

DIAMONDS

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For the diamond industry, 2002 can be described as an interim year, a year in which most people waited to see what would happen. The effects of the events of September 11, 2001 were not as bad at first as many people feared, as Christmas 2001 sales in the US were better than expected, up 1% over Christmas 2000, whereas other luxury goods were down 13% from 2000. Diamond sales continued to be good in the first half of 2002, but drifted lower during the second half. Nevertheless, Christmas 2002 sales in the US were up 8% over Christmas 2001 and, for the full year, global sales in 2002 were 4% higher than in 2001.

The delisting of De Beers and its change in strategy from being a custodian of the market (and maintaining a large buffer stock) to becoming 'Supplier of Choice', is working its way through the diamond pipeline and the diamond industry is adjusting to it. Sales by De Beers' Diamond Trading Co. (DTC) for 2002 were up 15.7% over 2001 for a total of US\$5.15 billion (all monetary figures are in US dollars throughout this review). The increase enabled De Beers to reduce its debt from US\$3.5 billion to US\$2.5 billion and the size of its diamond stocks by a value of US\$1 billion. However, the state of the global economy and the threat of global terrorism and war in the Middle East eroded investor confidence and it became very difficult to raise venture capital for new projects.

Significant events

The legal dispute between De Beers and the European Commission was resolved and the new strategy of 'Supplier of Choice' was implemented. The DTC will be competing with other traders in a global market, 'sights' will continue, but the selection of sight-holders will be more open and the description of parcels offered for sale more detailed.

The move by De Beers into the retail trade and the introduction of a brand name (the 'Forever' mark) in the Rapids World joint venture with the luxury goods chain MVLH (Louis Vuitton Moët Chandon) was effected, and the first De Beers-LV diamond retail store was opened in Bond Street, London, on January 1, 2003.

The terms of the new five-year trade agreement between De Beers and the Russian diamond producer Alrosa raised objections from the European Commission and is being revised. In the meantime, De Beers is buying 50% of Alrosa's production (worth approximately US\$800 million in total) under a willing seller/willing buyer agreement until the dispute is resolved.

Complex negotiations between the World Diamond Council, the United Nations, individual governments and non-governmental organisations were concluded and the protocol – the Interlaken Agreement (which will govern the

export and import of rough diamonds) – was signed and ratified by 50 countries in November 2002. As a result, the Kimberley Process, which involves the issuing of certificates warranting the place of origin and the legitimacy of the miner for each parcel of diamonds, came into force on January 1, 2003.

The publication of the Minerals and Petroleum Development Act in South Africa in October 2002 will have an impact on the country's diamond-mining industry. The act promotes Black Economic Empowerment and includes regulations that South African mining projects controlled by South African-based companies must have at least 15% equity owned by black South Africans within five years and 26% equity within ten years. The 'Money Bill' setting standards for royalty payments, including a royalty on diamonds of 8%, is still being hotly debated.

Three small but new diamond mines commenced production in 2002. They are Namdeb's Daberas mine in Namibia, Debswana's Damtshaa mine in Botswana and Kimberley Diamond Co.'s Ellendale mine in Western Australia. When in full production they will add respectively 100,000 ct, 250,000 ct and 500,000 ct/y to world production.

Finally, mention should be made of the sudden death of Hugo Dummett in a car crash in South Africa in August. A well-known diamond explorer, Hugo had recently retired as BHP's manager for diamond exploration North America.

Regional developments

Diamond exploration is still continuing at a brisk pace, with Canada in the lead. Worldwide, about 190 companies are investigating some 450 projects. In 2002, exploration expenditure was up 11% over the previous year and is estimated at US\$243 million. Some 50% of the total expenditure was in Canada, with 5% in South Africa, 22% in the rest of Africa, 10% in South America and 13% in Australia.

Canada

According to De Beers, 540 kimberlites had been discovered in Canada by the end of 2002, most of them located in the Archaean Slave Craton of the Northwest Territory (NWT) and Nunavut (for a short discussion on cratons in Canada see last year's review). Of this number, 202 are located in the Ekati and Diavik mine leases alone. This is the result of intense exploration which began after the first discovery of diamondiferous kimberlite in this region in November 1991. So far this has generated the development of two mines, Ekati (commenced production in October 1998) and Diavik (commenced production in March 2003), and four advanced projects, Snap Lake (production planned to commence in 2005), Jericho (production planned to commence in 2005), Gahcho KuĶ (no decision on mine feasibility to date) and Victor (no decision on mine feasibility to date).

The shift of exploration activity from the Slave Province in the Northwest Territory and Nunavut to other areas, in particular eastern Quebec, continued

in 2002. Activity is about equal for NWT-Nunavut and Québec, but much work is also going on in Alberta, Saskatchewan and Ontario. In 2002, De Beers Canada spend US\$29 million on 30 projects located in NWT-Nunavut, Saskatchewan, Manitoba, Ontario and Québec; Ashton Mining Canada spend about US\$12 million in Alberta, Nunavut and northern Quebec; and Kennecott spent about the same amount in Nunavut, Ontario and Québec.

