BOTSWANA

By Roger Murray

Diamonds remained the motor of Botswana's economy during 2003, and although this is likely to continue to be the case for some years to come, mining output will be broadened by the start of production from the new Mupane gold mine under construction by Australia's Gallery Gold Ltd by the end of 2004, along with ongoing expansion of copper-nickel mining and processing by Tati Nickel Mining Co (TNMC). President Festus Mogae and his ruling Botswana Democratic Party (BDP) have determined on a national development strategy which aims to reduce the country's present heavy dependence on diamonds as the main source of GDP growth, export earnings, and government revenues by diversifying the economy and boosting employment. Under the country's 9th five-year national development plan, which runs until 2008-09, priority is being accorded to developing Botswana as a financial services centre, expanding tourism and attracting foreign investment inflows into value-adding export-orientated manufacturing activities, including more downstream processing of the country's mineral resources.

No major changes with regard to existing mineral policies are envisaged and in the diamond sector the government seems set to maintain its close working relationship with De Beers SA through their partnership as 50:50 joint owners of the country's sole rough diamond producer, Debswana Diamond Co (Debswana). However, in February 2004 the government announced it would be appointing consultants to conduct a strategic review of Botswana's diamond sector, with the aim of ensuring policies are implemented that will ensure the optimal development of the country's diamond resources. It is understood that the review, by LEK Consulting of the UK, may examine the option of the government independently marketing its share of Debswana's output, or of reserving a portion of Debswana's production for processing by local cutting and polishing firms. During the first half of 2004, several foreign investors, including Israel's Leviev Group, contacted the government to express their interest in developing a range of downstream activities in the diamond sector, including the local manufacture of jewellery and diamond branding, in addition to cutting and processing plants.

Botswana retained its global position as the leading diamond producer by value and second biggest (after Australia) by volume. Production in 2003 reached a new record of 30.4 Mct (28.4 Mct in 2002), with an export value of US$2.4 billion. Diamonds were the mainstay of Botswana's economy, accounting for 83% of total export earnings, unchanged from 2002, and 44% of projected government revenue in the 2004-05 fiscal year. Debswana accounted for 69% of the total 43.9 Mct of rough diamonds produced by De Beers-operated mines in Africa (Botswana, Namibia, South Africa and Tanzania), slightly below its 71% share in 2002.

Botswana is a participant in the Kimberley Process, the association of governments of diamond-producing and importing countries, commercial diamond firms and pan-industry associations, non-governmental organisations (NGOs), which has implemented a certification system for the international trade in rough diamonds, designed to prevent so-called “blood” or “conflict” diamonds from being shipped through legitimate trading channels. Botswana is fully Kimberley-compliant, having the required legislation, independent valuation facilities and export/import controls in place.

During 2003, the Botswana Government also continued its ‘Diamonds for Development’ campaign, which aims to inform opinion-formers of the transparency of the country’s diamond industry and usage of the profits generated for legitimate national development purposes. However, it has found it more difficult to counter a campaign waged by a UK-based NGO, Survival International, which has accused the government and De Beers of complicity in an alleged strategy of compulsorily removing the small San (Bushman) community from their traditional land in the Central Kalahari Game Reserve (CKGR), in order to make way for diamond mining activities. Despite successive, categorical denials by both the government and De Beers of Survival’s claims, the organisation intensified its activities during 2003, signing up the international fashion model Iman to its campaign. Although Debswana has a retention licence in respect of the Gope kimberlite deposit within the CKGR, which was evaluated comprehensively in the 1990s, Gope is currently regarded as a marginal prospect with no plans for a commercial mining operation, and even in the event of such a development De Beers has stressed that it is not its policy to seek the removal of rural communities living in adjoining areas.

Mining continues to account for the biggest share of Botswana’s GDP, at 35% in the 2002-03 (June 30-July 1) national accounts year. By far the biggest contribution is made by diamonds, followed at a considerable distance by copper-nickel, soda ash, salt and coal. Real growth by the mining sector was just over 10%, reversing a 3% decline in the preceding national accounts year, driven by a 10% increase in diamond production, along with higher copper-nickel and soda ash output. However, the Bank of Botswana (central bank) projected there would be slower growth by the mining sector in 2003-04, resulting in a deceleration in overall GDP real growth to some 5%, compared with just under 7% in 2002-03. It predicted this would largely come about because of the reduced capacity of the diamond sector for further substantial output expansion, owing to operating systems running at optimal levels and systems efficiency at close to the maximum acceptable standards. Debswana’s production target for 2004 of just over 31 Mct, would represent only a 3% rise on the preceding year’s output.

