.2M	\$ 20.27/t milled
<b>Mine Services</b>	\$ 18.3M	\$ 125.6M	\$ 143.9M	\$ 17.77/t milled
<b>Concentrate Transportation</b>	—	\$ 40.5M	\$ 40.5M	\$ 5.00/t milled
<b>Processing</b>	\$ 0.4M	\$ 256.5M	\$ 256.9M	\$ 31.72/t milled
<b>Administration</b>	\$ 8.4M	\$ 54.8M	\$ 63.2M	\$ 7.80/t milled
<b>Environment</b>	\$ 0.3M	\$ 1.4M	\$ 1.7M	\$ 0.21/t milled
<b>Total</b>	<b>\$ 37.9M</b>	<b>\$ 652.4M</b>	<b>\$ 690.2M</b>	<b>\$ 85.24/t milled</b>

### 18.6.6 Cash Flow Analysis

The project has an undiscounted Net Present Value (NPV) of \$ 306.6M and an NPV of \$ 132.3M at a 7.5% discount rate and shows an Internal Rate of Return of 21.3%. Details are shown on the cash flow summary (Table 18.8).

**Table 18.8: Cash Flow Summary**

	Total	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
<b>Gold price</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>750</b>
Tonnes Mined	8 098	—	—	—	1 108	1 093	1 085	1 084	1 084	1 083	1 017	—	—	—	—	—	—
Tonnes Milled	8 098	—	51 709	489 824	538	087	004	797	622	250	252	—	—	—	—	—	—
Grade	083	—	—	500 000	000	000	000	000	000	000	083	—	—	—	—	—	—
Au (gr/t)	6.46	0.00	0.00	7.69	6.62	6.96	7.51	6.83	5.62	5.43	5.68	—	—	—	—	—	—
Ag (gr/t)	36.41	0.00	0.00	50.47	52.90	49.73	42.12	32.88	25.12	20.73	24.27	—	—	—	—	—	—
Cu (%)	0.42%	0.00%	0.00%	0.82%	0.55%	0.57%	0.53%	0.35%	0.28%	0.23%	0.22%	0.00%	0.00%	0.00%	—	—	—
S (%)	6.69%	0.00%	0.00%	6.86%	6.94%	6.82%	6.86%	6.87%	6.44%	5.98%	6.82%	—	—	—	—	—	—
Gold Recovery	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Copper Recovery	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Gold Production (Oz)	1 514	—	—	111 310	209 620	220 460	237 801	216 479	177 924	171 944	168 847	—	—	—	—	—	—
Copper Production (000Lb)	67 660	—	—	8 236	11 999	12 483	11 569	7 634	6 099	5 026	4 613	—	—	—	—	—	—
Gold Revenues (000\$US)	1 135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	790	—	—	83 483	157 215	165 345	178 351	162 359	133 443	128 958	126 635	—	—	—	—	—	—
<b>OPERATING COSTS</b>																	
(000\$US)																	
Mining	299 210	—	—	14 136	43 943	41 963	40 556	40 337	40 120	40 008	38 147	—	—	—	—	—	—
Processing	296 594	—	—	19 377	40 383	40 358	39 950	39 705	39 705	39 705	37 412	—	—	—	—	—	—
Administration	56 225	—	—	3 454	7 745	7 649	7 579	7 544	7 526	7 485	7 243	—	—	—	—	—	—
By-Product Credit (Delayed)	(240 488)	—	—	(17 825)	(38 564)	(44 610)	(41 596)	(31 784)	(23 698)	(19 096)	(17 519)	(5 796)	—	—	—	—	—
<b>Total</b>	<b>411 540</b>	<b>—</b>	<b>—</b>	<b>19 141</b>	<b>53 507</b>	<b>45 360</b>	<b>46 489</b>	<b>55 801</b>	<b>63 653</b>	<b>68 102</b>	<b>65 283</b>	<b>(5 796)</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>
<b>OTHER EXPENSES (000 \$US)</b>																	
Working Capital	—	—	2 000	2 000	—	—	—	—	—	—	—	(4 000)	—	—	—	—	—
Royalty NPI (Cogema)	16 018	—	—	—	—	569	1 520	2 129	4 681	2 282	2 405	2 433	—	—	—	—	—
Profit Sharing	47 711	—	—	—	—	1 706	4 559	6 386	14 044	6 505	7 214	7 298	—	—	—	—	—