In **Nunavut**, exploration activity in 2001 had moved from the southern and central portions of the Slave Craton to its northern portion in the Coronation Gulf district in Nunavut (see also the discussion on the various joint ventures and kimberlites in this region covered in last year's edition of *Mining Annual Review*).

A joint venture between Tahera and Kennecott (Rio Tinto) found the Tenacity kimberlite on the Hood River property in 2001, but as Kennecott has withdrawn from the JV, one can presume that this kimberlite is not economic. The same partners found five kimberlites (one of which, Anuri, is diamondiferous) in their 150,000 ha Rockinghorse property and in 2002 found one additional kimberlite, Alani, within 20 km of Anuri. Results from a 271 kg mini bulk sample from Anuri indicated that its diamond content is 'significant', with the largest diamond recovered weighing 0.75 ct. More work is planned for a further evaluation in 2003. No results have been announced to date for the new Alani kimberlite.

In the Jericho area, Tahera and Kennecott are investigating several unresolved kimberlite indicator mineral trains within 10 km of Jericho. However, Kennecott has withdrawn from the Jericho prospect itself, which is now once again 100%-owned by Tahera. Tahera submitted its final Environmental Impact Statement (EIS) for Jericho in January 2003. The company plans to construct and operate a diamond mine with a life of eight years commencing with an open pit for the first four years. Defined reserves are 2.53 Mt averaging 1.19 ct/t, with an average value per carat of US\$75-88, recently revised to US\$94. At a planned mining rate of 330,000 t/y for the open pit this will yield approximately 400,000 ct/y. If all permits are granted in time production will commence in the middle of 2004 and full production in the first quarter of 2005. Tahera has agreed to sell all of Jericho's output to Lazare Kaplan International, with an option to reserve 25% for sale elsewhere.

Further south, in the Northwest Territories, the joint venture between Tahera and BHP Billiton has terminated investigations of the ICE claims and Ranch Lake area without conclusive economic results. BHP Billiton has since withdrawn from the JV.

Ashton Mining of Canada (AMC) is active in the Coronation Gulf region in several joint ventures. In 2001, the AMC-Pure Gold joint venture found five kimberlites on the Kim and Ric properties of which the Artemisia kimberlite appeared the most promising. In 2002 work on this body proved it to be 3 ha in size with a grade of 0.11 ct/t, based on an 11 t mini bulk sample. Further work is planned for 2003. In addition, the new Thrift kimberlite was found near

Artemisia. The AMC-Caledonia Mining-Northern Empire joint venture which found the promising Potentilla kimberlite in 2001 on their Kikerk Lake property, discovered the new diamondiferous Stellaria kimberlite dyke and several smaller kimberlite dykes near Potentilla. A mini bulk sample of Potentilla yielded a grade of 0.22 ct/t from 5.8 t. Although the grades of Artemisia and Potentilla are not high, they have encouraged AMC to carry out further work in these areas.

The joint venture between De Beers Canada and Rhonda Mining is still continuing the evaluation of the Knife kimberlite. Rhonda has formed a joint venture with Teck Cominco on the Inulik property which adjoins the Knife property.

In summary it can be said that the high expectations of investors for success in the Coronation Gulf region have not been realised. Results of evaluation of Anuri, Potentilla, Artemisia and Knife were 'interesting' and Kennecott, Ashton and De Beers will continue their investigations of this region, but investor interest has shifted to the Otish Mountains area in northern Québec.

Diamond prospecting is still continuing on Victoria Island north of Coronation Gulf. About 20 kimberlites have been discovered so far by several junior companies. The latest discovery is the Apollo kimberlite found in 2002 by the Canabrava-Diamonds North joint venture on the Hadley Bay property.

Canabrava has recently withdrawn from the jv to concentrate on its projects in the James Bay Lowlands and northern Québec. Despite much work, no economic discoveries have been announced from this region to date.

Further to the west of Coronation Gulf, Diamondex has taken up the Lena West property. This area was outlined by Nick Pokhilenko, a well-known Russian diamond geologist, as a possible hard-rock source for the alluvial diamonds found in the Upper Yukon drainage system.

In the eastern part of Nunavut along the north shore of Baffin Island, junior company Twin Mining has increased its property around the Freightrain and Cargo kimberlites, but no further significant results have been announced.

Northern Empire Minerals announced a joint venture with Shear Minerals on its Churchill property near Rankin Inlet (NEM 35%, Shear 51% and Hunter Resources 14%) where at least one kimberlite pipe and several small dykes have been found by previous gold explorers. BHP Billiton has offered to buy into this project by purchasing all or part of Hunter's equity.

Also in this region, Northern Empire Minerals and Stornoway Ventures announced results from their large Aviat property on the Melville Peninsula. Diamondiferous kimberlite boulders were found in 2002 and early in 2003 the diamondiferous AV 1 kimberlite was found by drilling an airborne magnetic anomaly. Northern Empire and Stornoway have recently announced their intention to merge.

In the **Northwest Territories**, in the central part of the Slave Craton in NWT the Ekati operation (80%-owned by BHP Billiton and 10% each by Fipke and Blusson, the original prospectors) is mining by open pit a tight cluster of four small pipes, Panda, Koala, Fox and Leslie, plus the Misery pipe, 30 km to the south. Underground development commenced at Koala North during 2002.