In local currency terms, Botswana’s merchandise trade surplus declined by 19% to an estimated P3.4 billion in 2003, down from P4.3 billion in the previous year. Total exports fell by 3% to P14.2 billion (P14.7 billion in 2002) largely as a result of the pula’s sharp appreciation against the US dollar in 2003. Despite the strong global diamond market and higher volume sales, the local currency value of diamond exports dropped by 6% to P11.7 billion

(P12.5 billion), including small quantities of locally-cut stones. However, in US dollar terms, the value of total exports increased by 24% to US$2.9 billion in 2003 and diamond exports by 20% to US$2.4 billion, indicating that, taking into account the higher volume of diamond sales, the average price received rose by some 13% to US$79/ct. This figure would have been slightly above the average rough diamond export price, which is lower than De Beers' standard selling value (SSV) after allowing for the marketing premium paid to the DTC, owing to the inclusion of small quantities of cut stones in Botswana's diamond export figures. The value of copper-nickel exports rose by 44% to P695 million in 2003, converting into an even stronger US dollar-denominated increase of 84% to US$140 million, as a result of a substantial improvement in metal prices. In contrast, soda ash exports rose by 14% to P230 million, although in US dollar terms exports rose by 10% to US$46 million, which the central bank attributed to intensified competition from other suppliers of the South African market (mainly US exporters). This was because of the strength of the South African rand, and hence the pula, which is partially pegged to the former, against the US dollar during the course of 2003.

Despite valuation losses caused by the pula's appreciation during 2003, the foreign trade surplus remained sufficiently large to underpin a continued substantial current account surplus, which the central bank estimated at P3.7 billion (US$748 million) for that year. Botswana's balance of payments position strengthened with an estimated overall payments surplus of P797 million (US$161 million) in 2003 compared with P336 million (US$53 million) in the previous year. But the impact on the appreciated pula on the profitability of Debswana's operations, measured in local currency terms, resulted in a shortfall in mineral tax and royalty receipts, causing the government's budgetary position to deteriorate in the 2003-04 fiscal year. With mineral revenues originally projected at P8.1 billon, 46% of total revenue, a small budget surplus was anticipated in 2003-04, but mineral revenue was adjusted downwards in the revised estimates to P6.7 billion resulting in a small budget deficit, although this was still an improvement on the P1.4 billion deficit recorded in 2002-03, when the shortfall in mineral revenues as a result of weaker diamond prices in 2001-02 was even greater. The position is expected to improve in 2004-05 due to a subsequent recovery in mineral revenues, projected at P8.1 billion or 44% of total revenue, providing for a small budget surplus of P69 million, effectively a balanced budget.

Diamonds

Debswana's target of producing 30 Mct of rough diamonds in 2004 was met a year early, as output from its four mines totalled 30.4 Mct in 2003, an increase of 7.1% on the preceding year. This included the first full year's output from the Damtshaa mine commissioned in 2002. Debswana's production target for 2004 was accordingly revised upwards to just over 31 Mct. 2003's higher production was partly due to a modest increase in the ore tonnage treated at all four mines, up by just over 2% at 30.2 Mt, but mainly to a significant improvement in the overall average recovery grade to 1.08 ct/t, a rise of almost 5% on the 0.96 ct/t figure for 2002.

Compared with a 10% increase in 2002, recoveries from the Orapa mine near Francistown in the northeast rose by just under 14% in 2003 to 16.3 Mct, 8% above target. With ore tonnage treated virtually unchanged over the preceding year, the increase was due to what Debswana described as "excellent recovery efficiencies and the selective treatment of high-grade ore". This resulted in a 13.5% improvement in the average recovery grade to 0.99 ct/t, up from 0.87 ct/t in 2002.

By contrast, recoveries from Jwaneng near Kanye in the southwest fell by 2% to 12.8 Mct in 2003, 6% below target, as a 4% drop in ore tonnage treated, to 8.9 Mt, was only partially offset by an improvement in the average recovery grade to 1.43 ct/t, up from 1.4 ct/t in the preceding year. A number of technical problems were encountered during 2003, ranging from mainline conveyor failures and a major fire to blockages of slime distribution circuits. Also, owing to an early closure of the mine, 13 fewer production shifts were worked in 2003 compared with the previous year.

At Letlhakane, which adjoins Orapa, production rose slightly to 1.1 Mct in 2003, 4% above target, with a slight improvement in the average grade to 0.29 ct/t (0.28 ct/t in 2002).

Recoveries at the Damtshaa mine, located 17 km east of Orapa, had been projected at 250,000 ct in 2003 but, in the event, output was 17% above target at 292,000 ct. The average recovery grade also showed a sizeable improvement to 0.24 ct/t, up from only 0.06 ct/t in 2002. The mine plant achieved full capacity output during the first quarter of the year and Damtshaa is forecast to yield some 5.0-5.5 Mct from the mining of 39 Mt of ore over a 30-year life.

