

# HISTORICAL OVERVIEW OF MINING IN PNG

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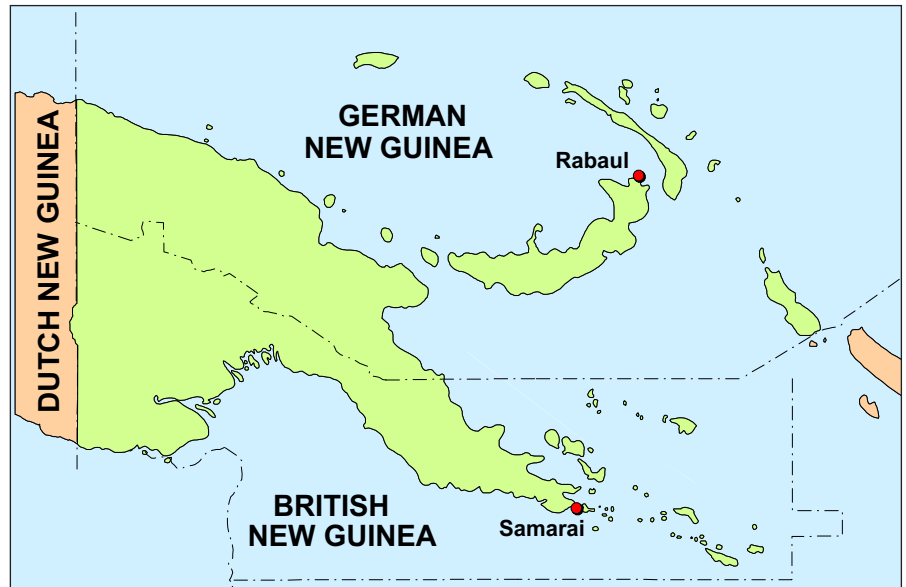
## *Melanesian Resources*

Papua New Guineans have been mining and manufacturing stone implements, harvesting oil seeps and using clay for pottery for about 40,000 years, however metals never became part of the indigenous culture. The first reported traces of gold were from pottery collected in Redscar Bay to the west of Port Moresby in 1852. An expedition to find the source of this gold in 1855 failed when the ship carrying the prospectors was wrecked on the Great Barrier Reef off the Queensland coast.

The 1800s was a period of rapid colonial expansion by European powers and in the Pacific this mainly involved Britain, Germany and France with the Netherlands active in southern Asia. In 1828, fearing British intentions, the western half of the island of New Guinea (west of 141° longitude) was claimed by the Governor of the Maluccas, Pieter Merkus, for the Netherlands (Dutch New Guinea). In 1875, the Netherlands Government defined its 1828 claim by fixing 140° 47' east as its eastern boundary.

Various proclamations by British officers taking possession of the eastern portion of New Guinea (Lieutenant C.B. Yule, at Cape Possession in 1846 and Captain Moresby at Hayter Island in 1873) were not acknowledged by the British Government. A claim in 1880 by the Marquis de Rays to the whole of New Guinea and adjacent islands outside the Dutch possession for his free colony of Nouvelle France received no international recognition. In 1883, Queensland, then a British colony, attempted to secure the territory of New Guinea outside the Dutch possession by proclaiming British sovereignty over the land between 141° and 155°. This action was repudiated by the British Government.

During 1884, Germany annexed the northern half of the eastern side of the island (German New Guinea) and this was quickly followed by Britain's



*Early colonies - circa 1885*

annexation of the remaining southern half of the island as the British Protectorate of New Guinea (British New Guinea). The boundary between the two possessions was finalised in April 1885.

The British proclamation contained an interesting statement "that all purchase of land from the natives by white men is absolutely prohibited". This was to have a long lasting impact on the development of the colony and ultimately on the Independent State of Papua New Guinea. This was, in fact, recognition of the indigenous land rights of the inhabitants of the possession and PNG remains almost unique in the developing world in that its indigenous people retain ownership of 97% of their original land. The other 3% is owned by the State. This simple statement in 1884 set the underlying premise for the drafting of all laws in the country, including laws relating to resources. The recognition of indigenous land rights in German New Guinea was introduced by the Australian administration in 1921 when the former German colony became a Mandated Territory under the League of Nations after the First World War.

The development of PNG as a nation is closely tied to the development of the

mining industry. It was the hope of discovering riches in unexplored lands that "opened up" much of the land interior. The miners and missionaries often went first and the administration and development followed. PNG has suffered the same "boom and bust" times in mining as experienced by many other countries. There have been periods of intense activity, driven by the hope of striking it rich in new lands and by changing commodity prices, followed by periods of little or no activity. The various phases of mining development, which have occurred during the past 120 years, are outlined below.

## **Pre-Colonisation**

Several expeditions occurred prior to colonisation. The most notable was a rush in 1878 to the Laloki River near Port Moresby following the discovery of flakes of gold by Andrew Goldie, a storekeeper and trader of Port Moresby. The rush soon failed due to the lack of gold and many of the miners died of malaria. In 1876 Luigi d'Albortis, together with aviation pioneer Lawrence Hargraves, navigated up the Fly River in a steam launch and found a speck of gold and a specimen of copper at the upper most point of their expedition in the lower Ok Tedi River above its ►

confluence with the Fly River (D'Albertis junction) about 90km directly south of the present day Ok Tedi mine.

