

THE MINERAL INDUSTRY OF PAPUA NEW GUINEA

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The mineral industry in the Independent State of Papua New Guinea remains the cornerstone of the country's economy, as it has since 1972 when the large Panguna porphyry copper-gold-silver mine on Bougainville Island in North Solomons Province concluded its first full year of production. The country's mining operations range from primitive gold panning and sluicing by individuals and small gold-mining companies to large, modern, mechanized copper and gold open-pit and underground operations.

At yearend, four major metal mines (Lihir, New Ireland Province; Misima, Milne Bay Province; Ok Tedi, Western Province; and Porgera, Enga Province) and one minor gold mine (Tolukuma, Central Province) were operating. The petroleum sector included the Hides Natural Gas Project in Southern Province and two petroleum production fields (Agogo, Gulf Province, and Iagifu-Hedinia, Southern Highlands Province,) in the Kutubu Oilfield. These facilities produced virtually all the country's mineral production, excluding minor amounts of alluvial gold by individual panners, and clays, sand and gravel, and stone used for construction purposes.

The mining and petroleum sectors contributed an estimated 25% to the country's gross domestic product (Orogen Minerals Ltd., Overview, accessed April 16, 1998, at URL <http://www.rogen.com/company/overview.htm>), approximately 70% of export revenue, and 75% of taxation and mining royalty revenue (PNG Resources, 1998). In addition to this direct contribution to the economy of Papua New Guinea, the mining and petroleum sectors also contributed intangibly to the economy through interdependence with the construction and service sectors, providing people with employment and training in technical skills, and contributing to the funding of health, education, and community infrastructure and development programs.

Mining and petroleum exploration and development in Papua New Guinea are regulated by the Mining and Petroleum Acts of 1992. The Mining Act details the types of mining tenements available; the making of mining development contracts; payments of rents, fees, and royalties; registration of interests and dealings in tenements; and compensating the occupiers of affected lands. The principal mining tenements for large-scale operations under the Mining Act are exploration licenses and special mining leases. There also are mining leases and alluvial mining leases for smaller scale development, as well as ancillary tenements, such as leases for mining easements. An exploration license confers the exclusive right to explore for certain minerals within a defined area. The special mining lease gives tenure to carry out construction and operations for the mining of a large mineral deposit. These leases are dependent on the negotiation and signing of a mining development contract with the Government, the approval by the Minister for Mining and Petroleum of a proposal for development, and reaching agreement for appropriate compensation with the indigenous people who occupy the land. The holder of a mining lease or special mining lease is entitled to conduct mining operations and owns all minerals lawfully

extracted.

The Petroleum Act deals with the types of petroleum licenses available, registration of interests and dealings in tenements, compensation for owners and occupiers of affected lands, and payments of rents, fees and royalties. Three types of tenements may be issued under the Petroleum Act, namely licenses for petroleum prospecting, petroleum development, and pipelines. Petroleum-prospecting licenses confer the exclusive right to explore for petroleum, but the holder is required to enter into a further agreement with the Government regarding exploration and development within the license area. Petroleum-development licenses give tenure to recover and own the petroleum and to construct and operate all necessary facilities. Pipeline licenses confer the authority to construct and operate a pipeline system and related facilities. (Orogen Minerals Ltd., Regulatory regime, accessed April 16, 1998, at URL <http://www.rogen.com/company/regregim.htm>)

The Department of Environment and Conservation is the Government agency responsible for environmental protection and conservation of Papua New Guinea's diverse natural environment and serves as the regulatory and monitoring agency for the extraction of all mineral resources in the country (Orogen Minerals Ltd., Environment considerations, accessed April 16, 1998, at URL <http://www.rogen.com/company/envconsi.htm>).

Towards yearend, the civil strife on Bougainville Island seemed to be nearing a peaceful solution. Following two rounds of talks led by New Zealand beginning in June at the Burnham Army Camp south of Christchurch, New Zealand, an interim cease fire peace agreement, the Burnham Truce, was reached on October 10, temporarily stopping the 9-year civil war on Bougainville Island. Participants in the negotiations were representatives of the Government of Papua New Guinea, the Bougainville Transitional Government, and the Bougainville Revolutionary Army, which advocates, among other demands, secession from control by the mainland Government of Papua New Guinea. The Burnham Truce set in motion a third round of peace talks scheduled to take place early in 1998. On October 24, Papua New Guinea's Defense Force (army) commander, in compliance with the truce agreement, announced that all restrictions imposed by the security forces on Bougainville Island had been lifted. Lifting of the restrictions directed the Defense Force to move out of its camp at Buka, allowing the indigenous population to resettle in their village; enabled people to travel freely into, within, or out of the island; and allowed shipping companies and airlines to operate normally. The Bougainville conflict began in 1988 when landowners revolted against the huge Panguna copper-gold-silver mine because of dissatisfaction with their royalties and anger at the environmental damage caused by the mine, which they shut down on May 15, 1989 (Pacific Islands Monthly, 1997a). The landowners then demanded \$6.95 billion in compensation and shut down all Government services to the island