On safety matters, Jwaneng retained its National Occupational Safety Association (NOSA) integrated platinum five-star status, with a an improved score of 94% in 2003, Orapa and Letlhakane did not have a good year, recording 20 lost time injuries, eight more than in the previous year, two of which were fatalities. Jwaneng was also reported to have made good progress towards the high National Occupational Safety Credited Awards (NOSCAR), and it retained its ISO 14001 certification for the third successive year with no environmental-related issues arising from its operations.

With regards to the situation at Orapa and Letlhakane, it was established by the Debswana management that the major problem was employees' commitment to the safety programme and their not following established procedures. As a result, a NOSA grading was not conducted as would have normally been the case in November 2003. Instead, the British Standard Institute (BSI) was invited to conduct an independent audit on the entire safety, health and environment programme (SHE) in order to prepare for a NOSA five-star grading in November 2004.

Debswana has continued its pro-active programme to combat the incidence of HIV/AIDS among the workforce, and from 2003 all HIV-positive employees and their spouses were covered 100% for anti-retroviral therapy (ART), prophylactic and related infections treatment. Overall HIV/AIDS prevalence among employees fell for the second successive year in 2003, according to Debswana figures, from 23% in 2002 to 20% the following year.

Debswana's rough diamond sales totalled 30 Mct in 2003, and as in the previous year the entire production was sold. Debswana's diamonds continue to be marketed exclusively through De Beers' Diamond Trading Co (DTC) after production has been processed and valued in Gaborone by the Botswana Diamond Valuing Co (BDVC), a Debswana subsidiary. Despite the higher volume of rough diamonds sold, sales revenue in local currency terms fell by just over 6% in 2003 to P10.5 billion, reflecting the appreciation of the pula against the US dollar. However, foreign exchange earnings were higher as US dollar-denominated sales revenue rose to US$2.1billion, up by 17% on 2002, for an average price per rough carat (after the DTC sales' commission) of US$70. The 2003 sales figure reported by Debswana was P1.2 billion lower than the P11.7 billion value of diamond exports reported by the central bank, even allowing for the latter's inclusion of small quantities of cut diamonds. The discrepancy was magnified by the pula's appreciation. In US dollar terms the difference was a more modest US$300 million, or 13%, and was likely to be largely eliminated by subsequent revisions to the central bank's preliminary export figures for 2003. (Table 1)

Downstream processing in the diamond sector comprise two cutting and polishing factories. The largest, Teemane Manufacturing Co (TMC), was opened by Debswana in the 1990s and is based in Serowe district some 300 km north of Gaberone, with the other located in Gaborone and owned by a leading Israeli diamond firm, Schachter/Namdar Botswana. In 2003, following an evaluation of TMC's prospects and in line with De Beers' "supplier of choice" programme, Debswana sold TMC to an Antwerp-based diamond manufacturer and distributor, Diarough NV, whose marketing capacity was regarded as providing sufficient potential for TMC to improve its performance. TMC had established a market for its polished round brilliant cut goods up to 1.0 ct in size, but consistent profitability proved difficult to achieve owing to a number of factors, including currency fluctuations, competition from cheaper cutting centres around the world and high initial training costs.

Local cutting factories have to import rough goods for polishing, as Debswana has remained committed to retaining 100% of its production for export, as stipulated by its exclusive sales contract with the DTC. However, this policy may change as a result of the strategic review of the diamond sector announced by the government at the beginning of 2004 and in line with the current National Development Plan, which places priority on the diversification of the economy through the establishment of new export-orientated, value-added manufacturing and downstream processing activities.

The government believes there is considerable potential for increasing employment through downstream diamond activities by new entrants, provided a commercially-viable business model can be developed. Although diamond trading is strictly controlled to curb smuggling, it is open to any investor to apply for a diamond cutting or polishing licence. However, the minerals, energy and water affairs minister, Boometswe Mokguthu, cautioned in April 2004 that Botswana needed to raise productivity levels in its diamond-cutting factories to compete with China and India and to attract investment in more local operations.

Mr Mokguthu was responding to a proposal by one of his party's MPs that 10% of Botswana's rough diamond production be reserved for local processing to create additional employment. He confirmed that the government was doing all it could to facilitate investment by two "reputable" companies that had recently made enquiries about establishing diamond-polishing operations.

In February 2004, representatives of the Israel-based Leviev Group, visited Botswana to explore investment opportunities in the diamond sector, including the manufacture of diamond jewellery, as well as cutting and polishing activities. During extensive talks with government officials, they were reported to have proposed an initial investment of US$10 million, in an integrated downstream operation, including both diamond manufacturing and branding. These would be linked with other downstream activities, including the establishment of jewellery shops strategically located in the main tourist attraction centres.

The government did not make an official response to the Leviev Group's reported request to be allowed to purchase up to 10% of Botswana's rough diamond production for a local cutting and polishing plant, but Mr Mokguthu described the proposal to cut, polish and manufacture jewellery in Botswana as what the government was looking for in seeking to add value to the country's minerals and create additional revenue and employment.

