SUPPLIES, MINING & EXPLORATION

SOUTH AFRICA

Supplies of platinum from South Africa expanded by 9 per cent to 5.03 million oz in 2004, an increase of 400,000 oz over the previous year. A substantial proportion of this growth came from Anglo Platinum, which met its target for platinum production of 2.45 million oz despite a 13-day strike. Impala Platinum also overcame the impact of industrial action, increasing output from its lease area and benefiting from the start-up of the Marula mine. Sales by other producers also climbed, with the exception of Northam, which lost 6 weeks of production following a serious fire. Shipments of palladium grew in line with those of platinum, rising 8 per cent to 2.50 million oz, while those of rhodium were also up 8 per cent at 587,000 oz.

Anglo Platinum

Additional production from its newer operations helped lift platinum output from Anglo Platinum to 2.45 million oz in 2004, up from 2.31 million oz the previous year. The new western limb tailings retreatment plant, the Rustenburg UG2 project, and the Modikwa joint venture together added over 150,000 oz of refined platinum last year; the company also received a one-off benefit of 91,000 oz from the clean-up of residues at the Waterval Smelter following the commissioning of the ACP converter plant. However, production at some of the established mines declined, partly due to a 13-day strike in October.

PGM Supplies: South Africa
'000 oz

	2003	2004
Platinum	4,630	5,030
Palladium	2,320	2,500
Rhodium	544	587

At Rustenburg Section, production from the Merensky Reef continued to fall; the milling rate in 2004 was 5.76 million tonnes of ore, a decline of 11.5 per cent compared with the previous year. However, equivalent refined platinum output fell by only 4.5 per cent to 545,000 oz, reflecting an increase in grades. Over the last two years the quantity of Merensky Reef mined and processed at Rustenburg has decreased by over 1.1 million tonnes, reflecting the depletion of ore reserves accessible from existing shaft systems. The company is currently reviewing a number of options to enable it to maximise future production from the Merensky Reef.

Declining Merensky production at Rustenburg has been greatly offset by the increase in output from the Rustenburg UG2 project, which is currently in its ramp-up phase. In 2004, this operation processed 6.51 million tonnes of ore, yielding 319,000 oz of platinum. A phase II expansion is planned; originally, this would have added 400,000 tonnes per month (tpm) of milling capacity but has been scaled back to 255,000 tpm.

The Amandelbult mine produced 592,000 oz of platinum last year, a decline of 8 per cent compared with 2003. Production was affected by difficult geological conditions at Number 2 shaft, while opencast output decreased in line with the depletion of near-surface reserves; in addition, some 23,000 oz of platinum were lost as a result of the strike. At Union Section, lower production from opencast workings was largely offset by the processing of old tailings and additional output from new UG2 declines.

Drilling underground at Norilsk Nickel's Oktyabrsky mine on the Taimyr Peninsula, Siberia, source of more than half of the company's annual pgm production.

Other operations reported increases in refined production. The biggest single contributor to last year's expansion in platinum output was the new western Bushveld tailings reprocessing operation, which milled 4.35 million tonnes yielding over 66,000 oz of platinum. Elsewhere, output at PPRust was up 4 per cent at 200,000 oz, while Lebowa saw a 13 per cent rise to 119,000 oz (of which some 4,000 oz came from trial mining at the nearby Twickenham project). There were also small gains at BRPM, as open pit tonnage was replaced by increased production from underground, and a boost in output at the Modikwa joint venture with ARM.

Impala Platinum

In 2004, refined production of platinum from the Impala lease area totalled 1.09 million oz, an increase of 5 per cent. Although the company lost 10 days of production and an estimated 44,000 oz of platinum due to a wage strike in October 2004, this was more than offset by higher rates of ore extraction and processing during the rest of the year. A total of 15.5 million tonnes of ore were processed in 2004, up 2.5 per cent, while a new tailings scavenging plant contributed to higher recoveries.

