

THE MINERAL INDUSTRY OF ECUADOR

By Steven T. Anderson and Pablo Velasco

In 2003, Ecuador's real gross domestic product growth rate was 2.7%, and its annual average inflation rate was about 6.1%. Higher oil prices since 2000 and pegging the Ecuadorian currency to the U.S. dollar in 2001 have helped the country continue to recover from the severe economic crisis of 1999. In 2003, Ecuador was one of the leading exporters of crude oil in South America; the value of the country's oil exports increased by about 27% compared with that of 2002. Oil revenues provided 40% of export earnings and accounted for about one-third of Government revenue. On March 21, 2003, the International Monetary Fund (IMF) approved an extension of a standby financial arrangement that will expire on April 20, 2004. Part of the obligations of the Government under this standby extension included privatizing power companies, eliminating fuel subsidies, and getting the state-run-electricity sector to pay for fuel purchases from Empresa Estatal Petróleos del Ecuador (PetroEcuador) (International Monetary Fund, 2004§;¹ U.S. Energy Information Administration, 2004§).

Government Policies and Programs

Since the most recent election in November 2002, the president of Ecuador has been publicly criticized for many of his key Government appointees, which included a controversial Minister to head the Ministerio de Energía y Minas (MEM) del Ecuador (Sutcliffe, 2004). In addition to the implications of the continuation of the IMF stand-by agreement for the hydrocarbons sector, the World Bank also provided recommendations for developing the metals and industrial minerals mining sectors as part of a financial bailout agreement in 2000. These recommendations resulted in an almost completely new set of mining regulations in 2001, which effectively modernized Ecuador's 1991 mining law. A new hydrocarbons law, however, had been drafted, but still not enacted in 2003 (International Monetary Fund, 2004§).

Structure of the Mineral Industry

In 2003, two projects were notably approaching the feasibility stage. One of these was the Rio Blanco gold-silver deposit, which is located in southern Ecuador; prefeasibility drilling was started at the end of 2003 (International Minerals Corporation, 2003§). The second project was the Mirador copper-gold deposit, which is located in the Rio Zamora copper porphyry district (Corriente Copper Belt). In 2003, the most notable developments at Mirador amounted to completion of some feasibility drilling and reports of some consideration of possible power-generation projects (Corriente Resources Inc., 2003§).

¹References that include a section mark (§) are found in the Internet References Cited section.

Exploration

In 2003, Aurelian Resources Inc. of Toronto, Ontario, Canada, began drilling at its Condor gold project in southeastern Ecuador (Aurelian Resources Inc., 2003§). IAMGOLD Corporation announced its Condor Joint Venture with Gold Fields Chile Ltda. on March 31, 2003, and drilling at the first of three initial targets on El Mozo property was conducted during the latter part of the year (IAMGOLD Corporation, 2003§). Sultana del Condor Minera S.A. conducted exploratory drilling near the Nambija gold district, which is located in the Province of Zamora in the Cordillera del Condor, and at the polymetallic sulfide deposit of La Plata, which is located in the Province of Pichincha on the western slope of the Cordillera Occidental (Chiaradia, Tripodi, and Fontboté, 2003).

Production

In 2003, production of metals and industrial minerals in Ecuador consisted mostly of informal (artisanal) production by small-scale private companies, which were mainly mining cooperatives. The activities and expenditures of larger mining firms were devoted to a substantial amount of exploration and some preliminary development work. In the vicinity of the towns of Portovelo and Zaruma, El Oro Province, a substantial amount of gold has been produced since the Colonial period. Ecuador, however, is thought to contain a more-diverse array of mineral deposit types. In 2003, the country's most immediately productive mineral potential still appeared to be primarily located in the Andes region (Sutcliffe, 2004).

Environment

In 2003, the Ministerio del Ambiente (MAE) was primarily responsible for administration of the nation's protected areas. Mining and exploration operations have been completely excluded by law from these areas, which constitute 18% of Ecuador, for the foreseeable future. The MAE also administered two additional types of environmentally sensitive land—forest and vegetation reserves and state forestry lands. Mining was permitted on these lands but only with prior approval of the MAE and most likely required additional precautions, such as flying in portable drill rigs to avoid road construction (Northern Miner, The, 2001).

