

**Appendix 2**  
**TECHNICAL & FINANCIAL REPORT**

## Technical and Financial Report

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## TECHNICAL & FINANCIAL REPORT FOR THE DIAMOND BUSINESS INTERESTS OF DE BEERS AND ITS PARTNERS

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### TECHNICAL AND FINANCIAL REPORT

#### 1. Executive Summary

##### 1.1 Introduction

This Technical and Financial Report (“TFR” or “report”) has been prepared by the De Beers Responsible Persons at the request of the Independent Committee of Directors of De Beers and provides relevant technical and financial information on the entire De Beers group of companies. The report has been written in order to assist the independent Linked Unit holders of De Beers in their evaluation of the scheme of arrangement proposed by DBI between DBCM and its shareholders, the resolutions to be considered at an extraordinary general meeting of DBCM, and the resolutions to be considered at the meeting of holders of depositary receipts.

With respect to De Beers’ mining assets, the basis for this report is the De Beers Strategic Business Plans (“SBPs”) prepared in mid-2000. These plans cover the extraction of mineral resources and mineral reserves for the life of each of De Beers’ mining operations.

De Beers’ diamond business includes some operations which are wholly-owned and some operations, principally in Botswana (Debswana) and Namibia (Namdeb), that are jointly owned between De Beers and the respective governments of these countries. The financial analysis and NPV calculations contained in this report reflect the revenues and cash flows attributable to De Beers’ wholly-owned operations and De Beers’ share of these joint ventures.

This report addresses the following issues:

- the mineral resources and mineral reserves to support the projections and NPV calculations contained herein;
- the capacity and equipment to mine and recover diamonds according to the production forecasts;
- the political, social, environmental and legal stability required to conduct De Beers’ business; and
- the marketing of production from its own and contracted partners.

There are many aspects of the diamond business which make it unique. The particulate nature of diamonds affects the processes of exploration, evaluation, mining and metallurgy and especially the way in which diamonds are valued, sorted and marketed. Descriptions of these processes are therefore included in this report. A discussion of each operating mine is also included.

The associated financial projections are presented on a consolidated basis.

##### 1.2 Professional Qualifications and Responsible Persons

This report incorporates elements of a Competent Person’s Report. The report has been prepared and signed off by the delegated heads of the technical, financial and marketing

disciplines within De Beers, all of whom qualify as Responsible Persons. This report contains all materially important technical, legal and financial information to meet the objectives stated above.

This report has been prepared under the direct supervision of Dr W.J. Kleingeld, Group Manager Mineral Resources. Dr Kleingeld has over 25 years experience in the estimation and assessment of mineral resources and mineral reserves in numerous commodities, but specifically diamonds and is a Competent Person with respect to mineral resources and mineral reserves. Dr Kleingeld is a member of the South African Mineral Resource Committee ("SAMREC") and Chairman of the Diamond Sub-Committee of SAMREC. The Responsible Person in respect of Finance is Mr M.L.S. De Sousa-Oliveira, Head of De Beers Corporate Finance and a member of the De Beers Executive Committee. Mr De Sousa-Oliveira is both a Chartered Accountant and a Chartered Management Accountant and has extensive experience in mergers, acquisitions, new company flotations and project financing. He was appointed Head of De Beers' newly established Corporate Finance Department in January 1998. The role of Responsible Person in respect of DTC Sales and Marketing is Mr G.P.H. Penny. Mr Penny was a Rhodes Scholar at Oxford where he obtained an MA in Philosophy, Politics and Economics. He is a 'director' of the DTC and a member of the De Beers Executive Committee, and will assume overall responsibility for De Beers' worldwide sales and marketing activities with effect from July 2001.

Dr Kleingeld, Mr De Sousa-Oliveira and Mr Penny have assumed joint and several responsibility for this report and its contents.

Other contributors to this report were:

Group Manager Exploration	W.F. McKechnie
General Manager Mining	A.P. Guthrie
General Manager Metallurgy	A.C. Rowan
General Manager Engineering	G.D. Scott
Manager Producer Relations and Legal Services	J.G. Hughes
Group Manager Human Resources	L.J. Gatherer
Manager Environmental Services	Dr M. Berry

The professional qualifications of all the contributors are set out in Appendix I.

### 1.3 Terminology and Abbreviations

The specialised nature of the diamond industry has necessitated the creation of a large number of technical terms and abbreviations which are either unique to the business or may have specific application or meaning which differ from their usage elsewhere in the minerals industry. De Beers has established standard terminology for many aspects of its business, which has been used herein. A list of abbreviations and glossary of technical and financial terms is contained in Appendix II. The metric system has been used throughout this report. A particularly important unit of mass is the carat (ct) which is 0.2g in mass. Grade has been expressed as carats per hundred tonnes (cpht) for kimberlite deposits and carats per square metre (cpsm or cts/m<sup>2</sup>) or carats per cubic metre (cpcm) in placer deposits. Currency units used are US dollars (US\$ or \$) or South African Rand (ZAR or R).

### 1.4 Overview of De Beers

#### 1.4.1 Company Profile

Cecil John Rhodes formed DBCM in March 1888 as an amalgamation of diamond mining interests in the Kimberley area of South Africa. Generally, DBCM represents De Beers' South African interests, whilst DBCAG covers De Beers' activities throughout the rest of the world. De Beers is an integrated company whose core business is the mining and marketing of rough diamonds.

Through exploration and acquisitions, De Beers has grown annual production to a total of 36.5 million carats of rough diamonds in 2000. De Beers and its partners conduct mining operations in South Africa, Namibia, Botswana and Tanzania. The DTC is headquartered in London and is responsible for marketing De Beers' and certain other producers' diamonds. In the year 2000, diamond sales by the DTC reached a record US\$5.7 billion. De Beers' own earnings in 2000 were US\$1,289 million.

De Beers and its partners are the largest diamond producers by value in the world. De Beers continuously develops and implements new technology to discover and manage its mineral resources and mineral reserves in a cost-effective manner. It has grown the market for gem diamonds through active marketing and advertising strategies.

Since 1997 when management of De Beers and Anglo American was separated, a number of important changes have taken place. Stakes in investments made jointly with Anglo American were sold to Anglo American in exchange for Anglo American shares prior to their listing on the LSE in 1999, and the policy of joint investments was discontinued. This has helped to simplify the valuation of De Beers from that time. In 1999, the last outstanding minorities were bought out in the diamond trading companies, allowing full control of their operations and cashflow. In 2000, the Venetia royalty was acquired from Anglovaal Mining Limited and Industrial & Commercial Holdings Group Limited in order to acquire a 100% economic interest in that operation. An unsuccessful bid was made for Ashton Mining Limited of Australia, and a successful bid was made for Winspear Diamonds Inc of Canada to acquire a 67% interest in the Snap Lake prospect. The remaining interest in the Snap Lake prospect was purchased from Aber Diamond Corporation in February 2001.

Starting in 1998, a strategic review of De Beers' global diamond business was undertaken with Bain & Company in an attempt to address the inadequate return on capital generated by De Beers' diamond business. This resulted in, amongst other initiatives, the As Is Plus programme which is focused on operational efficiency improvements to lower De Beers' cost base. A Supplier of Choice initiative was launched in mid-2000 with the aim of formalising relationships between the DTC and its shareholders and increasing their respective efforts to grow the diamond jewellery business.

De Beers has played a leading role in proposing and implementing controls to distinguish diamonds as having come from conflict-free areas. In support of this effort and recognising the uncertain origins of diamonds bought in the open market, De Beers ceased open market purchases in late 1999.

World-wide, De Beers and its partners have 23,000 employees. They pursue proactive human resources development programmes and provide equal opportunities to all personnel.

#### **1.4.2 Exploration**

De Beers carries out diamond exploration in 17 countries on five continents for both kimberlite pipe and placer deposits. Extensive research has identified the environments favourable for the deposition of diamonds, and specific technology has been developed to efficiently explore for and sample diamond deposits. Exploration expenditure in 2000 was approximately US\$69 million.

De Beers' exploration division has had notable successes in the past, including the discovery of the Orapa and Jwaneng pipes in Botswana and the Venetia pipes in South Africa. Jwaneng is the most valuable kimberlite diamond occurrence in the world. De Beers is also pioneering the development of deep-sea diamond exploration and mining off the West Coast of Southern Africa.

De Beers is currently fast-tracking the evaluation of the Victor (Attawapiskat) diamond project in Ontario, Canada. This project is currently at the desktop study stage and thus,

for the purposes of this report, is not sufficiently advanced to fulfil the necessary requirements for inclusion in the financial model referred to in this report.

### 1.4.3 Mineral Resources and Mineral Reserves

#### 1.4.3.1 General Overview

The particulate nature of diamonds, their size, shape, quality, colour and value are important factors in the accurate estimation and evaluation of diamond deposits. De Beers has developed specific methodologies that take these factors into account, as well as two other aspects:

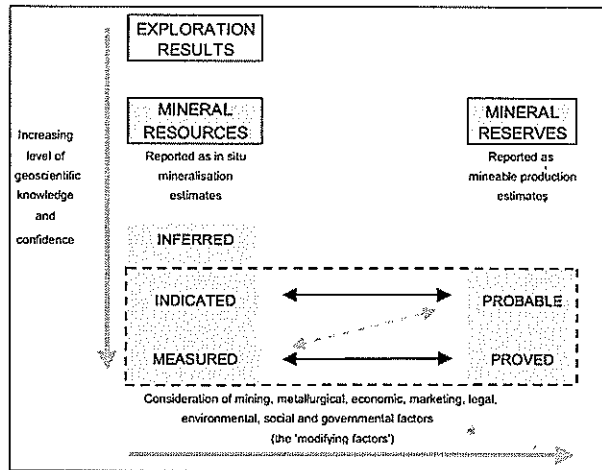
- diamond occurrences in nature are rare and are usually measured in parts per billion, whereas most other mineral commodities are measured in parts per thousand or parts per million; and
- in placer deposits, diamonds may be concentrated in trapsites that are relatively small and difficult to statistically predict and sample.

De Beers' methodologies for sampling and estimation of diamond deposits have been recognised and implemented throughout the world. In 2000, the South African Mineral Resource Committee ("SAMREC") implemented a diamond-specific code based on these methodologies.

#### 1.4.3.2 Estimation Methodologies

De Beers' methodology used in estimating mineral resources and reserves is as follows:

- When a potentially economic deposit is discovered, an in-situ mineralisation resource estimate is developed using appropriate sampling techniques and sampling density. Empirically derived conversion factors are applied to the estimated grades to allow for the bottom or lower diamond size cut-off which might be used in a commercial scale metallurgical plant, also taking into account the difference in the degree of diamond liberation between the sampling and commercial recovery processes.
- The baseline category for resource classification, which requires a minimum level of geological knowledge and confidence, is the inferred mineral resource. Increased sampling of the resource will lead to an improved level of geoscientific knowledge and confidence, and upgrading of the resource to an indicated category and ultimately to a measured status. However, diamond resources rarely achieve this level of classification because of the complex nature of diamond deposits and the large expenditure that would be required to achieve the high level of confidence stipulated in the SAMREC Code.
- Mineral reserves are a modified sub-set of indicated and measured resources where mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors are applied as appropriate to define that part of the resource that is economically mineable.



As at 31st December 2000, mineral reserves and mineral resources of De Beers and its partners were as follows:

- *In kimberlite mines and alluvial deposits where measured in tonnes:* probable mineral reserves were 523Mt @ 55cpt containing 290Mcts; indicated mineral resources were 528Mt @ 44cpt containing 234Mcts; and inferred mineral resources were 1,528Mt @ 42cpt containing 634Mcts; and
- *In alluvial, coastal and marine placer mines:* probable mineral reserves were 24 million m<sup>2</sup> at 0.31cpsm containing 7Mcts; indicated mineral resources were 37 million m<sup>2</sup> @ 0.14cpsm containing 5Mcts; and inferred mineral resources were 40 million m<sup>2</sup> @ 0.24cpsm containing 10Mcts.

#### 1.4.4 Operations

The operations forecast forming the basis for the financial evaluation calls for existing mines to produce 38Mcts from 87Mt of ore in 2001. Production is projected to increase to 45Mcts by 2010 with a slight reduction in tonnage to 82Mt.

The operations forecast takes into account the assumed successful completion of the following major capital projects:

- *Kimberley Mine CTP:* The construction of a new combined treatment plant is in progress. The plant is expected to improve recovery efficiencies and turn previously uneconomic resources both on surface and underground into mineable resources.
- *Finsch Mine Block 4:* Work has commenced on the establishment of a block cave to replace tonnage from the current block 3 cave when it is finally depleted.
- *Premier Mine C-cut:* The project will increase the depth of underground operations, and build new and increased plant capacity extending the life of mine by 17 years to 2025.
- *Snap Lake:* The project provides for the establishment of a complete mine and treatment facility initially to treat 3,000 tpd.
- *Debswana Damtshaa Mine (previously known as BK 9):* Construction is underway to provide a new mine and treatment facility east of Orapa in Botswana.

#### 1.4.5 Marketing through the DTC

The companies that form the DTC represent the marketing arm of De Beers. They purchase, sort, value and market rough diamonds mined by De Beers as well as those from contracted third-party sources.

In addition to its sorting, valuation and sales activities, the DTC has for many years made significant investment by way of generic diamond marketing and promotional expertise. This year it will spend approximately US\$180 million promoting diamond jewellery.

The DTC is pursuing several initiatives to increase the sales of its diamonds, notably through its Supplier of Choice initiative. The focus of this programme is to drive growth in consumer demand for diamond jewellery. The DTC will develop business relationships in a manner that will encourage its clients (sightholders) to pursue a more proactive role in promoting diamonds at the retail level. The DTC may offer marketing and technical assistance and expertise to enable sightholders to realise this goal.

The DTC has developed a new trademark, the 'Forevermark' from which it intends sightholders and retail customers to benefit. The 'Forevermark' will symbolise De Beers' commitment to integrity by the promotion of the highest professional and ethical standards throughout the diamond business.

To aid the determination of the sales target for 2001, a proprietary De Beers Supply/Demand model has been used. This model uses as inputs a number of assumptions about the factors that affect the diamond business. For the purposes of this report, three main scenarios have been evaluated:

- 'Consensus' – based on consensus forecasts of GDP growth, and the historic relationship between the economy and demand for diamonds. Consensus economic forecasts currently assume a slowdown, but not outright recession, this year, with some recovery in 2002.
- 'Upside' – based on the same economic forecasts as the consensus scenario but with more optimistic market expansion targets. This scenario also assumes a more optimistic view for contract third-party purchases by the DTC.
- 'Downside' – based on a more negative economic outlook, with recession in the US during 2001/2 and correspondingly lower growth in the rest of the world, with a further cyclical slowdown in 2007/8.

The DTC has set a target of US\$4.8 billion under the 'consensus' scenario for its sale of rough diamonds in 2001. Thereafter, the Supply/Demand model indicates an increase in sales between 2001 and 2010 at a CAGR of 4.5% in nominal terms. However, due to the limits on the availabilities of certain ranges of goods, this indicative percentage growth in DTC sales does not flow into the valuation model in which DTC sales have been capped at levels commensurate with forecast diamond availabilities.

#### 1.4.6 De Beers/LVMH Branding Initiative

One of De Beers' latest initiatives is the establishment of an equally funded new company with LVMH Moët Hennessy Louis Vuitton ("LVMH"). De Beers will (subject to regulatory approvals) transfer to the newly formed independent company the world-wide rights to use the De Beers name for luxury goods in consumer markets.

#### 1.4.7 Debid

Debid (De Beers Industrial Diamonds) was established in 1946 to concentrate on the production, processing and marketing of natural diamonds and subsequently synthetic diamonds for industrial purposes. Debid currently produces and markets synthetic industrial diamonds, and buys and markets natural industrial diamonds.

#### **1.4.8 Other Investments**

De Beers holds investments (other than its investment in Anglo American) in certain JSE listed companies. These are not core assets and could be disposed of should conditions require.

Income from unlisted diamond industry investments has been included in the financial model referred to in this report.

### **1.5 Valuation Methodology**

The methodology used to value the various assets of De Beers is set out below.

#### **1.5.1 General Principles**

De Beers' core diamond business has been valued on a going concern basis, with all the mines in which De Beers has an interest, the DTC and their related capital assets and working capital assets being treated as an integral and non-divisible part of that core business.

The nature of De Beers' core diamond business and factors such as pre-emption rights and marketing rights relating to various parts of the business make it inappropriate to value the business on a break-up basis.

The valuation has been prepared as at 31 December 2000 and, where appropriate, cash flows have been discounted back to this date.

#### **1.5.2 Operating Mines and DTC Sales**

De Beers' operating mines have been valued using discounted cash flow methodology. A financial model has been constructed which incorporates the life of mine cash flows for each mine and extends out to the year 2030. The production rates and costs for the mines have been based on the SBPs, as refined by De Beers' three-year rolling forecasts.

DTC sales, which include sales of diamonds produced from De Beers' and its partners' mines as well as sales of diamonds purchased under third party contracts, and changes in diamond prices have been estimated using the De Beers Supply/Demand forecasting model, capped by forecast limits on the availabilities of certain ranges of goods. Three supply/demand scenarios have been computed; 'upside', 'downside' and 'consensus'. A detailed description of these scenarios is set out in Section 11.

It should be noted that the De Beers Supply/Demand model seeks to forecast DTC sales and changes in diamond prices over a 10-year period but not specifically on a year by year basis. Accordingly, this impacts on the financial projections set out in this report which are not therefore intended to be year by year specific but intended to cover a period of years. The financial projections have been prepared by De Beers on the basis of current assumptions and have not been reported on independently.

#### **1.5.3 Exploration**

A valuation range of between US\$0 and US\$100 million has been placed on De Beers' exploration activities. The range indicated takes account of the three scenarios computed in this report. A maximum value of US\$60 million was assumed for advanced exploration projects and a maximum of US\$40 million for all other assets.

#### **1.5.4 De Beers/LVMH Branding Initiative**

Although a business plan remains to be fully developed (pending regulatory approvals) in respect of the enterprise, it has been valued using discounted cash flow methodology on the basis of initial and preliminary cash flow projections estimated by De Beers.

Given the current conceptual nature of the venture, the cash flow projections have not been incorporated into the financial model and a separate, stand-alone NPV has been estimated.

#### **1.5.5 Debid**

Debid has been valued using discounted cash flow methodology. The estimated future cash flows for Debid have been incorporated into the financial model.

#### **1.5.6 Listed Investments**

De Beers' interest in listed investments (other than its investment in Anglo American) have been valued based on market values as at 31 December 2000.

#### **1.5.7 Other Assets**

With the exception of adjusted net cash, De Beers' working capital, including diamond stocks and cash, has been valued on the basis that it is an integral part of De Beers' gem diamond and industrial diamond businesses and has therefore been incorporated into the financial model. De Beers' current diamond stocks are considered strategic and necessary for the ongoing conduct of its business as is its cash (other than adjusted net cash).

The adjusted net cash has been estimated having regard to the current level of De Beers' working capital and its future needs (and includes cash resulting from the exercise of options).

De Beers' other diamond industry investments have been valued on the basis of future estimated dividend streams and such dividend streams incorporated into the financial model.

#### **1.5.8 Discount Rates**

NPVs have been calculated using real discount rates ranging between 10% and 15% having regard to De Beers' weighted average cost of capital ("WACC") for its diamond business (adjusting for the impact of its shareholding interest in Anglo American), the estimated WACCs of other mining companies, implied discount rates estimated for comparable transactions and academic papers on the estimation of discount rates.

### **1.6 Strengths, Opportunities and Risks**

Strengths, opportunities and risks with respect to De Beers' diamond business are set out below.

#### **1.6.1 Strengths and Opportunities**

*General:* De Beers and its partners are the largest diamond producer by value in the world. The DTC is the world's leading marketer of rough diamonds.