as well. Secessionist rebels, along with militant landowners and others, formed the Bougainville Revolutionary Army with the goal of becoming independent from the mainland Government. Since Panguna's commissioning in 1972, prior to Papua New Guinea's independence from Australia, until its closure in 1989, the mine produced concentrate containing 3 million metric tons (Mt) of copper, 306 metric tons (t) of gold, and 784 t of silver. Panguna's production during its mining life represented 44% of Papua New Guinea's exports and 17% of internally generated Government revenues (Pacific Islands Monthly, 1997b). The Burnham Truce was being monitored at yearend by troops from Australia, Fiji, and New Zealand (Mining Journal, 1997b).

Australia's Highlands Pacific Ltd. completed its diamond drilling program at the Horse-Ivaal porphyry copper deposit (Orogen Minerals Ltd., [October 16, 1997] Highlands finds gold at Frieda, accessed April 15, 1998, at URL http://www.orogen.com/about_us/press_clippings_14.html), one of several copper-gold targets comprising the Frieda River project that straddles the border of East Sepik Province and West Sepik Province along the Frieda River in the northwestern corner of the country. A prefeasibility study of the project completed in 1996 estimated that the project was capable of producing 220,000 metric tons per year (t/yr) of copper and 10,000 kilograms per year (kg/yr) of gold during a 20-year mine life (Mining Journal, 1998a). At yearend, the Frieda River project was managed by Highlands Pacific with an 86% interest, in joint venture with the Japanese consortium OMRD Frieda Co. Ltd. holding the remaining 14% (Yahoo Finance, [January 13, 1998] Highlands-Cyprus in PNG pact, accessed January 14, 1998, at URL http://biz.yahoo.com/finance/980113/highlands_1.html).

Since the closure of Bougainville Copper Ltd.'s Panguna Mine on Bougainville Island in North Solomons Province in 1989, all the country's copper production has come from the Ok Tedi Mine on Mount Fubilan in the Star Mountains of Western Province, 18 kilometers (km) east of the border with the Indonesian Province of Irian Jaya.

Ok Tedi Mining Ltd. (OTML), operator of the enormous copper-gold-silver mine, stopped shipping copper concentrates on August 10 and declared force majeure on shipments September 9 owing to low water levels in the Fly River resulting from severe drought caused by the effects of El Niño on a large portion of the country. The drought disrupted barge movement between the loading port at Kiunga on the Fly River and the silo ship *Karabi* functioning as a storage and transshipment facility moored off Umuda Island, 850 km downstream at the river's mouth in the Gulf of Papua. The copper concentrate from the mine site at Tabubil is transported 160 km by slurry pipeline to the filtering and drying plant at Kiunga, where it is stockpiled until shipment by barge can be realized. OTML remained on a care-and-maintenance basis from September through yearend because of the drought conditions. About 150,000 t of copper concentrate was stockpiled at the port at Kiunga or on marooned barges (Mining Journal, 1997f). During the drought, aircraft brought in essential supplies for workers remaining at the mine site; other personnel were encouraged to use annual leave while the mine was closed (Metal Bulletin, 1997). OTML's production of about 600,000 t/yr of copper concentrates was sold under long-term contracts to various smelters in Asia and Europe, including Mitsui Mining and Smelting Co. Ltd. of Japan plus a consortium of seven other Japanese smelting companies; Lucky Goldstar Metals Corp. of the Republic of Korea; the Philippines Associated Smelting and

Refining Corp. at Isabel, Leyte Island; Germany's Norddeutsche Affinerie AG in Hamburg; and Finland's Outokumpu Oy at Harjavalta (Mining Journal, 1997g), producing about 210,000 t/yr of finished copper (Mining Journal, 1998b).