Impala's intention is to maintain platinum

production from its core lease area at a minimum of 1 million oz in future. To achieve this, it will need to construct two new shafts, in addition to its current programme of developing declines from existing mining infrastructure. In September 2004, the board of directors approved capital spending of R6.6 billion on the construction of the new shafts, which are expected to enter production in 2009 and 2012.

Impala's Marula mine on the eastern Bushveld had a difficult first year of operation. Production of 1.03 million tonnes of ore milled, yielding around 30,000 oz of platinum in concentrate, was below plan. In addition, it became apparent that the chosen mining method (mechanised bord and pillar) was not appropriate for the ore body, which dips relatively steeply in the shallower parts of the Marula lease, and also has an unexpectedly high incidence of 'rolling reef' (areas in which the reef undulates). As a result, Impala has decided to spend an additional R830 million on converting the operation to conventional labour-intensive mining methods over a period of about five years. The mine's output at full capacity is now expected to be in the region of 135,000 oz platinum per annum.

Impala Platinum also has a 45 per cent stake in the Two Rivers joint venture with ARM Platinum *(see separate section)* as well as an 84.5 per cent interest in Zimplats and a 50 per cent stake in Mimosa in Zimbabwe.

Production at Anglo Platinum's new smelter at Polokwane continued to build during 2004.

Lonmin

Sales of platinum by Lonmin totalled 943,000 oz in its financial year to September 2004, an increase of 4.5 per cent. Palladium shipments were almost unchanged at 406,000 oz, while rhodium supplies fell slightly to 127,000 oz.

The tonnage of underground ore mined by Lonmin declined in 2004 but this was more than offset by a sharp increase in the quantity of ore sourced from open pits. Refined production of platinum totalled 918,000 oz, of which 5,000 oz came from the processing of old residue ponds. The treatment of these residues, which has added over 30,000 oz to refined platinum production over the last two years, has now been completed.

Production at Lonmin's Number 1 smelter recommenced in early 2004, following an explosion in December 2002. However, in November 2004 a second serious incident took place when cooling water leaked into the furnace, causing a steam explosion. Although the smelter was out of action for approximately two months, Lonmin was able to treat much of its concentrate output via its old Pyromet furnaces, while sending the remaining material to Impala for toll-refining. The outage consequently had little impact on refined pgm production, and the smelter was recommissioned in January 2005.

In March 2005 Lonmin made a recommended cash offer for Southern Platinum, which has a 91.5 per cent stake in Messina Platinum. Lonmin also reached an agreement with Impala to buy out the latter's concentrate purchase agreement with Messina for $15 million plus the delivery of a fixed quantity of pgm concentrate until mid-2006.

Lonmin's intention is to raise production at Messina's Voerspoed section to 75,000 oz of platinum by 2007. It will also review a feasibility study already conducted by Southern Platinum into a new mine on the Doornvlei and Dwaalkop sections, producing up to 150,000 oz platinum annually.

Northam Platinum

On the 20th of September 2004, nine employees lost their lives in a fire at Northam Platinum. As a result, the mine was closed for three weeks and production was affected for several more. In total, approximately six weeks of output were lost.

As a result of the fire, mill throughput in 2004 fell by 12.5 per cent to 2.01 million tonnes, while production of platinum in concentrate was down by a similar percentage to 191,000 oz. However, a release of metal from the refining pipeline enabled the company to achieve platinum sales of 198,000 oz, a decline of only 7.5 per cent. Shipments of palladium and rhodium were 93,000 oz and 23,000 oz respectively.

There is currently little prospect of any significant expansion in output at the Northam mine, where sustainable platinum output is thought to be around 200,000 oz per annum. However, the company is expected to acquire Mvelaphanda's 50 per cent share in the Booysendal joint venture with Anglo Platinum. Under this agreement, Mvelaphanda will increase its shareholding in Northam Platinum to 34 per cent. The principal conditions required for this transaction to proceed, including the granting of prospecting licences, have now been fulfilled.