Government Royalty (Gross revenues)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Closure costs	6 050	—	—	—	—	—	—	—	—	—	—	3 303	2 423	124	124	38	38
Salvage value	(15 000)	—	—	—	—	—	—	—	—	—	—	(7 500)	(7 500)	—	—	—	—
<b>Total</b>	<b>54 779</b>	<b>—</b>	<b>2 000</b>	<b>2 000</b>	<b>—</b>	<b>2 274</b>	<b>6 079</b>	<b>8 515</b>	<b>18 725</b>	<b>8 787</b>	<b>9 619</b>	<b>1 533</b>	<b>(5 078)</b>	<b>124</b>	<b>124</b>	<b>38</b>	<b>38</b>
<b>OPERATING CASH FLOW</b>	<b>669 471</b>	<b>—</b>	<b>(2 000)</b>	<b>62 341</b>	<b>103 708</b>	<b>117 711</b>	<b>125 783</b>	<b>98 043</b>	<b>51 066</b>	<b>52 069</b>	<b>51 734</b>	<b>4 263</b>	<b>5 078</b>	<b>(124)</b>	<b>(124)</b>	<b>(38)</b>	<b>(38)</b>
<b>CAPITAL EXPENDITURES</b>	<b>362 883</b>	<b>24 099</b>	<b>795</b>	<b>174 231</b>	<b>4 863</b>	<b>4 265</b>	<b>3 730</b>	<b>3 700</b>	<b>3 200</b>	<b>3 000</b>	<b>3 000</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>
<b>UNDISCOUNTED NET CASH FLOW (PRE-TAX)</b>	<b>306 588</b>	<b>(24 099)</b>	<b>(140 795)</b>	<b>(111 890)</b>	<b>98 846</b>	<b>113 446</b>	<b>122 053</b>	<b>94 343</b>	<b>47 866</b>	<b>49 069</b>	<b>48 734</b>	<b>4 263</b>	<b>5 078</b>	<b>(124)</b>	<b>(124)</b>	<b>(38)</b>	<b>(38)</b>
<b>NET CASH FLOW (PRE-TAX)</b>	<b>306 588</b>	<b>(24 099)</b>	<b>(140 795)</b>	<b>(111 890)</b>	<b>98 846</b>	<b>113 446</b>	<b>122 053</b>	<b>94 343</b>	<b>47 866</b>	<b>49 069</b>	<b>48 734</b>	<b>4 263</b>	<b>5 078</b>	<b>(124)</b>	<b>(124)</b>	<b>(38)</b>	<b>(38)</b>
	<b>177 940</b>	<b>(22 673)</b>	<b>(126 157)</b>	<b>(95 483)</b>	<b>80 335</b>	<b>87 810</b>	<b>89 973</b>	<b>66 235</b>	<b>32 005</b>	<b>31 247</b>	<b>29 556</b>	<b>2 462</b>	<b>2 793</b>	<b>(65)</b>	<b>(62)</b>	<b>(18)</b>	<b>(17)</b>
	<b>132 271</b>	<b>(22 016)</b>	<b>(119 652)</b>	<b>(88 453)</b>	<b>72 689</b>	<b>77 606</b>	<b>77 668</b>	<b>55 847</b>	<b>26 358</b>	<b>25 135</b>	<b>23 222</b>	<b>1 890</b>	<b>2 094</b>	<b>(48)</b>	<b>(44)</b>	<b>(13)</b>	<b>(12)</b>
	<b>95 580</b>	<b>(21 392)</b>	<b>(113 620)</b>	<b>(82 085)</b>	<b>65 923</b>	<b>68 782</b>	<b>67 273</b>	<b>47 273</b>	<b>21 804</b>	<b>20 320</b>	<b>18 347</b>	<b>1 459</b>	<b>1 580</b>	<b>(35)</b>	<b>(32)</b>	<b>(9)</b>	<b>(8)</b>
	<b>21.3%</b>																

Because the regulations related to the new Mining Law have not been drafted yet, doing a cash flow analysis with the now outdated tax regime would have been irrelevant as the taxation framework will be certainly different once the new mining regulations have been adopted, which we expect will be sometime in mid 2009.

### **18.6.7 Sensitivity Analysis**

Sensitivities were made on the main parameters affecting the economics of the project. This analysis shows that the project economics are most sensitive to the price of gold. A 10% change on the price will impact the pre-tax IRR by 5.8%. Table 18.9 and Figure 18.6 summarize the sensitivity analysis.