In addition to broader regulation by the MAE, the MEM was responsible for the administration of environmental regulations as they relate to miners, which include informal or artisanal miners (Northern Miner, The, 2001). In 2003, the lack of environmental controls over mostly unofficial mining near the towns of Portovelo and Zaruma was an important environmental issue in Ecuador (Sutcliffe, 2004).

In the petroleum sector, exploration and development of projected reserves proved to be difficult in 2003 because

most of these reserves are located in the eastern Amazonian region of Ecuador. Indigenous communities staged numerous demonstrations against the Government and its oil-production policies, and they voiced concern that these policies would damage the environment, among other concerns (U.S. Energy Information Administration, 2004§).

Trade

In 2003, the trade relationship between Ecuador and the United States was conducted under the framework of unilateral trade preferences of the Andean Trade Preferences Agreement (ATPA). On November 18, 2003, the U.S. Trade Representative intended to initiate negotiations for a multilateral free trade agreement (FTA) with Bolivia, Colombia, Ecuador, and Peru. The U.S. Administration planned to begin the negotiations in the second quarter of 2004, initially with Colombia and Peru, and to work intensively with Bolivia and Ecuador to include them in the FTA. A number of issues, which included insufficient protection of worker rights and the difficulty in resolving disputes that involve U.S. investors, were of concern to the United States regarding the ATPA (U.S. Trade Representative, 2003§).

Commodity Review

Metals

Copper.—In 2003, Corriente Resources Inc. focused on developing the Mirador deposit in the Corriente Copper Belt. An outside contractor, AMEC E&C Services Limited, was hired to conduct the most recent drilling, which was then expected to be incorporated into a final feasibility study. Corriente Resources, which was based in Vancouver, British Columbia, Canada, expected to reinvest revenue from the potential development of Mirador into developing at least one of two other deposits (Panantza and San Carlos) that it controlled in the Corriente Copper Belt (Corriente Resources Inc., 2003§).

Gold and Silver.—In 2003, Bienes Raíces S.A. (BIRA) was the leading official gold producer in Ecuador. Artisanal gold mine production, however, was thought to have well-exceeded that of BIRA. At the Rio Blanco deposit, the owner International Minerals Corporation (IMC) estimated a diluted inferred resource of 744,000 metric tons at average grades of 18.3 grams per metric ton (g/t) gold and 146 g/t silver. IMC contracted for a feasibility study to be undertaken by Micon International of Canada, and results were expected early in 2005. The company also contracted Water Management Consultants of Chile to undertake the environmental impact assessment for Rio Blanco (Sutcliffe, 2004).

Mineral Fuels

Natural Gas.—By 2003, Energy Development Corporation Ecuador Ltd. (EDC Ecuador) (an affiliate of United States-based Noble Affiliates Inc.) had completed a 64-kilometer (km) pipeline that connected the Amistad field in the Gulf of Guayaquil, which had an estimated 5,012 million cubic meters of recoverable gas reserves, to the 130-megawatt Machala

natural-gas-fired powerplant located onshore. The powerplant continued operations through 2003, but the expected duration of reserves from the Amistad field is indeterminate. Plans to import natural gas from Peru to supply other powerplants in Ecuador that could be converted to use natural gas were being considered (U.S. Energy Information Administration, 2004§).

Petroleum.—In 2003, PetroEcuador, which oversaw all hydrocarbon operations in Ecuador, reportedly made attempts to attract foreign investment in joint-venture projects with the encouragement of the IMF. Without a new hydrocarbons law to provide an adequate legal framework for investment, however, attempts at joint ventures with firms in the private sector in oilfields owned by PetroEcuador failed (International Monetary Fund, 2003§).

Proven petroleum reserves were about 4.6 billion barrels in Ecuador at the beginning of 2003 (BP p.l.c., 2004, p. 4). Ecuador's major oilfields in 2003 included the Auca, the Cononaco, the Cuyabeno, the Lago Agrio, the Libertador, the Sacha, and the Shushufindi in the eastern Amazonian region. The new pipeline Oleoducto de Crudos Pesados Ltd. became operational in September 2003 and was expected to alleviate at least partially the "oil transport bottleneck" that has deterred progress in Ecuador's petroleum industry for at least 10 years (U.S. Energy Information Administration, 2004§).