Annual production at Ekati now amounts to roughly 3.5 Mct. In late 2002, BHP Billiton ended the agreement by which De Beers purchased 35% of Ekati's output, and will now market the whole of Ekati's production. All mine production is sorted and valued at Yellowknife prior to shipment for sale. About 8% is cut and polished there under the brand name Aurias diamonds.

The development of the Diavik mine (60% Rio Tinto; 40% Aber) is on schedule and within the budget of US\$850 million (C\$ 1.3 billion). It will mine a tight cluster of four small pipes, A154S, A154N, A21 and A418 which lie beneath the shallow waters of a bay of Lac de Gras. A water-retention dyke has been constructed to encircle the cluster and the water pumped out.

Mining operations commenced in early 2003 from an open pit on the A154S kimberlite at a planned rate of 500,000 t/y. It came as a surprise when the top layer which was believed to represent lake sediments turned out to be a layer of kimberlitic ash up to 10 m thick which may add 200,000 ct to the reserves of A154S.

The Snap Lake project (100%-owned by De Beers) is a shallow-dipping kimberlite dyke with a mineable reserve of 22.8 Mt. De Beers had planned to start operations in 2005, but recently Richard Molyneux, president of De Beers Canada, claimed that the permitting process has been bogged down in red tape and that this will delay approvals for almost one year.

It is interesting to note that a recent estimate by De Beers and others for the revenue per tonne (grade times value per carat) for six projects is as follows: Ekati US\$147, Diavik US\$378, Snap Lake US\$182, Jericho US\$110, Gahcho Kuž US\$100, and Victor US\$94. Taking into account the defined reserves, this gives a total value as follows: Ekati US\$8.8 billion, Diavik US\$9.8 billion, Snap Lake US\$4 billion, Gahcho Kuž possible US\$1.6 billion, Victor- no reserves calculated yet, and Jericho US\$0.3 billion.

The Gahcho Kuž project (De Beers 64% and Mountain Province-Camphor Ventures 36% combined) has not yet passed into a mine feasibility stage as additional kimberlite pipes and sills are still being discovered on the Kennady Lake property. So far, eight small kimberlite pipes and several sills and dykes have been found but the partners are encouraged by the recovery of large diamonds, such as a 9.9 ct diamond found in 2001 in the 5034 pipe and in 2002 three diamonds of respectively 8.7, 6.4 and 4.9 ct from the Hearne and 5034 pipes.

The latest discoveries in this area were made by a joint venture between De Beers and GGL Diamond Corp., and included a diamondiferous kimberlite sill at Doyle Lake, located immediately south of Kennady Lake.

Several junior companies are continuing diamond exploration in various parts of the Slave Craton in NWT. Recently New Shoshoni Ventures found a new diamondiferous kimberlite in the Drybones Bay area.

In **Alberta**, Ashton Mining Canada is continuing its prospecting activities in the Buffalo Hills in joint ventures with Alberta Energy and Pure Gold. The total extent of their property now amounts to 1.4 million ha. So far, 38 kimberlites have been found of which the most promising is K252 with a grade of 0.55 ct/t derived from a 22.8 t mini bulk sample. The largest diamond recovered was 0.94 ct. The pipe is less than 2 ha in size and instead of a characteristic magnetic anomaly it has a distinct EM anomaly. Following up EM anomalies in the area, AMC discovered the K296 and K300 pipes in early 2003 and in so doing added another string to its bow for tools for new kimberlite discoveries.

The largest kimberlite pipe in the Buffalo Hills field is K6 discovered in 1997. Its size was found to be 250 x 600 m and its grade was 0.06 ct/t from a mini bulk sample of 13 t; the largest diamond was 0.78 ct. In 2002, a south lobe was discovered which yielded a grade of 0.09 ct/t from a mini bulk sample of 5.7 t. The interesting grade of 0.55 ct/t for K252 and the promising results of EM surveys have encouraged AMC to continue with its exploration in the Buffalo Hills area.

In **Saskatchewan** the joint-venture project between De Beers Canada (42.25%), Kensington Resources (42.25%), Cameco (5.5%) and UEM (10% free carried) embraces 63 of the 72 known kimberlites in the Fort à la Corne field which includes very large pancake- or shallow bowl-shaped kimberlites, some of which have potential resources of several hundred million tonnes. The most promising is the 140/141 body where a 3.35 ct diamond and two of respectively 0.25 and 0.125 ct were found in the top clay-rich layer. A C\$ 5.2 million drilling programme is planned which includes large diameter (up to 36-inch diameter) drilling to collect a bulk sample. A 10.23 ct diamond was found in May 2003.

Junior company Shore Gold is still continuing evaluation of its Star kimberlite which has a potential ore resource of 400 Mt.

In **Manitoba**, Dunsmuir Ventures formed a joint venture with BHP Billiton to apply the Falcon airborne gravity gradient survey over selected areas where BHP had previously found kimberlite indicator minerals.