De Beers benefits from a sound operating base, efficient use of assets, good relationships with its major stakeholders, and a management team aimed at growing the diamond business to a value of US\$10 billion by the year 2004, in line with a carefully considered strategy.

As a fully integrated group focused wholly on the diamond business, De Beers believes it possesses the strengths required to maximise the opportunities that present themselves, while being aware of the risks that exist.

*Workforce:* De Beers has a dedicated and loyal workforce which takes great pride in its work, De Beers and De Beers' company values. This workforce is motivated and

capable of growing the company, and has contributed significantly to the increase in profits realised over the last three years and to the strategic transformation of the company. De Beers continues to invest in the development of staff at all levels.

*As Is Plus:* As a result of the strategic review started in 1998, De Beers has implemented a number of initiatives that have reduced unit costs and improved efficiencies. Further progress in this area continues to be made in the Southern African operations. The threat of AIDS and the employment equity issue, and their associated financial costs do, to an extent, limit the potential gains from these initiatives.

*Technical Ability:* De Beers has invested heavily in research and development of new, leading edge technology in many areas of the diamond business. For example, this has led to the successful implementation of deep-water mining of marine placer deposits off the coast of Namibia. De Beers is the only mining company involved in large-scale underground mining of kimberlite pipes and has unrivalled expertise in large, block cave excavations. Ongoing research and development has resulted in cutting edge plant design with a high degree of automation. The newly commissioned Aquarium Plant at Jwaneng contains the Completely Automated Recovery Plant ("CARP") for the recovery of diamonds from x-ray concentrate and the Fully Integrated Sort House ("FISH") where the sorting and acid cleaning processes have been automated.

*Exploration:* De Beers has an extensive exploration programme both on existing mines and in extensive greenfield sites on five continents and is committed to securing new sources of supply through exploration on its own and in joint ventures with others.

*Resource Base:* De Beers and its partners have a large mineral resource base, unrivalled by any other diamond mining company, currently standing at approximately 2.6 billion tonnes amounting to some 1.2 billion carats. The majority of these resources occur in large scale, low cost mines where the current life of mine expectation is in excess of 20 years.

*Supplier of Choice:* In July 2000, De Beers announced the launch of the DTC's Supplier of Choice initiative, a move away from the market perception of the CSO as custodian of the market in its role as supplier of last resort. The focus of the initiative, which will be subject to review by the European Commission, is to drive long-term growth in consumer demand for diamond jewellery by developing the DTC's business relationships with its sightholders. Successful implementation of this long-term strategy will result in a sustainable increase in rough diamond demand. An important component of Supplier of Choice is the subscription of the DTC and its sightholders to a set of best practice principles to promote and encourage high industry, ethical and business standards.

*Client base:* The DTC sells its goods to approximately 120 client companies or sightholders. These companies represent the highest levels of expertise in diamond manufacture and distribution, in addition to proven financial strength. The Supplier of Choice initiative is designed to enable clients to grow their own businesses through successful marketing strategies. Supplier of Choice will also ensure that sightholders subscribe to the highest professional and ethical standards.

*Brand Power:* De Beers recognises the latent power of branding, and is encouraging the development of a competitive multi-brand jewellery consumer market. It believes that this will significantly increase consumer choice and re-invigorate the diamond jewellery category.

In January 2001 De Beers signed an agreement with LVMH Moët Hennessy Louis Vuitton, the world's leading luxury goods company, to establish an independently managed and operated company to develop the global consumer brand potential of the De Beers name.

## 1.6.2 Risks

*Mining Titles:* Currently, De Beers owns or leases from the state all of its South African mineral rights in perpetuity. However, the South African government has publicised its intention to take all mineral rights into state ownership. The resulting uncertain issues of tenure and fiscal regime may have an influence on the viability of present and future operations and new projects. De Beers is actively involved in discussions with the South African government to provide sound minerals legislation and to ensure that the economic viability of its future investments in operations is not jeopardised.

In Botswana and Namibia, the Debswana and Namdeb mining rights are held by way of 25-year mining leases. Upon lease expiry, there is no obligation on these states to renew the existing licenses on similar terms. The Jwaneng mining lease falls due for renewal in 2004.

*Political:* All of De Beers' current producing mines are situated in Southern Africa. Accordingly, De Beers is subject primarily to Southern African political risk and to risk of disruption as a result of localised events. This would also include ongoing differences of opinion and interpretation with various authorities with regard to the valuation and export of De Beers' diamonds from South Africa.

*Dependence on Botswana:* A substantial proportion of De Beers' production and profits is sourced from Debswana's mines located in Botswana, exposing De Beers to any actions which impinge upon Debswana's ability to recover and deliver diamonds to the DTC.

*Legal:* An indictment, issued in 1994 by the United States District Court for the Southern District of Ohio, remains unserved upon DBCAG. Two related private class action lawsuits have been filed in the Southern District of New York. De Beers believes that these suits do not subject it to significant legal risks and, having managed its business so as to avoid undue legal risk arising out of US antitrust laws, is not aware of any other material exposure to its business under US law.

*Investment Portfolio:* In the past, De Beers has raised debt finance to finance stocks and to exploit opportunities at difficult times in the diamond market. The raising of this debt finance has been facilitated by the existence of De Beers' shareholding in Anglo American. Without the portfolio, De Beers' ability to raise capital could be restricted and growth prospects limited.

*Earnings Cyclicity:* Retail demand in the diamond business responds to changes in economic activity. The lag in the diamond pipeline's response to changes in consumer demand has tended to accentuate the cyclical nature of the rough diamond business. The single product nature of De Beers' business and the volatile nature of the rough diamond business has been cushioned to an extent by the investment in Anglo American and the income stream relating thereto.

*Health:* HIV/AIDS is prevalent in Southern Africa. De Beers has developed education and prevention programmes.

*Workforce:* There has been a steady emigration of skilled personnel from Southern Africa in recent years. De Beers has developed innovative programmes to recruit, train and retain personnel. Parts of the diamond industry require advanced technological skills, and De Beers has developed an aggressive development and remuneration strategy, directly tied to individual performance, in order to retain core competencies. The retention of people will be dependent on the financial, economic and political stability of the region.

*Contractual Agreements:* De Beers' diamond purchase agreements with Russia and with BHP (in respect of the Ekati mine in Canada) expire in December 2001 and December 2002 respectively and are therefore subject to negotiated renewal. In

addition, sales agreements with Namdeb and Debswana are subject to five-yearly negotiated renewal.

As is usual in mining industry practice, pre-emption rights and change of control clauses exist between De Beers and its joint venture partners. De Beers' joint venture agreements provide for sharing of expenditure. These agreements tend to limit choices available to De Beers while introducing uncertainty as to the terms of contract renewal.

*Additional Diamond Supply:* As evidenced in 1992 in Angola, additional unexpected supply of diamonds has the capacity to disrupt the industry. Additional diamond supply from African alluvial sources could occur as a result of the exploitation of new deposits and changes in the socio-political climate in certain of these countries.

*Market:* The market for diamonds, a high-fashion luxury product, is sensitive to changes in the global economic climate, affected particularly by the US economy. The US currently accounts for approximately half of world-wide consumer consumption of diamond jewellery in value terms. In 2001 De Beers, through the DTC, plans to spend approximately US\$180 million world-wide on generic diamond advertising.

*Conflict diamonds:* De Beers has taken a strong stance on this issue to ensure that the diamonds it markets are conflict-free. It has adopted a code of practice that also requires its shareholders to adopt the same policy. In the future, the DTC Forevermark may be used to distinguish diamonds as being sourced from conflict-free areas.

*Cuttable Synthetic Diamonds:* Synthetic diamonds, particularly industrial grit products, have been produced since the late 1950s. The technology to manufacture synthetic diamonds of sufficient size and quality for cutting and polishing has existed since 1970. However, production costs are high and it is only in the last few years that cuttable synthetics have been produced in commercial quantities albeit small: a few thousand carats (cf 30 Mcts per annum of polished natural gem diamonds). Nevertheless, any suggestion of synthetic diamonds being fraudulently sold as natural diamonds could have a disproportionate effect on consumer confidence. For this reason the DTC has an on-going research programme investigating the characteristic features of synthetic diamonds that can be used for identification and communicating this information to leading gem grading laboratories.

*Exchange Controls:* De Beers' operations in South Africa and Namibia fall within the Common Monetary Area ("CMA"). Although the South African government has committed to easing exchange controls, restrictions remain in force and any movement of funds outside the CMA remains subject to South African Reserve Bank approval. As a result, surplus cash flows from the South African and Namibian operations are not freely available for use in growing the business internationally.

*Taxation:* For over a year, the revenue authorities in South Africa and the UK have been engaged in general enquiries into the tax affairs of De Beers in their respective jurisdictions. These enquiries are general and wide ranging and include matters such as deductibility of expenses and transfer pricing.

## 1.7 Economic Evaluation

### 1.7.1 Diamond Business

The NPVs, at real discount rates of 10%, 12.5% and 15% of the estimated future cash flows generated by De Beers' core diamond business, industrial diamond business and other assets incorporated into the financial model are set out in the table below. The NPVs have been prepared on the basis of the 'consensus', 'upside' and 'downside' supply/demand scenarios and appropriately factored inferred mineral resources.

REAL DISCOUNT RATES Description of scenario	10%		12.5%		15%	
	US\$M	RM	US\$M	RM	US\$M	RM
'Consensus' scenario	7,159	55,352	6,117	47,296	5,329	41,204
'Downside' scenario	4,967	38,403	4,246	32,829	3,699	28,598
'Upside' scenario	8,736	67,547	7,355	56,869	6,321	48,877

### 1.7.2 Other Assets

With respect to assets not incorporated into the financial model and valued separately, the estimated value of these assets is as follows:

Assets	US\$M
Exploration Properties	0-100
De Beers/LVMH Branding Initiative	200-500
Listed Investments	300
Adjusted Net Cash	750
<b>TOTAL</b>	<b>1,250-1,650</b>

### 1.7.3 Aggregate Asset Evaluation

The aggregate values of the gem and industrial diamond businesses and De Beers' other assets excluding its shareholding interest in Anglo American on the basis of the various scenarios are as follows:

Scenario	Value Range	
	US\$M	RM
'Upside' scenario at 10%-15% real discount rate range	7,971-10,386	61,912-80,582
'Consensus' scenario at 10%-15% real discount rate range	6,779-8,609	52,659-66,807
'Downside' scenario at 10%-15% real discount rate range	4,949-6,217	38,473-48,278

On the basis of a real discount rate of 10.5% to 11.5% which N M Rothschild & Sons Limited ("Rothschild"), independent financial adviser to the Independent Committee, has advised is an appropriate basis on which to value the gem and industrial diamond businesses, the value of the gem and industrial diamond businesses and De Beers' other assets excluding its shareholding interest in Anglo American is as follows:

	US\$M	RM
Gem and Industrial Diamond Businesses	6,498-6,925	50,239-53,545
Other Assets	1,450-1,450	11,455-11,455
<b>TOTAL</b>	<b>7,948-8,375</b>	<b>61,694-65,000</b>

### 1.7.4 Sensitivity Analysis

The NPVs stated in Section 1.7.1 above are not particularly sensitive to variations in mine operating costs, capital expenditure and exchange rates. Sensitivity of the NPVs to diamond pricing, diamond production and demand is reflected in the scenarios in the table in Section 1.7.1.

On the basis of the 'consensus' scenario comprising only probable mineral reserves and indicated mineral resources, the NPV at a 10% to 15% real discount rate range

amounts to US\$4,460 million to US\$5,638 million (or ZAR34,483 million to ZAR43,597 million).

**1.8 Conclusion**

A copy of this report has been provided to the committee of independent directors of De Beers and the committee's independent financial advisors, Rothschild. A copy of the financial model together with supporting working papers and relevant documentation has also been provided to Rothschild, which has used this report and the financial model as part of the basis of preparation of its fair and reasonable opinion prepared in relation to the offer by DBI for De Beers.

Signed .....  
Dr W.J. Kleingeld

Signed .....  
Mr M.L.S. De Sousa-Oliveira

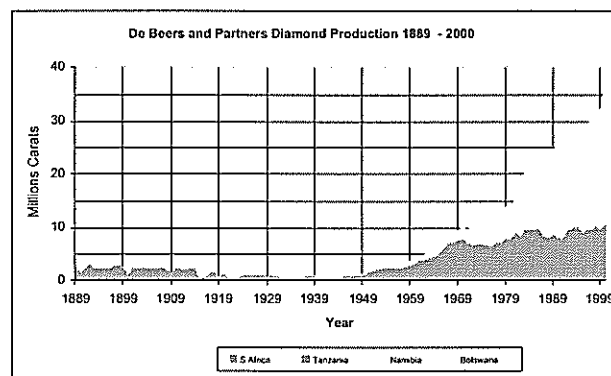
\* Signed .....  
Mr G.P.H. Penny

## 2. Corporate Profile

### 2.1 History

Two prominent diamond mining companies emerged from the diamond rush in and around Kimberley in the late 19th century: Barney Barnato's Kimberley Central Company and Cecil John Rhodes' De Beers Company, named after the De Beer brothers, on whose farm its mine was established. Following a protracted battle for overall control, Barnato agreed to a merger and DBCM was formed on 12 March 1888, with Rhodes as the founding Chairman. De Beers was granted an official listing on the JSE in August 1893.

South African and Namibian production was cyclical until about 1950 with interruptions resulting from influenza (1915-1916), the economic crises of the 1930s and the Second World War. Thereafter production increased with the operation of both kimberlite and placer mines. Namibian production expanded until 1980, as placer deposits and subsequently marine deposits



were brought on stream. The Williamson pipe in Tanzania was a significant contributor in the 1960s and early 1970s. However, production has declined since then and today the mine is a minor contributor. Production from Botswana has grown spectacularly since 1970 with the opening of kimberlite mines at Orapa (1971), Letlhakane (1977) and Jwaneng (1982).

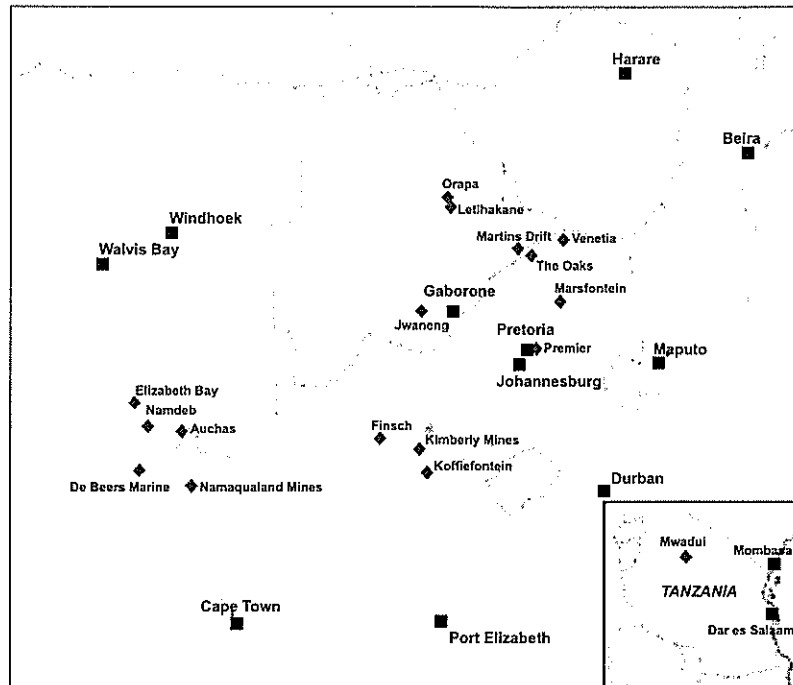
In February 1890, De Beers signed a sales contract with the newly formed London Diamond

Syndicate, which agreed to purchase the entire production from all the De Beers mines. This syndicate was the model on which Ernest Oppenheimer was to establish the Diamond Corporation in 1930, which, in turn, formed the basis of the Central Selling Organisation, the single channel marketing structure. Today, the DTC is De Beers' marketing arm which sells rough diamonds, achieving distribution efficiencies to meet modern market conditions.

In 1990 to lend visibility and coherence to the international assets owned by the company, DBCAG was registered in Switzerland to hold all of De Beers' non-South African assets. Thus was born the 'De Beers Linked Unit', which secures the rights and interests of shareholders simultaneously in the two De Beers companies: DBCM and DBCAG.

Broadly speaking, the history of De Beers falls into three stages. In its early years, the company produced over 90% of the world's diamonds. Then, in the early 1930s (when the diamond industry was close to collapse as a result of the Great Depression following the Wall Street collapse in 1929), the Central Selling Organisation ("CSO") was established to market rough diamonds produced by De Beers, diamonds bought from third party producers on a contractual basis and those purchased on the open market. Whilst the CSO was highly successful when it was first established, market conditions have now changed significantly (including the emergence of many new sources of rough diamonds, the increasing importance of diamonds sold outside traditional channels of distribution and strong competition from other luxury goods.) In response to these changes, De Beers introduced strategic and innovative programmes including its Supplier of Choice initiative (announced on 12 July 2000) in order to drive growth in consumer demand for diamond jewellery.

Today, De Beers and its partners are the largest diamond mining group in the world, producing over 40% by value of the world's gem diamonds from its mines in Southern Africa and through its partnerships with the governments of Botswana (Debswana – 50%), Namibia (Namdeb - 50%) and Tanzania (Williamson Diamonds Limited - 75%).



*De Beers and its partners' operations in Southern Africa*

The 'Diamond Pipeline' is a term that refers

to the system by which diamonds are discovered, extracted, marketed, cut, polished and sold to the consumer. De Beers' gem mining operations span every category of diamond mining – open-pit, underground, alluvial, coastal and deep-sea – while its exploration programme extends across five continents.

Based in London, the DTC sorts, values and currently sells about two-thirds of the world's annual supply of rough diamonds, which it sources from the mines of De Beers and its partners and from the sales agreements De Beers has in place with other producers. Over the last 60 years, De Beers has also undertaken the generic advertising and promotion of diamond jewellery around the world.

De Beers has always operated in ways appropriate to the times, and has responded to the ever-changing and now increasingly competitive business environment.

In the late 1990's De Beers recognised that it needed to transform the way it conducted business in order to benefit from the opportunity to grow the diamond business and to match the growth rates enjoyed by the leading companies in the luxury goods sector.

From this was born the Supplier of Choice initiative, which is ultimately about the DTC working more closely with its clients and equipping them to service their downstream partners to drive consumer demand and to put the industry in a more robust position to face the challenges of the 21st century.

Whilst the core business of De Beers remains the mining and marketing of rough diamonds and its core strategy one of driving demand for rough diamonds, the De Beers name has very strong consumer awareness and credibility. The creation of a multi-brand environment remains a focal point of the Supplier of Choice strategy, and consistent with this, the company believes that the De Beers name has the potential to become one of the leading jewellery brands. It was for this reason that De Beers and LVMH agreed to establish an independently managed and operated company to unlock the value of the De Beers name as a premier consumer brand.

## 2.2 Debid

De Beers Industrial Diamonds (“Debid”) is part of the De Beers group of companies and is the world’s leading supplier of high quality super abrasives and industrial diamond materials, including synthetic and industrial-grade natural diamonds used in industry for their unique and extreme properties.

In 1946, former De Beers Chairman, the late Sir Ernest Oppenheimer, spearheaded De Beers’ interests in industrial diamonds. Shortly thereafter, the Diamond Research Laboratory (“DRL”) was established in South Africa to support the use of diamonds in industry.

Debid has been central to the evolution from conventional abrasives to more cost-effective diamond solutions, and provides the basis for continual developments in diamond technology.

## 2.3 Benefits to countries in which De Beers operates

Contracted producers marketing their rough diamonds through the DTC benefit from guaranteed regular payments that bring financial stability and confidence to invest in long-term development projects. Revenue from diamonds has helped to provide schools, hospitals, civic amenities, roads and railways, building a stronger infrastructure and more prosperous society.