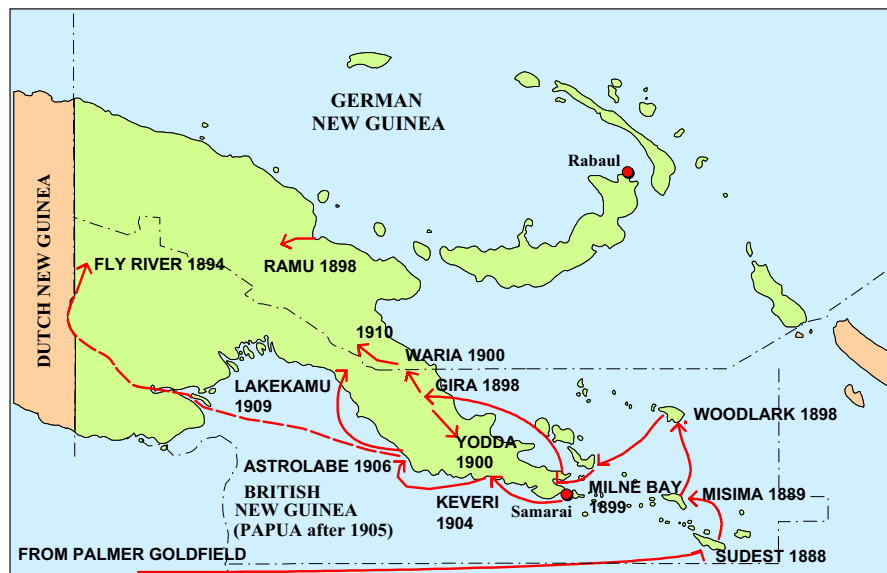
### 1887 to 1914

Most of the mining activity during this period was in British New Guinea later renamed Papua, as the British, then Australian administration from 1905, saw gold mining as a valuable source of revenue. The German administration (Neuguinea-Kompagnie) in German New Guinea was more focused on commercial agriculture and scientific endeavours than prospecting and as a result, there was little mining activity.

The first significant gold discovery in Papua was made on Sudest Island, Milne Bay in 1888 by David Whyte who returned to Cooktown in North Queensland with over 142oz. Gold on the Palmer goldfield to the west of Cooktown was getting hard to find and a rush to Sudest soon followed with 200 miners on the field by end of 1888 and 400 a year later. The gold on Sudest was easily won by ground sluicing however this required permanent supplies of water. The distinct wet and dry season on the island soon caused miners to seek riches elsewhere.

William McGregor (later Sir William), the British Administrator, used HMS Swinger to transport miners wanting to prospect on nearby islands and by 1889 gold had been found on Misima. In 1895, when word reached the miners on Misima Island that Lobb and Ede, traders and prospectors, had won a 'half billy can' of gold from a creek on Woodlark Island another gold rush ensued. The Murua goldfield was declared that year and by 1897, 400 miners were working, but that number soon dwindled to 160 by 1898 as the easy, shallow gold was worked out and malaria took its toll.

The miners then moved from the islands to the mainland and began to prospect the Papuan peninsular. By 1900, the Mambare, Gira, Yodda and Papua Waria fields had been discovered. The Gira field was the site of intense conflict between the miners and the local people and many miners were killed (and eaten). One famous story



*Pre-World War I discoveries*

from those times is still told in the area today. "We eat boots". The local people were not aware that a man's shoes were not part of his body and they smoked and cooked his boots until they consumed them.

As the fields became worked out or gold became difficult to find, the miners continued their search westward. Often syndicates, funded by local businessmen, would undertake expeditions into unexplored lands. Other times, well-off miners would sneak off to find a new field for themselves. At this time, the administration offered reward claims for the discovery of new fields and this was an important incentive for miners and financiers alike.

The westward exploration found the Keveri goldfield in 1904 but this field proved to be small. The Astrolabe mineral field (copper) was found in 1906 and by 1909 the Lakekamu goldfield had been found to the west of Port Moresby. The Lakekamu was the first major find since the Gira and a major rush followed. Dysentery and malaria killed many but the field was able to support a considerable number of miners even though the supply line was long and the costs were high. The first engagement between Australians and the Germans after the outbreak of World War 1 occurred near the British/German border on the Lakekamu field.

The administration in Papua viewed

these alluvial gold rushes as short term and transient and sought to develop a more permanent industry.

In 1893, the Caledonian reef was found at the western end of Sudest Island but was soon abandoned. In the same year the Mt Adelaide lode was discovered in the centre of the island and by 1896 the British New Guinea Gold Pty Ltd had commenced development of the first underground mining operation and installed a 10 head stamp battery. Ore crushing commenced in September 1897 however a cyclone in April 1899 caused permanent closure of the operations.

The hardrock source for the alluvial gold on Misima (Umuna Lode) was found in 1904 and a succession of syndicates and companies attempted mining of the lode but only a few of them were financially successful. Between 1910 and 1912, St Aignan Mining Company operated a cyanidation plant. Pacific Island Mines installed an eight mile railway line at the cost of £30,000 and in 1917, Block 10 Misima Gold Mines owned by BHP took over the operations and continued until 1921 when it closed and laid off 40 whites and 400 national labourers. This was the only operation to continue after the commencement of World War 1.

By the early 1900s, underground operations had also commenced on Woodlark Island (Kulumadau, followed ▶

by Boniavat and Busai) and at Laloki and Dubuna for copper on the Astrolabe mineral field.

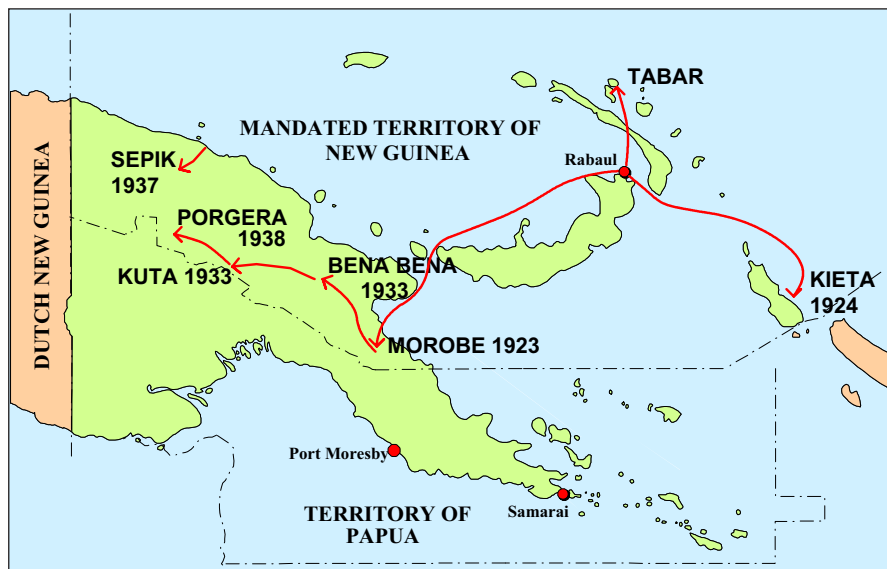
In German New Guinea, Earnest Tappenbeck discovered gold in the lower Ramu River in 1898 and a German syndicate worked gold in the Waria River from 1901 to 1904. Some Australian prospectors entered the Waria valley from Papua with the blessing of the German Administration, although this area was reserved for the Rudolf Wahlen syndicate. In 1910, a Canadian-Australian, Arthur Darling identified gold in what became the Morobe goldfield.