In **Ontario**, diamond prospecting is focused in an area near Wawa and in the James Bay Lowlands around and south of the Attawapiskat cluster where 16 diamondiferous kimberlites were found by De Beers in 1988. De Beers is evaluating the Victor pipe, which has a complex structure of two pipes coalescing at the surface to an area of 16 ha. The two lobes have pyroclastic and hypabyssal facies with variable grades and recently a deeper third lobe has been found. Development of the Victor pipe was interrupted in September 2002 because of disagreements in talks with the Attawapiskat First Nation but

has resumed in 2003. If results stack up, possible mine development is anticipated in 2007, but no feasibility studies have been announced to date.

Two additional kimberlites in the Attawapiskat cluster, MacFadyen 1 and 2, were found by Spider Resources in 1994. In 2002, the Canabrava Diamond Corp./ Navigator Exploration joint venture discovered the AT-56 kimberlite on the Kat property, close to the Attawapiskat cluster. (The previous Severn property was split into the Kat and Frontier properties and the latter was downgraded). Much activity is occurring at present in claim blocks south of Attawapiskat, in the trend of the Timiskaming structure and at least one kimberlite has been found in the Metalex Ventures/Arctic Star property.

Further south along this trend, in the New Liskeard-Cobalt area, Sudbury Contact Mines is re-assessing its four kimberlites (two are diamondiferous) found originally in Lundy township in 1994-95. Several juniors, including Tre-Or Resources, AntOro Resources, Big Red Resources and Coba Mining, are resuming diamond exploration in the Lake Temiskaming area on the Ontario as well as on the Québec side.

In the Wawa area, several companies are prospecting the enigmatic diamondiferous rocks north of Wawa. These rocks form part of the ubiquitous Archaean granite greenstone succession which exhibits low amphibolite facies metamorphism and makes the petrological nature of the diamond-bearing rocks difficult to classify. They include agglomeratic dykes, sills, and breccia vents, and lava flows of basic to ultrabasic composition. They have been variously described as ultramafic lamprophyres, metamorphosed kimberlites and komatiitic lavas. Numerous microdiamonds and some macrodiamonds (up to 0.72 ct in the Festival property of Pele Mountain Resources) have been found in all rock types and explorers are now looking for these 'Wawa-type' rocks in many other areas in Canada and the US. Several companies are working in the Wawa area, including some that have progressed to a mini bulk-sampling stage, such as Pele Mountain Resources in a joint venture with De Beers Canada on its Festival property, and Band-Ore Resources in a joint venture with Kennecott on its GQ property.

Prospecting activities for these Wawa-type rocks should not be confused with prospecting for more traditional kimberlites in areas south of Wawa, where diamonds and kimberlite indicator minerals occur in glacial and recent stream sediments. Canabrava announced a kimberlite find near Whitefish Lake in 2001 and in a joint venture with Kennecott and Paramount Ventures and Finance, it is exploring the Groundhog property in a wide area south of Wawa, so far without announcing any interesting results.

In **Québec**, in the northern part of the province extending from the east side of James Bay to the Otish Mountains, many companies are exploring, some with land tracts amounting to several hundreds of thousands of hectares. These include Majescor in joint ventures with BHP Billiton and Canabrava. However, the discovery rate of kimberlites to date has been very low, except for Ashton Mining of Canada, which has thus far been the most successful exploration company in this region. On its Foxtrot property AMC has thus far discovered

several kimberlites – Renard 3 to 8 in 2002, and Renard 9 in early 2003. This was in addition to Renard 1 and 2 discovered in 2001. Foxtrot is one of four properties, the others being, Tichigamme, Taiga and Caniapiscou, which cover an area of 380,000 ha in the Otish Mountains region in northeastern Québec. AMC holds them in a 50:50 joint venture with Soquem. The kimberlites are all diamondiferous, and small in size from 0.3 to 1.5 ha, but Renard 2, 3, 4, 5, 6, 8 and 9 occur close together in a 'core area' of 0.5 x 1 km which includes at least 3.4 ha of kimberlite and is similar in size to the Panda cluster at Ekati. Three 5 t mini bulk samples of Renard 2, 3, and 4 yielded grades of respectively 0.63, 1.34, and 0.65 ct/t. The largest diamonds recovered weighed 0.92 and 0.73 ct and were from Renard 5 and 3 respectively.

The only other explorers finding kimberlites in this region are the joint venture partners Ditem Explorations and Pure Gold Minerals who discovered four kimberlites on their Tichegami River property in late 2002/early 2003. (Uranerz discovered a kimberlite in the area at Beaver Lake in 1979.). Evaluations for diamond potential are in progress. Elsewhere in the area, Majescor has discovered a diamondiferous kimberlite sill on its 100%-owned Wemindji property, but the occurrence does not represent an economic deposit.

United States

Alluvial diamonds have been found in the US since 1843. These incidental finds were widely scattered and generally only amounted to a few stones here and there, so they never attracted much attention from investors or the public at large.

Nevertheless, more than 2000 authenticated 'chance' finds are recorded in 30 of the 48 contiguous states. The largest diamond found weighed about 34.5 ct. Moreover, several diamondiferous lamproites and diamondiferous kimberlites have been found in Arkansas, Michigan and Colorado.