Aquarius Platinum

In 2004, there was in increase in pgm output from both of Aquarius Platinum's operations in South Africa. At Kroondal, mill throughput rose by 12 per cent to 3.34 million tonnes of ore yielding 155,000 oz of platinum in concentrate, an increase of 17 per cent on the previous year. Palladium output increased by 22 per cent to 75,000 oz, while rhodium production totalled 28,000 oz. Under the Pool and Share Agreement (PSA) with Anglo Platinum, which came into operation in November 2003, the value of pgm production was split equally between the partners. However, in 2004 all pgm concentrate produced at Kroondal was refined by Impala under a pre-existing concentrate purchase agreement.

Under the PSA, capacity at Kroondal is set to double; a new 250,000 tpm concentrator has been constructed and when operating at full capacity this will raise the mine's annual refined platinum output to 280,000 oz per annum. Expansion of the underground mine is underway, involving the construction of a third decline shaft and the extension of underground workings at the existing Central and East shafts.

A new 250,000 tpm concentrator was constructed at Aquarius Platinum's Kroondal operation last year as part of the company's Pool and Share Agreement with Anglo Platinum.

Commissioning of the concentrator was completed in late March 2005, and throughput is expected to build up to planned levels by June. All concentrate production from the new plant will be purchased and refined by Anglo Platinum.

The Marikana mine had a more difficult year. Although production of platinum in concentrate increased by 9 per cent to 55,000 oz in 2004, the mine's performance fell short of expectations. Early in the year, operations were affected by heavy rainfall, which resulted in the loss of 23 days of production. In certain areas of the pit sulphide ore was found to be either exceptionally difficult to process or it was more oxidised than anticipated. As a result, recoveries were disappointing, falling below 50 per cent for much of the year, although some improvement was seen during the final quarter.

In response to these difficulties, Aquarius revised the mine plan in order to accelerate the development of production from deeper, competent ore. Trial underground mining from a decline through the pit high wall was due to start in the first quarter of 2005, and if successful, underground production may be increased to 50,000 tonnes per month.

Aquarius' BEE transaction was completed in October 2004, following the approval of the deal by the company's shareholders and the finalisation of funding arrangements by its BEE partner, the Savannah Consortium. The latter injected R860 million into Aquarius in return for a 29.5 per cent equity stake in the company's South African subsidiary, Aquarius Platinum South Africa (Pty) Limited. Following the receipt of this funding, Aquarius commenced development of its third South African platinum mine, at Everest South. This operation is due to enter production in 2006, producing an average 225,000 oz pgm per annum over the life of the mine.

In addition to its South African interests, Aquarius holds a 50 per cent stake in ZCE Platinum, which operates the Mimosa mine in Zimbabwe *(see Zimbabwe section)*.

ARM Platinum

ARM Platinum has interests in two pgm-producing mines in South Africa: the Modikwa joint venture with Anglo Platinum, and the Nkomati base metals mine that produces pgm as by-products. In 2004, output at Modikwa increased by 25 per cent to 114,000 oz of platinum, although production remained below planned levels due to poor geological conditions and difficulties in employee relations.

ARM Platinum's Nkomati nickel mine currently exploits a high-grade, massive sulphide orebody from which it produces about 5,000 tonnes of nickel and 30,000 oz of pgm annually. In February 2005 it was announced that the Australian company LionOre Mining International was to take a 50 per cent stake in the operation. The joint venture partners are investigating a major expansion that would exploit a larger, low-grade disseminated ore body. If this were to proceed it could lift annual production to around 16,500 tonnes of nickel and 100,000 oz pgm.

ARM Platinum also holds a 55 per cent interest in the Two Rivers joint venture with Impala Platinum. The boards of both companies have approved the project, and development will proceed upon completion of financing arrangements. At full production the mine is expected to produce 110,000 oz of platinum per year.