In May, OTML signed the agreement with landowners for the out-of-court settlement made in 1996 with the communities of the lower Ok Tedi River region for the payment of \$28.6 million during a 13-year period in compensation for severe environmental changes caused by the mine's operations, including a gray tide of mud from the mine spreading from the banks of the Ok Tedi River into food gardens, fishing grounds, and villages, that have disrupted the traditional life styles of the local people since mining began. OTML also established the Ok Tedi Development Trust allocating \$3 million per year to help build local infrastructure and to introduce sustainable development projects among the communities (Pacific Islands Monthly, 1997c).

In February, Australian Gold Fields NL (AGF) completed its agreement made in November 1996 with Rio Tinto Ltd. (formerly RTZ Corp. Plc-CRA Ltd.) for the purchase of the Hidden Valley gold-silver project in Morobe Province. The purchase price was \$15.5 million, and a royalty was to be paid to Rio Tinto for production of more than 6,221 kilograms (kg) [200,000 troy ounces] of gold. Hidden Valley, a former gold producer, contains an estimated 109,000 kg of gold and 2 million kg of silver (South Sea Digest, 1997c). Hidden Valley is adjacent to the Wau gold project, also a former producing mine, that AGF purchased from Goldfields Ltd. for \$21 million and a 2.5% royalty to Goldfields on all gold production (Resource Information Unit, 1997). In March, AGF announced that it expected to begin production at the amalgamated Hidden Valley-Wau project by the end of 1998. The Wau area of the project contains an estimated 53,000 kg of gold (South Sea Digest, 1997d).

Gold production from oxide ores at the Lihir gold project on Lihir Island, 600 km northeast of the Papua New Guinea mainland in the Bismarck Sea, began on May 25, on schedule and within the revised project cost estimate of \$715 million (South Sea Digest, 1997e). The first doré bars from Lihir were shipped by barge to Port Moresby-based Metals Refining Operations Pty. Ltd. for refining. The processing of sulfide ores began with the commissioning of the first of three autoclaves on August 20. Lihir's high-sulfide gold ore is refractory, responding poorly to conventional direct cyanide leaching. Therefore, after conventional crushing, grinding, and bulk flotation of the gold-bearing sulfides, the resulting concentrate must be oxidized in autoclaves operated at high temperature and pressure. The gold is then recovered from the washed oxidized slurry in a conventional carbon-in-leach (CIL) plant and gold recovery circuit. The Lihir project was based on an open-pit mining operation consisting of two adjacent overlapping pits that supply high-grade ore for direct feeding into the CIL processing plant and lower grade ore for stockpiling for processing during postmining operations. Mining was expected to proceed for an initial 15-year period during which the higher grade ores will be fed directly into the processing plant and the lower grade ores will be stockpiled for processing during the following 21 years, giving a total projected operating life of 36 years (Lihir Gold Ltd., 1997).

In October, Lihir increased its gold production forecast by almost 1,400 kg, to 6,850 kg for the year on the basis of the smooth startup of the pressure oxidation circuit (autoclaves) that oxidizes the sulfide ores for gold recovery in the CIL plant (South Sea Digest, 1997f).

By yearend, Lihir processed 1.967 Mt of ore at an average grade of 4.24 grams per metric ton, recovering 7,597 kg of gold on carbon and producing 6,608 kg of gold bullion (Lihir Gold Ltd., 1997). Lihir expects to produce 18,662 kg/yr of gold when operating at full capacity (Mining Journal, 1997d).

Misima Mines Pty. Ltd. began a gold-silver open-cast operation on Misima Island in the D'Entrecasteaux Islands approximately 240 km southeast of the Papua New Guinea mainland in 1989 in the vicinity of previous small-scale lode mining that took place from about 1910 until 1922 (PNG Resources, 1997). In mid-1996, Misima Mines exceeded the final feasibility study's projection for gold production of 68,428 kg. Mining is done by conventional open-pit methods, primarily from the Umuna pit and, to a lesser extent, from the nearby Ewatinona pit, which was developed in 1996. Higher grade ore is processed immediately in a carbon-in-pulp (CIP) circuit, and the lower grade ore is stockpiled. Mining of ore reserves was scheduled to be completed by mid to late 1998 at which time the operation is expected to begin processing the approximately 20 Mt of stockpile material. The doré produced at the treatment plant was refined in Papua New Guinea by Metals Refining Operations (Orogen Minerals Ltd., Misima gold mine, accessed April 16, 1998, at URL <http://www.rogen.com/projupd/misima.htm>).