Exploration intensifies

During 2003, intensive prospecting for diamonds continued, focussed especially on central and northeastern areas. De Beers and BHP-Billiton (BHPB) were the most active of the larger companies, and prospecting by several junior exploration firms continued at high levels. Debswana views the successful development of the Damtshaa mine, the first new diamond mine since Jwaneng in the early 1980s, as indicating that it may be viable to mine other kimberlites in the vicinity of Orapa previously regarded as marginal. Damtshaa mines the BK cluster of kimberlites, long thought to be uneconomic but now regarded as sufficient to support a mining life of some 30 years. However, during 2003, Debswana discontinued work on the Kgare kimberlite in the south, where exploration results had proved disappointing.

Two particularly promising developments on the exploration front included the provision by BHPB of its patented Falcon technology for prospecting in Botswana and the investigation of kimberlite clusters in the Orapa and Serowe areas. Also, Dublin-based junior, African Diamonds (AfD) has explored along ancient river courses that may contain alluvial deposits from the Orapa pipe. AfD was formed in 2000 by a group of Irish mining entrepreneurs, and was approached by the directors of Botswana-based diamond-exploration company, Kukama Exploration, to finance a number of exploration projects that Kukama had initiated. In the first half of 2004, AfD teamed up with both BHPB and De Beers to further the exploration of a number of promising kimberlite targets identified during three years of surveying and exploration work.

In 2003, BHPB established a stand-alone associate company, Kalahari Diamonds (KDL), to explore for kimberlites beneath deep Kalahari sand cover and the Magadi salt pans north of Orapa, using Falcon airborne gravity technology. BHPB holds a 20% stake in KDL and the International Finance Corp 10%, with the balance held by institutional investors and international diamond industry firms. KDL has been endowed with all BHPB's exploration licences and exploration data covering large areas in central and southern Botswana, including much of the Central Kalahari Game Reserve (CKGR), where the company currently holds the largest acreage.

AfD registered on London's Alternative Investment Market (AIM) in mid-2003 and in July of that year the company raised US$1.3 million through an AIM placement of 11.4 million shares. It now holds 4,000 km^2 under licence and its primary targets include undiscovered kimberlites north of Orapa, tracing the so far undetected alluvial deposits along ancient river channels from Orapa, and a new diamond field in Serowe. Outside Botswana, AfD is exploring elsewhere in Africa, including Lesotho, Guinea and Sierra Leone.

Work carried out in 2003 mainly focussed on geophysical surveys and drilling of its Orapa licence area. Surveys were conducted along six lines across an area where the company expected to locate ancient palaeo-alluvial channels that drained the Orapa kimberlite field, approximately 100 km to the northwest. The results of the gravity surveys strongly suggested that the north-south extent of the projected channel system is at least 5.5 km and that there is more than one channel within the area investigated. In December 2003, AfD announced its first diamond discovery, of two diamonds, weighing 0.11 ct and 0.14 ct, from an ongoing analysis of drilling samples from the BK10 kimberlite in the Orapa area. During the first quarter of 2004, AfD made further discoveries in its Orapa concession, including a 0.26 ct white gem, found in a small sample of the AK8 kimberlite. The company stated in March 2004 that it had discovered diamonds in all three pipes analysed so far, and that processing of drill material from a fourth kimberlite had started.

In February 2004, a joint venture was formed between AfD (40%) and KDL (60%) to use Falcon technology to explore undiscovered kimberlite pipes on the former's licence areas, excluding the 21 kimberlites it had already identified. One of these, BK10, in which several diamonds have been discovered, is thought likely to contain some 455,000 ct of recoverable diamonds at an average grade of 0.07ct/100 t. The main aim of the JV was to identify new pipes on the Orapa and Serowe licences, which AfD believes will save three years using conventional exploration techniques. Orapa was to be flown as soon as possible, probably during the second quarter of 2004, and Serowe in early 2005. KDL can earn a 60% interest in new discoveries by flying the ground, analysing the data and identifying targets, and AfD can elect to retain its 40% interest in all follow-up work or agree to be diluted to a royalty interest.

In April 2004, AfD entered into a second JV, this time with De Beers SA, covering all AfD's current licences, and certain of De Beers Botswana Prospecting's licences in the Orapa area, where there are 29 known kimberlites, including the 21 located on AfD's acreage. De Beers holds an initial 51% interest in the JV, which would rise to 70% on the completion of the first bankable feasibility study on any prospect. Agreement was also reached on the operation of any mine: larger mines would be operated by De Beers, with those below a certain threshold to be operated by AfD. Work was expected to focus initially on high potential targets around Orapa, with airborne and ground geophysical surveys of AfD's 1,000 km^2 licence area scheduled to start during 2004, followed by a similar programme on the company's Serowe licence.