Southern Platinum

Output from Southern Platinum's Messina mine rose sharply last year, with pgm production jumping by 52 per cent to 86,000 oz (of which platinum accounted for an estimated 40,000 oz). Although the expansion of production at the mine fell behind schedule, there was a strong increase in mill throughput, up 57 per cent to 766,000 tonnes of ore. The average grade declined to 3.97 grams per tonne but concentrator recoveries improved and, at over 88 per cent, were among the best in the industry.

There were significant changes to the ownership of Messina in 2004. In June, the mine's owner SouthernEra acquired an additional 18.4 per cent of the shares in Messina, raising its total holding to 91.5 per cent. Subsequently, in September 2004, SouthernEra reorganised its businesses, with a new company, Southern Platinum Corporation, acquiring the former's pgm and gold assets. In March 2005, it was announced that Lonmin had made an agreed cash offer for Southern Platinum; this transaction is expected to be concluded in the second half of 2005.

RUSSIA

Sales of Russian palladium accelerated in the final two months of 2004 and are estimated to have reached 3.8 million oz for the year. This total includes 375,000 oz of metal that was sold from stocks held by Stillwater Mining in the USA. Shipments of platinum and rhodium from Russia are estimated to have been 850,000 oz and 105,000 oz respectively.

Norilsk Nickel stated that it intended to sell its full production of palladium during 2004 and it seems likely that this was achieved, although the company has to date remained unable to release any specific data as secrecy regulations governing pgm remain in force. Although the Russian parliament passed a law in February 2004 declassifying such information, it was not until March 2005 that President Putin signed a decree permitting the release of the data. Norilsk is expected to be able to publish data on geological reserves, production, stocks and sales of pgm later this year, but information on stocks of pgm held in the State Treasury (Gokhran) and the Central Bank will remain secret for at least the immediate future.

PGM Supplies: Russia
'000 oz

	2003	2004
Platinum	1,050	850
Palladium	2,950	3,800
Rhodium	140	105

An ore transfer station at Norilsk's Oktyabrsky mine. Production of ore from the company's operations on the Taimyr Peninsula has stabilised at around 13 million tonnes per year.

There are also signs that the system of export quotas and licences for pgm may be brought to an end. Norilsk already has long-term quotas and export licences and was able to export steadily throughout last year. In contrast, it is believed that export licences for state metal were only granted as late as September and this is probably the reason why Russian exports of palladium and rhodium soared in November and December 2004. Although there were strong indications of Russian palladium sales at that time, Swiss trade statistics suggest that some of the metal remained in Zurich, perhaps for sale in 2005. Interestingly, no such rise in platinum shipments was evident, perhaps reflecting a lack of stocks for export.

Data published by Norilsk Nickel in June 2004 show that ore production at its mines in the Taimyr Peninsula has stabilised at just over 13 million tonnes per year. The proportion of cuprous ore produced in the Talnakh sector is increasing slightly at the expense of rich ore as the mines there expand, whereas the quantities of disseminated ore that are produced largely at the old Norilsk-1 operations are gradually declining. As a result of these changes, output of pgm from the Taimyr mines is probably increasing marginally. Production of platinum from the alluvial mines of the Far East of Russia, primarily Kondyor (Khabarovsk) and Koryak (Kamchatka), is thought to have declined slightly in 2004.

In 2003 Norilsk Nickel transferred 877,169 oz of palladium to Stillwater Mining in part payment for a majority shareholding in the company. Although the metal was exported from Russia, none of it was sold during the year and so was not included in our 2003 supply data. Stillwater entered into sales agreements during the first quarter of 2004 to sell the palladium received from Norilsk, and shipped a total of 375,000 oz in the year. This has been incorporated into our 2004 Russian supply total of 3.8 million oz. The remainder of the inventory is scheduled to be sold during 2005 and the first quarter of 2006, at a rate of approximately 36,500 oz per month, and will again be accounted for as Russian supply.