One must recognise the important role of ‘Development’ diamonds in countries such as South Africa, Botswana and Namibia. A strong and secure diamond industry creates jobs, generates tax revenue and foreign exchange earnings, and promotes economic growth in the Southern African countries in which De Beers and its partners operate.



### 2.3.1 South Africa

South Africa was the birthplace of the modern diamond industry, following the discovery of the first diamond in the Kimberley area in 1866, which very soon thereafter contributed to the industrialisation of the country. The sound management of South Africa’s diamond resources has meant that whilst South Africa was the leading diamond producing country in Africa until Botswana came on stream in the 1970s, De Beers, a company with its roots firmly in South Africa and still responsible for just under 90% of South Africa’s diamond production by value, nevertheless remains the leading institution in the world’s diamond industry. This is a source of pride for the company and a source of international empowerment for South Africa itself.

De Beers has committed itself to the mining industry in South Africa, evidenced through its prospective investment in the order of R11 billion (US\$1.3 billion) in its South African operations over the next five to ten years, in projects which aim to extend the life of older operations and perhaps even revive others.

De Beers is also committed to a number of job creation and economic empowerment projects which seek to include those previously excluded from the industry.

Diamond is the most benefited mineral in South Africa. Last year, the equivalent of more than half of De Beers’ South African production, by value, was sold to the South African cutting and polishing industry. The industry contributes significantly to the

training of young diamond workers in South Africa, and skilled artisans are given the opportunity to become fully-fledged entrepreneurs through the Velani Hive, an initiative which provides affordable working space to experienced diamond workers on contract.

### 2.3.2 Botswana

Botswana was amongst the world's poorest countries when it became independent in 1966. Today, Botswana has the highest international credit rating in Africa, and the capital city of Gaborone is a flourishing city. Prudent management of the country's diamond resources within a stable democratic environment has allowed Botswana to become one of the world's economic success stories.

Diamonds contribute 75% of foreign exchange earnings, 45% of government revenue and 33% of GDP in Botswana. Diamond wealth has been distributed throughout the country, providing the major source of funding\* for schools, hospitals and other infrastructure. Debswana is the largest employer after the government, and 96% of its employees are Botswana citizens. Significant investment in education by the company has improved skills and productivity in the country.

### 2.3.3 Namibia

Diamonds play a vital role in the economy of Namibia. Diamond revenue (the largest portion of it contributed by Namdeb) contributes approximately 35% of Namibia's foreign exchange earnings, and Namdeb is second in size only to the government as an employer.

Revenue from diamonds funded the construction and initial development of the University of Namibia, a maternity clinic in the north of the country, and the Namibian Institute for Educational Development, an institution that is making a valuable contribution to the future of Namibia and young Namibians.

## 2.4 Important developments in the last five years

- Announcement at the end of 1997 that De Beers was separating its management ties from Anglo American.
- Nicky Oppenheimer was appointed as Chairman and Gary Ralfe appointed as Managing Director of De Beers from 1 January 1998.
- The company moved to its new corporate headquarters in Crown Mines (South Africa) in June 1998.
- At the end of 1998 De Beers announced a strategic review of its business, motivated by the under-performance of the company, measured by financial returns, investment ratios, and as reflected in De Beers' share price history.

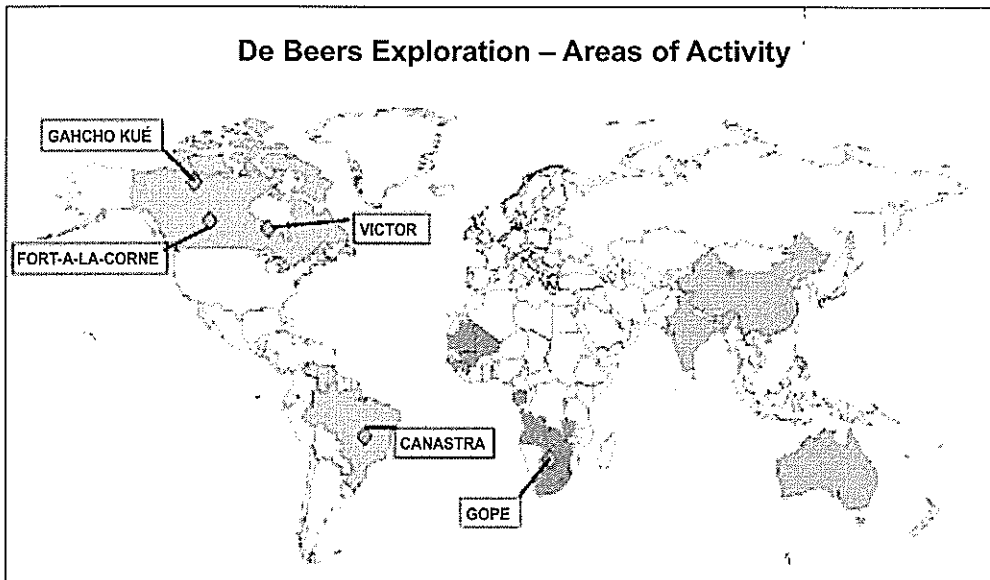
From the strategic review four focus areas emerged which formed a new strategic plan:

- ***As Is Plus:*** Ensuring the business runs more efficiently and more economically.
- ***Becoming the preferred supplier for our customers:*** Moving away from the seller of last resort to becoming the supplier of choice to our clients.
- ***Growing demand by at least 5% per year:*** De Beers must work with its clients and the whole diamond industry to generate real incremental demand for diamond jewellery.
- ***Exploiting the value of the De Beers brand:*** Although the core business of De Beers remains the mining, sorting and selling of rough gem diamonds, additional value could be generated by the De Beers brand.

- De Beers renewed its sales agreement with Alrosa, the Russian state diamond company, for a further three-year period from December 1998. This was partly responsible for the increase in industry optimism at the end of 1998.
- In March 1998 De Beers signed a three-year agreement with BHP (which came into effect during 1999) to purchase 35% of the run-of-mine production of the Ekati mine in Canada's Northwest Territories.
- Two important projects were completed in Debswana:
  - The Orapa 2000 project was opened in May 2000, which at a cost of US\$300 million doubled the production at Orapa from six million carats to 12 million carats per annum from the year 2000; and
  - The US\$50 million Aquarium project – a new high-tech, high-security recovery and sort-house facility – was completed at Jwaneng Mine.
- De Beers reached agreement in 1999 to acquire Anglovaal Mining's 87.5% interest and Industrial and Commercial Holdings' 12.5% in the Saturn partnership, which had a right to a 50% royalty of pre-tax profits earned by the Venetia Mine in South Africa.
- In 1999 the last outstanding minorities in the diamond trading companies were bought out, allowing De Beers full control of the operation and cashflow of the companies.
- De Beers announced in October 1999 that it would close down its buying operations in Angola and would be reviewing other buying operations, in Central and West Africa. Since the end of that year, the DTC has ceased buying diamonds on the open market. From March 2000, De Beers issued a guarantee to its clients on all invoices stating, *inter alia*, that diamonds purchased from the company do not originate from areas of conflict.
- Following on from the strategic plan, De Beers announced its Supplier of Choice programme in London on 12 July 2000, which effectively addresses focus areas two and three of the strategic plan. The initiative is designed to stimulate long-term change in the diamond industry and to modernise business practices so as to encourage shareholders to innovate and work more closely with their downstream partners to stimulate demand for diamond jewellery. Part of the Supplier of Choice programme is the introduction of a set of Best Practice Principles to which both the company and its customers are expected to commit and adhere. The Best Practice Principles address, amongst other things, the issue of dealing in diamonds from conflict areas and have been adopted to ensure that the industry is run in an ethical and professional way.
- In November 2000, the DTC renewed its sales agreements with Debswana and Namdeb for a further five years.
- De Beers acquired a 67.76% interest in the Snap Lake project in Canada's Northwest Territories through a take-over bid for Winspear Diamonds Inc in July 2000, and the remaining interest in Snap Lake from Aber Diamond Corporation in February 2001. The project may be De Beers' first Canadian diamond mine.
- On 16 January 2001, De Beers and LVMH Moët Hennessy Louis Vuitton, the world's leading luxury products group, announced an agreement to establish an independently managed and operated company to develop the global consumer brand potential of the De Beers name.

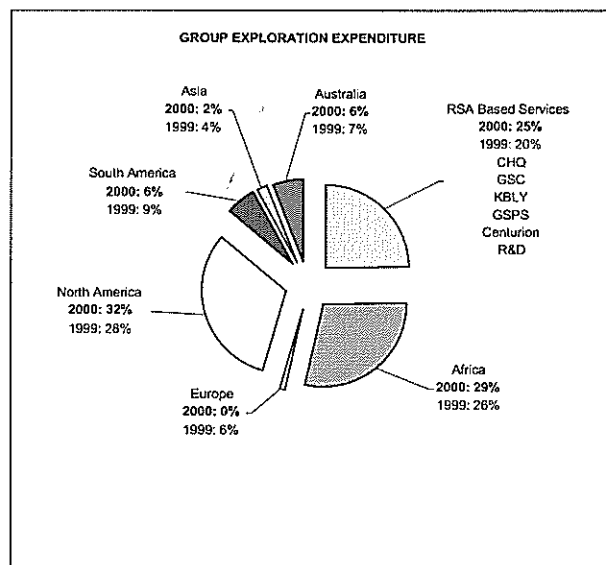
### 3. Exploration

#### 3.1 Introduction



De Beers carries out diamond exploration in 17 countries on five continents, and exploration efforts are firmly aligned with the wider strategy of creating sustainable shareholder wealth by adding profitable resources to its portfolio and extending the geographic diversity of its mining operations.

Current and future focus is on the highest priority areas and projects, assessed against country and business risk criteria. To this end, a considerable proportion of the 2000 and 2001 budgets is directed towards prospecting for new discoveries in Canada, Southern Africa and increasingly India; regions with the best potential to yield profitable new diamond mines. World-wide exploration expenditure for year 2000 was approximately US\$69 million.



During the next two to three years, De Beers hopes to fast-track advanced exploration projects, such as Victor (Attawapiskat) and Gahcho Kué in Canada, through to feasibility study.

Longer-term growth will flow from well-directed and successful early-stage exploration to locate new diamond bearing deposits (primarily, but not exclusively, kimberlites), and then to move these quickly through the project pipeline to the advanced stage. The current portfolio of early-stage projects has a well-balanced risk profile and has excellent potential to contribute to De Beers' future growth in the long term.

De Beers' current suite of projects covers the full exploration 'pipeline':

- desktop appraisal of potentially prospective areas;
- grassroots reconnaissance work to discover new kimberlite provinces; and
- advanced exploration projects to evaluate the economic viability of diamondiferous kimberlites.

Acquisitions and joint ventures, where appropriate, complement De Beers' own exploration efforts and provide opportunities for downstream entry into the exploration pipeline.

World-wide diamond exploration is managed from De Beers' corporate headquarters ("CHQ") in Johannesburg, South Africa and subsidiary regional exploration offices are situated in Centurion near Pretoria in South Africa, Toronto in Canada and Perth in Western Australia.

The De Beers exploration laboratories in Kimberley and Johannesburg and other regional centres support De Beers' prospecting operations. Each laboratory is a world-class facility in terms of staff quality and experience, volume of work handled, quality of service provided, and the utilisation of leading edge technology and knowledge.

### 3.2 Pre-Feasibility Exploration Projects

#### 3.2.1 Gahcho Kué, Northwest Territories of Canada

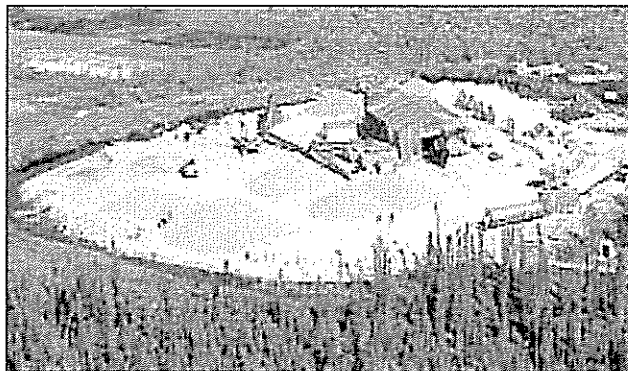
De Beers Canada Exploration Inc is the operator of the Gahcho Kué project situated to the north east of Yellowknife in the Northwest Territories of Canada. De Beers holds a 51% shareholding in the project, with the balance owned by Mountain Province Diamonds Inc and Glenmore Highlands.

The joint venture holds rights to the AK claim block on which four diamondiferous kimberlite pipes have been discovered; 5034, Hearne, Tuzo and Tesla. The pipes have been evaluated by bulk sampling using large diameter drilling, and mineral resources have been identified. Approximately 3,000 carats of diamonds have been recovered to date.

The project is revenue sensitive, and further bulk sampling is to be carried out in early 2001 to obtain an additional parcel of 2,500 carats of diamonds from Hearne and 5034 to improve confidence in the diamond revenue estimates made from earlier sampling.

#### 3.2.2 Victor project, Attawapiskat

De Beers Canada Exploration Inc holds claims in northern Ontario where 16 kimberlites have been discovered so far, within the Attawapiskat project area. One of these, the Victor pipe, is currently the subject of a bulk sampling evaluation exercise that commenced in 2000. The programme includes delineation core



*The Victor Camp – Attawapiskat*

drilling, large diameter sampling as well as geotechnical drilling in order to establish a global resource. Several other kimberlites in the project area will be sampled for macro- and micro-diamonds during 2001.

### **3.2.3 Fort á la Corne**

De Beers Canada Exploration Inc is the operator of the Fort á la Corne project in Saskatchewan. The project is a joint venture with Kensington Resources, Uranerz Inc and Cameco Corporation. A large diameter drilling programme on two of the most interesting kimberlite pipes was successfully completed in 2000.

### **3.2.4 Canastra**

De Beers holds rights to mineral claims over the Canastra kimberlite, a prospect in Minas Gerais, Brazil. Alternative mining scenarios have been examined and evaluated. The project does not meet De Beers' investment criteria, and further work is unlikely.

### **3.2.5 Gope**

The Gope kimberlite pipe (Go25) was discovered by Falconbridge at Gope in Botswana in 1981. A feasibility study was completed by the De Beers Prospecting Botswana (Pty) Limited ("Debot") and Falconbridge Limited joint venture. The Go25 pipe is approximately 10ha in area but lies buried beneath approximately 70m of Kalahari sediment cover. Socio-economic and environmental concerns have added to the doubts associated with the project. In 2000 the joint venture company, Gope Exploration Limited, applied for and was granted a retention licence for the property by the Government of Botswana.

## **3.3 Early-Stage Exploration Projects**

De Beers is actively prospecting for new kimberlites and diamond deposits in many parts of the world using a systematic approach involving desk-top studies, target selection, reconnaissance and follow-up sampling, target delineation and assessment by micro-diamond analysis and indicator mineral interpretation.

### **3.3.1 Angola**

De Beers is currently exploring for new kimberlites and diamond deposits in Angola in a joint venture association with the Angolan government organisation Endiama. The De Beers-Endiama (50-50) association currently holds prospecting permits to three concession areas situated in Quela, Mavinga and the Lundas in the north east of the country. So far 59 new kimberlites have been discovered in the Lundas concession area. The poor security situation continues to prevent any work in the Quela and Mavinga areas. De Beers is reviewing its position with respect to its ongoing activities in Angola.

### **3.3.2 Botswana**

Systematic diamond exploration by De Beers Prospecting Botswana (Pty) Limited ("Debot") started in the mid 1950s and led to the discovery of the Orapa and Letlhakane pipes (1967) and the Jwaneng pipe (1973). Debot currently holds prospecting rights to several prospective areas in Botswana either in its own right or in joint ventures with other parties. Although several new kimberlites have been found in the southern part of the country, none of these are of sufficient size or apparent grade to suggest that they might be economic.

### **3.3.3 Zimbabwe**

Kimberlitic Searches Limited ("KSL"), De Beers' wholly owned subsidiary in Zimbabwe, holds Exclusive Prospecting Orders (EPO's) and mineral claims over approximately 24,000km<sup>2</sup> in the southern and eastern parts of the country. Since recommencing diamond prospecting in Zimbabwe in 1994, KSL has found 41 new kimberlites, two of which are larger than 10ha in extent, the largest being the Mwenezi pipe of 18ha in the Nuanetsi area. Although most of the kimberlites are

diamondiferous, unfortunately none appear to have economic potential, and a number are vertical dykes of limited thickness.

#### **3.3.4 South Africa**

De Beers continues to prospect actively in parts of South Africa. This has resulted in two small diamond mines being brought into production in the Northern Province in the last five years.

#### **3.3.5 Guinea**

De Beers commenced diamond prospecting in Guinea in 1995 and since that time has discovered 11 new kimberlites on its prospecting licences in the eastern part of the country. Based on micro-diamond analysis, some of these kimberlites are interpreted to have possibly significant diamond grades, but they are all narrow dykes and are unlikely to be of economic significance to De Beers. Some follow-up work is required and other new kimberlite discoveries are likely.

#### **3.3.6 Mauritania**

In 2000 De Beers concluded a joint venture with Rex Diamond Corporation with respect to the Akchar licence area in Mauritania, covering an area of approximately 10,000km<sup>2</sup>. An airborne geophysical survey has been flown over the licence area, and results are being followed up. No new kimberlites have been found to date. Discussions are being held with Rex Diamond Corporation on the possibility of joint venturing their other exploration properties.

#### **3.3.7 Other African Countries**

Elsewhere in Africa, assessment of airborne geophysical targets in the western part of Zambia is being carried out in joint venture with African Minerals Limited. No new kimberlites have been discovered to date. Reconnaissance work in northern Mali produced disappointing results, and work has been terminated.

#### **3.3.8 Australia**

De Beers Australia Exploration Limited (previously Stockdale Prospecting Limited) has carried out diamond prospecting in Australia since the late 1960's and in that time it has discovered 244 kimberlite pipes and related occurrences in various parts of the country, a number of which have proven diamondiferous but none of which are economic.

#### **3.3.9 India**

A representative office was established in Delhi in 1997. Five local De Beers companies were incorporated in India after a long period of negotiation with the State and Central Government mining authorities.

Recently, De Beers was granted prospecting licences in Karnataka, and exploration activity is expected to start during the first quarter of 2001.

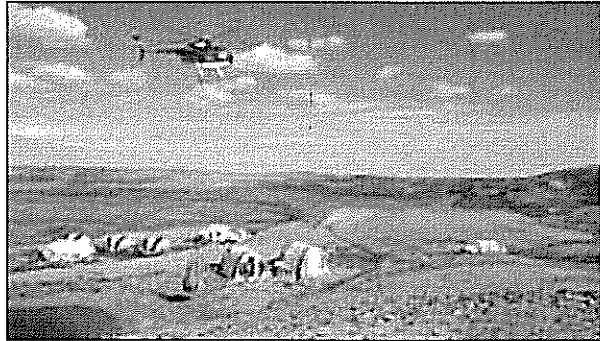
#### **3.3.10 China**

De Beers operates two joint ventures in China with the Provincial Bureaux of Geology and Mineral Resources in Hebei and Sichuan. Reconnaissance work has been completed in both areas and three months notice of contract termination has been given to the Hebei authorities due to negative results. To date nothing of significance has been discovered in Sichuan.

### 3.3.11 Canada

Early stage prospecting in Canada is being carried out in Ontario, Manitoba, Northwest Territories (“NWT”) and Nunavut.

During recent years numerous new diamond bearing kimberlites have been discovered in the Slave Province of NWT and Nunavut, a number of which are currently being assessed.



*Sampling in Nunavut Territory – Canada*

Much of Canada is considered to be prospective, and new kimberlite discoveries are likely in the short term.