All mining operations in German New Guinea ceased during WWI and during the period of military administration (1914 to 1921).

### 1922 to 1942

Most of the mining activities during this period were focused in the Mandated Territory of New Guinea (former German New Guinea) at Wau and Bulolo although mining activities recommenced at Misima and Laloki (Papua) after the war. The New Guinea Administration, based in Rabaul, derived significant revenues from gold mining whereas Papua was poor by comparison.

Laloki, near Port Moresby, was the first post war mine to be developed. High grade copper ore was mined



*World War I to World War II discoveries*

underground, transported by overhead cableway then a tramway to a smelter at Bootless Bay. The mine operated from 1922 to 1926 when it closed due to operational difficulties. This mine was very important as it provided the only source of copper for Australia at the time apart from the Burra mine in South Australia. It is important to note that Mt Isa, which became Australia's major copper producer, was yet to be discovered.

At Misima, the Block 10 operation which closed in 1921 was purchased by the Massive Samarai Syndicate and between 1922 and 1928 produced about 13,000 ounces of gold. The

operation changed hands several times in the period to 1942 (New Misima Gold Mines, Misima Gold Mine, Cuthberts Misima Mines). All were profitable and returned good dividends to shareholders. On Sudest, underground mining resumed briefly in 1935 at Cornucopia near the old Mt Adelaide mine.

The end of military administration in 1921 and a new Mining Act for New Guinea in 1923 led to a rush of exploration activity in the Mandated Territory which had previously been closed to Australian prospectors.

Shark-eye Park relocated Arthur Darling's alluvial gold find in Koranga Creek near Wau in 1922 and worked it secretly until 1923 when the new Mining Act came into force. News of the discovery initiated the first small rush, however it was not until 1926 when rich alluvial gold was discovered at Edie Creek by William Royal and Dick Glasson that activities commenced in earnest. Within six months there were 500 expatriates and 1,500 labours on the field with some miners winning up to 240 ounces per day. Over 100,000oz was produced in the first year.

There was much controversy over the granting of the Edie Creek leases to the Big Six Syndicate formed by those connected to the initial discovery and a Royal Commission was established. The Commission found in favour of the Administration and the Big Six Syndicate retained their leases. Hardrock deposits at Edie Creek were ▶



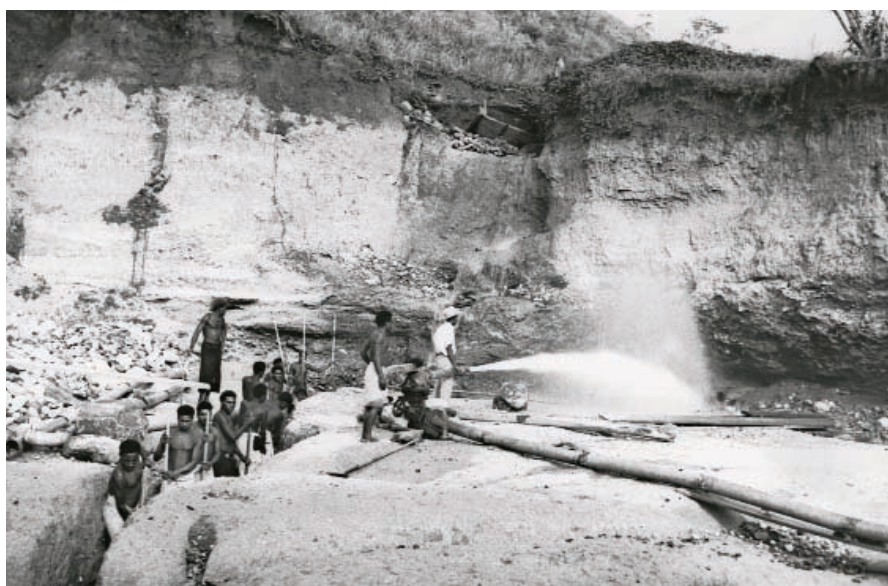
*Stamp battery used at Mt Adelaide mine, Sudest Island, 1897 - 1899*



*Hardrock mines 1930s to 1942*



*Big Six syndicate camp at Edie Creek, 1927*



*Sluicing on Chapman's claim at Bulolo, circa 1932*

discovered in 1927 and in the same year the Big Six Syndicate sold their leases to Ellyou Corporation (Leslie Urquart) of London for £500,000. Following the consolidation of many leases in the Wau-Edie Creek area, New Guinea Goldfields (NGG) was floated on the Australian Stock Exchange in 1928 to raise £4.5 million. This was the largest capital raising by any company to that time and was the start of mining company operations in New Guinea.

NGG developed an underground mine on the four main lodes at Edie Creek via five shafts (Edie 1-4 and Karuka). The main haulage shaft was No.4 which was 150m deep. Operations commenced on 1 January 1936 and ceased in 1941 due to a strike that resulted in flooding of the workings. Over 200,000 tonnes of ore with a head grade 11.7g/t Au and 257g/t Ag was treated using a 20 head stamp battery and batch cyanide tanks. 1,926kg of gold and 7,947kg of silver were recovered.