NORTH AMERICA

Supplies of pgm from North America recovered last year, following a dip in output due to industrial action at Inco in 2003. Shipments of platinum rose by 34 per cent to 388,000 oz in 2004, although production was still below the level seen in 2002. Sales of palladium increased by 11 per cent to exceed 1 million oz, a record figure, reflecting strong performances from both Inco and North American Palladium but lower production at Stillwater Mining.

Canada

The North American Palladium mine at Lac des Iles accounts for over half of Canada's palladium production. In 2004, the open-pit operation processed 5.3 million tonnes of ore at a palladium grade of 2.41 grams per tonne, yielding 309,000 oz of palladium and 25,000 oz of platinum in concentrate. This represented an improvement in pgm output of around 7 per cent compared with 2003.

In late 2004 the installation of a secondary crusher was completed, lifting milling capacity to 16,000 tonnes of ore per day (up to 5.8 million tonnes per annum). This should help to maintain output in 2005, during a period when the open pit will be exploiting a lower-grade portion of the ore body. Output will subsequently increase when a new underground section comes on stream, exploiting a higher-grade ore body located directly beneath the existing open pit. First production from underground is expected during the second half of 2005, with the operation due to reach full capacity of 2,000 tonnes of ore per day in early 2006. With grades being comparatively high at 7.4 grams of pgm per tonne, the operation is forecast to produce around

110-120,000 oz of palladium annually over its 5-year life, and should increase total palladium output from Lac des Iles to well over 300,000 oz per annum.

Inco's deliveries of pgm in 2004 were substantially higher than the previous, strike-affected year. Platinum and palladium shipments more than doubled to 183,000 oz and 212,000 oz respectively, although rhodium sales contracted from 17,000 oz in 2003 to 9,000 oz last year, probably reflecting changes in the refining pipeline. About 92 per cent of Inco's by-product pgm production came from ores extracted at its Sudbury operations, with the remaining 8 per cent from its Manitoba mines. The company also refines small quantities of pgm from ore and intermediate materials supplied by other companies; in 2004, it purchased some 280,000 tonnes of nickel-copper ore from FNX Mining's Sudbury joint venture, and also bought concentrate from two Australian nickel producers.

PGM Supplies: North America
'000 oz

	2003	2004
Platinum	295	385
Palladium	935	1,055
Rhodium	26	18

Inco expects its pgm production to decline in 2005, reflecting a planned reduction in nickel output at its Sudbury and Manitoba operations. Scheduled one-month maintenance shut-downs at the mines will result in the loss of an estimated 35,000 oz of pgm production; the company expects total pgm output to be around 370,000 oz this year.

Falconbridge's by-product pgm come from both its Sudbury ores (which contain platinum and palladium in an approximately 1:1.1 ratio) and its Raglan operation (where about 70 per cent of the pgm grade is palladium). The quantity of ore mined at the Sudbury operations declined by 3 per cent last year, but mill throughput was unchanged at 2.26 million tonnes. However, nickel grades fell slightly and output of nickel in concentrate declined to 22,600 tonnes. At Raglan the milling rate increased by 12 per cent to 945,000 tonnes of ore last year, but grades declined and nickel output rose by only 6 per cent to 26,550 tonnes.

In 2005, Falconbridge expects nickel output from its Sudbury operations to be steady. However, production at Raglan is likely to be sharply lower; this will have a negative impact on the company's output of by-product pgm, especially palladium.

Shaft sinking at Falconbridge's Nickel Rim South project in the Sudbury basin was expected to begin in early 2005. This project will replace declining nickel output from the company's other mines in the area, and may also result in an increase in total pgm production due to its relatively high grade.

USA

The Stillwater Mining Company in the USA produced 130,000 oz of platinum and 439,000 oz of palladium in 2004, down about 3 per cent compared with the previous year. Sales of pgm from the company's mines were slightly below these levels, at 125,000 oz and 432,000 oz respectively. In addition, Stillwater sold 375,000 oz of the 877,169 oz of palladium that it received under the acquisition of a 50.8 per cent share in the company by Norilsk Nickel. The sale of the Norilsk metal is not included in our estimates of North American supplies, but is instead incorporated in our figures for Russian sales.