### 3.3.12 South America

De Beers’ diamond prospecting activities in South America are carried out by Pesquisa e Exploração de Minérios S.A. (“SOPEMI”), a wholly owned subsidiary. So far, well-over 460 kimberlitic intrusions have been discovered by De Beers in Brazil, Bolivia and Venezuela. To date, an economic source of diamonds has not been found.

## 3.4 Support Services

De Beers’ global exploration activities are backed up by support services including laboratories in Kimberley, Centurion (Pretoria), Johannesburg, Melbourne, Lobatse (Botswana) and Toronto, the Evaluation Services unit in Kimberley, the Geological Sample Processing Services (“GSPS”) laboratory and the GeoScience Centre (“GSC”) in Johannesburg. Independent audits of the GSPS have been conducted by MPH Consulting and HA Simons.

The GSC provides diamond isotope, geochemical, petrological, mineralogical, Geographical Information Systems (“GIS”) and remote sensing services to all De Beers’ prospecting ventures. Analytical facilities for major and trace elements in kimberlitic minerals, kimberlite age dating, and geophysical and remote sensing interpretative technologies provide De Beers with strategic and competitive advantages in terms of quality and quantity of analytical and interpretative output. The GSC also holds an extensive collection of kimberlite and related rocks from all over the world, an unrivalled database on some 6,000 kimberlites and in excess of 6 million indicator mineral grains.

The De Beers Kimberley Micro-diamond Laboratory (“KMDL”) specialises in the quantitative recovery of micro-diamonds (<0.5 mm in size) from kimberlites and other related rocks using proprietary technology.

The Evaluation Services Unit in Kimberley provides a quantitative macro-diamond sample treatment service to De Beers’ exploration ventures and its operating mines. Bulk sample treatment may be carried out in Kimberley or at the project site using modular treatment plants with flowsheets customised to suit project applications.

The GSPS is a macro-diamond final recovery facility. It specialises in secure quantitative recovery of diamonds from sample concentrates produced from evaluation projects on diamond deposits throughout the world. This unit also carries out diamond characterisation work.

### 3.5 Safety, Health and Environment

De Beers Exploration is committed to “best-practice” standards of environmental management and employee health and safety, both at its exploration sites and laboratories. The facilities in South Africa have obtained ISO 14001 accreditation, and Canada and Australia are currently at an advanced stage of achieving similar status.

## 4. Mineral Resource Management

### 4.1 Introduction

The Mineral Resource Management (“MRM”) function of De Beers and its partners use a holistic approach to the development and optimal management of resources and reserves. Information gathered through the exploration, project evaluation, exploitation and sales and marketing phases is used collectively to optimise the exploitation of resources and reserves. This approach is necessary because of the complex nature of the sampling, estimation, exploitation and marketing of diamonds. Key to the MRM philosophy is the multi-disciplinary approach whereby the various MRM departments on the mines, at De Beers CHQ and at the DTC in London are staffed by experts in the fields of geology, metallurgy, mining, statistics and geostatistics, survey and diamond revenue. The MRM function ensures that strategies for optimal exploitation and best practice are correctly applied on the mines.

MRM committees operate on the mines to ensure that the correct modifying factors are used to convert (in situ) resources to (recoverable) reserves. These modifying factors include mining dilution, metallurgical recovery factors (liberation cut-off sizes and recovery efficiencies) and revenue. The MRM function is responsible for the development and implementation of resource/reserve reconciliation and auditing systems on the mines.

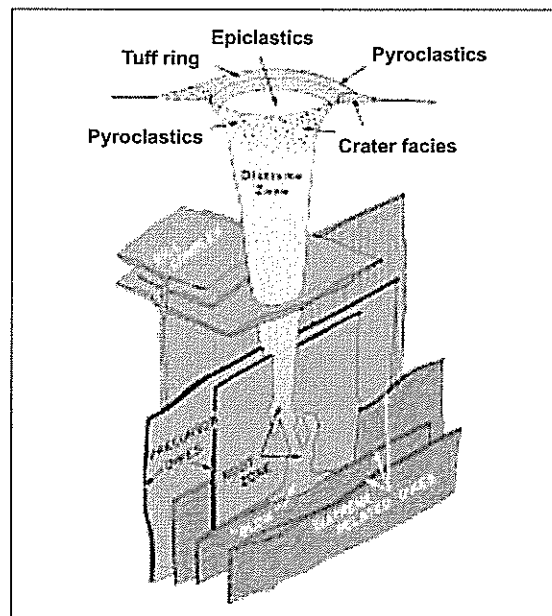
### 4.2 Geology

The primary sources of diamonds are the volcanic host rocks in which the diamonds were transported to surface from deep within the earth’s upper mantle. There are two rock types from which hard-rock diamonds are mined, kimberlite and lamproite. All of the De Beers hard-rock mines are in kimberlites, with the only lamproite in production being the Argyle mine in Western Australia. Weathering and erosion of these volcanic rocks liberates the diamonds, which are then incorporated into a variety of placer deposits by sedimentary processes. De Beers operates a number of mines in placer deposits both offshore and onshore along the coast of Namibia and onshore along the West Coast of South Africa.

#### 4.2.1 The Geological Setting of Kimberlite Operations

Kimberlites generally occur as small volcanic pipes, dykes and sills ranging from <1 to 200 ha or more. The pipes occur as gently tapering cylindrical to conical structures that narrow with depth until the original feeder system of dykes and sills is reached. A kimberlite pipe can be divided into three distinct zones - the root zone, the diatreme zone and the crater.

The root zone is characterised by a highly irregular morphology, mainly due to fracture and/or joint control during emplacement. The root zone is generally characterised by complex internal geology caused by the overprinting effects of several different magma pulses.



*Model of a kimberlite system*

Blind extensions, i.e. offshoots from the main pipe which did not reach the surface and are covered by country rock, also occur in the root zone and are typically capped by breccia zones. Kimberlite from the root zone (including dykes and sills) is known as hypabyssal kimberlite and can be subdivided into hypabyssal kimberlite and hypabyssal kimberlite breccia, depending on the country rock xenolith content. Unaltered hypabyssal kimberlite typically exhibits a dark-grey, black to deep green colour and is competent in hand specimen. Alteration generally results in the rock becoming considerably more friable or clayey, and is associated with a change in colour, depending on the amount of water present.

The diatreme zone (i.e. the middle part of the kimberlite pipe) is characterised by a much more regular morphology and steep, smooth wallrock contacts due to the fundamentally different processes that created this part of the pipe compared to the root zone. The country rock xenoliths in this part of the intrusion are unaffected by thermal metamorphism; the absence of which serves as a useful tool in distinguishing diatreme facies kimberlite from hypabyssal kimberlite. The diatreme zone generally exhibits a much simpler, more homogenous internal geology. Kimberlite from the diatreme zone is known as tuffisitic kimberlite and can also be subdivided into tuffisitic kimberlite and tuffisitic kimberlite breccia. Tuffisitic kimberlite is generally lighter in colour compared to the hypabyssal kimberlite and may or may not appear more fragmental, depending on the xenolith content.

The surface expression of a newly erupted kimberlite is in the form of a crater, typically associated with country rock brecciation. The crater is in-filled with pyroclastic and epiclastic material and surrounded by a tuff ring. Crater deposits often exhibit a complex internal geology. The tuff rings are seldom preserved for long due to rapid erosion. Very few kimberlites have their crater deposits preserved, the best examples of active mines containing crater facies material are Orapa in Botswana, and Mwadui in Tanzania. Crater deposits may be extremely variable in appearance and range from fine, bedded sediments that appear similar to common sandstones and shales, to irregular breccias.

During emplacement of the kimberlite, fragments of mantle-derived material are occasionally incorporated into the magma. These mantle-derived rock types are dominated by peridotites and eclogites, both of which can be diamondiferous. Diamonds and their host rocks are therefore transported to the earth's surface much like passengers on a bus - they occur in kimberlite, but are not directly derived from the kimberlite itself. Diamonds may contain inclusions of peridotite or eclogite minerals, and dating of these inclusions has shown that the majority of diamonds are significantly older than the host kimberlite. This serves to confirm that most diamonds are indeed xenocrysts (accidental inclusions) and not related to the kimberlite itself in any way. The abundance of diamond varies considerably between kimberlites because of varying concentrations of diamond in the earth's mantle. In addition, geomorphic processes on surface can preferentially enrich surficial and crater-lake deposits by several orders of magnitude.

#### 4.2.2 Geological Setting of the “West Coast” Placer Operations

The operations of De Beers located on the West Coast of Southern Africa are predominantly situated on the coastal plain and continental shelf.

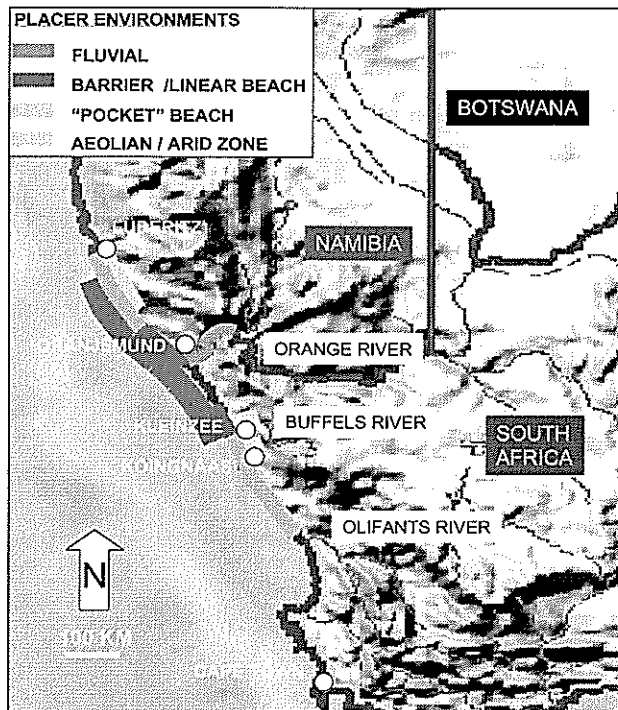
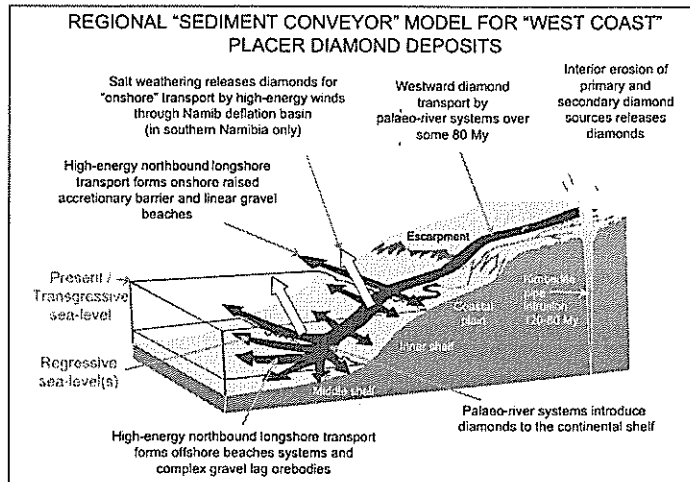
Onshore exploration and mining operations occur in fluvial, marine and aeolian sedimentary environments. Periodic sea-level changes resulting in trans-

gression and regression across the continental shelf and coastal plain, coupled with climate change, have resulted in extensive interaction between placer environments. The reworking of earlier deposits has created ideal conditions to progressively upgrade the concentration of diamonds.

The concentration of placer diamonds is controlled by natural transport and depositional processes and by the presence or absence of fixed trapsites, which generally consist of irregular bedrock morphology and large relatively immobile obstacle clasts. Where trapsites exist, discrete zones of higher-grade diamond mineralisation are patchy and markedly discontinuous (known as the “nugget effect”) due to localised transport conditions caused by extreme bed roughness. In the absence of trapsites, diamond placer orebodies are characterised by large volumes and low grades of 1 cpht or less.

The rapid and marked variation of orebody characteristics and diamond content between sedimentary facies within sedimentary orebodies makes mineral resource management of placers a specialised field.

*Map showing the spatial distribution of major placer environments along the West Coast of Southern Africa in areas where De Beers and its partners hold the mineral rights to prospect and/or mine*



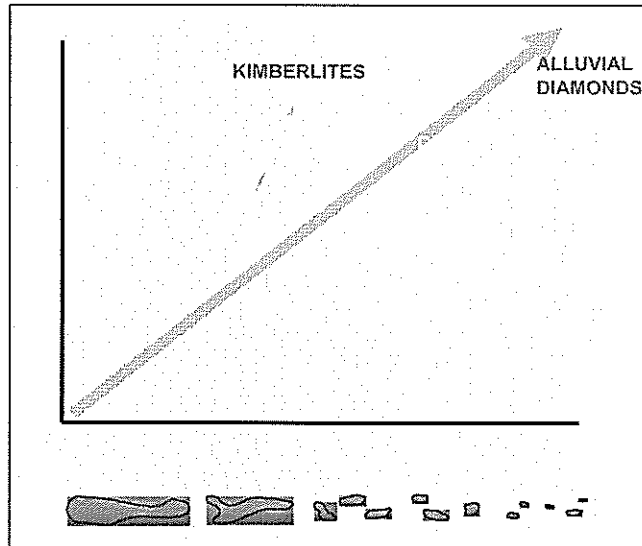
Due to the high-energy fluvial and marine environments, most sequences mined consist of coarse clastic gravels and conglomerates ranging in age from Cretaceous, Eocene and Miocene to Pleistocene. Grits and gritstone characterise aeolian placers. Offshore diamond exploration and mining focuses predominantly on marine sequences that were deposited during the Late Pleistocene and Holocene periods (less than 2 million years ago).

The diamonds have been derived from the erosion of primary and secondary sources located within the hinterland of Southern Africa.

#### 4.2.3 Sampling and Estimation

Because of the unique nature of diamonds and diamond deposits, it has been necessary to develop specific methodologies for sampling, evaluation and estimation. The particulate nature of diamonds, their size, shape, quality, colour and value are important factors in the accurate estimation and evaluation of diamond deposits. Diamond occurrences in nature are rare and are usually measured in parts per billion, whereas most other mineral commodities can be measured in parts per million or parts per thousand. As mentioned earlier, diamonds are brought to the earth's surface in volcanic host rocks, principally kimberlite. Most of these primary source rocks or kimberlite pipes do not contain diamonds, and those that do are very rarely economic. Approximately 5,000 kimberlites have been discovered to date world-wide of which only 1% have been developed into mines. Depending on whether the diamonds are contained in kimberlites or placer deposits, they are either free or locked up in the host rock. Though diamond is the hardest natural substance, it is brittle, which makes it susceptible to breakage during its release in either sampling or commercial treatment.

The following diagram illustrates the complex nature and difficulties of estimating diamond deposits compared to other mineral commodities. It also highlights the fact that marine placer deposits require a high degree of selective mining.



*Grade and geological continuity – sampling and estimation difficulty*

Geological modelling is an essential first step in the estimation process, as the variability between facies is much higher than the variability within individual facies. Once a geological model has been developed, it is then necessary to define the required sampling strategy for grade and revenue determination. This involves establishing sample support size (volume), sample frequency (density) and sample spacing (spatial distribution). The sample size used is a function of the complexity of the orebody and the required level of confidence.

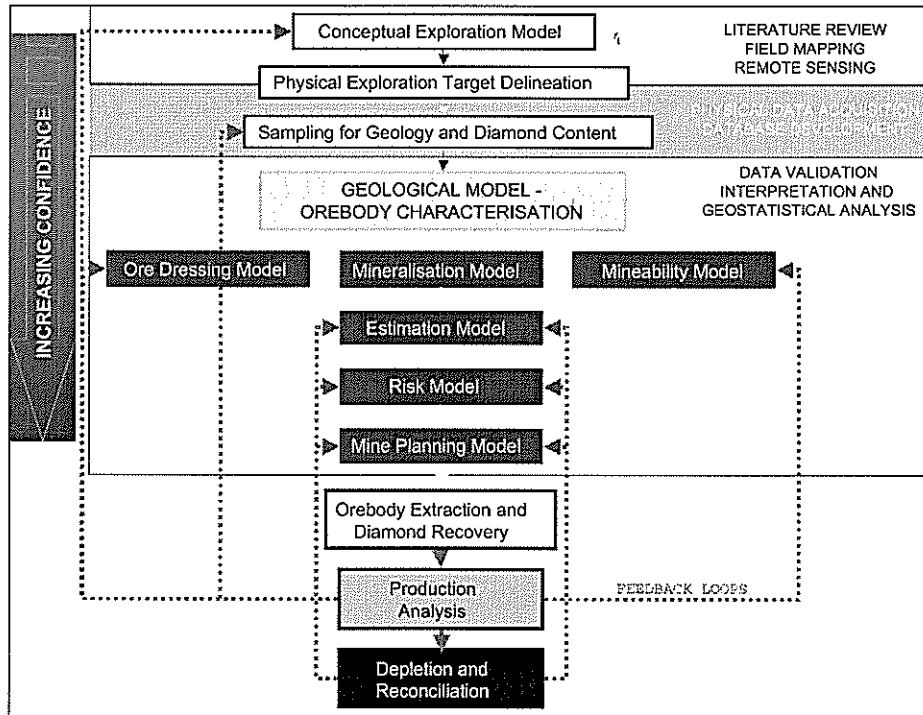
Placer deposits and in particular marine placer deposits are extremely complex and difficult to estimate because of the low level of geological continuity, the clustered distribution of diamonds in trapsites and the low grades. The probability of finding a diamond = the probability of finding a trapsite times(x) the probability of finding a

diamond in a trap site. Therefore a large sample support size is required, or alternatively cluster sampling can be used to collect as large a sample as possible. The sample size typically used in the offshore marine deposits is 10m<sup>2</sup>, and 4m<sup>2</sup> in the onshore deposits depending on the geological continuity and trap site morphology of the orebody. Samples are collected from trenches along sample lines that are positioned according to the simulated linear deposition of the mineralisation. Because of this complexity, special techniques in sampling strategy and resource estimation have been developed in conjunction with world leaders in the fields of classical statistics, geostatistics and spatial simulation of ore deposits.

The estimation process in kimberlites uses geostatistical techniques, but there are added difficulties of variable rock density and variable diamond liberation and recovery characteristics for different host rocks.

In order to estimate the value of the diamonds, it is necessary to obtain bulk samples per geological facies and to recover as many diamonds as possible, generally at least 2,000cts. During exploitation, selective mining is undertaken locally to footprint the detailed diamond characteristics (diamond assortment) per geological facies to help in forecasting the diamond assortment for planning purposes.

De Beers is pioneering the use of micro-diamonds in the estimation of macro-diamond grades, both global and local, as well as in the development of recovery factors as discussed in Section 5.2.



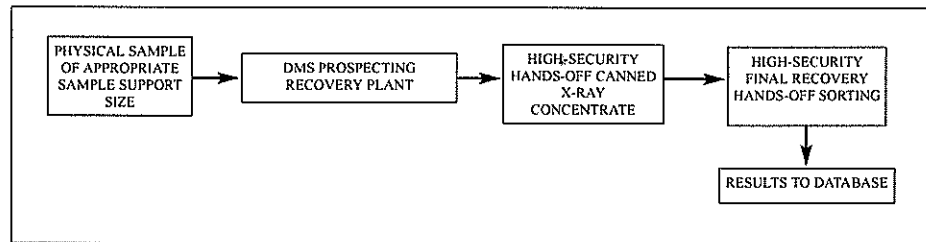
*Project-based methodology for development of diamond resources*

The MRM teams at De Beers typically follow a project-based methodology for the diamond resource. Extensive use is made of production information to continuously improve sampling methodology and the recovery of diamonds from geological samples.