Underground and processing operations were also developed at Golden Ridges near Wau by NGG. A 14 kilometre road from Wau to Edie Creek was hand excavated and a 10 kilometre power line was installed to service the Edie Creek operations. This infrastructure is still in use today.

Cecil Levine, a former government patrol officer, recognised the dredging potential of the Bulolo flats which lay downstream of the Wau and Edie Creek deposits and floated Guinea Gold NL on the euphoria created by the Edie Creek discovery.

Guinea Gold optioned its properties to several groups before concluding a deal with Placer Development which at the time was newly listed on the Vancouver Stock Exchange. Bulolo Gold Dredging Pty Ltd (BGD) was established as the operating company and Bulolo became the first major mining project for Placer.

Eight section alised bucket line dredges, some of which weighed up to 4000 deadweight tonnes were flown from the coastal port of Lae to Bulolo by Junker Aircraft. This was a major logistical exercise and during 1930-1931 more airfreight was moved to Wau/Bulolo than in the rest of the world combined. At the time New Guinea was the world's major centre of aviation, a mode of ►

transport which was to become important to the exploration and development of the Territory as a whole as there were simply no roads anywhere. The other transportation alternative was walking.

Dredging operations commenced in 1932 and in the ten years to 1942, BGD produced 1.3 million ounces of gold. Peak production was achieved in 1940 when 185,000oz was recovered. The Bulolo operations were highly profitable and shareholders were well rewarded.

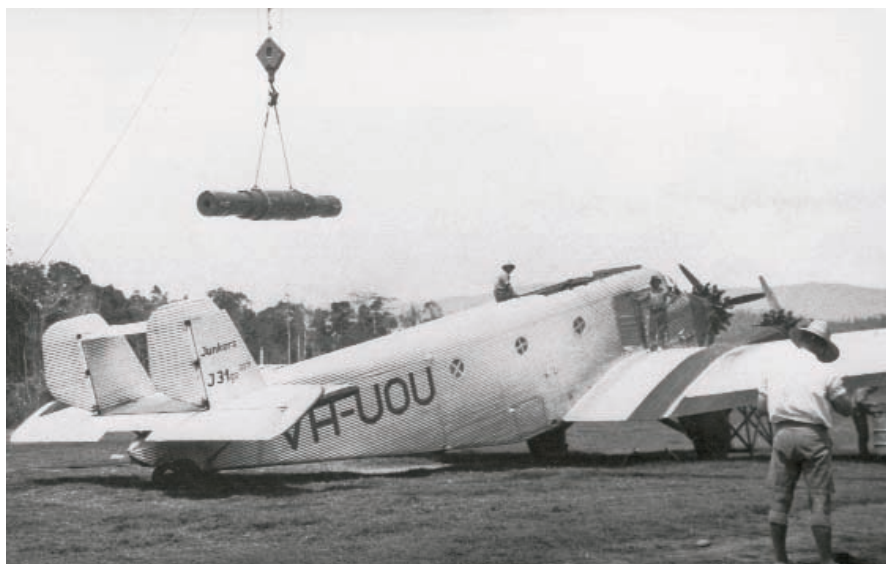
The entire Morobe goldfield reached its peak production in 1938 when 700 expatriates and 6,218 national labourers produced 404,000oz.

The significant mining activities in the Wau-Bulolo district prompted exploration into the unknown regions in the centre of the mainland. The Leahy Brothers patrol in 1933 to the highlands was the most famous. This expedition, which was part-sponsored by NGG, discovered gold at Bena Bena, near Kainantu in Eastern Highlands, and at Kuta in the Western Highlands. By 1937, gold had been found in the Sepik and a goldfield proclaimed.

Jim Taylor and John Black's Hagen-Sepik patrol in 1938-39 found "big rough edged flat colours in every dish" down stream of Porgera and Black noted that it was the "best prospect I have seen"[on this patrol]. There was to be no activity at Porgera to follow this up for another 10 years.

Exploration was also happening in the New Guinea islands. In 1924, gold was discovered at Kupei on Bougainville, and a small operation was developed which continued until the Japanese invasion in 1941. Gold was also found in the Tabar Group of islands although activity was small.

Operations at both Wau and Bulolo ceased in January 1942 when the Bulolo airstrip was bombed by the Japanese. All expatriate personnel were evacuated but the 3,000 or so national workers were abandoned and left to fend for themselves. Allied forces adopted a scorched earth policy and destroyed most of the infrastructure to prevent it falling into enemy hands. This policy seriously impaired the restart of



*Transporting dredge components by air, 1932*

operations after the war.

The Australian Government evacuated all the miners from Misima in 1942 due to the presence of Japanese forces in Lae and Salamaua. Nearly 700 national workers were stranded but were later rescued by missionaries and returned to their homes on other islands within Milne Bay.

At Laloki, a mining and sintering operation by Mandated Alluvials suffered the same destruction at the hands of the Allied Forces as did the Wau and Bulolo operations.

By mid 1942 all mining operations in Papua and in New Guinea were closed.

### 1948 to 1965

The rebuilding of mining operations after WWII was difficult because of the lack of supplies and equipment, manpower shortages and of course, the scorched earth policy adopted by the Allied Forces. Only the major mines at Wau and Bulolo were reconstructed after the war. The fighting ended the many small and medium scale mining operations which were scattered throughout the country.

BDG was the first to get operational after the war. The first dredges began operating again in 1948 with the last rebuilt dredge being recommissioned in 1951. The rebuilding effort was assisted by compensation received from the Australian Government for the damages

caused by the war.

Placer concluded in 1950 that dredging would cease in about 15 years and undertook vigorous exploration throughout the country. It prospected Porgera in 1948 but concluded that the country was unsuitable for dredging and evaluated the Lakekamu and many other locations without locating suitable dredging ground.

The dredging operations at Wau-Bulolo finally ceased in 1966. Prior to the closure of the mining operations, BGD in partnership with the Australian Government commenced a major plywood and timber operation which survives to this day as PNG Forest Products. This provided a sustainable outcome for the community in Bulolo which were affected by the closure of the mining operations.