**Table 18.9: Pre-Tax Cash Flow Sensitivity**

<b>GOLD PRICE</b>	<b>-10%</b> <b>\$675</b>	<b>-5%</b> <b>\$713</b>	<b>BASE</b> <b>\$750</b>	<b>+5%</b> <b>\$788</b>	<b>+10%</b> <b>\$825</b>
0,0%	213,787	259,278	306,588	353,902	401,217
5,0%	110,002	143,389	177,940	212,477	246,982
7,5%	73,602	102,470	132,271	162,053	191,793
10,0%	44,628	69,729	95,580	121,408	147,187
<b>IRR</b>	<b>15,5%</b>	<b>18,4%</b>	<b>21,3%</b>	<b>24,2%</b>	<b>26,9%</b>

<b>COPPER PRICE</b>	<b>-10%</b> <b>\$2.52</b>	<b>-5%</b> <b>\$2.66</b>	<b>BASE</b> <b>\$2.80</b>	<b>+5%</b> <b>\$2.94</b>	<b>+10%</b> <b>\$3.08</b>
0,0%	290,714	298,651	306,588	314,525	322,463
5,0%	166,191	172,066	177,940	183,815	189,691
7,5%	122,071	127,171	132,271	137,371	142,472
10,0%	86,677	91,129	95,580	100,032	104,484
<b>IRR</b>	<b>20.3%</b>	<b>20.8%</b>	<b>21.3%</b>	<b>21.9%</b>	<b>22.4%</b>

<b>VAT</b>	<b>-10%</b>	<b>-5%</b>	<b>BASE</b>	<b>+5%</b>	<b>+10%</b>
0,0%	306,588	306,588	306,588	298,244	289,903
5,0%	177,940	177,940	177,940	171,721	165,505
7,5%	132,271	132,271	132,271	126,846	121,424
10,0%	95,580	95,580	95,580	90,818	86,058
<b>IRR</b>	<b>21.3%</b>	<b>21.3%</b>	<b>21.3%</b>	<b>20.8%</b>	<b>20.2%</b>

<b>DUTIES</b>	<b>0%</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>
0,0%	311,685	309,136	306,588	304,039	301,544
5,0%	181,638	179,789	177,940	176,090	174,288
7,5%	135,452	133,861	132,271	130,680	129,133
10,0%	98,332	96,956	95,580	94,203	92,868
<b>IRR</b>	<b>21.6%</b>	<b>21.5%</b>	<b>21.3%</b>	<b>21.2%</b>	<b>21.0%</b>