A small diamond mine operated in Colorado from mid-1996 until mid-1997 and produced very high quality, large diamonds (up to 26 ct). Despite this, very little systematic diamond exploration has been carried out in the US, although recently a joint venture between Dunsmuir and Majescor commenced prospecting.

Greenland

Several companies, including Cantex (formerly Diamet), Citation and De Beers, continue diamond prospecting in Greenland, but no significant discoveries were announced in 2002.

Venezuela

Alluvial diamonds are mined by local workers, often combined in small syndicates. The main areas are the Santa Elena area in the southeasternmost part of the country on the border with Brazil, and the Guaniamo River area in central southern Venezuela where diamondiferous kimberlite sills were discovered in 1972. US and Canadian companies have been active in the

area but were discouraged by difficulties in gaining title and by social unrest. Recently, Kansai Mining Corp. has been drilling 2,000 m-long kimberlite sills on its Natal property to outline reserves.

Brazil

Nearly every major river system in Brazil has yielded alluvial diamonds and many deposits are mined by local workers, often grouped into small syndicates, so-called *garimpeiros*, or backed by Brazilian companies. Expatriate companies have been prospecting since 1975 and have found hundreds of kimberlites in many areas, but so far none has been developed as a significant diamond mine.

De Beers carried out trial mining on the Tres Ranchos kimberlites in Goias, the Juina kimberlites in Mato Grosso and the Canastra kimberlites in Minas Gerais, and Rio Tinto outlined alluvial deposits in Mato Grosso, but both companies terminated the projects as they did not fall within their parameters of size and revenue.

Several companies based in Canada and Australia have re-evaluated these projects and investigated others, but so far no profitable mine has been established.

The latest advanced projects include: the Juina Mining (49%) and Diagem (51%) joint venture investigating kimberlite pipes and alluvial diamonds in the Juina area of Mato Grosso. (Juina merged recently with Emerging African Gold and Mousseau Tremblay of EAG is now president of Diagem.); Chapada Diamonds' alluvial project in Mato Grosso. (Chapada is seeking a listing on AIM in London.); an alluvial project in Mato Grosso involving Ofex-listed River Diamonds in partnership with Harry Baines's HB Group; a partnership between Black Swan Resources and AKD is planning to develop an alluvial project on the Abaete River in Minas Gerais, where bulk sampling is in progress; the Canastra kimberlite project in southern Minas Gerais, purchased from De Beers by Black Swan Resources, is re-assessing the potential to develop a small diamond mine on the small 1 ha Canastra No.1 pipe. (The Canastra No.8 pipe could be as large as 21 ha.); and the Canabrava/ SouthernEra partnership which has found additional kimberlites in the Patos de Minas area of Minas Gerais, but not, as yet, an economic deposit. (SouthernEra has recently withdrawn to pursue other interests elsewhere.)

Australia

The Argyle diamond mine in Western Australia has now completed operations to move sterile ground to widen the open pit. Because of improved recovery processes the mine has increased production from 26.1 Mct in 2001 to 33.5 Mct in 2002. Since April 2002, Argyle has been wholly-owned by Rio Tinto which purchased the last remaining small holding (0.1 %) from the Western Australian Diamond Trust.

Merlin, Australia's second mine, is going to close in mid-2003, after a four-year life during which time it will have produced approximately 500,000 ct of

high-quality diamonds. The largest diamond found so far weighed 107 ct. However, Rio Tinto has decided that the deposit does not meet its parameters as to size and revenue, and has put the mine up for sale at a price of US\$30 million. So far, there are no takers and thus the mine will close.

Ellendale, Australia's third hard-rock diamond mine, was developed by Perth-based Kimberley Diamond Co. on parts of two lamproite pipes, Ellendale No.4 and No.9. Production began in July 2002 at a planned rate of 500,000 t/y and at an average grade of 0.15 ct/t. Production has exceeded design capacity and the treatment plant, located at the No.9 pipe is running at nearer 700,000 t/y which could yield around 60,000 ct/y. In December 2002, KDC announced an expansion based on the construction of a second plant at the No.4 pipe where exploration has substantially increased the resource. The second plant will have a treatment capacity of 2.2 Mt/y. KDC expects to produce 176,000 ct this year and 390,000 ct in 2004. Thereafter, annual production could be of the order of 300,000 ct/y until 2012.

During the evaluation stage in 2000/2001, several large diamonds weighing 7.9 ct, 8.04 ct, 6.88 ct and 9.5 ct were found. The find of a 7.64 ct gem during the first two weeks of mining and a find in September of a magnificent yellow octahedral gem of 11.47 ct indicates that Ellendale should produce many +5 ct stones. Output is characterised by good-quality yellow diamonds. The average value per carat for a sale by David Lapa of Overseas Diamonds in Antwerp was US\$135/ct.

A most interesting announcement was made in October 2002 by Striker Resources, which has been working hard to establish a mine in the northern part of the Kimberley region of Western Australia. Previous attempts at the Bulgurri dyke system and the Ashmore pipe cluster failed to outline economic deposits, but the latest results at the Seppelt No.2 pipe yielded a grade of 2.25 ct/t from a 183 t bulk sample, which contained a 2.95 ct diamond and up to 30% of the diamonds recovered were greater than 0.25 ct. The Seppelt No.1 pipe located 5 km to the north, yielded a grade of 0.43 ct/t and contained gem-quality diamonds of 3.15, 1.95, 1.55 and 1.2 ct respectively. Investigations are under way to evaluate the viability of a mine drawing ore from both pipes.