NGG at Wau was much slower to rebuild their operations and was not fully operational until 1949. The Edie Creek plant, which was not destroyed during the war, was relocated to Wau. The war provided a road from Lae to Bulolo and Wau and road transport became the major method of supply so the use of aircraft for the transport of equipment declined greatly. The great aviation era was over. Underground mining was the main stay of the operations at Wau until the 1960s when open cut mining was commenced.

In 1948, Joe Searson applied for dredging and sluicing claims at Porgera ▶

and commenced alluvial mining. Gold was discovered at Kumbruf near Simbai in Madang Province in 1954 by a government patrol and worked in a small way until the late 1960s.

Several attempts were made to reopen Misima operations between 1945 and 1949 but all were short lived and unsuccessful. CRA looked at Misima in 1949 but decided it was not of interest at the time. Small developments were undertaken in the Kainantu district during the 1960s at Mt Victor/Clarkes Ridge and Kathnell.

By 1966, the only operating mine in the country was the NGG operations at Wau.

### 1966 to 1979

The first phase of modern exploration commenced in the late 1960s with the Australian Bureau of Mineral Resources (BMR) promoting exploration and initiating regional geological surveys. Many international companies began major regional exploration programs at the same time. One of the first was the CRAEstar program undertaken by CRA.

Concurrently with the company exploration efforts, the Government was conducting regional mapping and producing the first of the 250,000

geological sheets. Many a government geologist received free beers from the company geologists to get that latest information from the bush. This first phase of exploration was focused mostly on base metals (porphyry copper, nickel, etc) and resulted in the discovery of copper porphyries at Yandera in the Madang Province (1962), Panguna on Bougainville (1964), Frieda (1967), Wanum (1967), Ok Tedi (1968), and nickel at Marum (Ramu) (1962), Wowo Gap and Lake Trist, and chromite at Morobe.

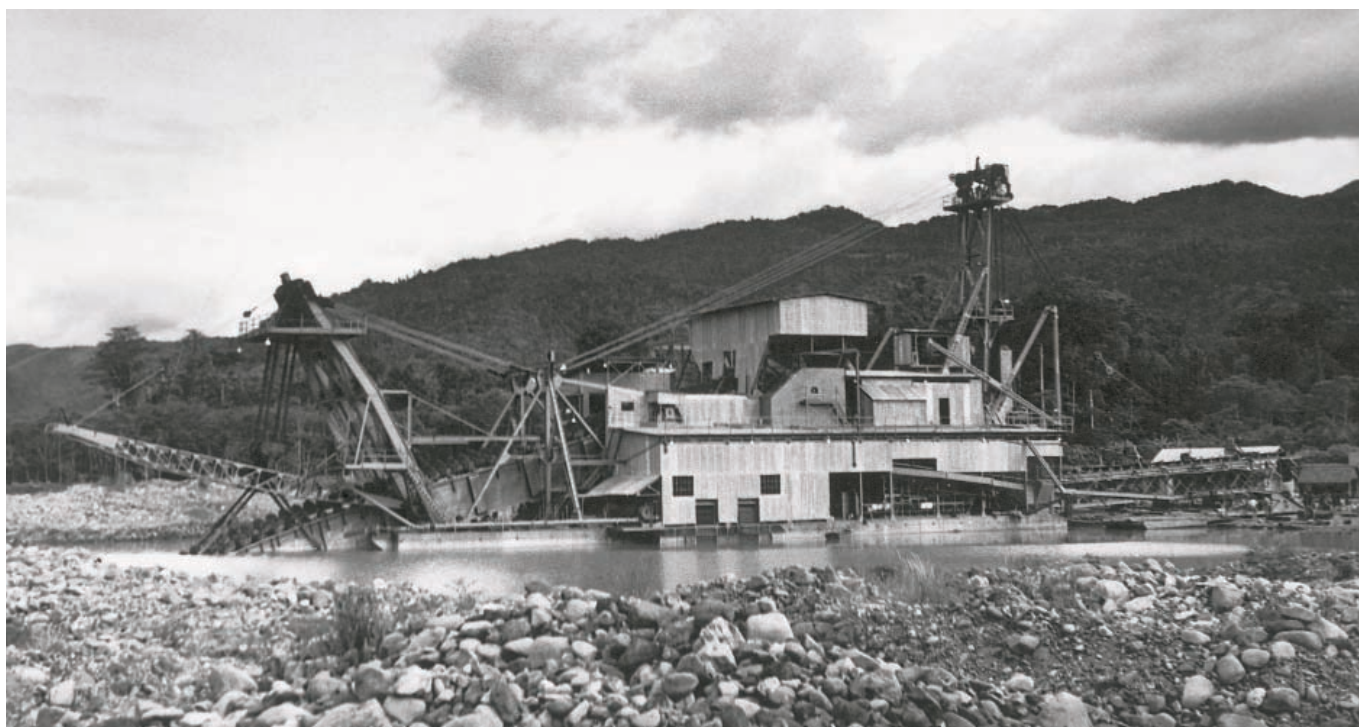
Panguna was brought into production in 1972 in the period leading up to Independence and was associated with a growing level of nationalism. This was the first new mine developed in New Guinea for 40 years. The large profits generated by the Panguna mine for Bougainville Copper, in which the Government held a 20% equity interest, caused mistrust by the Government and resulted in the imposition of an excess profits tax in 1974. This changing of the "goal posts" frightened many of the international mining companies as many were still recovering from nationalisation of their copper assets in Chile. In 1975, Kennecott withdrew from PNG when it failed to reach agreement with the new PNG Government on the development of Ok



*Dredge bucket line, circa 1960*

Tedi and an air of uncertainty descended on the mining sector. In October 1976, BHP farmed into the Ok Tedi project and completed a two year feasibility study in 1979.