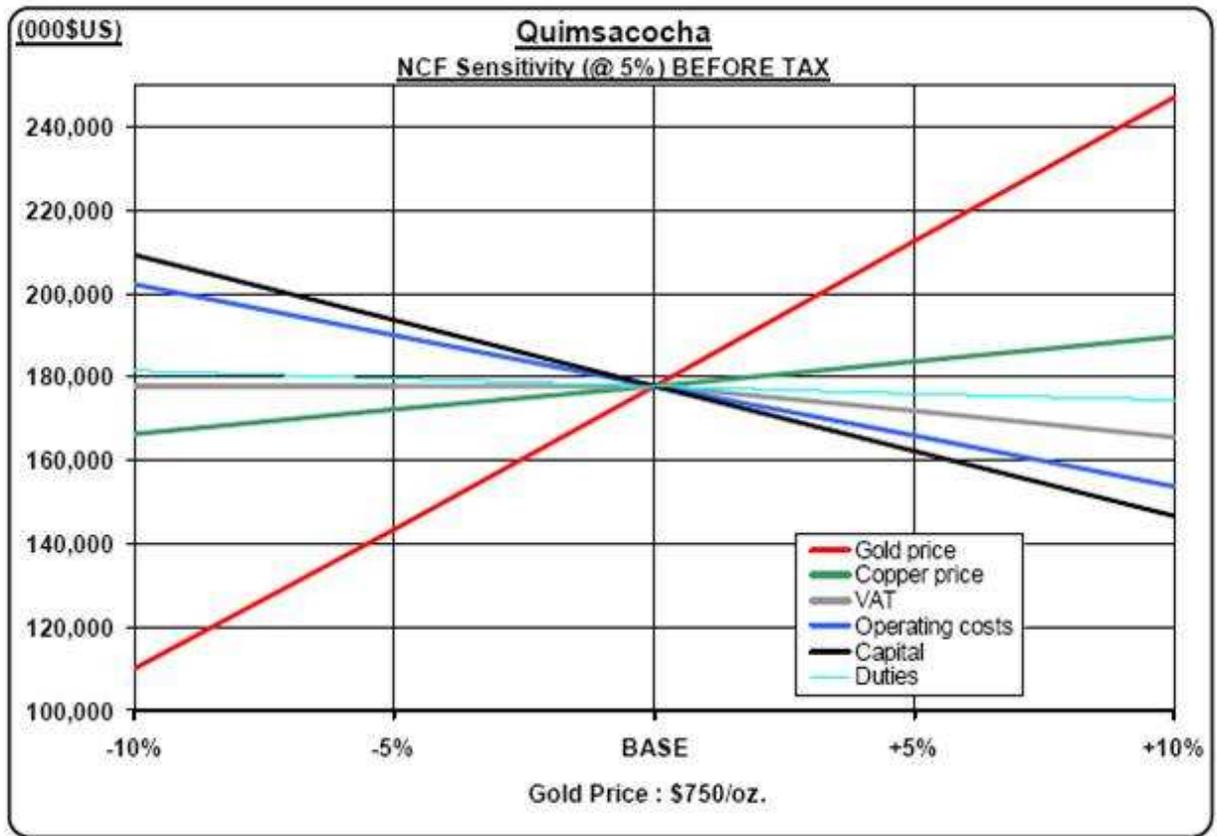
  

<b>OPER. COSTS</b>	<b>-10%</b>	<b>-5%</b>	<b>BASE</b>	<b>+5%</b>	<b>+10%</b>
0,0%	340,735	323,661	306,588	289,516	272,444
5,0%	202,317	190,128	177,940	165,753	153,566
7,5%	153,068	142,669	132,271	121,873	111,476
10,0%	113,430	104,505	95,580	86,656	77,731
<b>IRR</b>	<b>23.2%</b>	<b>22.3%</b>	<b>21.3%</b>	<b>20.4%</b>	<b>19.4%</b>

<b>CAPITAL</b>	<b>-10%</b>	<b>-5%</b>	<b>BASE</b>	<b>+5%</b>	<b>+10%</b>
0,0%	342,877	324,732	306,588	288,444	270,300
5,0%	209,360	193,650	177,940	162,231	146,521
7,5%	161,620	146,946	132,271	117,597	102,922
10,0%	123,059	109,319	95,580	81,841	68,101
<b>IRR</b>	<b>25.9%</b>	<b>23.5%</b>	<b>21.3%</b>	<b>19.3%</b>	<b>17.5%</b>

Figure 18.6: Cash Flow Sensitivity Graph



## **19.0 Interpretations and Conclusions**

### **19.1 Geology and Mineral Resource**

Quimsacocha is a typical epithermal high sulphidation system with Au-Ag-Cu mineralization. It is located in the Ecuador province of Azuay, in the Western Cordillera of the Andes.

It was formed by multi-phase fluid injections associated with lithological and structural controls with a strong spatial association with silicified bodies. Mineralization mainly consists of pyrite, enargite, barytine and gold.

High-grade outliers were capped prior to estimation using a combination of statistical and decile analysis. Samples preparation and analysis were performed by certified, independent assay laboratories and backed up by a full QA/QC program set early in the sampling campaign.

Resource calculation for the Quimsacocha project was done by means of the block model method using Gemcom Software. This Study includes a total of 280 holes located within the mineralized zone for a total of 4,228.91 m. Solids were generated in GEMCOM using the 3D rings and tie lines system. The solids were based on the presence of silica alteration and on Au composites at grades  $> 0.8$  g Au/t and  $> 3.0$  g Au/t respectively. A few zones at the north end of the Cerro Casco sector were later found to have been missed by the modeling. These will be added in the next modeling exercise during Feasibility. The interpolation was performed using inverse distance squared weighting method with search ellipse and interpolation profiles based on variographic analysis and the Qualified Person's experience of similar deposits.

Drilling density inside the mineralization solids is deemed sufficient to classify most of the ore as indicated. Because the resource has only been drill-defined and data has shown high level of skewness which may result in increased imprecision in the higher grade ranges, we concluded the level of confidence was not high enough to classify any resource as measured.

Current Quimsacocha's Indicated and Inferred Mineral Resource at a 3.0 g Au/t cutoff are shown on Table 19.1 and Table 19.2.

**Table 19.1: July 2008 Indicated Mineral Resource at 3.0 g Au/t grade cutoff**

ZONE	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
High grade	9,242.41	6.76	2,009	37.94	11,275	0.44	88,926,400
Low grade	692.93	4.40	98	26.31	586	0.47	7,182,800
<b>Total</b>	<b>9,935.34</b>	<b>6.60</b>	<b>2,107</b>	<b>37.13</b>	<b>11,861</b>	<b>0.44</b>	<b>96,109,200</b>

**Table 19.2: July 2008 Inferred Mineral Resource at 3.0 g Au/t grade cutoff**

ZONE	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
High grade	104.60	8.94	30	41.09	138	1.18	2,728,400
Low grade	194.60	4.91	31	47.48	297	0.85	3,629,700
<b>Total</b>	<b>299.20</b>	<b>6.32</b>	<b>61</b>	<b>45.24</b>	<b>435</b>	<b>0.96</b>	<b>6,358,100</b>

## 19.2 Mineral Reserves Estimates and Mining

In 2008, a Constituent Assembly accepted a mandate to revise the country's mining laws. While Ecuador's interim legislature overwhelmingly approved a new draft mining law in January 2009, it is still not known how the new regulations and taxation regime will affect the profitability of new mining projects in the country. The available Mineral Reserve shown below is only indicative of material available for mining if the taxation and regulatory framework does not change.