AfD's chairman, John Teeling, said that his company had received expressions of interest from a number of companies in the specific targets identified within its licence areas, but that none could match the advanced exploration expertise of De Beers. While AfD's management team would be involved on a consultancy and advisory basis, the Orapa and Serowe licences would be explored with De Beers' proprietary technology, including specialist airborne techniques such as Bell Geospace. Mr Teeling expressed confidence that AfD's licence areas included targets with the potential for large gem-quality diamond mines, and these would be the main targets of the joint venture.

Copper-nickel

Production and sales by the Selebi-Phikwe copper-nickel mine operated by the BCL subsidiary of Botswana RST (BRST) increased in 2003, due to improved base metal prices, especially for nickel. Only partial data is available for 2003, excluding financial results, due to the tardy publication of the BCL annual report, which was not received in time for this review. However, it was likely that both the volume and value of sales, along with operating profit, improved over 2002, to reflect higher volume output, and imporved copper and nickel prices. Nevertheless, BCL experienced renewed technical problems with its smelter, which was shut down for six weeks from February 3, 2003, during which period BCL declared *force majeure* and ceased accepting concentrate production from Tati Nickel Mining Co (TNMC) for toll smelting. By the end of the year, all stockpiled amounts by TNMC had been delivered to BCL for smelting or to alternative facilities for treatment. A further, 55-day shutdown of the smelter was planned by BCL during June and July 2004, to enable end-of-campaign capital repairs to the flash furnace to be carried out.

Despite the smelter shutdown and force majeure, BCL's production of metal-in-matte in 2003 increased by 14% to 51,983 t. Toll-smelted material accounted for just under 40% of the total material treated by the BCL smelter in 2002 and is estimated to have made up just under half the total in 2003. The two mining firms are run as an increasingly integrated operation, following Canada's LionOre Mining International (LionOre) becoming the sole private shareholder in TNMC, with an 85% stake (the remaining 15% being owned by the government) and a 50:50 partner (on an effective basis) with the government in BRST/BCL at the end of 2002. Production of copper metal by BCL was 13% higher at 24,289 t in 2003, and nickel output rose by 15% to 27,400 t. Exports of copper-nickel-cobalt by BCL were worth P695 million in 2003, up 44% on the preceding year, and an increase in US dollar terms of 84% to US$140 million, the highest level for over five years.

At Tati, LionOre completed the commissioning of a US$66 million expansion project at the Phoenix underground mine in 2003 to upgrade ore throughput and construct an on-site wet concentrate treatment facility. This has expanded ore-handling capacity to 3.6 Mt/y, doubling TNMC's payable nickel production capacity to some 12,500 t, along with by-product recoveries including copper, small amounts of platinum group metals, silver and gold. By the end of 2003, Phoenix was reported by LionOre to be exceeding targeted metal production by 10%, due to circuit improvements and ongoing optimisation, which had resulted in higher head grades and significantly improved nickel recovery. Nickel recoveries had increased to 89%, exceeding the original feasibility study estimate by 6%.

In 2003, 14 Mt of material were mined from the Phoenix open pit, and an overall waste-to-ore ratio of 3.9:1 was achieved. The pit depth was extended to 140 m, with 280 m being the current ultimate pit design depth. A total of 3.1 Mt of ore were treated (878,000 t in 2002) Concentrate recoveries totalled 278,746 t, almost double the output of the previous year, with nickel and copper head grades of 5.68% and 3.57% respectively. All production was from the Phoenix mine, as the Selkirk underground mine had been placed on care and maintenance at the end of the third quarter of 2002, due to depletion of massive sulphide ore. Payable nickel production totalled 11,509 t, 53% higher than in 2002, and payable copper sold totalled 8,141 t, 79% higher than in 2002. Payable cobalt output was 71 t (36 t in 2002). The Phoenix deposit also hosts significant concentrations of PGM, particularly palladium, and in 2003 by-product metal production comprised 33,039 oz of palladium (up 80%), 5,396 oz of platinum (up 93%), 6,549 oz of silver (5,129 oz in 2002) and 950 oz of gold (670 oz).

LionOre reported its 85% attributable share of payable nickel production (defined as attributable refined metal net of all items) was 9,783 t in 2003, at a cash cost of US$2.37/lb of nickel produced. TNMC's overall payable nickel sales of 11,509 t were worth US$127 million, up from US$51 million in 2002. Sales of all metals were worth US$154 million, of which nickel and copper sales accounted for US$142 million, and other metals US$12 million. Earnings (before the non-controlling 15% government interest) were US$34.2 million in 2003, compared with US$1.8 million in 2002. Sales were strong during the year, with the increase in payable nickel sales reflecting the progressive improvement of production throughput during 2003, despite the BCL *force majeure* that occurred during the first quarter. TNMC also benefited from the higher nickel price during 2003; it does not hedge any of its metal production. LionOre's 2003 annual reported projected an increase in ore treated to 3.6 Mt in 2004 (from 3.1 Mt in 2003), with an increase in the nickel recovery rate to 88% expected to offset a slight decrease in the grade of ore treated to 0.80%. TNMC will continue concentrate production during the planned June-July 2004 shutdown of the BCL smelter, with a portion to be sent to alternative treatment facilities, and the remainder stockpiled for treatment at the Selebi-Phikwe plant later in the year. In its 2003 annual report, LionOre anticipated that some 700 t out of the 13,000 t of payable nickel projected to be produced in 2004 would remain untreated by the year-end.