Near yearend, a settlement agreement with the Government was approved that will pave the way for alluvial mining and accelerate exploration programs at the Mount Kare alluvial gold project in Enga Province. The agreement resolves the problems that may have developed owing to the overlapping of the alluvial and hard-rock projects, which are governed by different regulations and different exploration and special mining licences. The settlement includes the landowners' interest in the exploration license, with a 10% free carry to the point of development. Their interest is being held by Kare-Puga Development Corp. (KDC), the same landowner company that holds the special mining lease for hard-rock gold at Mount Kare. KDC is the only landowner entity recognized at Mount Kare (Mining Journal, 1997a).

After spending more than \$8 million on the hard-rock exploration program at Mount Kare, Madison Enterprises Corp. of Canada earned a 65% interest in the project in October (Mining Journal, 1997e). Carpenter Pacific Resources NL and Ramsgate Resources NL owned 66.6% and 33.3%, respectively, of Matu Mining Pty. Ltd., which had a 25% interest. The local landowners had the remaining 10% share, which was being held by KDC. The Mount Kare hard-rock prospect is about 18 km southwest of the huge Porgera Mine and may have the potential even to be larger (Orogen Minerals Ltd., [October 18, 1997], Mt. Kare fails to spur rush despite drill finds, accessed April 15, 1998, at URL http://www.rogen.com/about_us/press_clippings_13.html).

Production at the large Porgera open-cut and underground gold-silver mine was significantly reduced in 1997 owing to the drought caused by El Niño that began on June 1 and ended on November 22; it was especially severe during the last quarter of the year. The drought completely stopped milling operations for 54 days and reduced throughput feed capacity to about 50%, or about 7,000 t per day of ore, for a further 67 days because of low water reserves held in Porgera's main process water source, the Waile Creek Dam reservoir. Mining and other operations at the site, including performing essential maintenance that had been planned for the processing circuit, remained unaffected (South Sea Digest, 1997b). Gold recovery of about 71% during the last semester of the year was

expected to improve in 1998 following full commissioning of the flotation circuit upgrade and installation of a gravity circuit at the mine (South Sea Digest, 1998).

Porgera's underground operation produced high-grade ore from the central core of the ore body, and the open pit produced lower grade ore from the upper zones of the ore body. Underground mining was scheduled for completion in 1998, and open-pit mining was anticipated to conclude about 2007 followed by an additional 2 years of treating stockpiled ore. Exploration drilling and pit optimization could extend the mine life, however. Porgera's high-sulfide gold ores are oxidized in autoclaves, and the gold is then recovered in a conventional CIP plant (Orogen Minerals Ltd., Porgera gold mine, accessed April 16, 1998, at URL <http://www.rogen.com/projupd/porgera.htm>). About 70% of Porgera's production is refined in country at the Metals Refining Operations (Mining Journal, 1997h).

In midyear, Australian gold producer Macmin NL deferred development of its Sinivit (formerly Wild Dog) gold project south of Rabaul in East New Britain Province because of declining gold prices. Sinivit had been scheduled to begin production by yearend (Mining Journal, 1997j).

In January, Union Mining NL acquired Macmin's 49% interest in the small gold mining operation, including exploration tenements, at Wapolu in the northwestern corner of Fergusson Island in the D'Entrecasteaux Islands of Milne Bay Province. Union Mining shut down the Wapolu Mine in mid-March because of lower-than-expected ore grades and decreasing gold prices (Union Mining NL, 1997, 1997 annual report—exploration focus, accessed April 17, 1998, at URL <http://www.unionmining.com.au/AnnReport97Exp.html>).

Deep diamond drilling completed in October as part of the final feasibility study begun in July for the huge Ramu nickel-cobalt project encountered mineralization that was 11% higher in nickel and 10% higher in cobalt than expected, enhancing the economic viability and improving the prospects of the project for development in 1998 (Mining Journal, 1997i). Following drilling, the resource was estimated to contain about 107 Mt of ore grading 1% nickel and 0.1% cobalt, sufficient for a probable mine life of 30 to 35 years, an increase over the 20-year mine-life model being used in the feasibility study, which was scheduled to be completed in midyear 1998. Highlands Pacific has a 65% interest in the Ramu deposit, and Bermuda-based Australian copper producer Nord Pacific Ltd. holds the remaining 35% share. At the end of mine development, the Government of Papua New Guinea will take 5%, and Orogen Minerals will take a 25% share; Highlands Pacific will retain a 40% to 45% stake, with Nord Pacific holding the remaining interest (South Sea Digest, 1997a). The mine was expected to be in operation by early 2001, with upgraded nickel ore sent by pipeline to a facility near Madang 74 km distant for processing using pressure acid leaching, solvent extraction, and electrowinning to produce 33,000 t/yr of London Metal Exchange-grade nickel and 2,800 t/yr of cobalt salts (Metal Bulletin, 1998).