The estimation of Mineral Reserve was done using 5 meters plan views and contouring Indicated Au blocks only, with grades higher than 3.0g Au/t. Cut-off grade should have been lower than 3.0g Au/t with the study's base price of \$750/oz but ground conditions tend to deteriorate as the grade decreases and should result in a significant cost increase that will compensate gains in the resource available to mining. A mining recovery of 95% was factored in the production tonnage to take into account loss generated by mining.

The Mineral Reserve included in the mining plan takes into account dilution and is presented on the following table (Table 19.3). Since none of the resource could be classified as measured, all the reserve stated above are classified as **probable**

**Table 19.3: Probable Mineral Reserve**

Source	Tonnage	AU		AG		CU	
	000 t	g/t	000 oz	g/t	000 oz	%	lbs
<i>Development</i>	<i>135</i>	<i>6.46</i>	<i>28</i>	<i>34.45</i>	<i>150</i>	<i>0.42</i>	<i>1,250,021</i>
<i>Mining Recovery (95%)</i>	<i>7,963</i>	<i>6.46</i>	<i>1,654</i>	<i>36.45</i>	<i>9,332</i>	<i>0.42</i>	<i>73,732,717</i>
<b><i>Probable Mineral Reserve</i></b>	<b><i>8,098</i></b>	<b><i>6.46</i></b>	<b><i>1,682</i></b>	<b><i>36.44</i></b>	<b><i>9,482</i></b>	<b><i>0.42</i></b>	<b><i>74,982,738</i></b>

Quimsacocha will be an underground mining operation using jumbo drills, scoop trams, haul trucks and typical support equipment. The ore body will be accessed by means of two 5m by 5m drifts.

The production rate will be 3,000 tonnes per day using a Post/Pillar, cut and fill mining method. Post pillar mining allows recovery of the mineralization in horizontal slices, starting from a bottom slice and advancing upwards. The mined-out stopes are backfilled with paste tailings and the next slices are mined. The grid pattern used for the purpose of this Study allows extraction of 85% of the ore with 15% remaining in pillars.

Other than the initial stages of the ramp development there will be little or no waste extracted from underground. The estimated 81,000 tonnes of waste that will be brought to surface will be reused as backfill as much as possible and the remaining stored inside a tailings containment facility.

Of the total tonnage of ore extracted from the underground, 60% will be returned as paste backfill.

The mine will operate 24 hours per day, 7 days per week. Three operating crews assisted by technical and supervisory staff will form the mine workforce. Minor equipment repairs will be performed underground in service bays while major services and repairs will be performed in a maintenance facility that will be constructed on surface.

Close consideration of ground conditions and ground water, particularly near faults that have been identified by drilling will be required during more detailed mine design work to be done at the Feasibility Study stage.

### **19.3 Processing**

Quimsacocha is a deposit containing gold with significant amounts of silver and copper, mostly in the form of enargite. The refractory nature of the ore makes the extraction of its valuable metals a complex undertaking. The proposed extraction method will be a two-stage process:

1. The first stage includes crushing, SAG and ball mill grinding and flotation at the mine site, producing a copper, silver and gold concentrate.
2. The second stage is a pressure oxidation (autoclave), copper recovery and cementation, neutralization, CIL, electrowinning and gold/silver refinery process ("POX"), producing cemented copper and gold/silver doré. The cemented copper product will be shipped overseas to a smelter and the doré will be transported by air to a refinery for final processing and sale. Plant location is still unknown though a number of candidate sites have been selected and will be reviewed in the upcoming months.

Annual throughput will be 1,095,000 tonnes averaging 6.46 g Au/t, 36.41 g Ag/t and 0.42% Cu. Copper, gold, silver concentrate will be produced at a rate of 240,000 tonnes per year at the mine site concentrator. From this, 202,000 ounces of gold, 987,000 ounces of silver and 4,400 tonnes of copper will be produced annually.

Quimsacocha ore is relatively hard and highly abrasive. Both of these characteristics are taken into consideration in the design and operating costs of the plant.