As part of its ongoing development programme for TNMC, LionOre is proceeding with the design and construction of a modular Activox demonstration plant at Phoenix, with the ultimate aim of installing a hydrometallurgical facility at the mine.

Following approval of a US$10 million budget for design, construction and operation of the Activox demonstration plant, LionOre subsidiary Western Minerals Technology, in conjunction with Tati, carried out construction of a skid-mounted plant in Australia. The plant is to be installed at Phoenix to facilitate the training of operating and maintenance personnel in addition to establishing the economic viability of the planned hydrometallurgical plant. At a scale-up factor of 1:170, the facility will also provide valuable information in respect of optimising and testing the construction materials required for the design of a full-scale refinery, thereby reducing the technical risk of installing a hydrometallurgical plant at Tati or anywhere else. The plant modules were transported from Perth for reassembly on site by the end of 2003, with commissioning expected to take place during the second quarter of 2004. The plant is scheduled to be operating on a continuous, fully integrated mode from successful commissioning through to the end of 2004. In addition, GRD Minproc was appointed to conduct a definitive feasibility study on the establishment of a hydrometallurgical plant at the Phoenix mine.

TNMC has also continued an active exploration programme to extend the resource base. A US$2 million exploration programme aimed at testing additional resource potential commenced in 2003, with an extensive ground-induced polarisation (IP) and magnetotelluric (MT) geophysical survey carried out over both the Phoenix and Selkirk areas. At Phoenix, the geophysical survey delineated a series of anomalies to the north and south of the open pit. An initial programme of reverse circulation percussion (RCP) drilling and follow-up diamond drilling was carried out to the south of the pit. This drilling phase, supported by downhole electromagnetic (DHEM) surveying, delineated encouraging indications of disseminated sulphide extensions with subordinate associated massive sulphide lenses, and is being evaluated more comprehensively by a follow-up programme of infill diamond drilling. By end-2003, 52 drillholes had been completed, and the programme was due to be finished by the second quarter 2004, with the aim of increasing reserves. Significant PGM mineralisation was intersected over two zones in one drill hole.

At Selkirk there were encouraging results also, with further drilling to be carried during 2004 after completion of the Phoenix programme. Key anomalies were tested by ten diamond drill holes which, together with DHEM geophysical surveying, indicated the presence of disseminated and possible massive sulphide mineralisation, developed semi-continuously over a distance of about 1,500 m, down-plunge from the Selkirk underground workings.

As at December 31, 2003, Phoenix's total indicated resource, at a 0.25% Ni cut-off, was 142 Mt averaging 0.29% Ni and 0.17% Cu, with probable reserves of 37.6 Mt, averaging 0.55% Ni and 0.34% Cu. At current production rates Phoenix has a proven mine life to 2014, with indicated contained metal resources of 408,313 t of nickel and 237,052 t of copper, and probable resources of 206,564 t of nickel and 127,683 t of copper.

Gold
In recent years, gold production, from deposits in and around Francistown, where commercial gold workings date back some 80 years, had virtually ceased owing to depletion of reserves and operational problems. But Botswana will become a gold producer again by the end of 2004, with the development of a new mine at Mupane, some 40 km southeast of Francistown in the Tati greenstone belt. Gallery Gold Ltd has confirmed 914,000 oz of contained gold in four identified deposits in and around Mupane. The company commissioned a bankable feasibility study (BFS) and in May 2003 announced it was proceeding with the development of an open-pit mine based on the positive outcome of the BFS. This confirmed the viability of a 1 Mt/y plant producing 100,000 oz/y of gold, based on a mineable reserve of 589,000 oz, derived from open-pit optimisations completed at US$320/oz, providing a five-year mine life. At higher gold prices the conversion of the present resource base of 983,000 oz to reserves should be increased and the mine life consequently extended. Gallery expects to expand reserves through exploration.

Constructing of the US$28 million mine began at the end of 2003, with the first gold pour scheduled for October 2004. In its 2004 first quarter report, Gallery stated that continued exploration of its licence areas had identified new satellite deposits, which should improve project profitability and mine life. These included the results of evaluation of the potential of additional deposits in its nearby Shashe concession, including several previously-worked mines. A 36,300 oz resource was confirmed at the Golden Eagle deposit in April 2004, which the company said was expected to be only the first of a series of Mupane reserve upgrades to be announced during the course of 2004.