Specific remote sensing/mapping, drilling and sampling systems are required for the evaluation of different orebody types. Although the processes are similar at each operation in general terms, the sampling campaigns differ in order to ensure sampling

is representative and that the required level of confidence is achieved. Different technology is used as phased evaluation progresses, and higher levels of confidence are required to move from inferred to indicated resources.

All samples are treated through high security, specialised sampling plants utilising dense media separation (“DMS”) cyclones. De Beers’ Diamond Control Team regularly audits security measures. Heavy concentrate is sorted using specifically designed x-ray sorting systems, and the product is canned in a hands-off high-security environment. Final recovery of sampling diamonds occurs in specially designed high-security, hands-off prospecting laboratories. The independent Diamond Control Teams comprising personnel from both operations and from De Beers’ corporate headquarters subject procedures to regular audit.



*Simplified sample flowchart*

To ensure data validation, an integrated system of acceptability criteria involving the flagging of samples, statistical tests and geological analysis is undertaken on all sampling, geological and diamond resource data.

The integrity of the key databases of sampling, geological and diamond resource data are maintained by a combination of user procedures, restricted input criteria, purpose-built referential integrity and customised audit functions. In addition to audit trails, databases are regularly backed-up.

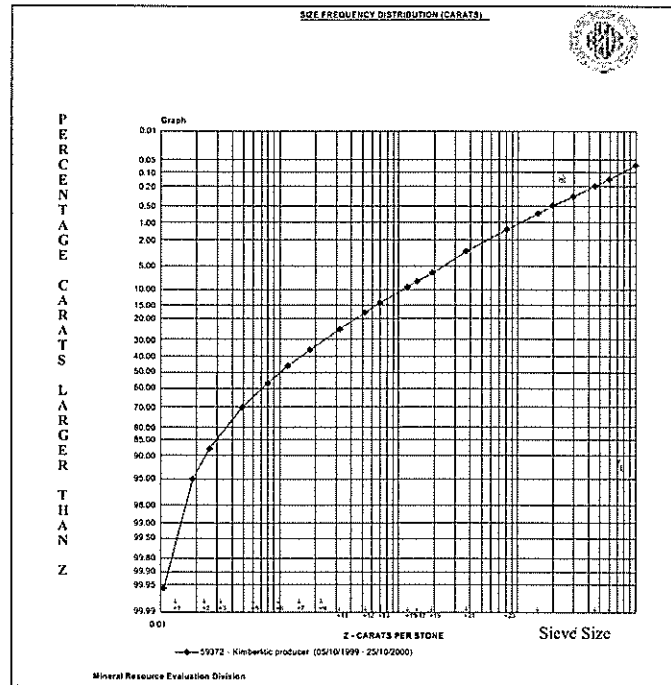
#### 4.2.4 Estimation of Diamond Revenue

In order to produce an estimate for the dollar per carat revenue and the diamond assortment profile for a given deposit, at an overall mine level, or at an individual facies or lithology level (be it an existing operation or a new project), the following procedures are followed:

#### 4.2.5 Size Frequency Distribution

The estimation process begins with the size frequency distribution. Typically this is represented on a logarithmic plot. The cumulative percentage carats larger than Z are plotted on the y-axis against Z, the number of carats per stone, on the x-axis. For a typical kimberlitic deposit, the graph may look like this:

*Kimberlitic Size Frequency Distribution:*



In most instances, the size frequency distribution will require a degree of modelling. This will amongst other things, estimate the quantity of large diamonds considered to be missing either as a result of the sample size or the recovery technique. Further modelling may be necessary to account for diamond breakage in the recovery process and to reflect the bottom cut-off that will be utilised in production if this varies from that of the sampling program.

An under-recovery of fines may also be evident from examination of the distribution, and these too will have to be adjusted back into the sample.

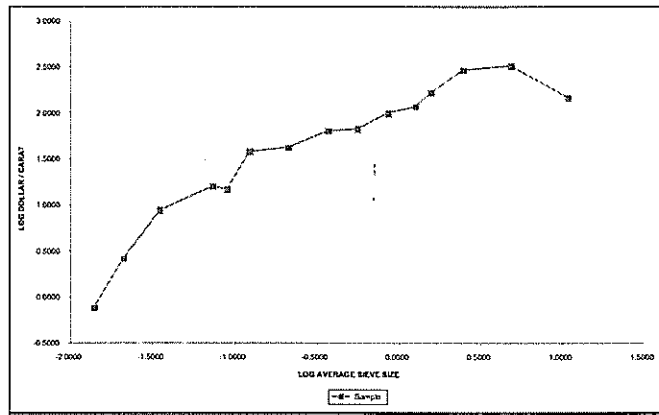
Typically, a parcel of 2,000 carats would be required for such an exercise.

#### 4.2.6 Dollar per Carat Estimation

Having modelled the size frequency distribution, the next step is to analyse the dollar per carat revenue data. The raw information is available once the sample parcel has been valued using the current DTC price book. This process will take place at one of the DTC sorting and evaluation houses, where each stone will be classified according to its weight, model (i.e. shape), quality (i.e. absence or presence of cracks and inclusions) and colour. This combination of variables can lead to up to 16,000 price book items.

A similar modelling process will be necessary to ensure fair representivity of the diamond assortment across the sieve classes, and again a plot in logarithmic space is utilised. In this case the log of the average sieve size is plotted on the x-axis, against the log of the dollar per carat on the y-axis.

Statistical modelling is carried out on the data to arrive at a best fit curve and develop a theoretical dollar per carat per sieve class. This in turn would be applied to the modelled size frequency distribution in order to arrive at a final dollar per carat for the parcel.



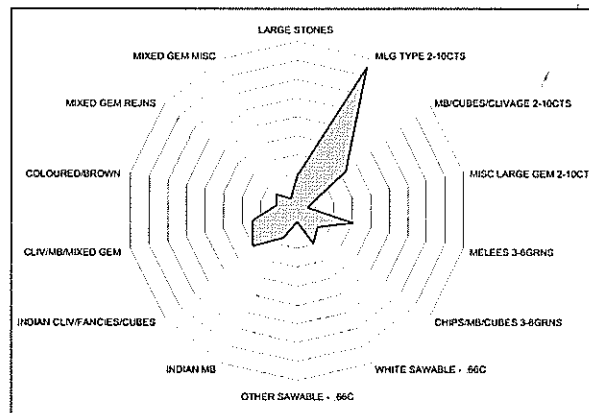
Log US\$/¢ v log sieve size

Typically, a parcel of at least 2,000 carats would be required for such an exercise.

#### 4.2.7 Diamond Assortment

The final stage in the modelling process is to achieve a greater understanding of the diamond assortment profile of the final production. Having valued the sample at full price book level, an amalgamation procedure is followed which will reduce the potential 16,000 price book items to 14 representative major article groups. This can then be more directly associated with the downstream availability planning.

The major article groupings can be graphically represented in a number of ways; however, either a stacked bar chart or radar charts are usually favoured. The latter is particularly useful for measuring variance from a forecast.



Radar chart for a typical mine

To complete the process, a thorough auditing and reconciliation function is carried out. The actual figures compared to the expected forecasts will be analysed for total caratage, variance in size distribution and ultimately variance in assortment. The information gained from these exercises will then be fed back into the modelling process to reduce the error in subsequent estimates.

#### 4.2.8 Reconciliation and Auditing

Reconciliation of estimated grades, revenues and diamond assortments versus those recovered is undertaken for all operations of De Beers and its partners using in-house audit systems. The principal system utilised is known as MINRAS (Mineral Resource Auditing System). MINRAS is a relational database management system ("RDBMS") that stores and tracks all relevant data and information about an operation's mineral resources and reserves. More specifically, the data and information contained in the resource database is a set of relevant models, which estimates each sub-division, or unit of resource. These models have been derived using various techniques such as geological interpretation and spatial statistics (e.g. grade, density, ore dressing studies,

etc.) and are associated with both in-situ resources (e.g. blocks, panels etc.) or bulked resources (e.g. stockpiles, dumps etc.). Resources and reserves are classified and reported in the system according to the SAMREC Code in cases where implementation is complete. The database not only contains the status of unmined resources and reserves but also all historical information regarding adjustments and resource movements. The current or future information contained in the resource database is used for the strategic business planning cycle, and the historical information is used for reconciliation, analysis, audit and playback of various scenarios. All relevant data elements such as grade, volume and density can be selected to be auditable, and internal or external auditors can perform audit exception reporting.

#### 4.2.9 Resources and Reserves

De Beers has made a policy decision to classify resources and reserves according to the rules for public reporting in South Africa, as defined by the South African Mineral Resource Committee (SAMREC). Mineral Resource Management teams at operations are in the process of implementing this policy. This code has been incorporated into the JSE Listings Requirements. The SAMREC code has been compiled along the lines of the Australian JORC code, which has been used as a guideline for mineral codes drafted in other countries such as Canada, US and the European Union.

The SAMREC code requires that a Competent Person be responsible for the declaration of the resources and reserves in their defined sub-categories in all public reporting, which includes the company annual report. Dr W.J. Kleingeld, Group Manager Mineral Resources, is De Beers' appointed Competent Person.

In accordance with the SAMREC code the following table lists the resources and reserves of De Beers and its partners:—

#### SUMMARY OF DE BEERS AND ITS PARTNERS' RESOURCES & RESERVES (as at end December 2000)

Operating mines & advanced projects	INFERRED RESOURCES					INDICATED RESOURCES					PROBABLE RESERVES				
	Metric Tonnes millions	Grade (epht)	Area (m <sup>2</sup> ) millions	Grade (m <sup>3</sup> )	Total Carats millions	Metric Tonnes millions	Grade (epht)	Area (m <sup>2</sup> ) millions	Grade (m <sup>3</sup> )	Total Carats millions	Metric Tonnes millions	Grade (epht)	Area (m <sup>2</sup> ) millions	Grade (m <sup>3</sup> )	Total Carats millions
<b>SOUTH AFRICA</b>															
Finsch	51.5	36.9			19.0	28.4	52.8			15.0	25.4	43.3			11.0
Kimberley	188.0	7.4			14.0	88.0	18.2			16.0	8.0	18.8			1.5
Koffiefontein	130.0	3.1			4.0	10.0	5.0			0.5	21.0	8.6			1.8
Marsfontein	0.3	12.1			0.04	0	0			0	0	0			0
Namaqualand Mines	0	0	16.1	0.34	5.4	0	0	18.2	0.06	1.1	0	0	17.4	0.37	6.4
The Oaks	2.6	53.8			1.4	0	0			0	0	0			0
Premier	117.0	9.4			11.0	180.0	67.8			122.0	39.0	53.8			21.0
Venetia	64.0	77.3			49.5	9.8	134.7			13.2	43.6	121.6			53.0
<b>BOTSWANA</b>															
Orapa	273.0	45.8			125.0	105.9	34.5			36.5	274.0	57.8			158.5
Lethakane	47.4	26.4			12.5	6.2	30.6			1.9	9.0	21.1			1.9
Jwaneng	229.6	160.7			369.0	14.0	28.6			4.0	44.0	90.9			40.0
<b>TANZANIA</b>															
Williamson	114.0	5.7			6.5	0	0			0	0	0			0
<b>NAMIBIA</b>															
Namdeb & Debmarine	301.7	1.5	23.9	0.17	8.6	73.6	2.3	18.8	0.20	5.4	59.4	1.5	6.8	0.19	2.2
<b>CANADA</b>															
Snap Lake	9.3	196.8			18.3	12.0	197.5			23.7	0	0			0
<b>GRAND TOTAL</b>	<b>1,528.4</b>	<b>41.5</b>	<b>40.0</b>	<b>0.24</b>	<b>644.2</b>	<b>527.9</b>	<b>44.4</b>	<b>37.0</b>	<b>0.13</b>	<b>239.3</b>	<b>523.4</b>	<b>55.3</b>	<b>24.2</b>	<b>0.32</b>	<b>297.3</b>

(i) Namdeb/Debmarine and Namaqualand Mines are two-dimensional placer type deposits reported in square metres (m<sup>2</sup>) and grades calculated in carats/m<sup>3</sup>  
(ii) Snap Lake is an advanced Canadian exploration project

GRAND TOTAL (includes Kimberlites & Placers)	Metric tonnes million	Grade epht	Metric (m <sup>2</sup> ) million	Grade cts/m <sup>3</sup>	Carats million
Probable reserves	523.4	55.3	24.2	0.32	297.3
Indicated resources	527.9	44.4	37.0	0.13	239.3
Inferred resources	1,528.4	41.5	40.0	0.24	644.2
<b>GRAND TOTAL</b>	<b>2,579.7</b>	<b>44.9</b>	<b>101.2</b>	<b>0.22</b>	<b>1,180.8</b>

## 5. Diamond Winning

### 5.1 Mining

#### 5.1.1 Introduction

Diamond “winning” (i.e. the act of mining and recovering diamonds) operations have been conducted viably by De Beers since the late 19th century.

The scope of these operations includes open-pit and underground mining of kimberlite pipes, mining of fluvial, alluvial and deflation deposits and more recently the capability and capacity to mine marine deposits at depth beneath the sea.

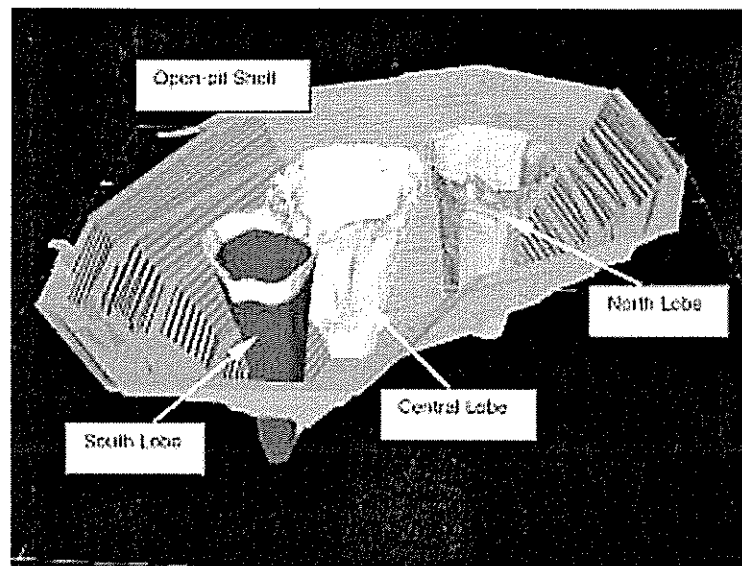
De Beers’ mining engineers, geologists and geotechnical engineers have developed expertise in the uniqueness of underground block caving of kimberlite pipes, in the mining of beach and marine deposits on and off the West Coast of Southern Africa and in open-pit mining operations. All these have resulted in a competence of the group to exploit lower grade deposits feasibly and thus to extend probable reserves, whilst maintaining and improving the margins on existing reserves.

#### 5.1.2 Mining Methods

##### 5.1.2.1 Open-Pit Mining

Surface outcrops of a deposit are normally exploited using open-pit methods. The advantages of open-pits are generally:

- earlier revenue generation;
- flexibility of mining rate and sequence;
- lower initial capital and operating cost per tonne mined;
- less limitation on size of machinery; and
- better blending capabilities.



*Typical open-pit planning output showing pipe boundaries and pit shell (Jwaneng Mine)*

The size, shape, value of the resource and the stability of the host rock are the prime determinants of the layout and ultimate depth of the open-pit mine.

Within De Beers, sophisticated computerised design and scheduling software tools are used continuously to ensure that the return from exploiting the resource is optimised.

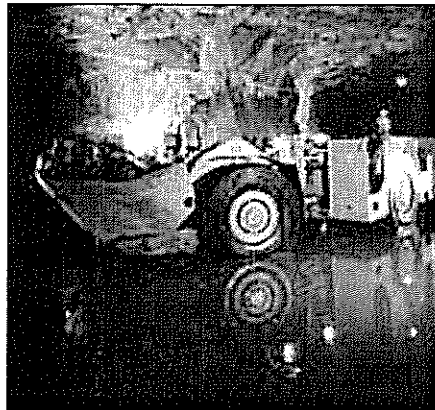
The use of GPS and dispatch type control systems, integrated with on line drilling systems and blast design contributes towards enhanced efficiency of the mining operations.

### 5.1.2.2 Underground Mining

Kimberlite pipes have been mined by a variety of underground mining methods over the years. This section focuses on the methods that are still being applied today.

Mechanised blast hole open stoping (“BHOS”) has generally been selected as the most appropriate method for facilitating the change from open-pit to underground mining for the following reasons:

- fast build-up of tonnage and easy interface with open-pit layout;
- low front-end capital requirement (but high long term development cost);
- opportunity for selective mining of waste; and
- more control and less dependence on the predictability of the rockmass.



*LHD hauling kimberlite in an underground operation*

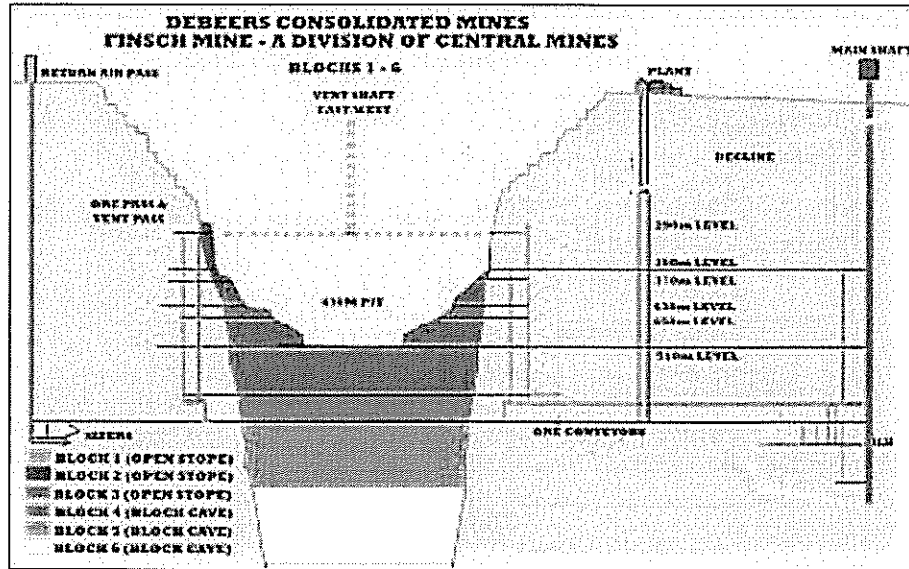
This method has been applied at Premier, Koffiefontein and Finsch mines.

Long hole drilling rigs are used to drill rings of holes from drill drives situated perpendicular to the pit faces. These holes are then charged and blasted and the broken ore pulled to the production levels below where the material is loaded by load-haul-dump units (“LHD”s).

The depth to which BHOS is applicable is however limited in kimberlite pipes situated in unstable country rock such as the Karoo System. BHOS is vulnerable to waste dilution, and in certain areas the mining method is revised in order to cope with early waste dilution resulting from

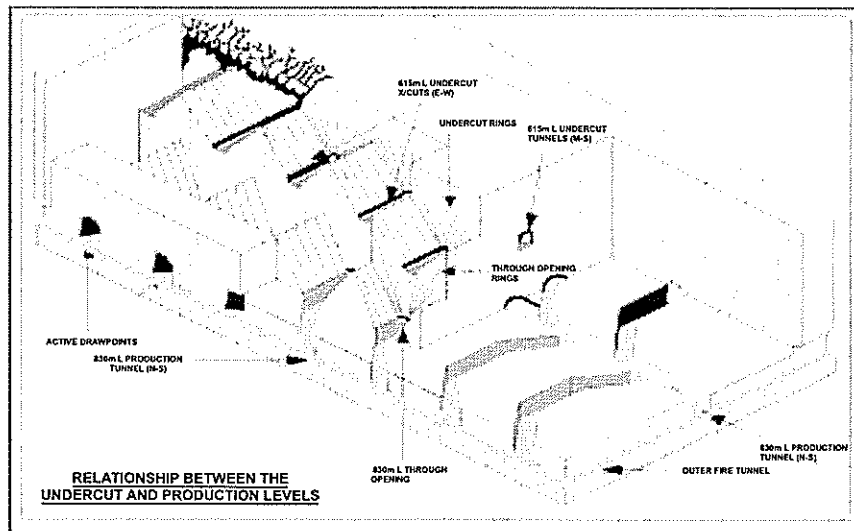
pit sidewall failures. In areas where this has occurred, the mining method has been changed to a modified sub-level caving method. This is currently the case for Koffiefontein and Finsch.