The country's only cement factory was a clinker grinding plant in Lae, Morobe Province, owned by PNG-Halla Cement Pty. Ltd.

Development of Papua New Guinea's second petroleum project began early in 1997. The Gobe Oilfield, 500 km northwest of Port Moresby and straddling the Gulf and Southern Highlands provincial border, comprises two fields about 5 km apart, the Gobe Main and the South East Gobe. The fields are about 85 km southeast of the

Kutubu Oilfield and are approximately 15 km from the existing Kutubu export pipeline that crosses the Gulf and the Southern Highlands Provinces (Pacific Islands Monthly, 1997d). Oil from the Gobe fields will be transported by pipeline to the Kutubu export pipeline. The \$440-million Gobe Oilfield was scheduled to come on-stream at a rate of about 50,000 barrels of oil per day early in 1998 (World Oil, 1997). Gobe also contains natural gas, but, as with the gas at Kutubu, it was anticipated that almost all the gas produced will be used either for field operations or reinjected back into the field.

The Kutubu Oilfield is in Southern Highlands Province, 480 km northwest of Port Moresby. Kutubu is Papua New Guinea's first oil development and consists of a number of producing wells that, together, comprise the Agogo and the Iagifu-Hedinia fields. The oilfield's name was derived from nearby Lake Kutubu. Oil was first discovered in the Iagifu structure in 1986, and production began in June 1992. The Kutubu joint venture incorporates an export pipeline to the coast and a marine loading terminal in the Gulf of Papua. Kutubu has substantial quantities of natural gas, all of which was used either for field operations or reinjected into the field to aid in oil recovery (Orogen Minerals Ltd., Kutubu petroleum project, accessed April 16, 1998, at URL <http://www.rogen.com/projupd/kutubu.htm>).

Discovered in 1996, the Moran Oilfield in the Southern Highlands Province continued to be developed and evaluated on a fast track for commercial production to begin in 1998. The field, operated and managed by Chevron Niugini Pty. Ltd., was considered to be potentially bigger than the Kutubu Oilfield, Papua New Guinea's first commercial field. Its reserves were estimated to be more than 300 million barrels of oil (World Oil, 1997).

A Chevron Asiatic Ltd.-led consortium was considering developing a \$1.48-billion 2,500-km pipeline to transport natural gas from the Kutubu Oilfield into Northern Queensland via the Torres Strait, down the Cape York Peninsula to the port city of Townsville, and then on to the industrial city of Gladstone. Chevron was negotiating with the Queensland Government to supply a proposed 750-megawatt base-load power station in Townsville and the possible construction of a new alumina refinery at Gladstone that Comalco Ltd. has had under consideration for several years (Mining Journal, 1997c). Besides Chevron, the consortium included Australia's BHP Petroleum, Japan's Merlin Oil Co. Ltd., and Papua New Guinea's Oil Search Ltd. and Orogen Minerals Ltd. (Orogen Minerals Ltd., PNG-Australian State gas pipeline on schedule—Chevron, accessed April 15, 1998, at URL <http://www.rogen.com/presclip/aapjul21.htm>). The consortium is also considering constructing a liquefied petroleum gas (LPG) plant near Kopi along the existing Kutubu oil export pipeline. According to planning, the LPG is to be stored in an offshore storage facility adjacent to the existing marine oil terminal platform at the mouth of the Kikori River delta (Orogen Minerals Ltd., PNG-Qld gas pipeline, accessed March 13, 1998, at URL <http://www.rogen.com/halfyear/pngqld.htm>).

All the country's petroleum production was exported from the marine export terminal in the Gulf of Papua and sold to refineries in Australia, Japan, and Southeast Asia. Natural gas production from the Hides Gasfield was flared, except for a small amount used at the Porgera Mine. The country's only refinery, the small topping Iagifu Ridge Refinery, 200 meters above Lake Kutubu in Southern

Highlands Province, produced a small quantity of aviation and diesel fuels from condensate for sale within the country and in conjunction with the Kutubu project itself.