Thundelarra Exploration's Philips Range project, also in the Kimberley region, includes the 18 ha size Aries kimberlite pipe. In 2001, three small satellite kimberlite pipes, Athena, Helena and Persephone, were discovered to the south of Aries as a result of an airborne Falcon gravity gradient survey and in 2002 the Niobe kimberlite was found. Gravity Capital/BHP Billiton can earn up to 60% equity by spending A\$500,000 on ground-based surveys and target drilling.

Tawara Resources did not intersect kimberlite when drilling its Flinders Island project which contained highly promising kimberlite indicator mineral anomalies over a limited area. De Beers has withdrawn from the joint venture. The two diamond exploration juniors, Elkedra Resources and Flinders

Diamonds, which floated successfully in early 2002, have not announced significant discoveries during 2002.

South Africa

De Beers continues to operate seven large kimberlite mines, Finsch, Dutoitspan, Bultfontein, Wesselton, Koffiefontein, Premier, and Venetia, plus three alluvial mines. The three old Kimberley mines are underground mines now operating at depths of 700 to 800 m, and are plagued by clay-rich mud rushes. Their continued operations to 2018 have been assured by the construction of a new central treatment plant at Kimberley which began operating in September 2002. The plant was specifically constructed to process clay-rich ore and old mine tailings. The seven mines together produced 9.5 Mct in 2002. In addition, De Beers operates The Oaks, a small kimberlite mine producing approximately 120,000 ct/y. De Beers also has a 50% equity interest in SouthernEra's Klipspringer mine which produces some 180,000 ct/y. The three alluvial mines operated by De Beers are located in Namaqualand at Langhoogte on the Buffels River, and Kleinzee and Koiingnaas-Hondeklip along the coast. Together they produce about 800,000 ct/y.

Other alluvial operators are Transhex and Firestone Diamonds, both with mines at Hondeklip and along the Orange River. After protracted negotiations, the South African Government has decided to privatise 51% of its Alexkor alluvial mine located along the coast south of the mouth of the Orange River. The shortlist of bidders includes four consortia in each of which Black Economic Empowerment groups have at least a 25% equity interest. The bidders include Dimeng Diamond Holdings in which Petra Diamonds holds a controlling interest, Transhex which includes Mvelaphanda Holdings, New Alexkor Consortium which includes New Diamond Corp. with connections to De Beers, and Pan African Gems. The successful bidder will be announced in June 2003.

Australian-based Namakwa Diamonds, has outlined promising deposits onshore along the coast of Namaqualand in raised beaches about 38 m above sea level, located between 12 km and 47 km north of the mouth of the Oliphants River. A conservative estimate puts reserves at 10 Mt at an average grade of 0.1 ct/t. A dense media separation plant was commissioned in February 2002, and bulk sampling has produced grades between 0.23 ct and 0.28 ct/t. The largest stone recovered weighed 3.64 ct. A decision will be made soon on whether or not to develop a mine with a throughput of 500,000 t/y. The average weight per stone is 0.3 ct and average value per carat is US\$140-\$160. The figures are very robust as operational costs are only US\$5-6/t, and the conservative value used in the feasibility studies is US\$10/t. For comparison, the average grade for the large volume of ore mined by De Beers in its coastal operations is 0.14 ct/t at a lower cost per tonne.

Several Australian and Canadian junior companies, including County Diamonds, Dwyka Diamonds, Majestic Corp., SouthernEra and Vaaldiam are prospecting and mining alluvial deposits along the Vaal and Orange Rivers

with varying degrees of success. In general, past and present annual production of all these prospects is low (at around 10,000-15,000 ct), and grades are also poor (generally 0.01 ct/t) but values are high (US\$300-600/ct). However, none of these companies has yet shown an operational profit. Majestic is also assessing the re-opening of the old Star fissure mine in the Theunissen district of the Orange Free State. Tawara Resources is evaluating a kimberlite pipe on Perdevlei, east of Finsch. The most interesting announcement was that Tawara, in joint venture with BHP Billiton, has found buried alluvial channels close to the Finsch mine and hopes to outline a viable alluvial deposit.

Namibia

Namdeb, a 50:50 joint venture between De Beers and the Namibian Government, operates onshore, while De Beers Marine Namibia, a jv between Namdeb (30%) and De Beers (70%) manages the major part of the offshore operations at about 110 m depth along the Namibian coast. The proportions of onshore to offshore production are about 55:45. In 2002, Namdeb produced 1,275,899 ct, a decrease of 108,805 ct relative to 2001. Sales, however, were worth N\$4.1 billion, 20% up on the previous year. Production was concentrated in five mining areas: Orange River, Mining Area 1, Elizabeth Bay, Bogenfels and Atlantic 1. On the north bank of the Orange River Namdeb's operations have been augmented by the start-up of the new Daberas mine in May 2002 with a planned production rate of 100,000 ct/y.