At the mine site concentrator, 200,000 tonnes of paste tailings will be deposited in the containment facility annually. As the majority of the sulfide material will be leaving the site as concentrate, the acid generating potential of stored tailings will be low. Limestone use for neutralization purposes will be transported to site on the concentrate truck backhauls.

At the POX site, neutralization is part of the process, resulting in low acid generating potential for the tailings as well. The POX plant tailings volumes will be much greater than those at the mine site.

#### **19.4 Project Economics**

Capital expenditures for the life of mine have been estimated at US\$ 362.9M of which \$ 76M have been earmarked for mine-related equipment, infrastructure and activities and \$ 164M for processing, tailings and water management. Other capital expenditures include the Feasibility Study, indirect costs; working capital and 15% contingency (see Table 19.4).

Mine operating costs have been estimated at \$ 12.90/tonne. Plant Operating costs at \$10.60/tonne of ore and \$26.12/tonne of concentrate at the Mill and POX plant respectively.

Over the life of mine, the total operating costs (not including capitalized pre-production expenditures) are estimated to total \$652.4M or \$80.52/tonne of ore milled. Once the by-product revenues are credited, the operating costs will be \$411.5M or \$50.82/tonne of ore milled (Table 19.5).

The project will generate \$ 1,376M in net revenues from the production of 1,515,000 ounces of gold and 67,660,000 lbs of copper. \$ 240.5M of this revenue will be accounted as by-product credit in the operating costs.

The project has a pre-tax Net Present Value of \$ 132.3M at a 7.5% discount rate and shows an Internal Rate of Return of 21.3%. The cash flow summary is shown in Section 18.6.

**Table 19.4: Capital Expenditures**

<b>Capitalized</b>	<b>Pre- production</b>	<b>Production</b>	<b>Total (\$000)</b>
<b>Feasibility Study and Drilling</b>	14,000		14,000
<b>Deferred Development</b>	4,663	725	5,388
<b>Cogema</b>	2,365	1,183	3,548
<b>Surface Support Equipment</b>	3,605		3,605
<b>Mining</b>	26,237	2,850	29,087
<b>Infrastructure</b>	29,361		29,361
<b>Processing</b>	131,169		131,169
<b>Tailings &amp; Water Management</b>	12,510	21,000	33,510
<b>Indirect</b>	30,000		30,000
<b>Contingency</b>	45,000		45,000
<b>Pre-production</b>	38,215		38,215
<b>TOTAL</b>	<b>337,126</b>	<b>25,758</b>	<b>362,883</b>

**Table 19.5: Operating costs**

<b>Item</b>	<b>Pre- Production (Capitalized)</b>	<b>Production</b>	<b>Total</b>	
<b>Definition Drilling</b>	\$ 0.3M	\$ 7.8M	\$ 8.1M	\$ 1.00/t milled
<b>Stope Preparation</b>	\$ 5.4M	\$ 6.4M	\$ 11.8M	\$ 1.46/t milled
<b>Extraction</b>	\$ 4.8M	\$ 159.4M	\$ 164.2M	\$ 20.27/t milled
<b>Mine Services</b>	\$ 18.3M	\$ 125.6M	\$ 143.9M	\$ 17.77/t milled
<b>Concentrate Transportation</b>	—	\$ 40.5M	\$ 40.5M	\$ 5.00/t milled
<b>Processing</b>	\$ 0.4M	\$ 256.5M	\$ 256.9M	\$ 31.72/t milled
<b>Administration</b>	\$ 8.4M	\$ 54.8M	\$ 63.2M	\$ 7.80/t milled
<b>Environment</b>	\$ 0.3M	\$ 1.4M	\$ 1.7M	\$ 0.21/t milled
<b>Total</b>	<b>\$ 37.9M</b>	<b>\$ 652.4M</b>	<b>\$ 690.2M</b>	<b>\$ 85.24/t milled</b>

## **19.5 Risk Analysis**

As with any mining project Quimsacocha is exposed to a number of situations that could affect the estimates presented in this study. Among the risks identified that could affect the results of the evaluation are notably (not necessarily by order of importance):

1. Change in metal prices.
2. Unfavourable state regulations.
3. Change in Ecuador taxation regime.
4. Change in prices of consumables.
5. Project start-up date in relation to regulatory changes and the permitting process.
6. Delay in obtaining mobile and major fixed equipment. (Grinding Mills, Oxygen plant, Autoclave)
7. Acceptance of the project from the surrounding communities.
8. Access to water source at both mine site and POX site.
9. Unexpected ground conditions around mine workings.

All of these points will require further investigation during the Feasibility Study stage to reduce or otherwise mitigate these risks.