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TABLE 1
PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES 1/

Commodity 2/		1993	1994	1995	1996	1997 e/
Copper, mine output, Cu content	metric tons	203,945	209,329	212,737	168,024 r/	111,200
Gold, mine output, Au content	kilograms	61,671 r/	59,286 r/	53,405 r/	51,119 r/	49,900
Gas, natural	million cubic meters	1,471	1,757	1,832	1,990	2,100
Natural gas liquids	42-gallon barrels	63,200	73,100	77,000	110,800	116,000
Petroleum, crude	thousand 42-gallon barrels	45,884	44,008	33,624 r/	38,641	29,000
Silver, mine output, Ag content	kilograms	96,017 r/	77,758 r/	68,306 r/	58,131 r/	49,500

e/ Estimated. r/ Revised.

1/ Table includes data available through May 20, 1998.

2/ In addition to the commodities listed, cement and crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates.

TABLE 2
PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity e/
Cement	thousand tons	PNG-Halla Cement Pty. Ltd. (Halla Cement Corp. of the Republic of South Korea, 50%; State of Papua New Guinea, 50%)	Lae, Morobe Province	500
Copper	do.	Ok Tedi Mining Ltd., operator [BHP Copper, managing shareholder, 52.6%; Mineral Resources Development Co. (State of Papua New Guinea), 30%; and Inmet Mining Corp. of Canada, 17.4%]	Ok Tedi Mine, Mount Fubilan, Western Province	215
Do.	do.	Bougainville Copper Ltd., operator and manager. [Rio Tinto Ltd., 53.6%; public shareholders, 27.3%; and Mineral Resources Development Co. (State of Papua New Guinea), 19.1%]	Panguna Mine, Bougainville Island, North Solomons Province 1/	180
Gold		Lihir Gold Ltd. [Southern Gold (Bahamas) Ltd., a 75:25 joint venture between Rio Tinto Ltd. and Vengold Inc., 22.87%; Niugini Mining Ltd., 17.15%; Mineral Resources Lihir Pty. Ltd. (State of Papua New Guinea trust for the people of Lihir Island), 10.34%; Orogen Minerals Ltd. (state-controlled corporation), 6.81%; Vengold Inc., 3.7%; and other public shares, 39.13%]	Lihir project, Lihir Island, New Ireland Province	18
Do.		Misima Mines Pty. Ltd., operator and manager [Placer Niugini Ltd., 80%; Orogen Minerals Ltd. (state-controlled corporation), 20%]	Misima Mine, Misima Island, Milne Bay Province	6
Do.		Oakland Pty. Ltd., operator and manager, 90%, and Kare-Puga Development Corp. (local landowner group), 10%	Mount Kare alluvial deposit, 18 kilometers southwest of the Porgera Mine, Enga Province	5
Do.		Madison Enterprises Corp. (Canada), manager, 65%; Matu Mining Pty. Ltd., 25%; and Kare-Puga Development Corp. (local landowner group), 10%	Mount Kare hard-rock deposit, 18 kilometers southwest of the Porgera Mine, Enga Province	
Do.		Ok Tedi Mining Ltd., operator [BHP Copper, managing shareholder, 52.6%; Mineral Resources Development Co. (State of Papua New Guinea), 30%; and Inmet Mining Corp. of Canada, 17.4%]	Ok Tedi Mine, Mount Fubilan, Western Province	50
Do.		Bougainville Copper Ltd., operator and manager [Rio Tinto Ltd., 53.6%; public shareholders, 27.3%; and Mineral Resources Development Co. (State of Papua New Guinea), 19.1%]	Panguna Mine, Bougainville Island, North Solomons Province 1/	10
Do.		Placer Niugini Ltd., manager, 25%; Highlands Pacific Ltd., 25%; Goldfields Ltd., 25%; Orogen Minerals Ltd. (state-controlled corporation), 15%, and [Mineral Resources Porgera Pty. Ltd. (State of Papua New Guinea), 51%; Mineral Resources Porgera Pty. Ltd. (Porgera landowner group and Enga Provincial Government), 49%], 10%	Porgera Mine, 130 kilometers west of Mount Hagen, Enga Province	30
Do.		Clayfield Pty. Ltd., operator and manager (Dome Resources NL, 100%)	Tolukuma Mine, 100 kilometers north of Port Moresby, Central Province	2
Do.		Union Mining NL, operator and manager, 100%	Wapulu Mine, Fergusson Island, Milne Bay Province	1
Silver		Misima Mines Pty. Ltd., operator and manager [Placer Niugini Ltd., 80%; Orogen Minerals Ltd. (state-controlled corporation), 20%]	Misima Mine, Misima Island, Milne Bay Province	100
Do.		Ok Tedi Mining Ltd., operator [BHP Copper, managing shareholder, 52.6%; Mineral Resources Development Co. (State of Papua New Guinea), 30%; and Inmet Mining Corp. of Canada, 17.4%]	Ok Tedi Mine, Mount Fubilan, Western Province	50
Do.		Placer Niugini Ltd., manager, 25%; Highlands Pacific Ltd., 25%; Goldfields Ltd., 25%; Orogen Minerals Ltd. (state-controlled corporation), 15%, and [Mineral Resources Porgera Pty. Ltd. (State of Papua New Guinea), 51%; Mineral Resources Porgera Pty. Ltd. (Porgera landowner group and Enga Provincial Government), 49%], 10%	Porgera Mine, 130 kilometers west of Mount Hagen, Enga Province	5
Do.		Clayfield Pty. Ltd., operator and manager (Dome Resources NL, 100%)	Tolukuma Mine, 100 kilometers north of Port Moresby, Central Province	4
Natural gas	thousand cubic meters per day	BP Petroleum Development Ltd., operator and manager, 92.5%, and Oil Search Ltd., 7.5%	Hides Gasfield, Southern Highlands Province	425