Outlook

The major economic activities in the mineral industry of Ecuador are expected to continue to center around the efforts of PetroEcuador to find joint-venture partners and to develop the many oilfields under its control. In metallic mining, several advanced exploration projects may have the potential to form the basis of a modern mining industry; Ecuador remains relatively underexplored. The recent modernization of Ecuador's mining law will help attract more investors interested in exploration and development of a mining industry (Sutcliffe, 2004).

References Cited

- BP p.l.c., 2004, BP Statistical review of world energy: London, United Kingdom, BP p.l.c., June, 42 p.
- Chiaradia, Massimo, Tripodi, David and Fontboté, Luis, 2003, Visit of the La Plata gold rich VHMS deposit, Ecuador, Field trip UNESCO-SEG Metallogeny Course: Geneva, Switzerland, University of Geneva, June, 10 p.
- Northern Miner, The, 2001, A strong commitment to sustainable development, *in* Explore Ecuador: The Northern Miner, Supplement, November 5, p. 8.
- Sutcliffe, John, 2004, Ecuador, *in* Mining annual review 2004: London, United Kingdom, Mining Communications Ltd., CD-ROM.

Internet References Cited

- Aurelian Resources Inc., 2003, More high grade gold assays returned from the Condor project, Press Release, accessed May 6, 2005, at URL http://www.aurelian.ca/pressreleases/aru-32_2003-11-24.pdf.
- Corriente Resources Inc., 2003 (December 17), Mirador feasibility drilling underway at the Corriente Copper Belt, News Release, accessed May 6, 2005, at URL <http://www.corriente.com/nr/pdf-nr/nr031217.pdf>.
- IAMGOLD Corporation, 2003 (June 11), IAMGOLD announces new JVs and exploration results, Press Release, accessed May 6, 2005, at URL <http://www.iamgold.com/public-relations/press-releases/releases/PR-Expl-06-11-03.pdf>.

International Minerals Corporation, 2003 (December 2), International Minerals starts feasibility study drill program on high-grade zone at Rio Blanco gold-silver project, Ecuador, News Release, accessed May 6, 2005, at URL http://home.globalcrossing.net/~emc/news_releases/pr_03-12-02.html.

International Monetary Fund, 2003 (August), First review under the stand-by arrangement and requests for modifications and waiver of nonobservance and applicability of performance criteria—Staff report; staff statement; press release on the Executive Board discussion; and statement by the Executive Director of Ecuador, International Monetary Fund Country Report No. 03/248, accessed May 5, 2005, at URL <http://www.imf.org/external/pubs/ft/scr/2003/cr03248.pdf>.

International Monetary Fund, 2004 (August 12), IMF concludes 2004 Article IV consultation with Ecuador, accessed May 5, 2005, at URL <http://www.imf.org/external/np/sec/pn/2004/pn0491.htm>.

U.S. Energy Information Administration, 2004 (February), Ecuador, Country Analysis Brief, accessed October 2004, at URL <http://www.eia.doe.gov/emeu/cabs/ecuador.html>.

U.S. Trade Representative, 2003 (November 18), USTR notifies Congress of intent to initiate free trade talks with Andean countries, accessed February 2005, at URL http://www.ustr.gov/Document_Library/Press_Releases/2003/November/USTR_Notifies_Congress_of_Intent_to_Initiate_Free_Trade_Talks_with_Andean_Countries_printer.html.