At Porgera, Searson approached several companies during the 1960s to test the hardrock potential. CRA looked in 1964 and Mt Isa Mines (MIM) showed interest in 1967 and then pegged the area surrounding Searson. Searson ▶



*No.5 dredge in operation, 1960*

reached agreement with Anaconda in 1969 to drive two adits then sold out to MIM in 1971 and drill testing of the Waruwari hardrock resource commenced. In 1975, Placer entered into a joint venture with MIM and continued drilling. NGG (later to become Renison Goldfields Consolidated known as RGC) joined the joint venture in 1979 and brought funds and metallurgical expertise to the now three-way joint venture (one third each). The State had an option to acquire at sunk cost up to 10% of the project if developed.

At Frieda, MIM explored and drilled the porphyry copper system and by 1979 had located the higher grade Nena mineralisation.

In the islands, there was intermittent exploration on Woodlark Island. CRA explored for gold from 1967 to 1971 then withdrew and BHP commenced exploration in 1978 and from 1981 continued under a joint venture with Nord Resources. At Misima, various groups explored for porphyry copper style mineralisation up to the early 1970s. In 1976, Peter Macnab acquired a licence over the area of the Umuna Lode and in 1977 farmed out the property to Placer (PNG) Pty Ltd which carried out intensive drilling of the Umuna Lode for the next 10 years.

By the end of the 1970s, exploration was at a low ebb. Most operators were conducting programs just to maintain their properties. The NGG mine at Wau was struggling however Bougainville Copper's operation at Panguna was performing well. The feasibility study on Ok Tedi had been completed and was being reviewed. The industry was marking time.

## 1980 to 1991

When gold prices increased significantly in 1980, international miners once again focused their attention on PNG based mostly on the country's past gold production and its perceived high prospectivity. This confidence was to be well rewarded. The second phase of modern exploration had started.

In 1980, Esso (PNG) Inc. applied for vast exploration areas throughout the country, which overwhelmed the

Department of Minerals and Energy and resulted in a moratorium on new applications. When the moratorium was lifted in November 1982, new applications flooded in from international companies such as the Niugini Mining/Kennecott joint venture, CRA, and RGC, as well as from junior companies. The new gold rush had begun.

Much of the sampling conducted during the 1970s did not include gold; so the race was on to find the obvious deposits based on newly developed geological models. This was a period of extensive grass roots exploration and discovery.

New deposits were found at Zone VII-Porgera (1982), Lihir (1983), Wapolu (1983), Wild Dog (1984), Tolukuma (1985), Kerimenge, Hamata (1986), Wafi - gold (1986), Hidden Valley (1987), Mt Kare (1988), Simberi, and Golpu - copper (1990) - see map on page 2.

A significant number of mine developments also occurred during this period. First off the rank was Ok Tedi followed by Upper Ridges at Wau, Mt Victor near Kainantu, Misima and finally Porgera. Unfortunately during the same period, Panguna was forced to close due to civil unrest. Mt Victor and Upper Ridges both closed in 1990 when reserves were exhausted.

Construction of the massive Ok Tedi project commenced in 1981 with the development of the gold circuit which began production in 1984. Copper production commenced in 1987. This was a mammoth engineering feat as Ok Tedi is located in the headwaters of the Fly River, 800km from the coast in an area which receives some of the world's highest rainfall.

The discovery of the rich Zone VII at Porgera in late 1982 finally changed the economics of this project after more than 10 years of work. A development proposal was put to the Government in 1988, the Special Mining Lease was issued in May 1989 and construction commenced in June 1989. By 1990, underground mining of Zone VII had commenced and in the following year produced over 1.2 million ounces. In 1994, the operation was ramped

up with the commencement of open pit mining.

The lifting of the moratorium in 1982 allowed the Kennecott/Niugini Mining joint venture to apply for an exploration licence covering Lihir which they had earlier investigated while assessing the Tabar Group to the north-west in joint venture with Nord Resources.

Lihir was a new style of deposit for PNG and enthusiasm was high for the success of this world class deposit. Sampling and drilling to 1985 delineated the Coastal and Lienetz zones, however the initial feasibility study on these zones, which were geothermally hot and refractory and required a high strip ratio, showed mining was not viable. Continued exploration identified the Minifie zone which had higher gold grades, better metallurgy, lower geothermal temperatures and lower strip ratio. By the end of 1989, a massive drill out of these zones had been completed and in 1992 a new positive feasibility study was produced.

Activities continued at Frieda and in 1979, CRA and Norddeutsche Affinerie joined the venture, and two separate feasibility studies were completed in 1981 and 1985.

RGC purchased NGG in 1982 and began detailed evaluation of the Wau district tenements as well as a regional reconnaissance which led to the discovery of the Kerimenge deposit in 1983 and the Hamata deposit in 1987. At the same time, CRA began evaluation of the region to the south of RGC's Wau holdings and discovered the Hidden Valley deposit in 1985.

RGC continued to mine oxide ore from the Wau mine until July 1985 while constructing a new Upper Ridges CIP mill which was commissioned in January 1986. The Wau mine closed in 1990 after 63 years of operation and all plant and machinery sold.

Exploration by RGC in the Kainantu area identified a number of interesting prospects including Arakompa, however RGC's focus on the Porgera development led to these properties being farmed out to Highlands Gold in 1989. Landowner disputes delayed ▶



*Upper Ridges mine at Wau, 1987*

further exploration until 1993.

Newmont discovered Tolukuma during a helicopter-supported regional reconnaissance geochemical survey in 1985 and soon commenced drilling. This was the first new gold discovery in Papua since the discovery of Lakekamu in 1909.

Wafi was first located in 1979 but not drilled until 1984. By 1986 the testing indicated low grade, refractory gold and this lack of success led CRA to joint venture the project to Elders Resources in 1988. Elders commenced a major drilling program and by late 1990 located the adjacent rich Golpu copper-gold porphyry system as well as significantly expanding the Wafi gold resources. In 1991, a takeover of Elders by Carter Holt Harvey saw CRA purchase Elder's 45% stake and regain 100% ownership.