See footnotes at end of table.

TABLE 2--Continued
 PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity e/
Petroleum--Continued: thousand 42-gallon barrels per day	Chevron Niugini Pty. Ltd., operator and manager, 19.38%; BP Petroleum Development, 19.38%; Mobile Exploration and Producing Australia Pty. Ltd., 16.46%; BHP Petroleum (PNG) Inc., 9.69%; Oil Search Ltd., 7.75%; Mineral Resources Development Co. (State of Papua New Guinea), 6.75%; Merlin Pacific Petroleum Co., 4.84%; Orogen Minerals Ltd. (state-controlled corporation), 15.75%	Kutubu Oilfield (Agogo and Iagifu-Hedinia Fields), Gulf and Southern Highlands Provinces	140
Do.	do. Chevron Niugini Pty. Ltd., operator and manager, 19.375%; BP Australia Ltd., 19.375%; Orogen Minerals Ltd. (state-controlled corporation), 15.75; Mobile Exploration and Producing Australia Pty. Ltd., 11.612%; BHP Petroleum (PNG) Inc., 9.688%; Oil Search Ltd., 7.762%; Petroleum Resources (Kutubu) Pty. Ltd., 6.75; Merlin (JPP) Petroleum Co., 4.844%; and Merlin Pacific Oil Co. NL, 4.844%	Moran Oilfield, Southern Highlands Province 2/	40
Do.	do. Chevron Niugini Pty. Ltd., operator and manager, 19.37%; Oil Search Ltd., 27.14%; Orogen Minerals Ltd. (state-controlled corporation), 20.5%; Mobile Exploration and Producing Australia Pty. Ltd., 16.46%; BHP Petroleum (PNG) Inc., 9.69%; Merlin Pacific Petroleum Co., 4.84%; and Mineral Resources Development Co. (State of Papua New Guinea), 2.00%	South East Gobe Oilfield, Gulf and Southern Highlands Provinces 2/	40
Do.	do. Chevron Niugini Pty. Ltd., operator and manager, 10.66%; Oil Search Ltd., 21.90%; Orogen Minerals Ltd. (state-controlled corporation), 20.5%; Southern Highlands Petroleum Ltd., 17.61%; Mobile Exploration and Producing Pty. Ltd., 9.05%; Mount Isa Mines Ltd., 6.98%; BHP Petroleum (PNG) Inc., 5.33%; Merlin Pacific Petroleum Co., 2.66%; Cue Energy, 2.44%; Mineral Resources Development Co. (State of Papua New Guinea), 2.00%; and Mountains West Exploration Inc., 0.87%	Gobe Main Oilfield, Southern Highlands Province 2/	50

e/ Estimated.

1/ Closed since May 1989 because of civil unrest.

2/ Under development for probable 1998 commissioning.