Modified sub-level caving involves a similar process to blast hole open stoping. The underground infrastructure (the tunnels and level spacing etc) remains largely unchanged, but the amount of material extracted is reduced to facilitate semi-choke blasting. The broken ore is then loaded via the tunnels by LHDs. This creates a layer of ore above the retreating tunnels that protects against waste ingress with the loaded ore. This method reduces the percentage of ore that can be extracted, due to ore being left in the protective layer. Thus it should be seen as an interim method only, while the infrastructure for a block cave is being established.



*Schematic section of Finsch Mine, indicating mining methods used*

Block caving is the most cost effective and productive method of mining kimberlite underground. It is however dependent on the pipe having sufficient cross-sectional area to allow the ore to cave, once it has been undercut. Currently De Beers employs scraper drift block caves at the Kimberley Mines, where poor ground conditions require small, closely spaced tunnels. Mechanised block caving is used at Premier Mine, where the more competent rockmass facilitates larger, more widely spaced tunnels allowing the use of high-capacity electric - and diesel-driven LHDs. A new block cave is in the process of being established at Finsch (Block 4) and another is in the final stages of planning at Premier (C-Cut).

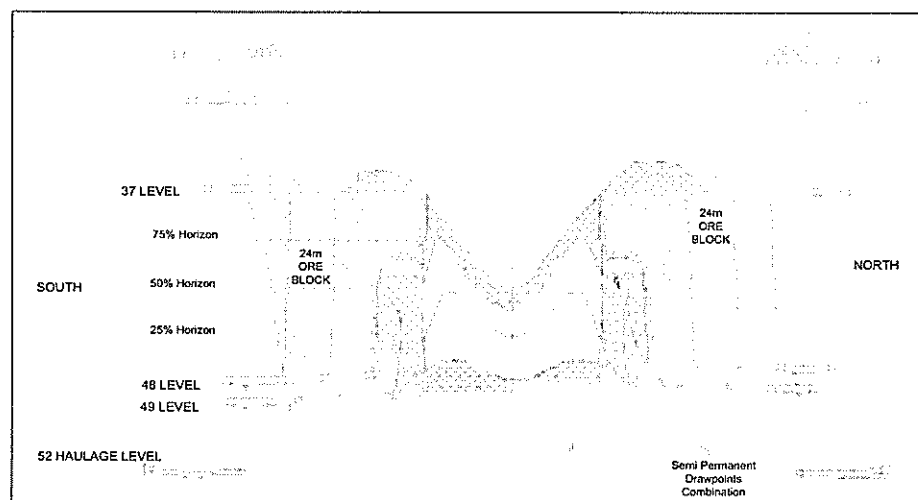


*Diagrammatic representation through a block cave section (Premier Mine)*

Once the rockmass has been destabilised by undercutting and caving occurs, the ore migrates through a series of drawbells (resembling an egg box) developed between the production and undercut levels. These drawbells concentrate the broken ore into draw

points, where it is loaded by LHDs. Any oversize material is drilled and blasted at the drawpoints by means of specialised equipment.

A new mining method being implemented at Koffiefontein Mine is called front caving which is a combination of sub-level caving and blockcaving. The front cave method was developed to control waste dilution from a large sidewall failure in the pit. The front cave is dependent on extremely accurate and disciplined draw control to ensure that the material is drawn out of the mine in the correct sequence, without any uneconomic mixing of kimberlite with waste. Another advantage of this method is that overall draw level infrastructure is less expensive than a similar sized block cave layout, since the complete drawpoint infrastructure is not required to last the life of the cave. Lower initial capital requirements, together with the benefit of concurrent production from the upper levels, further ensure that early revenue offsets initial capital expenditure.



*Diagrammatic section of Koffiefontein Mine illustrating the front caving mining*

#### *Underground ore transport*

Most orepasses for underground mines are situated in the host country rock. Although the haulage distances and cycle times are at times longer than ideal, the variable geotechnical conditions of the kimberlite generally precludes ore-passes within the kimberlite ore-body.

At Premier Mine, as part of the draw-control management process, the LHD loading is datalogged automatically via a system of beacons, on-board LHD computing and leaky-feeder transmission to a surface data-storage facility. The Finsch Mine system of LHD management is more complex, providing supervisory functions, similar to that of open-pit truck dispatch systems. Each of the Finsch Mine ore-passes empties into a mineral sizer, and a horizontal conveyor system transports the ore to the shaft. Radar measuring devices monitor the content levels in the orepasses to enhance the groundhandling management process.

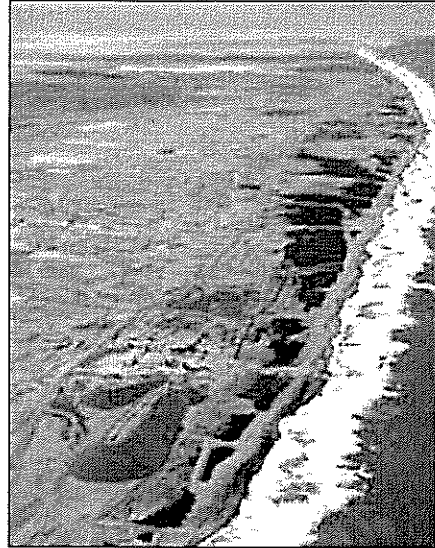
Both Premier and Koffiefontein mines use electric train haulages for collecting the ore from the ore-passes and transporting it to centralised crushing stations equipped with jaw crushers. At Koffiefontein Mine, the crushed ore is fed via a loading station into skips and hoisted to the surface by means of a vertical shaft equipped with a Koepe Winder. At Premier Mine the crushed ore is transported by means of a series of inclined conveyors to the loading station at the shaft, used previously to serve the above-sill mining operations and then hoisted to the surface.

### 5.1.2.3 Alluvial Mining

De Beers mines extensive marine terraces at Namaqualand and north of the Orange River at Namdeb. Ancient river gravels are also mined at Daberas on the North bank of the Orange River. These deposits, together with those at Elizabeth Bay, form the majority of De Beers' placer mining activities.

Overburden removal is the first step in the mining process. The overburden requiring removal can be anything from zero to 40m thick and can vary from loose sand to cemented conglomerate. A variety of methods and equipment are used for this process, depending on the application:

- *conventional stripping:* This method utilises bowl scrapers and bulldozers. Although it is a flexible system it is a more costly method.
- *ADT stripping:* This method utilises excavators and articulated dump trucks (ADTs) and is extensively used due to its flexibility and lower cost.
- *stripping by bucket-wheel excavator:* Namdeb currently runs 2 bucket-wheel excavators. The larger O&K S800 has the capability to strip 12Mtpy of overburden up to depths of 15m and the smaller O&K SH400, which operates in areas of overburden depths up to 11m, has the capability to strip 6Mtpy.
- *stripping by dragline:* This is the lowest cost stripping method; however, the lack of mobility of the dragline implies that areas requiring overburden stripping should be situated adjacent to each other wherever possible. The dragline generally operates in areas of unconsolidated overburden of 15m to 30m in depth.



*Aerial view of the Namdeb onshore beach placer mining operations*

#### *Ore Excavation and Bedrock Cleaning*

The excavation of the bulk of the ore that overlies the bedrock is achieved by trackdozers and excavators which create windrows from which ground is removed by rubber-tyred front-end loaders into ADTs and rigid frame trucks. Employees utilising pneumatic breakers and a containerised vacuum cleaning system perform final bedrock cleaning. In areas where cemented conglomerates occur, drilling and blasting is necessary. In other areas where only light cementation occurs, hydraulic impact hammers are used to separate the diamond bearing material from the bedrock, or it is broken up using the trackdozers' ripping tool.

The haultrucks or ADTs carry the ore from the mining faces to the treatment plants. It is therefore of importance to have a network of major and minor haul roads. The correct maintenance of these haul roads helps reduce the running cost of the haultrucks or ADTs.

#### *Dewatering*

Methods have been pioneered at Namdeb for mining the foreshore (the area between the original sea low water mark and original high water mark). This operation has

managed to advance some 300m beyond the original high water mark and has allowed for the mining of ore down to 19m below mean sea-level. Beach walls are created and maintained by dumping overburden sand onto a wall, which is subsequently pushed by trackdozers further out to sea, to counter erosion by wave attack.

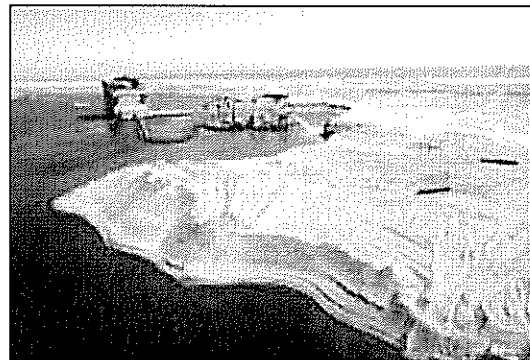
In areas where the water table is above the diamondiferous horizon, a system of well points is installed in banks, depending on the depth, along the landward side of the wall in order to stabilise it and at the same time reduce seepage into the working area. Further dewatering is carried out using conventional pumps, allowing the mining operations to proceed below sea-level. The water is pumped from the wellpoints and pumps to a sump from which it is pumped back to the sea or out of the area using larger pumps.

#### *Surf Zone Mining*

Generally, contractors are used to mine in the surf zone (30m from high water mark). The contractors, utilising their own equipment, scour out the gullies in the surf zone. This process is weather dependent and makes up a small contribution to the total mining volume.

#### *Dredging*

Dredging has been implemented at Namdeb for overburden removal in areas likely to have very wet ground conditions. The dredge is floated in an initial pond and then moved into the mining block, excavating down to the diamondiferous material and the bedrock using a cutter suction head. This will generally take place down dip to enable the water level to be controlled and enable conventional bedrock cleaning to take place once the water level has dropped sufficiently. The discharge of the dredge is on the seaward side of the seawall, "pushing" back the sea and resulting in more ore reserves becoming accessible. The water for the dredge pond is supplemented with water pumped from the sea. The dredge is also equipped with a floating treatment plant to allow the treatment of low-grade diamond bearing overburden. The successful implementation of this mining method has and will continue to result in substantial increases in Namdeb's mineable reserves.



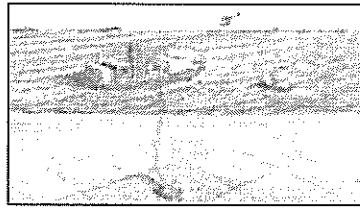
*The dredge operating at Namdeb, with the floating treatment plant in the background*

#### **5.1.2.4 Marine Mining**

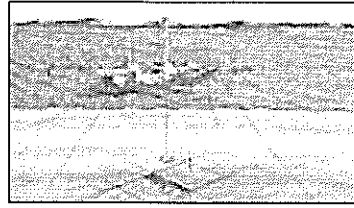
De Beers Marine's current production fleet consists of four mining vessels and one evaluation sampling and mining vessel, based in Cape Town. The company currently provides a total offshore management service for the exploration and recovery of marine diamonds.

Two mining methods are used - one horizontal and the other vertical attack:

- *horizontal system:* A seabed crawler, achieves precise coverage of the area to be mined and utilises an airlift system to deliver diamond-bearing gravels to the vessel through flexible slurry hoses.
- *vertical system:* A large-diameter drilling device mounted on a compensated steel pipe drill string, recovers diamond-bearing gravels from the seabed in a systematic pattern over the mining block.



*Diagram of  
horizontal mining system*



*Diagram of  
vertical mining system*

De Beers Marine are constantly researching and developing more advanced underwater mining systems to facilitate the mining of the seabed at lower costs and at a higher rate.

### 5.1.3 Safety and Health

De Beers is committed to the promotion of the health and safety of its employees and all DBCM mines have instituted procedures to achieve those aims. Each mine has a Safety, Health and Environmental department that continuously monitors compliance and works to promote improvement. Health and Safety agreements have been concluded on all mines, and full-time health and safety representatives play a major role in accident and incident prevention. Health and Safety committees function effectively at all operations. Risk assessments of work are ongoing and reviewed regularly. Wellness and health engendering programmes ensure that health and safety awareness is communicated to all employees, including contractors. There is also, compulsory health and safety training for all. In addition, outside consultants are used to measure compliance with international best practice.

De Beers' mines participate in the internationally recognised National Occupational Safety Association ("NOSA") safety grading system – without exception being graded four star or better. De Beers Marine is graded according to the NOSA Sea Safe System, with the vessels of the fleet being individually graded. The top NOSA award, the Noscar, is presented to operations that consistently excel at safety. This Noscar award is currently held by De Beers Marine, Venetia, and at Namdeb's Elizabeth Bay and Orange River mines. The group's lost time injury frequency rate ("LTIFR") remains below one – better than any other large mining house in the world.

## 5.2 Metallurgy

### 5.2.1 Introduction

Metallurgy provides strategic metallurgical leadership by ensuring that metallurgical excellence, standards and best practice are established and maintained on all group operations. This ensures that the operations have the capacity to achieve their strategic KPIs. Metallurgy has a close relationship with the operations and provides key services including annual diamond value management audits and placement of technical staff.

A model for the design of new plants has evolved and continues to be fine-tuned. Projects are initiated from head office or from the mines and follow the pre-feasibility study, feasibility study, full project route to fruition. The systems acquisition approach is the basis of all projects, and a Required Operating Capability ("ROC") is produced from which a Project Execution Plan ("PEP") is drawn up.

To measure process plant efficiency is prohibitively costly, given that the residual concentration of diamonds in these streams is less than one part per billion. Thus, in order to ensure that the operations are run optimally, a strategic programme of continuous optimisation has been adopted, namely Diamond Value Management ("DVM").

DVM encompasses the following value adding components:

- diamond control, that addresses elements associated with security of the product;
- diamond damage, a system of measuring and tracking the revenue losses attributable to damage;
- diamond recovery efficiency, a multitude of techniques that measure and improve free diamond recoveries; and
- optimum top, recrush, and bottom cut-off sizes which are determined and monitored at each operation using techniques such as granulometry, stage crushing and size frequency analysis.

Ore dilution, an approach aiming to quantify and minimise waste rock fed to the process, and marine mining tool efficiency are additional elements that add value.

In order to ensure ongoing success over a wide range of operating conditions, De Beers has continually invested in research and development. The product of this investment is embodied in the corporate research and development centre (DebTech).

### 5.2.2 DebTech

DebTech's mission is aligned with the current vision of De Beers. Through research, development, delivery and support, in exploration, mining and ore treatment, DebTech provides timely, cost-effective technology platforms. DebTech has knowledge of De Beers' needs and opportunities in diamond winning, knowledge of current and emerging technology, and the capability to match the technology with these needs. The selected technologies will provide the capability to profitably mine lower-value ore bodies and to maximise extraction of value from the ore deposit.

Research is concerned with projects and activities leading to new knowledge. Development utilises new and existing knowledge to produce new products and services. Unlike many corporate R&D organisations, DebTech goes further; the 'Products and Services' function is responsible for the building, integrating, transferring and long-term support of projects and activities.

Several engineering and scientific disciplines support this value generation chain. These disciplines provide specialised technical competencies, such as x-ray, electro-optics, signal processing and materials handling to the projects as required. Recent products include LARA, a high-performance, value-engineered x-ray diamond sorting machine, and Scannex, a low-dosage full-body x-ray scanning and digital imaging machine. In addition DebTech has developed a completely automated recovery plant and fully integrated hands-free sort-house, including diamond sorting using laser-Raman technology.

Other examples of current and past research and development projects include work in exploration drilling, undersea mining tool development, technology to detect diamonds whilst still locked in pieces of rock, diamond liberation studies, unique security platforms, and remotely operated high-capacity diamond packaging and weighing machines.

At the business level, DebTech measures the value of current and emerging technology based on the extent to which it will increase De Beers' diamond revenue earnings, and/or reduce its operating costs. DebTech then prioritises, initiates and manages programmes of research and development and supply accordingly.

In keeping with the De Beers philosophy of responsible and environmentally friendly mineral resource mining and processing, DebTech has established a programme of environmental technology development. This programme includes novel technologies

developed for water reclamation and purification. Technology developed in-house is also sometimes applicable to other fields, as demonstrated by the LODOX x-ray machine that has been installed at Groote Schuur hospital in Cape Town, facilitating high-speed low-dose full body digital imaging for trauma patients.

### 5.2.3 Design of Diamond Winning Processes to Match Reserve Characteristics

The recovery of diamonds from ore involves four primary processes:

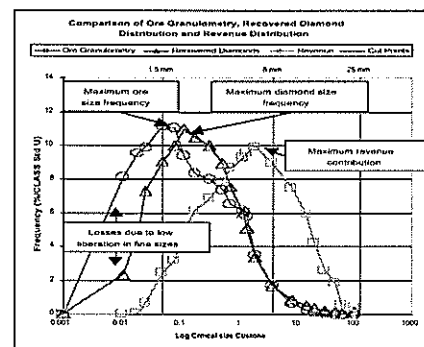
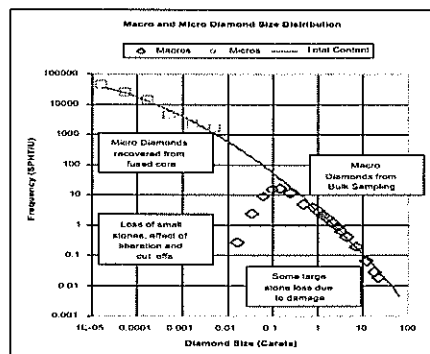
- ore extraction;
- liberation;
- free diamond recovery; and
- final sizing weighing and packaging.

The ore is received at the plant in a mixture of material ranging from clay to boulders. The feed is washed, scrubbed, crushed, and its diamond content is progressively upgraded to facilitate diamond recovery.

The value of diamonds increases exponentially with size. Thus, De Beers does not employ the milling and chemical extraction methods, common to the mineral processing industry. To extract maximum value, the process must be matched to the combination of ore facies, fracture properties of the host ore, and included diamond distribution.

From initial core samples, an estimate of the micro diamond content is obtained. These results are combined with results from drill chip and bulk sampling to determine the total diamond content per facies, and more importantly the size distribution of this total content.

This distribution is used to determine the optimum number of crushing stages that are required in the process.



This process ranges from setting the initial drilling and blasting parameters, through to the determination of the bottom cut-point of the finest screens used in the recovery process.