Esso's exploration efforts identified many new prospects but did not lead to any developments and in 1996, Esso sold its exploration tenements to City Resources which continued active exploration until 1990.

One of the major 20th century gold rushes occurred in 1988 with the discovery of rich alluvial gold at Mt Kare. The area, located by CRA, quickly became a confusion of brown bodies in a sea of black mud with nearly 5,000 local people extracting masses of alluvial gold. Over 250,000oz is estimated to have been won in the first year and about one million ounces by 1991. Mt Kare displayed all the features of a modern-day gold rush. Helicopters ferried goods in and the miners and their gold out. Fortunes were made and lost by the age-old gold field methods of gambling, women and grog.

CRA continued exploration during the gold rush, and reached an agreement with the Government to develop a helicopter-supported, mechanised alluvial gold mining operation. In 1991, a group of armed combatants entered the CRA operation at night and burnt part of the camp and other facilities. CRA activities ceased, and by 1993 the company had relinquished its rights to the exploration and alluvial mining tenements.

Niugini Mining commissioned the small Mt Victor mine in 1987, however reserves were soon exhausted and the mine closed in February 1990.

The prospect of copper exports doubling from 1987 when Ok Tedi came on stream was never realised as the production from Panguna ceased in 1989 simultaneously with the growing production from Ok Tedi. Gold production made its greatest growth since the 1930s with the development of Misima and Porgera and the shorter lived Upper Ridges and Mt Victor mines.

The ten or so years between 1980 and 1991 saw a rapid expansion of the mining sector with new mines brought on stream, feasibility studies completed, extensive coverage of the country with grassroots exploration for gold, and identification of many prospects. The platform for continued growth and expansion was set, however the closure of the Panguna mine due to civil unrest dulled this bright future.

### 1991 to 2002

The stock market crash in November 1987 dramatically reduced the availability of funds for exploration, however this took a number of years to flow through to the PNG exploration scene. By the early 1990s, grassroots exploration was in decline and this was to remain the case for the next 10 years. The focus of companies moved from grassroots exploration to delineating prospects which had been located in the 1970s and 1980s.

In 1992, BHP was still conducting grassroots exploration programs and identified and drill tested a new porphyry copper-gold system at Mt Bini. This was a late discovery in the ►



history of porphyry systems in PNG and demonstrates that large systems remain to be discovered.

In early 1993, Newmont determined that Tolukuma did not fit its project target size and had access road difficulties and sold the property to Dome Resources. Dome Resources continued drilling and by late 1993 upgraded the measured resources to 440,000 tonnes at 17g/t Au and 46g/t Ag (250,000oz gold equivalent) and sought development approval. The approval process was difficult as Tolukuma was the first new medium scale, greenfields mine development since independence and some government departments had difficulties in adjusting to the differences between this project and large scale developments.

Construction began in May 1995 and processing of ore commenced in December 1995. No road link was built to service the operations and the mine is totally helicopter supported. It commenced initially as an open pit operation and then moved to underground extraction of ore as strip ratios increased. In mid 2000, Durban Roodepoort Deep Ltd acquired Dome Resources and commenced a re-evaluation of the property and the mining methods. A new underground mining method was introduced in 2002 and production is now being sustained at 7000oz per month.

At Lihir, the completion of a positive feasibility study in 1992 launched the project on the development track. Special Mining Lease 6 was issued by the Government in March 1995 and in September 1995 Lihir Gold Ltd was publicly floated to raise A\$450 million for development capital. Construction commenced in 1996 and the first gold was poured in 1997. Annual production from the mine has averaged about 600,000oz.

Tolukuma and Lihir were both discoveries of the 1980s gold boom and were explored, developed and in production within 10 years and 15 years respectively. These achievements demonstrate that mines of different size and capital requirements can be brought on stream in PNG even when the



*Lihir mine process plant and open pit*

financial environment for exploration is difficult.

Operations at the other producing mines continued unabated although some were impacted by external forces. At Misima, mining continued until exhaustion of the open pit reserves in 2002 when treatment of low grade stockpiles commenced. The operation closed in May 2004 when all economic ore was exhausted. At Ok Tedi, drought caused by the El Nino event during 1997, resulted in temporary closure due to low river flows. Ok Tedi's largest shareholder, BHP Billiton, exited the project in 2002 over concerns of environmental damage to the Fly River system. Its 52% interest passed to the PNG Sustainable Development Program Company which has a wide mandate to promote the development of PNG. Porgera was the first mine to reach an annual production of one million ounces which was achieved from 1991-4. The open pit operations were continually expanded but the underground operation was closed in 1997. It was re-opened in 2001 to exploit newly delineated reserves. The Porgera operations were also disrupted by the El Nino drought of 1997 and processing of ore was disrupted for a period of about four weeks.

MIM reorganised its exploration and mining holdings in 1989 and established Highlands Gold Ltd as its PNG operating company. In 1992,

Highlands Gold was publicly listed and MIM exited PNG. Highlands Gold intensified its exploration efforts and in 1997 announced a measured resource for Nena (at Frieda) and the commencement of a bankable feasibility study on the combined Nena and Ivaal porphyry properties. In the same year, Placer Dome made an unsolicited takeover of Highlands Gold to increase its equity in the Porgera Mine (Highlands Gold owned 30% of Porgera). Placer Dome agreed to assign the non-Porgera assets of Highlands Gold to Highlands Pacific Ltd (HPL) which floated on the Australian Stock Exchange with the help of local institutions.

In 1998, HPL reached agreement with Cyprus Amax USA to re-evaluate the Frieda porphyries, however in late 1999 Cyprus was taken over by Phelps Dodge who elected not to explore in PNG and Frieda reverted to HPL. In 2002, Noranda farmed into Frieda and commenced drilling of the Trukai prospect which encountered several drill intercepts of 100m grading greater than 1% copper.