## **20.0 Recommendations**

The Quimsacocha Pre-feasibility Study examined the economical potential of the project under a certain set of parameters and assumptions. A pre-tax return on investment of 21.3% has been projected by the Study which clearly suggests a move forward to the next phase of full Feasibility Study. More detailed studies could lead to significant modifications and improvements to project acceptance with stakeholders and profitability. Other items have not been completed in the present Study and will require additional work during the next phase of investigation. Recommended future studies are, notably:

### **20.1 Mineral Resource Estimation**

1. Identify the major controlling features such as faults by a properly oriented geotechnical drilling program.
2. Include the mineralized intercepts in the northern sector of D1 that are not part of the current model.
3. Model all zones on an equivalent metal basis to include significant silver- and copper-rich intercepts in new or expanded ore shells.
4. Silicification is strongly associated with mineralization and will be a major factor in the underground mine design. Silica content should be modeled and results incorporated in the grade block model.
5. Investigate the extent and orientation of the deep intersection found in hole IQD112 centered on section 1775NE (24.7 g Au/t, 2.4% Cu over 9.1m from 374.6m).
6. The definition of measured resources is not deemed necessary in preparation of a Feasibility Study though steps (such as closely spaced drilling) should be taken to better define the mineralization controls.
7. Test the use of the co-kriging and conditional simulation methods to better define the areas of greater metal content uncertainty.

### **20.2 Mining**

1. More geomechanical tests and geotechnical mapping are required to better characterize the ore and host rocks for stope span dimensioning. These measurements will have to be

performed at different locations of the orebody to better model the rock strength's spatial variability.

2. Formulation of an alteration model based on degree of silicification will refine the rock mechanic block model.
3. The piezometric data is insufficient to adequately model the hydrogeological regime surrounding the mine. A greater number of piezometers will have to be put in and around the orebody to better model the impacts of the underground operation on the regional water regime. The geotechnical mapping of faults mentioned previously will also help model the groundwater flow simulation model.
4. Within the abovementioned geomechanical constraints, a proper mine design will have to consider the proper placement of the portal and ramp location as well as pillars and openings to minimize dilution and maximize gold recovery.
5. Continue to monitor the implementation of the mine development legislation and participate as appropriate in the establishment of working regulations that will be used to development quimsacocha as a responsible mining project.

### **20.3 Processing and Tailing Disposal**

1. Final decision on the location of the POX plant and its related tailing area will have to be made and permitting secured before the Feasibility Study is completed.
2. Bond Work and Abrasion Index tests will have to be performed on larger samples for better representativity.
3. Scaling-up of the metallurgical testwork into a pilot plant will be needed to in order to:
  1. Complete the metallurgical testing program;
  2. Do detailed design on major equipment;
  3. Do the final process selection;
  4. Optimize the grinding circuit.

#### **20.4 Infrastructure and Environment**

1. Do a study on tailings management at the concentrator site involving limestone – paste mix to obtain a neutral tailings site.
2. Start environmental base line for the pox site, road and power line.
3. Complete the mine site environmental study.
4. Rock material generated by the road access should be investigated for construction potential.
5. Investigate the concentrate transportation and storage issues and possible infrastructures required at the port.
6. Start negotiation with power suppliers.
7. Commitment on major equipment with long delivery dates should be addressed as soon as these have been chosen to avoid delays in project start-up.

#### **20.5 Social**

1. Start a social baseline study at the pox site and complete the study at the mine site with the final impacted area.
2. Start negotiations for land acquisition and easements at the mine and pox sites as well as for the road and the power line.
3. Start negotiations for water rights at the mine and pox sites.

#### **20.6 General**

1. Continue the follow-up on the political situation and maintain participation in the mine proactive committees.
2. Begin discussions with copper refineries for a formal smelter contract.

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## 22.0 SIGNATURE PAGE

This report titled *Technical Report on the Quimsacocha Gold Project, Azuay Province, Ecuador (February 2009)* dated February 16, 2009 was prepared by the following authors who are IAMGOLD employees and act as Qualified Persons as defined by the National Instrument 43-101:

*Daniel Vallières, Eng .*

Dated in Longueuil, Québec  
February 16, 2009

Daniel Vallières, Eng.  
Manager, Underground Projects  
Gestion IAMGOLD-Québec inc.

*Pierre Pelletier, Eng .*

Dated in Longueuil, Québec  
February 16, 2009

Pierre Pelletier, Eng.  
Vice-President, Metallurgy  
Gestion IAMGOLD-Québec inc.

*Francis Clouston, Eng .*

Dated in Longueuil, Québec  
February 16, 2009

Francis Clouston, Eng.  
Manager, Project Evaluations  
Gestion IAMGOLD-Québec inc.