Construction of the processing plant at Mupane was some 40% complete as at end-March 2004, and all terracing works for plant completion, along with excavations for raw and processed water dams, were virtually finished. Also, earthworks for the tailings facility had started. The Mupane plant will be a conventional facility incorporating single-stage crushing, SAG and ball mill primary grinding, flotation of primary ore and regrinding of flotation concentrate, followed by CIL to recover the gold. Mining tender evaluations were completed during the first quarter of 2004, and a contract was scheduled to be signed with South Africa's Basil Read was scheduled to be signed during the second quarter of the year. A new company, Mupane Gold Mining (Pty) Ltd, has been established as the mine operator and this is likely to remain a wholly-owned subsidiary of Gallery, which does not expect the government to opt to claim its entitlement to a 15% equity participation.

Gallery's Botswana mineral licences cover a total of 3,730 km^2 and include three Archaean greenstone belts, of which the Tati belt, containing Mupane, is 1,730 km^2 in size. Exploration results during the first quarter of 2004 included the drilling of five deep holes at Mupane's main Tau deposit to test the mineralised zone at 50-100 m below the planned base of the open pit in order that the potential for underground mining could be fully evaluated. The drilling indicated the presence of one or two high-grade gold zones (+5 g/t Au) in four of the five holes. Further evaluation was to be carried out to determine if the widths and grades would be sufficient for underground mining, and if positive, further drilling would take place in preparation for stope design.

At the Map Nora concession, 85% owned by Gallery, a new recoverable resource model was completed using the Multiple Indicator Kriging (MIK) method. At Golden Eagle and Kite properties, the total resource above the 870 m level (approximately 100 m below the surface), was estimated at 971,000 t averaging 2.2 g/t Au for 67,800 oz, using a 1 g/t Au cut-off grade. This total included a full JORC breakdown: measured, 512,000 t at 2.4 g; indicated, 312,000 t at 2.0 g; and inferred, 147,000 t at 1.8 g. The resource down to 820 m, some 150 m below surface, totalled 1.3 Mt at 2.2 g/t Au, equivalent to 91,500 oz at a 1 g/t cut-off. The MIK model is for an initial pit design with a total 36,300 oz at 2.5 g/t (proven 27,500 oz at 2.6 g/t) based on a US$390/oz gold price.

A programme of detailed trenching, mapping and sampling was commenced in the area between Golden Eagle and Kite to define better the mineralised shoots for resource drilling, and results of the 16 trenches completed out of a planned 24 during the first quarter were viewed as encouraging, with grades of up to 4.7 g/t Au

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At the old Map Nora gold mine, work included metallurgical testing of three composite ore samples, which indicated a recovery of some 7.5 g/t for 125,000 oz of gold, using the resource/reserve estimate by the previous licence holder, Phelps Dodge (515,255 t at 10.4 g/t), with the ore processed at the Mupane plant.

Other minerals (Table 2)
Other minerals produced in 2003 included soda ash, salt and bituminous coal, along with small quantities of semi-precious stones and quarried aggregates. Output and sales of soda ash by Botswana Ash (Botash) at the Sua Pan brine resource northwest of Francistown, were lower in 2003 because of stronger competition from rival North American suppliers to the main South African market, the depreciation of the dollar against the pula and the rand making their products comparatively cheaper. This impacted on the

financial situation of Botash. The Botswana Government holds a 50% interest in Botash, with Anglo American, De Beers and associated companies holding 42%, and a consortium of banks the remainder.

The lower earnings in 2003 led to the deferral of the plan to increase output to the design capacity of 300,000 t/y. Brine reserves tapped by the existing 360 km^2 wellfield are sufficient to support a larger operation: the entire Sua Pan area covers some 3,500 km^2 and contains an estimated brine resource of 16 billion m^3, one of the largest in Africa. In 2003, soda ash production declined by 17% to 234,500 t, and salt production fell by 27% to 229,400 t. Soda ash exports, which provide some 80% of Botash's total revenue, declined in value by 14% to P238 million, although in US dollar terms, the export value increased marginally to US$46 million. The value of salt exports are not separately itemised in central bank export statistics, but the estimated production value (EPV) was P47 million, down from P65 million in the preceding year. The EPV for soda ash was P174 million, down from P210 million in 2002. The strong competition from American Natural Soda Ash Corp (Ansac), a grouping of North American producers, which jointly export soda ash, saw Botash's share of the South African market fall below the 70% average achieved in recent years.

The most important customers are the South African glass-making industry, chemical producers, metal refineries, and latterly, detergent manufacturers. Zimbabwe is Botash's second most important soda ash market but in recent years sales have been adversely affected by the country's political and economic crisis. Salt is currently sold to South Africa, Zimbabwe and several central African countries, including Democratic Republic of Congo (DRC), Malawi and Zambia; Botswana is sub-Saharan Africa's second-largest salt exporter, after Namibia.