Other previous and current offshore operators in Namibia include the Trans Hex Marine/Diamond Fields International joint venture, Namibian Minerals Corp. (Namco) and Afri-Can Marine Diamonds. Efforts to evaluate and mine submarine river channels near Luderitz have been hampered by difficult technology and sinking ships, and no profitable operations have been established to date.

Australian junior, Mt Burgess Mining, continues to evaluate its Tsumkwe prospect in northern Namibia on the Botswana border, where it has found two kimberlites to date. Reefon Mining, another Australian junior, found good grades and good diamonds during exploration trenching of coastal deposits along the Skeleton coast, north of Swakopmund.

Botswana

Debswana, a 50:50 joint venture between De Beers and the Botswana Government, is Botswana's sole diamond producer and operates the Orapa, Letlhakane and Jwaneng mines. Debswana is the world's number one diamond producer accounting for approximately 25% by weight and 30% by value of world production. In 2002, Debswana treated 29.5 Mt of ore, and recovered 28.4 Mct. Sales of rough diamonds totalled 28.39 Mct and the company's total revenue increased by 7% to P11.2 billion. Recent improvements in treatment and recovery have greatly increased production capacity.

Jwaneng, located about 170 km west of Gaborone, is the world's richest mine, and in 2002 it treated 9.3 Mt of ore for the production of 13.04 Mct at an

average recovery grade of 1.25 ct/t. The open-pit operation shifted nearly 37 Mt of waste. Jwaneng began operations in 1982 and has a further mine life of some 27 years. At Orapa, production totalled 14.33 Mct whilst Letlhakane produced 1,025 ct. The US\$40 million Damtshaa mine, a complex of four small pipes of the BK cluster, located 20 km east of Orapa, commenced production in October and contributed 7,000 ct. Ramping up to full production of 1.2 Mt/y is planned for June 2003 and will generate 200,000 ct/y at a grade of 0.17 ct/t.

Several Australian, UK, Canadian and South African junior companies, including Botswana Diamond Fields, Cantex, Firestone Diamonds and Trivalence, continue their prospecting efforts in various parts of Botswana, but no economic prospects have been identified so far.

Angola

Ascorp, the Angolan government agency, to which all legal alluvial miners must sell their diamonds and which is the sole legal exporter of diamonds, is still functioning, although many Angolan diamonds are sold in the Democratic Republic of Congo (DRC) where miners obtain higher prices. Since the death of Jonas Savimbi in late February 2002 and the signing of a peace agreement in April, most Unita forces have disbanded, and the civil war in Angola has officially ended.

Large stocks of diamonds are still supposed to be in the illicit pipeline but Ascorp, and the Kimberley Process requiring certification of diamonds, appears to be curbing this trade.

By special arrangement with Ascorp, the production from Angola's major producer Catoca Ltd goes directly to Israeli buyers. The Catoca kimberlite mine, located near Saurimo in Angola's northeastern province of Lunda Norte, is managed by Sociedade Mineira de Catoca (SMC). This is a joint venture between Angola's state-owned mining company Endiama (32.8%), the Russian producer Alrosa (32.8%), the Brazilian company Odebrecht (16.4%) and Daumonty Financing (18%). Daumonty is controlled by the Israeli diamantaire Lev Leviev. Through Welox Ltd, Mr Leviev also holds a 24.4% interest in Ascorp. In 2001, Catoca recovered 3.0 Mct of diamonds worth US\$170 million but a second ore treatment plant is under construction that will more than double throughput to 7.5 Mt/y and raise annual diamond recovery to some 5 Mct by 2005.

In May 2003, Trans Hex Group Ltd of South Africa was seeking to acquire Odebrecht's equity stake in SMC but negotiations were subsequently complicated when Daumonty exerted its pre-emptive rights to purchase the Odebrecht stake and then offered Trans Hex its entire 34.4% shareholding in SMC in return for a major shareholding in Trans Hex. Early in 2003, the South African company announced plans to invest US\$30 million in two alluvial diamond concessions in Angola, Luarica and Fucauma.

Government approval for opening Angola's second kimberlite mine, Camafuca, has been granted and SouthernEra anticipates commencement of

production within 12 months. Other diamond explorers, including Petra Diamonds, are returning to Angola to explore and test the hundreds of kimberlites known to occur in the country. In June 2001, De Beers announced that it had suspended all diamond buying and exploration activities in Angola, and negotiations with the government for a return of De Beers to Angola have thus far proved unsuccessful.

West Africa

Little news of diamond exploration activities has come from West Africa. Rio Tinto and De Beers are continuing exploration in Mauritania. In Sierra Leone rebellion and civil war appeared to have quieted down and Diamond Works and Mano River Resources have returned to explore again. Mano River announced the finding of eight new kimberlites containing macrodiamonds. Trivalence continues to produce good-quality alluvial diamonds from its lease in southeastern Guinea, where Rio Tinto has farmed in to explore kimberlite targets. In the Ivory Coast, African Mining and Petroleum Resources plc (quoted on London's Ofex) entered a joint venture with de Beers but recent insurrection has hampered further development of their Bobi concession.