Ministerio de Energía y Minas del Ecuador
Av. Orellana N26-220 y Juan León Mera
Edificio MOP
Quito, Ecuador
Telephone: (593-2) 2550-018; (593-2) 2550-041
Fax: (593-2) 2540-279
Internet: www.menergia.gov.ec/php/index.php

PetroEcuador, Gerencia Administrativa
Alpallana E8-86 y Av. 6 de Diciembre
P.O. Box 17-11-5007
Quito, Ecuador
Telephone: (593-2) 2562-502; (593-2) 2563-060
Fax: (593-2) 2503571
E-mail: gad@petroecuador.com.ec
Internet: <http://www.petroecuador.com.ec>

Major Sources of Information

Dirección Nacional de Minería (DINAMI)
Calle General Baquedano No. 222 y Reina Victoria
Edificio Araucaria, Piso 1
Quito, Ecuador
Telephone: (593-2) 2254-110; (593-2) 2550-082
Fax: (593-2) 2228-100
Internet: www.mineriaecuador.com

TABLE 1
ECUADOR: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003 ^c
METALS					
Cadmium, mine output, Cd content ^e kilograms	200	200	200	200	200
Copper, mine output, Cu content ^e	100	100	100	100	100
Gold, mine output, Au content kilograms	2,026	2,871	3,005	2,750	3,020
Steel, crude and semimanufactures	53,000	58,483	59,732 ^r	68,743 ^r	79,800
Lead, mine output, Pb content ^e	200	200	200	220	220
Silver, mine output, Ag content ^e kilograms	2,000	2,000	2,000	96 ²	100
Zinc, mine output, Zn content ^e	100	100	100	100	100
INDUSTRIAL MINERALS					
Barite	2,532	1,476	1,181	1,180 ^e	1,180
Cement, hydraulic thousand tons	2,300	2,800	2,920	3,000 ^e	3,100
Clays: ⁴					
Common do.	413	325	345	382	420
Kaolin	20,652	11,022	703	8,483	9,330
Feldspar	33,142	47,041	60,688	31,254	34,400
Gypsum, crude	1,456	1,043	834	4,730	5,200
Salt, common ^e	95,000	90,000	90,000	90,000	90,000
Sand:					
Silica	21,978	27,522	34,718	40,880	45,000
Ferruginous ^c	9,950	9,950	9,900	9,000	9,000
Stone and sand and gravel:					
Limestone ⁴ thousand tons	2,865	3,147	4,079	6,699	6,280
Marble	2,508	1,680	1,344	265	292
Pozzolan	13,978	27,687	373,023 ^r	519,090 ^r	571,000
Pumice thousand tons	275	345	373	130	144
Sand and gravel thousand cubic meters	2,459 ^r	2,596 ^r	3,414 ^r	4,467 ^r	4,910
Sulfur: ^e					
Native	4,000	4,000	4,000	4,000	4,000
Byproduct:					
From petroleum	8,243 ²	11,778 ²	11,700	11,700	11,700
From natural gas	5,000	5,000	5,000	5,000	5,000
Total	17,200	20,800	20,700	20,700	20,700
Zeolites	1,237	1,291	1,801	1,883	2,070
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic meters	964	1,057	1,001	998	1,039 ²
Marketed do.	113	156	121	93	103 ²
Liquefied natural gasoline thousand 42-gallon barrels	2,014	699	664	603	514 ²
Petroleum:					
Crude do.	136,300	146,209 ³	148,746 ³	143,758 ³	152,497 ³
Refinery products:					
Liquefied petroleum gas do.	3,000	2,818 ³	2,407 ³	2,060 ³	2,230 ³
Gasoline do.	9,783	13,306 ³	12,236 ³	12,887 ³	13,090 ³
Jet fuel do.	1,554	1,938 ³	1,771 ³	1,797 ³	1,879 ³
Distillate fuel oil do.	7,061	10,787 ³	10,953 ³	11,354 ³	10,812 ³
Residual fuel oil do.	18,530	14,079 ³	11,898 ³	10,742 ³	8,879 ³
Unspecified, including kerosene do.	8,572	13,942 ³	15,786 ³	14,687 ³	13,221 ³
Total do.	48,500	56,870 ³	55,051 ³	53,527 ³	50,111 ³

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. -- Zero.

¹Table includes data available through October 2004.

²Reported figure.

³No reports of separate quantities for limestone or clay used in cement production were received in the past 6 years.

⁴Cited from Empresa Estatal Petróleos del Ecuador's Web site at URL http://www.petroecuador.com.ec/cifras_de_petroecuador.htm.