Production of bituminous coal by Morupule Colliery, in which Debswana has replaced Anglo American as the sole private shareholder, fell by 14% to just under 823,000 t in 2003, reflecting lower demand from Botash. Morupule retains close links with Anglo Coal and is able to tap into the latter's technical expertise. All production is solely for the domestic market, with the adjacent Morupule thermal power station, the BCL mines and Botash plant as the major customers. In 2003, the EPV for Morupule output was P26 million, down from P30 million in the previous year. There are large untapped reserves, estimated at some 17,000 Mt in both the greater Morupule and Mmamabula coal fields of eastern Botswana, and the potential for developing additional capacity for export to the global steam-coal market remains under review. However, the high cost of transport to coastal ports from landlocked Botswana renders the development of export collieries currently unviable. In the short term, the government is hoping to expand domestic demand for coal by widening the customer base to include a much wider range of consumers. However, although suitable for use as power station fuel, the coal produced by Morupule is of low quality, with relatively high levels of ash and sulphur, which make it unsuitable for other purposes without washing and cleaning.

A coal beneficiation study completed in 2003 established a market potential for washed coal as its energy per unit mass (calorific value) would be increased whilst pollutants would be reduced. A feasibility study to determine the site and size of a coal beneficiation and briquette manufacturing plant is due to be completed during 2004. Measures being pursued by the government include securing private-sector investment in a coal washing and coal briquette plant, the construction of more coal depots, promotion of affordable coal-burning stoves for household use, and improved distribution facilities. The planned expansion of Morupule power station (the baseload station for the national grid, with an existing capacity of 132 MW) to increase domestic generating capacity, would increase demand for coal and possibly make development of an additional colliery viable. If completed as planned, these projects would lead to an increase in greenhouse gas emissions, and as Botswana is a signatory of the Kyoto climate change protocol, the government would presumably have to take remedial measures to limit emissions.

There is also potential for the recovery of natural gas from the coal-bearing sedimentary rocks of the Kalahari and Karoo Basins. An initial coal bed methane (CBM) study published in January 2004 concluded that the rocks contain a significant volume of gas-in-place resources. A drilling and testing programme undertaken by US consultants estimated a gas-in-place resource of 60 trillion cubic feet (Tcf), with an additional 136 Tcf estimated to be contained in associated carbonaceous shales, bringing the total to 196 Tcf. The study was the first attempt to quantify the coal and carbonaceous shale gas resources of Botswana at the national level and the government is seeking private sector participation to continue the next phase of evaluation. If it were to prove commercially viable to extract the gas, the development of a natural gas energy supply system would significantly diversify Botswana primary energy supplies and provide an alternative to coal.

Tables following pages.

Table 1 Diamond production

	2002	2003	% change
Diamond recoveries			
('000 ct)	28,397	30,412	7.1
Orapa	14,329	16,294	13.7
Jwaneng	13,035	12,765	-2.1
Letlhakane	1,026	1,061	3.4
Damtshaa	7	292	4,071.4
Ore treated			
('000 t)	29,506	30,172	2.3
Orapa	16,390	16,423	0.2
Jwaneng	9,326	8,922	-4.3
Letlhakana	3,666	3,590	-2.1
Damtshaa	124	1,237	897.6
Average grades			
(ct/100 t)	96.2	100.8	4.8
Orapa		87.4	99.2
Jwaneng	139.8	143.1	2.4
Letlhakane	28.0	29.6	5.7
Damtshaa	5.7	23.6	314.0

Source: De Beers SA.

Table 2 Botswana mineral production (t, except where stated otherwise)

	2002	2003
Diamonds ('000 ct)	28,397	30,412
of which Orapa	14,329	16,294
Value (US$ million) [1,2]	1,971	2,365
Copper-nickel matte	45,755	51,983
Value (US$ million) [1]	76	140
Copper	21,590	24,289
Nickel	23,896	27,400
Cobalt	269	n/a
Gold (oz)	670	950
Silver (oz)	5,129	6,549
Palladium (oz)	18,383	33,039
Platinum (oz)	2,793	5,396
Soda ash	283,400	234,520
Value (US$ million) [1]	42	46
Salt	315,100	229,432
Coal	953,081	822,780

1 Export values as published by the Bank of Botswana (central bank) in pula and converted into US dollars at annual average rates).
2 As well as rough diamonds, the figures include small quantities of cut diamonds 2 As well as rough diamonds, the figures include small quantities of cut diamonds exported by Teemane Manufacturing Co, and Schachter/Namdar Botswana (formerly Lazare Kaplan).
Source: Bank of Botswana; De Beers SA; Debswana Diamond Co. (Debswana); LionOre Mining International Ltd.