Other Africa

Owing to the unsettled conditions in Zimbabwe, diamond exploration activity is very low. Rio Tinto is reported to have deferred any development of the Murowa project and several junior diamond explorers have withdrawn from the country.

Diamond production by artisanal and government agency operations still continue in the Democratic Republic of Congo (DRC), Central African Republic and Zambia, but production and export data are unreliable as many diamonds move across national borders. According to Antwerp import statistics, several other African countries export substantial amounts of diamonds but most of these countries have no known diamond-mining operations.

In western Tanzania, the reconditioned Mwadui mine (De Beers 75%, Tanzanian Government 25%) commenced production in 1997. Recent production has decreased to 152,000 ct/y from a peak of 320,000 ct in 2000.

Russia

The Russian diamond producer, Alrosa Co. Ltd continued with its five-year (2001-05) US\$3.2 billion investment plan during 2002. The plan aims to increase annual output of rough diamonds by 20% to US\$2.0 billion. It has also secured a new sales agreement with De Beers guaranteeing minimum annual sales of rough diamonds to De Beers of US\$800 million.

All of Alrosa's current production comes from the Sakha Republic (formerly Yakutia). It is now principally derived from two large open pits, Udachnaya and Jubilee, developed on large kimberlite pipes, from two new small open-pit mines, Zarnitsa and Konsomolskaya, and two new underground operations, International and Aikhal.

All other open-pit mines there have reached their economic-depth limits, and a key element of the investment plan is to bring underground mines into operation. After overcoming many difficulties, including rushes of water and gas, the first of these underground mines, International, reached its design capacity of 1.5 Mt/y of ore early in 2002. Underground development work is continuing at the Aikhal pipe (500,000 t/y of ore to be commissioned in 2005) and Mir pipe (commissioning in 2006).

In 2001, Alrosa produced rough diamonds worth US\$1.66 billion from its four principal operations in Sakha. Udachnaya contributed US\$708 million and declining output from the main open pit was partially offset by higher output from the new, small open pit on the nearby Zarnitsa pipe. Mirny contributed US\$578 million, 15% higher than the previous year as a result of increased underground output from the International pipe. Aikhal, which in addition to the underground development, includes the Jubilee open pit and the new Komsomolskaya open pit, contributed US\$355 million. Anabar, comprising a number of small alluvial operations contributed US\$25 million.

This year, a new wholly-owned subsidiary, Nyurba, should begin making a significant contribution. Based at Nakyn it will exploit the Nyurba and Botuobinskaya kimberlites by open-pit mining, and a new 1.5 Mt/y capacity processing plant is scheduled to begin commercial production in August this year.

In addition to the operations in Sakha in eastern Russia, another potential producer towards the end of the five-year plan is the Lomonosov deposit located in the Arkhangelsk region of northwest Russia. The US\$400 million project is being developed by Alrosa via 73%-owned Severalmaz, a joint-stock company. Production could start in 2004 at a throughput of 5.0 Mt/y yielding diamonds worth US\$200-250 million.

The legal dispute between Denver-based Archangel Diamond Corp. (ADC) and the Russian company Arkhangel'sgeoldobycha (AGD) concerning ADC's contractual rights to participate in the Verkhotina diamond property (which includes the Grib pipe with estimated reserves of 67 Mct of diamonds to a depth of 500 m) was not resolved during the year. Under the terms of a joint venture between the two companies, ADC believes that AGD should have transferred the Verkhotina licence to a joint-stock company, Almazny Bereg (40%-owned by AGD and 40%-owned by ADC) over five years ago. Control of AGD was acquired by LUKoil in late 2002. LUKoil is Russia's biggest oil producer and is trying to render the JV agreement void. In December 2002, De Beers announced that it had invested a total of US\$2.7 million in ADC and had control of 64% of the total issued capital of ADC. De Beers managing director, Gary Ralfe, who is to be made chairman of ADC, said the dispute was not furthering the interests of either party and that, with its long experience of working in Russia, De Beers "may be able to assist in the resolution of the dispute".

Finland

European Diamonds and several other diamond explorers are continuing their activities in northern Finland, but lack of significant results from surface sampling and airborne magnetics has made it difficult to raise more venture capital.

India

De Beers, Rio Tinto and BHP Billiton, and several junior companies including Dwyka Diamonds, Oropa and Australian Indian Resources are exploring in several states, including Karnataka, Maharashtra, Madhya Pradesh, Andhra Pradesh, Chhattisgarh and Orissa. Oropa's evaluation of the Mainpur diamond field, located 150 km south of Raipur, capital of the new state of Chhattisgarh, is still on hold because of legal complications.

India's sole diamond producer is the Mahjawan open-pit mine, located 20 km west of Panna in Madhya Pradesh. It is operated by a government agency and has a modest annual production of 25,000 ct of good-quality diamonds

Other Asia

No significant diamond exploration news has come out of China since Astro Mining withdrew early in 2000.

In Indonesia, BM Diamond Corp. raised £1.75 million through Ocean Resource Capital to commence diamond-dredging operations at Cempaka in southeastern Kalimantan (previously an Ashton Mining operation). The company anticipates a production of 47,000 ct/y for an 18-year life, with by-product gold and platinum credits.