HPL commenced detailed evaluation of the Ramu nickel project which resulted in a positive feasibility study in 2000 for the development of a strip mine and processing plant for the production of nickel metal and cobalt. The proposed development differs from previous projects as the beneficiated ore would be ►

transported by a long slurry pipeline from the inland mine site to a processing plant on the coast southeast of Madang. Financing the US\$838 million development remains the main challenge for this project.

HPL also commenced evaluation of the Kainantu area in 1998 after resolution of access problems. Irumafimpa (now known as Kainantu gold project) emerged as a major target along strike of the old Kora mine, however due to HPL's focus on the Ramu project little activity occurred until about 2000 when detailed evaluation and feasibility commenced. By 2002, a development proposal was with the Government and development financing was being arranged. The scene was being set for a new mine development.

After the withdrawal of CRA from Mt Kare, competition for the exploration licence over the area was intense and only resolved by a ballot which was won by Carpenters Pacific Resources. Ramsgate Resources, however, laid claim as a result of landowner dealings and the matter was finally resolved with the formation of the Matu Mining joint venture (Carpenters 66.6% and Ramsgate 33.3%). In mid 1996, Madison Enterprises entered into a joint venture with Matu to acquire 65% by the expenditure of US\$8 million over five years. Later, a restructure of the equities in the property resulted in Madison holding a 90% interest and landowners a 10% interest. Madison continued exploration and outlined a significant resource.

Exploration in the Wau district saw some of the most dramatic changes during this period. The adjoining properties held by RGC and CRA, which collectively contained over five million ounces in the Hidden Valley, Hamata and Kerimenge deposits, were put on the market. These properties were acquired by Australian Goldfields and an intensive phase of exploration and feasibility studies commenced. Unfortunately, Australian Goldfields speculated the in-ground reserves on the silver future market and went into receivership. Aurora Gold NL, together with Commonwealth Development Corporation (CDC), formed Morobe Consolidated Goldfields Ltd (MCG)



*Small scale hardrock mining at Mt Kare, 2002*

and acquired the properties in 2001 but the shareholding in Aurora held by CRA and later the Guinness Peat Group clouded Aurora's future and that of the PNG properties. This was to finally be resolved in 2003.

Between 1996 and 2002, CRA commenced the drill out of the Golpu high grade porphyry copper and conducted limited drilling on Wafi which identified further gold mineralisation at depth and expanded the gold potential of the property. In 2002, Aurora Gold agreed to acquire the property from CRA.

During 2002, the Government sold off its holding in listed Orogen Minerals Ltd when Oil Search Ltd made a takeover offer for the company and as a result Oil Search became a 20% shareholder in Porgera and Misima.

The Busang gold exploration fraud in Indonesia in 1997 brought exploration worldwide to an abrupt halt. Risk capital moved to the Dot-Com sector and by 2001-2002, PNG was experiencing its lowest level of exploration applications since the late 1970s.

### **2003 Forward: The New Dawn**

The depressed state of exploration and realisation that most of the present

operations, excluding Lihir, would close within ten years prompted the Government to review the fiscal regime for mining in an attempt to attract a share of the scarce international exploration dollar. The outcome of these changes moved PNG from being an unattractive fiscal location in which to explore to being in the top quartile of fiscally attractive countries for mining. These changes together with the high prospectivity of PNG initiated a turn around in the exploration applications in 2003. An increase in metal prices in late 2003 saw further increases in exploration licence applications and increasing interest by international mining companies. The Government's initiatives were having the desired effect. A new era of mining development was beginning to manifest itself.

By the end of 2003, all approvals for the HPL Kainantu Gold were in place and construction of the 100,000oz per year operation commenced. The 15 month construction period should see production from Kainantu by mid 2005 and this will be the first new mine development in 10 years.

During 2003, the uncertainty of the Aurora share registry was resolved when Abelle Ltd, with the support of Harmony Gold of South Africa, acquired Aurora's interest in MGC and

also that of CDC. During 2004 Harmony acquired 100% ownership of Abelle. MCG completed the final feasibility on the Hidden Valley/Hamata project in early 2004 and lodged an application for a Mining Lease with the Government which is currently being reviewed. Construction is expected to commence first quarter 2005.

Harmony also committed to a major drill out and feasibility studies on the Wafi and Golpu projects with the view to making development decisions during 2005.

The Ramu Project advanced toward development with the signing of a Heads of Agreement with China Metallurgical Construction Corporation (MCC). MCC will acquire an 85% interest by free carrying the PNG interests (Highlands 8.56%, MRDC 3.94% and the Landowners 2.5%) to commercial production. Development agreements are yet to be finalised.

Oil Search sold its 20% interest in Porgera by public tender to Durban

Roodepoort Deep (DRD) of South Africa in late 2003 and DRD became a major player with interests in two mines.

The increase in metal prices also improved the development opportunity for a number of smaller projects. Nord Resources announced plans to develop its oxide gold reserves on Simberi and New Guinea Goldfields announced plans to sequentially develop Sinivit, Imwauna and Weioko deposits by heap leach process.

Continued exploration at Porgera has increased reserves and extended the mine life by several years and geological and technical innovations at Lihir have seen significant improvement in this challenging project. In April 2003, Lihir commissioned a six megawatt (MW) geothermal power station and soon after approved the construction of a further 30MW station which is due for completion in early 2005. The combined 36MW will meet 60% of Lihir's power needs from an environmentally sustainable energy source.

The timely changes to the fiscal regime by the Government, the high prospectivity of the country for world class deposits, the increases in commodity prices and the ability of the PNG system to facilitate mining developments through community consultation have focused international interest on PNG once again. The stock of prospects located during the major grassroots programs of the 1980s are rapidly moving to development or are under construction. A new wave of grassroots exploration is beginning and new discoveries will be made. Technical innovation and new geological models and ideas will see the life of mines extended. The significant contribution made by mining to the economy of PNG now seems certain to continue well into the future.

This new dawn should see a bright future for the industry but we need to be ever mindful of our history and vigilant as to the requirements of the international market. For as sure as there is a new dawn there will be a dusk and our challenge is to keep the sun shining as long as we can. ■