### **23.0 CERTIFICATE OF QUALIFIED PERSON**

#### **Certificate of Qualified Person (« QP »)**

##### **Francis Clouston**

1. I, Francis Clouston, *Manager, Project Evaluations*, at Gestion IAMGOLD-Québec inc., 1111 Rue St-Charles W., Suite 750, Tour Est, Longueuil, Québec J4K 5G4, hereby certify that:
2. I am a graduate of Ecole Polytechnique, Montréal (B. Eng. Mining) and Mining McGill University, Montreal (M .Sc. (Applied) Mineral Exploration).
3. I am a registered mining engineer in the Province of Québec (OIQ #100367) and I am a member of the Canadian Institute of Mining and Metallurgy.
4. I have practiced my professions of mining geologist and mining engineer continuously for the last twenty-two years in the fields of gold mining and mineral resource evaluation.
5. I have read the definition of “qualified person” set out in the National Instrument 43-101 (“NI 43-101”) and certify that as a result of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.
6. I have made two visits to the Quimsacocha Project in June 2007, and March 2008
7. I am responsible for the overall preparation and specifically of sections 1 to 15 and 17.1 to 17.5 of the Technical Report title “*Technical Report on the Quimsacocha Gold Project, Azuay Province, Ecuador (February 2009)*”
8. I did receive from my employer participation incentive securities (“options”) and company shares in 2007 and 2008.
9. I have read the National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
10. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all the scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
11. I consent to the filing of the Technical Report with any stock exchange or any regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated, in Longueuil, on this 26<sup>th</sup> day of February 2009.

*Francis Clouston, Eng.*

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**Francis Clouston, Eng.**

**Certificate of Qualified Person (« QP »)**

**Pierre Pelletier**

12. I, Pierre Pelletier, vice president, *Metallurgy*, at Gestion Iamgold-Québec inc., 1111 Rue St- Charles W., Suite 750, Tour Est, Longueuil, Québec J4K 5G4, hereby certify that:
13. I am a graduate of Laval University, Quebec (B. Eng. Mining).
14. I am a registered mining engineer in the Province of Quebec (OIQ # 36825) and I am a member of the Canadian Institute of Mining and Metallurgy.
15. I have practiced my professions of mining engineer in mineral processing continuously for the last twenty-five years in the fields of gold and base mineral processing.
16. I have read the definition of “qualified person” set out in the National Instrument 43-101 (“NI 43-101”) and certify that as a result of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.
17. I have made one visit to the Quimsacocha Project in January 2008.
18. I am responsible for the preparation and of section 5 of the Technical Report titled: “*Technical Report on the Quimsacocha Gold Project, Azuay Province, Ecuador (February 2009)*”.
19. I did receive from my employer participation incentive securities (“options”) and company shares in 2007 and 2008.
20. I have read the National Instrument 43-101 and Form 43-101 F1, and the Technical Report has been prepared in compliance with that instrument and form.
21. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all the scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
22. I consent to the filing of the Technical Report with any stock exchange or any regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated, in Longueuil, on this 27<sup>th</sup> day of January 2009.

*Pierre Pelletier, Eng*

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**Pierre Pelletier, Eng**

**Certificate of Qualified Person (« QP »)**

**Daniel Vallières**

23. I, Daniel Vallières, *Manager, Underground Projects*, at Gestion Iamgold-Québec inc., 1111 Rue St-Charles W., Suite 750, Tour Est, Longueuil, Québec J4K 5G4, hereby certify that:
24. I am a graduate of Laval University, Quebec (B. Eng. Mining).
25. I am a registered mining engineer in the Province of Quebec (OIQ # 107203) and I am a member of the Canadian Institute of Mining and Metallurgy.
26. I have practiced my professions of mining engineer continuously for the last eighteen years in the fields of gold and base metal mining.
27. I have read the definition of “qualified person” set out in the National Instrument 43-101 (“NI 43-101”) and certify that as a result of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.
28. I have made four visits to the Quimsacocha Project in October 2007, January 2008, March 2008 and January 2009.
29. I am responsible for the sections 17.6, 18, 19 and 20 of the Technical Report titled: “*Technical Report on the Quimsacocha Gold Project, Azuay Province, Ecuador (February 2009)*”.
30. I did receive from my employer participation incentive securities (“options”) and company shares in 2007 and 2008.
31. I have read the National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
32. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all the scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
33. I consent to the filing of the Technical Report with any stock exchange or any regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated, in Longueuil, on this 25<sup>th</sup> day of February 2009.

*Daniel Vallières, Ing.*

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**Daniel Vallières, Ing.**