Granulometry of the material exiting each process is evaluated to determine the optimum top, middle and bottom cut point. This optimum is defined as the combination, which maximizes the recovery and throughput for the blend of facies to be treated. 25mm is a typical top cut size, which equates to a diamond of critical size of approximately 120cts. The kimberlite at Premier Mine contains diamonds larger than this, thus it has been equipped with a large-diamond recovery plant. The bottom cut point is typically set at 1.0mm, as is usually not economic to recover diamonds

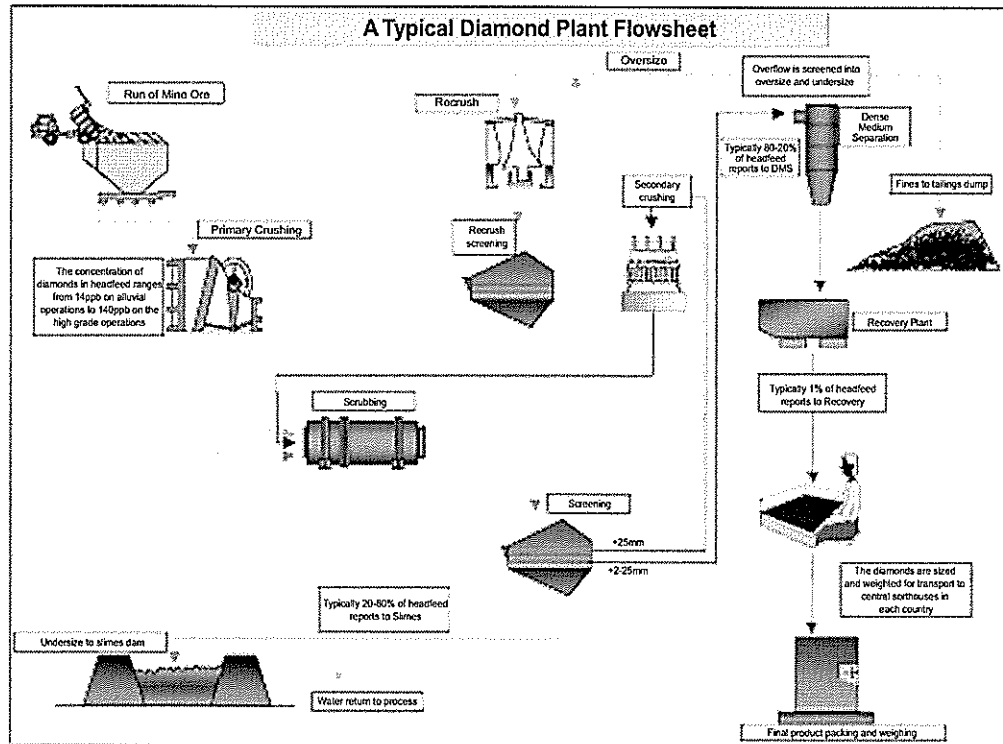
from particles below this size. The middle cut point is used to select and crush coarse tailings to liberate diamonds and hence increase recovery. The balance between these parameters is reviewed from time to time as the ore mix that is treated, and the revenue distribution of the diamonds produced, changes.

Once the primary parameters of an operation have been determined, a programme of characterising the waste, ore and diamonds is carried out to design and optimise the process flowsheet. This characterisation is used to determine the interaction matrix between a) the bulk rock, unique mineral and diamond properties on the one hand, and b) liberation, recovery and throughput on the other.

Typical trade-off studies include the balance between recovering more small diamonds and increasing throughput, and crushing finer to improve liberation versus installed crushing capacity. These trade-off studies also have impact on the required size of water treatment and reclamation systems. The conclusions arising from these studies are augmented with information gathered during the treatment of bulk samples.

Diamond characterisation studies are used to identify a particular sequence of processes in the final recovery processes that will provide maximum recovery. The characteristics that are studied for both the diamonds and gangue in the concentrate include x-ray luminescence profiles and magnetic susceptibility.

#### 5.2.4 Diamond Plant Flowsheet



##### 5.2.4.1 Diamond winning process description

Diamond winning processes includes scrubbing, crushing and screening, dense medium separation and final recovery.

#### 5.2.4.2 Scrubbing, Crushing and Screening

Ore is delivered to the plant in sizes less than 1m<sup>3</sup>. This ore falls into a primary crusher of either the jaw, gyratory or mineral sizer type and reduced to less than 250mm fragments. The crushed ore is then washed through a scrubber that removes much of the fine material and prepares the ore for sizing into several fractions.

The oversize (+25mm) reports for secondary crushing to reduce the size to less than 25mm. The crushed product passes over a screen that would separate and recycle the + 25mm fraction back to the crusher, with the undersize reporting to either a scrubber or DMS. On some operations where the ore is exceptionally hard a tertiary stage of crushing is employed.

There are two primary modes of crushing, geometric and inter-particle:

- *geometric crushing* is used for larger particles, and involves simply squeezing the particle between two metal plates. This type of crushing produces uniaxial stress and hence a flatter shaped product, and can be used to crush relatively large rocks. Gyratory and most cone crushers operate in this mode.
- *inter-particle crushing* involves rock-on-rock crushing that can be induced by compressing a bed of broken rock. The resultant multi-axial stress results in a crushed ore product that is typically half the size of the operating gap in this type of crusher. This means that diamonds are liberated without damage.

Crushed material is once again washed through a scrubber, the product being screened and sprayed, to remove undersize material, typically less than 1.5mm. This undersize material, in the form of slurry, reports to a water recovery system, typically comprising de-gritting and thickening. The slimes so produced are disposed of in a slime dam. On some sites this process produces slurry that is dry enough to be disposed of with the coarse tailings.

#### 5.2.4.3 Dense Medium Separation and Concentration

Custom-sized material, typically 1.5 to 25mm in size, moves to the next process, dense medium separation (DMS), where the ore is separated into a dense, or sink, component and a float component that is discarded.

The medium used is a mixture of water and ferro-silicon, which creates an apparent density of 3.1g/cm<sup>3</sup>. As diamonds have a density of 3.5g/cm<sup>3</sup>, they sink, and the majority of the ore, typically 99%, floats. The ore that floats is discarded on coarse tailings dumps. At some plants this material is crushed and separated a second time to improve the overall diamond liberation. Several other minerals sink along with the diamonds, such as magnetite and garnet, producing a diamond concentrate, that is transported to the recovery process.

#### 5.2.4.4 Diamond Recovery

Recovery methods for diamonds vary considerably, as they depend on the physical characteristics of the diamonds and the gangue that sinks along with the diamonds. Processes that are used include permanent magnet roll separators, x-ray separators, laser Raman separators, grease belts, and hand sorting. These are usually used in separate size streams to ensure maximum efficiency. Tailings from these processes are usually stored in a secure area to ensure any losses can be reclaimed when deemed economically viable.

#### 5.2.4.5 On Site Sorthouse Processes

The concentrates generated from the recovery processes, which in some cases concentrate in a ratio of 1 part of product to a 1,000 parts of discard, are either sent to

hand sorting, or in the case of more modern facilities such as the Debswana FISH (fully integrated sort-house) to single particle sorting that carries out a final diamond waste separation. At each operation these diamonds are sized, weighed and packaged for dispatch to a regional sorting and valuation facility.

## **5.3 Engineering**

### **5.3.1 Introduction**

The engineering management for De Beers is structured as two discrete entities, DBCM and Namdeb being one, and Debswana the other.

CHQ Services Engineering provides a centre core of consulting services to the group operations and major project teams. The philosophy of support is to provide a basic expert capability in the engineering discipline areas of asset management, civil, electrical, control and instrumentation, mechanical, mining equipment and project services. All other services are out-sourced via group or individual unique contracts.

The engineering functions at the DBCM and Namdeb operations are integrated within the production business units of these operations, with the engineering managers (and mine engineers) having a functional technical and legal responsibility for engineering matters.

Debswana operates in a similar fashion to DBCM, except that it has some limited central resources and makes use of the DBCM discipline expertise as required owing to limited resources of this type in Botswana. It maintains an experienced projects section in Johannesburg to project manage and execute large projects. This team taps into the group knowledge base as appropriate.

### **5.3.2 Project Management**

De Beers has a project management division, which provides project management services for new acquisitions, and various improvement or expansion projects at the operations. A core team of professional experts joins with designated project teams to form small owner representative bodies. The major work is then outsourced to professional consulting and project management service providers on contract. These companies design fit for purpose solutions on a lump-sum or re-measure basis. The risk to De Beers is thus minimised, as the contractor has accountability included in their services.

De Beers follows the PMBOK (Project Management Book of Knowledge) project management system including the system engineering acquisition methodology. A comprehensive set of guidelines has been developed and is used as a standard measure for project controls.

### **5.3.3 Asset Management**

The function of Asset Management is the co-ordinated and optimum management of the design, acquisition, utilisation, maintenance, and disposal of fixed assets and equipment. The company considers asset management a strategic leverage area, which is a key element in achieving the company goal of optimising the NPV of the operations. There is a centrally co-ordinated asset management plan with all operations having on-site teams to optimise the costs and use of assets. The primary goal of asset management is to ensure that equipment is safe, reliable and efficient, so that production targets can be met on time and at optimum cost. The secondary goal is to perform approved properly engineered and correctly funded modifications, replacement and development of the assets.

An "Asset Management Guideline" has been drawn up, which contains policies, procedures, and guidelines for the implementation of matters relating to asset management.

Mining equipment contributes significantly to operating cost, productivity and efficiencies and therefore it is given specific emphasis to reduce the costs of ownership, whilst improving productivity of assets throughout their entire life cycle, from specification, justification and procurement, through operation and maintenance to disposal. Over the last two years a strategy has been implemented to update mining fleets, outsource maintenance and to improve machine efficiency in order to reduce overall mining costs.

#### **5.3.4 Civil Engineering**

Specialist tailings management consultants are appointed to monitor the performance of the group's slimes dams and tailings dumps. The consultant's appointments are in terms of the Minerals Act or other regulations, and their duties are to review and advise on monthly operational data from the mines, to conduct quarterly inspections of the facilities and produce annual reports.

The CHQ civil engineering section provides technical support, appoints, monitors, and co-ordinates consultants and contractors for the provision of civil and structural engineering for the mines and operations. In addition, management is advised on civil and structural engineering policies, standards and best practice.

#### **5.3.5 Mechanical Engineering**

The objectives of the CHQ mechanical engineering section is to provide central support for critical and high-risk engineering functions in both operations and projects. This includes:

- shafts and winding, including ropes and conveyances. It ensures that all operations conform to legal requirements and that safety critical inspections are carried out by competent persons and certain inspection reports are reviewed;
- primary pumping and de-watering;
- selection of equipment for standardisation and economic life;
- structural design analysis including vibration analysis to reduce the possibility of material fatigue failure and ensure personal comfort of workers in the area; and
- reviewing processes and equipment with a view to maximising energy and cost efficiency.

The Mechanical Engineering section also conducts audits and inspections, conducts failure analysis and performs tests of critical equipment and components to reduce the possibility of failure.

#### **5.3.6 Electrical Engineering**

The CHQ electrical engineering section carries out the following major roles:

- group electrical specifications, which are used for the procurement of major equipment, have been written and are updated as required;
- close liaison with Eskom, with specific emphasis on point of supply negotiations, tariff analysis and to ensure best service levels; and
- electrical power management audits.

### 5.3.7 Control and Instrumentation

The Control and Instrumentation (“C&I”) discipline, in collaboration with its information technology, security, process, electrical and other associated counterparts, assumes responsibilities within the areas of measurement, control, automation and optimisation technologies as applied within the group. The C&I component of CHQ, in collaboration with DebTech, provide direction and consultative, facilitative and quality assurance services to the operations and projects. With the increasing trend of automation and control within the group and in order to optimise use of assets, C&I is becoming more complex and is rapidly expanding at the operations. Most of the larger operations are being staffed with C&I professional engineers and are assisted by skilled technicians.

### 5.3.8 Standards and Major Procurement

Standards are provided in the form of technical specifications for the more commonly used materials, commodities and designs for projects, maintenance and operations. The operations are provided with technical support for the procurement of major equipment in the form of an equipment acquisition philosophy that entails procurement through a tender process whereby equipment performance is evaluated in terms of operational requirements incorporating lifecycle costing for specific applications.

### 5.3.9 Operations Engineering

#### 5.3.9.1 General

The operations engineering departments are headed by engineering managers who report directly to the general managers of the mines and have a functional reporting role to the general manager level engineers at the two centres. Nearly all operations operate in a business unit model, whereby production sections are headed by a business unit manager who has all disciplines operating within that area reporting to him. The engineering manager has the overall engineering legal responsibility, responsibilities include implementation of best engineering practice and standards as well as staffing. Engineering managers usually have services engineering sections such as power, water, non-production maintenance and projects reporting to them. They are also responsible for asset management, including planned maintenance systems and asset management standards used by all engineering sections. In addition, engineering managers are usually responsible for capital control and large projects within the operations. Certain engineering managers are also responsible for safety, loss control and environmental sections.

#### 5.3.9.2 Mining

Underground mining usually has two engineering sections headed up by section engineers. These sections have a number of workshops to cover the trades of electrical, control and instrumentation, fitting, platework, auto electrical and mining equipment mechanics.

The shaft engineering section ensures the proper maintenance of this safety critical equipment and ensures that hauling meets production targets in these production bottlenecks. Conformance to legal inspections and industry best practice is of a crucial importance. This section usually also maintains the underground material handling equipment such as trains, crushers and conveyors. The trackless section maintains the underground mobile mining equipment such as LHDs, drills, development machines, vehicles, etc.

Open-pit mines have section engineers responsible for maintenance of the earthmoving fleets consisting of shovels, excavators, front end loaders, haul trucks, ADTs, dozers, graders, vehicles etc.

All mines have workshops capable of servicing the needs of plant and mining equipment. There is an increasing move towards outsourcing maintenance of the mining equipment to contractors under repair and maintenance contracts. This applies to Orapa, Letlhakane, Jwaneng, Venetia, Finsch and parts of Namdeb.

#### **5.3.9.3 Treatment**

Treatment plants usually have a section engineer, and there are a number of workshops in the areas of electrical, mechanical, control and instrumentation and platerwork trades. Maintenance is usually all in-house, with suppliers providing maintenance in specialised cases. All x-ray diamond recovery and sorting equipment is supplied by DebTech who provide an audit inspection service to ensure standards are not compromised. There is an increasing move to automation and control of process equipment. All large treatment plants (except Kimberley) have PLC control SCADA systems.

#### **5.3.9.4 Electrical**

Electrical engineering sections ensure that the operations have reliable power supplies and that appropriate tariffs are applied. De Beers' standard is to ensure that there is adequate standby capacity in the event of a long lead time item of equipment failure. Electrical engineering standards meet SABS requirements.

#### **5.3.9.5 Water**

Most mines tend to be located in regions of water shortages. All mines have sufficient water supplies to meet current operational needs with adequate standby capacity where needed. Water is treated as a scarce resource and there are projects to minimise water use where ever possible. Those mines that rely on boreholes have spare capacity to meet long-term needs and are monitored and modelled by external consultants to ensure long-term responsible abstraction.

### **5.3.10 Major Projects (greater than US\$15 million)**

#### **5.3.10.1 Overview**

In designing large projects the following considerations are taken into account:

- the mineral resource is evaluated via a full exploration and geological programme of drilling, bulk sampling, micro diamond analysis, geotechnical studies and ore dressing studies;
- the mineral resource is fully evaluated by the Mineral Resource Management Department and classified, graded and valued;
- the project is firmed up through the phases of desktop/conceptual, pre-feasibility and feasibility studies. These studies are conducted to group standards as documented in the company's MRM, mining and project management guidelines;
- due cognisance is taken of all internal factors that include: mining scoping studies to optimise life of mine and return, mine planning to optimise ore extraction and project NPV, process engineering design to optimise recovery subject to the ore characteristics and engineering designs to approved design standards;
- external factors that are considered include; infrastructure needs, water supply, power, sewage, waste disposal, roads, security, maintenance facilities, logistics, and accommodation;

- other macro environmental considerations that impact on major projects include conformance to country environmental laws and best practice, no compromise in safety and health, and socio-economic impacts; and
- all applications for projects are subjected to a review and audit process to ensure objectives are realistic and that best practices have been followed.

### 5.3.10.2 Project Descriptions

**Premier Mine C-Cut (US\$650 million):** A full feasibility study has been prepared, and is currently being reviewed prior to application to the De Beers Board in May 2001. The project consists of new shafts, development work, material handling systems and a new plant to treat 9Mtpy.

**Kimberley Mine CTP (Combined Treatment Plant – US\$100 million):** The CTP plant is under construction for completion by the end of 2001. The project has been fast-tracked to optimise the financial return on the investment. The cost of this project is being reviewed and is estimated to be US\$16 million over the authorised capital.

**Finsch Mine Block 4 (US\$89 million):** Work has commenced on this project to mine by block-cave method at a new level 100m below the current open stoping Block 3 level. Orders are being placed for the two long lead crusher units.

**Namdeb Chameis Pocket Beaches:** A feasibility study has commenced to mine a series of beaches via dredge and a movable plant.

**Debswana Orapa Mine Second Primary Crusher (US\$25 million):** This project is currently in the early stages of construction and provides a 3,200tph primary crusher and associated infrastructure to feed to the two Orapa treatment plants. Scheduled completion is March 2002.

**Debswana Jwaneng Mine Surface Primary Crusher (US\$24 million):** This Project was approved in March 2001 and provides for another 1,800tph primary crusher and associated infrastructure. Scheduled completion is end-December 2002.

**Debswana Damtshaa Mine (BK 9) (US\$30 million):** Construction has commenced in March 2001 on this green field site approximately 17km west of Orapa. The project scope includes the provision of a complete mine and treatment facility, as well as the associated infrastructure, to treat 200tph from four satellite pipes. Scheduled completion is end-September 2002.

**Snap Lake Project (Canada) (US\$250 million)** With the purchase of Winspear Diamonds Inc. in Canada, De Beers is currently compiling an application for approval in May 2001 to carry out a feasibility study to build the Snap Lake mine. The scope of the project is to build an underground mine and treatment plant to process 3,000 tpd initially, and associated infrastructure to support this remote location in a harsh arctic environment. Production is scheduled for 2004 depending on permitting application process.

## 5.4 Production Schedule

The production schedule of the various operating mines of De Beers and its partners is compiled below, taking cognisance of all aspects related to available resources and reserves and appropriate conditions: availability and capacity of plants and equipment, revenues and forecasted capital and working cost requirements. The table below shows the planned duration of the life of mine (“LOM”) based on production schedules (tonnes mined and carats recovered) as used in the strategic business plans. In the schedule below, a probability factor has been applied to the grade per mine for all inferred resources per operating mine as shown. The probability factor reflects potential techno-economic and grade uncertainties, which may impact negatively on recovered carats. Details of the factors applied to inferred resources are

discussed for each mining operation in Section 6. Also shown is the planning revenue per mine as used in the financial model.

The planning process has scheduled a small amount of production at Marsfontein during 2002, however, the likelihood is that the resources will be completely depleted during 2001.

Planning revenue per carat is included below for each operating mine and for Snap Lake, based on forecast figures for 2001. In the case of Namdeb, the former revenue pertains to Namdeb onshore and the latter is an average for the Atlantic I.