The Stillwater mine at Nye was affected by a one week strike in July 2004, and mill throughput for the year fell by 3 per cent to 787,000 tons; the grade also fell slightly, to 0.56 oz per ton. At the newer East Boulder mine the milling rate increased by 6 per cent, treating 483,000 tons of ore at a grade of 0.39 oz per ton. However, East Boulder continued to under-perform the targets set by Stillwater's management; the mine was expected to achieve a production rate of 1,650 tons per day by the end of 2004 but output last year fell 20 per cent short of that figure. The company now expects the target rate to be achieved in mid-2006. Production by Stillwater this year is planned to be 550-570,000 oz of pgm, similar to the rate seen in 2004.

ZIMBABWE

Supplies of platinum from Zimbabwe increased by around 5 per cent to reach 145,000 oz in 2004, with small increases in shipments from both the Mimosa and Ngezi mines. However, the future of proposed expansions is in question, following changes to the regulations governing foreign currency accounts, and uncertainties regarding the structure of future black economic empowerment legislation.

At the Ngezi mine, which is effectively controlled by Impala via its 84.5 per cent stake in Zimplats, mill throughput rose by 5 per cent to 2.05 million tonnes in

Production of pgm from both the Mimosa and Ngezi mines in Zimbabwe increased moderately in 2004.

2004. This was achieved despite lower than planned production from the open pit due to poor machine availability and an earlier than usual start to the rainy season. The trial underground mining section also performed well, producing 240,000 tonnes of ore in 2004. However, ore stocks ahead of the concentrator were depleted during industrial action in June and July, and this could have a negative impact on production of refined metal in 2005.

Sales by Zimplats in 2004 totalled approximately 88,000 oz of platinum, 74,000 oz of palladium and 8,000 oz of rhodium. These metals were shipped in the form of matte to Impala, which undertakes the refining and marketing of all of Zimplats' pgm output.

PGM Supplies: Zimbabwe and Others
'000 oz

	2003	2004
Platinum	225	235
Palladium	245	265
Rhodium	14	16

The Zimbabwe dollar's official fixed exchange rate posed serious problems for both Zimplats and the Mimosa operations in 2004, as rampant inflation drove significant increases in local currency costs. Profitability suffered accordingly. Zimplats, for example, had to agree a 31 per cent increase in its contract with an opencast mining contractor during the year, which called into question the long-term viability of open-cast mining at Ngezi. As a result Zimplats currently plans to phase out open-cast mining, gradually substituting this tonnage with material from underground operations.

The Mimosa mine (a 50:50 joint venture between Aquarius and Impala) operated close to its design rate of 1.32 million tonnes in 2004, an increase of 6 per cent compared with the previous year. Production of pgm in concentrate totalled 61,000 oz of platinum, 45,000 oz of palladium and 5,000 of rhodium. The company is considering a debottlenecking project, which would take production to around 80,000 oz platinum per annum, as well as a larger expansion which could potentially double output.

The expansion of Zimbabwe's platinum industry, however, hinges on the ability of platinum producers to obtain clarity from the government on a number of issues, including rules covering the repatriation of US$ revenues, security of tenure of mining leases, and black economic empowerment legislation.

New provisions published in February 2005 required platinum producers to liquidate their offshore accounts and deposit the proceeds into local foreign currency accounts (FCAs) by the end of that month. The future proceeds of sales must be deposited into FCAs, and any funds not allocated for loan repayments, dividends and specific creditors must be converted after 45 days into Zimbabwe dollars at the fixed exchange rate. This will affect producers' ability to invest in their operations and is likely to result in delays in expansion programmes, unless exemptions are granted.

There is also uncertainty over the issue of black economic empowerment; leaked draft proposals suggested that BEE investors should take 49 per cent shareholdings in the country's platinum producers, but this was later revised to 30 per cent within 10 years.