Production Schedule														Total tonnes, carats & average grade
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011 to 2015	2016 to 2020	2021 to 2030	
<b>Finsch (US\$50 per carat)</b>														
Tonnage mined (millions)	4.6	4.6	4.6	4.5	4.7	4.4	4.6	4.6	4.4	4.4	22.0	19.7	17.4	105
Average grade (cpht)	39.5	42.7	40.0	45.8	51.6	51.5	48.0	42.3	36.2	35.7	29.4	36.1	26.7	36
Carats recovered (millions)	1.8	2.0	1.8	2.0	2.4	2.3	2.2	1.9	1.6	1.6	6.5	7.1	4.7	38
<b>Kimberley (US\$76 per carat)</b>														
Tonnage mined (millions)	4.1	7.2	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	43.8	21.2		146
Average grade (cpht)	15.9	22.4	21.6	21.9	21.5	21.1	21.3	21.6	21.6	21.1	11.4	11.2		17
Carats recovered (millions)	0.6	1.6	1.9	1.9	1.9	1.8	1.9	1.9	1.9	1.9	5.0	2.4		25
<b>Koffiefontein (US\$228 per carat)</b>														
Tonnage mined (millions)	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	6.6			29
Average grade (cpht)	7.4	7.3	7.3	6.9	6.8	6.7	6.6	6.1	5.3	5.2	5.2			6
Carats recovered (millions)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.3			2
<b>Marsfontein (US\$165 per carat)</b>														
Tonnage mined (millions)	0.6	0.1												1
Average grade (cpht)	4.3	0.0												3
Carats recovered (millions)	0.02	0.0												0.02
<b>The Oaks (US\$127 per carat)</b>														
Tonnage mined (millions)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2						2
Average grade (cpht)	25.1	24.5	24.5	19.6	31.0	37.6	35.5	43.4						30
Carats recovered (millions)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1						1
<b>Premier (US\$46 per carat)</b>														
Tonnage mined (millions)	3.5	4.0	3.8	3.8	4.8	7.7	8.7	9.0	9.0	9.0	45.0	45.0	41.0	194
Average grade (cpht)	59.0	56.3	56.1	52.7	47.0	47.4	54.8	58.7	60.4	60.3	54.1	52.7	76.1	59
Carats recovered (millions)	2.1	2.2	2.1	2.0	2.3	3.7	4.8	5.3	5.4	5.4	24.3	23.7	31.2	115
<b>Venetia (US\$55 per carat)</b>														
Tonnage mined (millions)	4.2	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	23.0	2.0		71
Average grade (cpht)	136.1	138.3	131.7	133.4	134.7	141.0	153.9	143.8	131.4	155.9	85.5	72.4		120
Carats recovered (millions)	5.7	6.4	6.1	6.1	6.2	6.5	7.1	6.6	6.0	7.2	19.7	1.5		85
<b>Namaqualand Mines (US\$127 per carat)</b>														
Tonnage mined (millions)	6.6	6.6	6.6	6.3	6.1	6.1	4.2	1.9	1.9	1.0				47
Average grade (cpht)	11.5	11.5	11.4	11.7	11.5	11.5	15.6	28.7	26.1	28.8				14
Carats recovered (millions)	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.5	0.5	0.3				6
<b>Namdeb (incl. marine) (US\$322 &amp; US\$298 per carat)</b>														
Tonnage mined (millions)	30.2	30.9	34.9	38.5	38.5	35.4	33.2	35.4	32.3	18.3	49.8	8.6		386
Average grade (cpht)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A
Carats recovered (millions)	1.3	1.3	1.3	1.3	1.3	1.2	0.8	0.8	0.8	0.8	1.9	0.0		13
<b>Jwaneng (US\$108 per carat)</b>														
Tonnage mined (millions)	9.4	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	46.1	46.1	73.4	258
Average grade (cpht)	128.1	124.5	124.5	123.7	119.5	118.2	117.0	115.7	114.5	113.3	109.5	103.3	91.6	107
Carats recovered (millions)	12.0	11.5	11.5	11.4	11.0	10.9	10.8	10.7	10.5	10.4	50.4	47.6	67.2	276
<b>Orapa (incl. BK9) (US\$47 per carat)</b>														
Tonnage mined (millions)	17.5	17.8	19.0	19.1	19.1	19.1	19.1	19.1	19.1	19.1	95.7	95.7	191.1	571
Average grade (cpht)	69.3	58.9	60.2	50.2	57.1	66.5	68.5	70.5	70.9	65.1	57.5	41.9	32.4	49
Carats recovered (millions)	12.1	10.5	11.4	9.6	10.9	12.7	13.1	13.5	13.6	12.5	55.0	40.1	61.8	277
<b>Lethakane (US\$191 per carat)</b>														
Tonnage mined (millions)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	11.4			48
Average grade (cpht)	30.3	28.9	29.2	27.4	24.6	23.6	21.3	20.5	23.1	18.8	13.9			22
Carats recovered (millions)	1.1	1.0	1.1	1.0	0.9	0.9	0.8	0.7	0.8	0.7	1.6			11
<b>Totals (operating mines only)</b>														
Tonnage mined (millions)	87	91	98	101	102	101	99	99	95	80	343	238	323	1,857
Average grade (cpht)	44	41	39	36	37	40	43	43	43	51	48	51	51	46
Carats recovered (millions)	38	37	38	36	38	41	42	42	41	41	165	122	165	847
<b>Snap Lake (US\$100 per carat)</b>														
Tonnage mined (millions)				0.3	1.1	1.1	1.5	2.2	2.2	2.2	10.8	3.0		24
Average grade (cpht)				190.0	173.0	173.0	173.0	173.0	173.0	173.0	136.5	121.1		151
Carats recovered (millions)				0.6	1.9	1.9	2.6	3.7	3.7	3.7	14.7	3.6		37
<b>Totals (operating mines plus Snap Lake)</b>														
Tonnage mined (millions)	87	91	98	101	103	102	100	101	97	82	354	241	323	1,881
Average grade (cpht)	44	41	39	37	39	42	45	46	46	54	51	52	51	47
Carats recovered (millions)	38	37	38	37	40	43	45	46	45	45	179	126	165	884

(i) The first 3 years (2001-2003) are based on a three-year rolling forecast; 2004 to 2030 are based on the SBP 2000

(ii) Williamson Mine is marginal and is not reflected in the production schedule or financial model

(iii) The schedule represents the total production from De Beers and its partners and has no reference to attributable economic interests

## 6. Discussion of Mining Operations

### 6.1 Finsch Mine

#### 6.1.1 Background

The Finsch kimberlite pipe was discovered in 1960, and is named after its two discoverers, Fincham and Schram. Mining operations exploit a single kimberlite pipe, situated on the farm Carter, located 165km west of Kimberley.



*Aerial view of Finsch pit and treatment plant*

De Beers acquired a controlling interest in the mine in 1963 and began construction of a pilot plant in 1964. Finsch began shaft sinking in the 1980s and changed over from a conventional open-pit mine to an underground

operation in 1990. Evaluation sampling has been carried out primarily through underground drilling and tunnel sampling.

The circular kimberlite intrusion has a surface area of 18ha and is composed of several distinct kimberlite zones and precursor intrusions. Kimberlite types identified within the main pipe consist of diatreme-facies, tuffisitic kimberlite breccias and late stage hypabyssal kimberlite dykes and plugs. Significant volumes of down-rafted xenolithic materials derived from the local country rock are present within the pipe.

Finsch Mine has a 5 star NOSA rating and achieved 1 million fatality free shifts during 2000. The mine is planning to obtain ISO14001 accreditation during 2001.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 80%. This factor is based on an established and consistent mining history and well-developed geological model albeit with limited sampling data.

### 6.1.2 Diamond Winning

#### 6.1.2.1 Extraction

Currently production comes from the 350 and 510 mLs using the blast hole open stopping method (“BHOS”), and is moving to a modified sub-level caving system due to pit side-wall failures. Trackless equipment is utilised on the production levels, with ore reporting via ore passes to a conveyor level, where ore is transported to the shaft.

Finsch develops and implements leading edge underground technologies. A high degree of fleet management technology has been installed; this includes remote-controlled rock breakers and LHDs for extracting ore from open stopes.

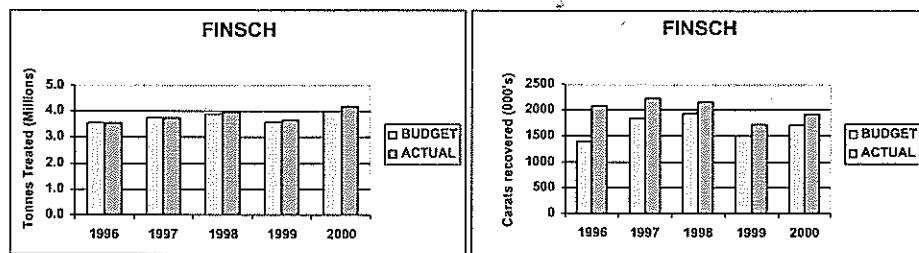
A new block cave (Block 4) is in the process of being established at a new level 100m below the current open stopping block 3 level, to replace tonnage from the upper blocks which are nearing depletion. Production is expected to commence from Block 4 in 2003. A further drop down to Block 5 is planned to start in 2014.

### 6.1.2.2 Treatment

The original plant was commissioned in 1963 and modified in 1980 to replace pans with DMS. The modifications also included an upgrade of the control systems to an improved level of automation. The plant is in good condition and has a capacity of 900tph. ROM is treated through crushers, scrubbers and DMS, with the concentrate being transferred to recovery plant employing x-ray technology for final diamond recovery. An “expert control” system is currently being installed to optimise plant utilisation.

As there are extensive tailings reserves that contain economically recoverable grades, an additional tailings treatment facility is being investigated.

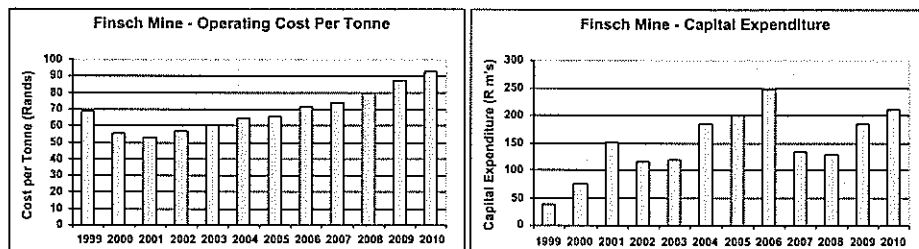
### 6.1.3 Current Production Trends



A steady increase in tonnage treated came from stretched targets and improving efficiency until 1999, when the budget was reduced due to market conditions. 2000 saw a large increase in tonnage treated due to an increase in the amount of tailings retreatment. This increase was not entirely reflected in the carats recovered, as the grade of the additional retreatment tonnage is low and the ROM grade decreased from 50 to 45cph.

The current reserves will be depleted in 2027. However, drilling planned in 2001 could delineate resources below those currently planned.

### 6.1.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms with 1999 and 2000 depicted as actuals and 2001 to 2010 as forecasts. Capital expenditure fluctuations are due to the establishment of Block 4.

### 6.1.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

<b>Finsch</b>	<b>Metric tonnes (millions)</b>	<b>Grade (cph)</b>	<b>Carats (millions)</b>
Probable reserves	25.4	43.3	11.0
Indicated resources	28.4	52.8	15.0
Inferred resources	51.5	36.9	19.0
<b>Total reserves and resources</b>	<b>105.3</b>	<b>42.7</b>	<b>45.0</b>

\*At a bottom cut-off size of 1.4mm, a planning revenue of US\$50 per carat and to a depth of 830m

## 6.2 Kimberley Mines

### 6.2.1 Background

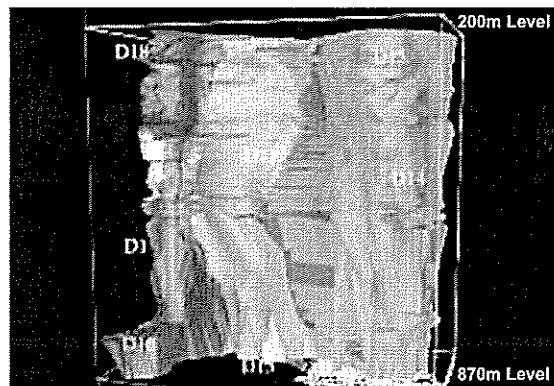
The first diamond in South Africa was discovered in 1866 on the banks of the Orange River, and subsequently diamonds were found along the Vaal River, where the so-called 'wet diggings' were established. Diamonds were afterwards discovered on the farm Dutoitspan, leading to a digging rush on the 'dry diggings'. Chaotic mining then ensued, with many individuals owning claims on each mine. These were later consolidated into several companies and eventually amalgamated under the control of De Beers Consolidated Mines Limited by the late 1890s. The principal kimberlite pipes mined during this time were Kimberley, De Beers, Dutoitspan, Bultfontein and Wesselton. In each of the orebodies a number of kimberlite types are present, and the complexity of the orebodies is due in part to their location in the root zone of the pipe. All the pipes were originally mined in the diatreme zone at present day surface level, transitioning to the root zone at depths between 400 and 800m below surface.



*Aerial view of Kimberley mines and current treatment plant*

The Kimberley and De Beers mines were worked open-pit to a depth of approximately 122m, when production moved underground. Bultfontein and Wesselton converted to underground operations when their average depth was 76m. The method adopted for underground operations was a mixture of chambering and sub-level caving, used from about 1890 until the 1950's. The mining method was then converted to a more efficient block caving method and later, vertical crater retreat stoping. Only underground operations at Bultfontein, Wesselton and Dutoitspan mines remain today. Since 1978 the retreatment of old tailings dumps has also been a major source of production, with 40-50% of plant feed being derived from this resource.

Sampling on the underground mines has been carried out principally by the development of sampling tunnels on specific levels, with each level sampled by extracting development ground in set patterns. In addition, the main Kimberley dumps have been sampled extensively, with several dumps classified as indicated resources for the Combined Treatment Plant ("CTP") feasibility study.



*Geological model of the Wesselton Kimberlite Pipes. Colours indicate separate Kimberlite zones.*

Kimberley Mines has a 5 star NOSA (National Occupational Safety Association) rating and achieved 1 million fatality free shifts during 2000. The mine is planning to obtain ISO14001 accreditation during 2001.

### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 70%. This factor is based on an established mining history. The majority of inferred resources comprises “root” zone hypabyssal kimberlites and dumps. Geological models are complex and variable in the root zones and the dumps have limited sampling data.

## **6.2.2 Diamond Winning**

### **6.2.2.1 Extraction**

#### *Wesselton*

This mine produced 0.13Mcts during 2000 from 0.65Mt. All production comes from the 995mL scraper winch block cave that exploits the centre south lobe and north south lobe of the Wesselton kimberlite pipe. The current reserves will be depleted in 2007.

#### *Dutoitspan*

This mine produced 0.03Mcts during 2000 from 0.22Mt. Production comes from the 870mL scraper winch block cave that exploits the east block and west extension portions of the pipe. The current reserves will be depleted in 2007.

#### *Bultfontein*

This mine produced 0.18Mcts from 0.67Mt during 2000. Ore is produced from the 845mL block cave as well as from rim loading on the 735 and 750m levels. The current reserves will be depleted in 2002.

#### *Dumps*

Various dumps were treated during 2000, producing 0.15Mcts from 1.16Mt. These dumps are planned to be depleted by 2018.

#### *Contractor Operations*

Contractors at Kimberley produced 0.08Mcts from 0.8Mt from various sources. Planned operations extend to 2018.

#### *Combined Treatment Plant (“CTP”)*

The construction of a new combined treatment plant is currently in progress, and will be completed at the beginning of 2002. The new plant is expected to improve the recovery efficiencies and profitability of Kimberley Mines, generating long-term economic benefits. New technology will turn previously uneconomic resources both on surface and underground into viable operations. An added environmental benefit is that retreatment of the mine tailings dumps will go hand-in-hand with dump rehabilitation.

### **6.2.2.2 Treatment**

Commissioned in early 1970’s, operations were suspended in 1982 and resumed in 1987. The plant has undergone minor upgrades to improve process efficiency and control functions. Process efficiency is fair, and the plant is in a fair condition. The plant treats 750tph ROM through crushers, scrubbers and DMS; concentrate is transferred to a recovery plant employing x-ray sorting for diamond recovery. The plant has a medium level of conventional automation.

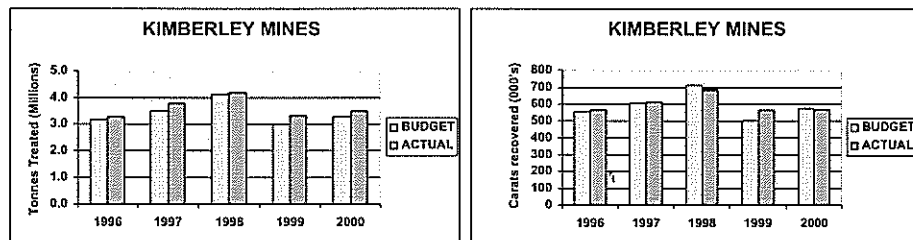
Underground material is crushed to -32mm. The feed is screened to remove +32mm material, and then undersize moves into the pan plant.

The pan plant process accommodates a wide ore-size range and tolerates varying degrees of undersize material. The material is distributed to 24 primary pans. The discard from these pans is screened to produce, two fractions, a -12mm fraction that reports to the secondary pans and a oversize +12mm fraction that is re-crushed.

The re-crush plant uses five cone fraction crushers in closed circuit to produce a -8mm product. This material returns to the secondary pans for concentration.

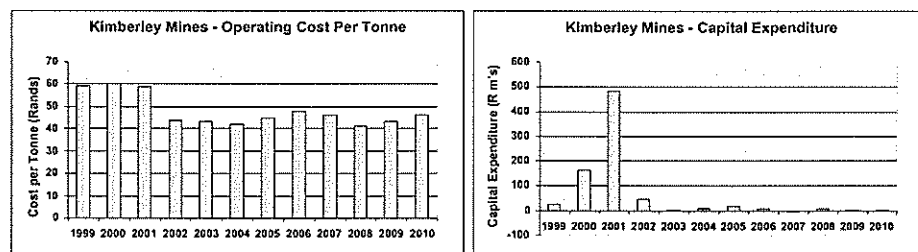
The concentrate from both sets of pans is treated in a recovery plant that includes a dense medium cone, an x-ray plant that treats a 7 to 32mm fraction, and a grease belt section that recovers the fine diamonds. An expert information system is currently being installed to optimise plant utilisation, and a tailings treatment facility is under investigation.

### 6.2.3 Current Production Trends



Over the last five years Kimberley operations have regularly exceeded budget in tonnage treated and carats produced. Targets were reduced in 1999 along with all other South African producers due to prevailing economic conditions. Production has not reverted to 1998 levels primarily due to the nearly depleted resources of the mature underground operations, particularly Bultfontein Mine.

### 6.2.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms with 1999 and 2000 depicted as actuals and 2001 to 2010 are forecasts. The capital expenditure reflects the feasibility study costs (1999 to 2000) followed by the construction of the CTP in 2000 to 2002. The operating cost graph shows the positive effect of the CTP from 2002 onwards. Operating costs fluctuate from 2005 onwards due to the planned closure of some of the underground sources over this period.

### 6.2.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

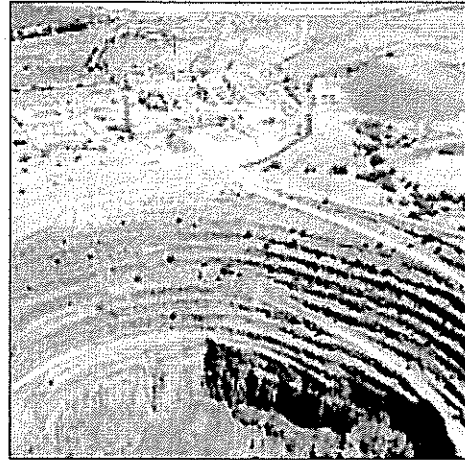
<b>Kimberley</b>	<b>Metric tonnes (millions)</b>	<b>Grade (cpht)</b>	<b>Carats (millions)</b>
Probable reserves	8.0	18.8	1.5
Indicated resources	88.0	18.2	16.0
Inferred resources	188.0	7.4	14.0
<b>Total reserves and resources</b>	<b>284.0</b>	<b>11.1</b>	<b>31.5</b>

\*At a bottom cut-off size of 0.5mm, a planning revenue of US\$76 per carat and to a depth of 995m

## 6.3 Koffiefontein Mine

### 6.3.1 Background

Diamonds were first discovered on the farm Koffiefontein in 1870. Mining commenced on a number of small claims, which were amalgamated into Koffiefontein Mine Limited, coming under the control of De Beers in 1911. Mining operations continued intermittently until the depression in 1932 when work was suspended. In November 1950, De Beers sunk a prospecting shaft, and production between 1951 and 1953 came from the sampling of the 244mL, after which work was stopped. Koffiefontein Mine re-opened in 1970. Production started in August 1971 as an open-pit operation to a depth of 270m. Underground development started with a sampling program in 1974, and underground production started in 1982. Operations were temporarily suspended in June 1982 and resumed in March 1987. By the end of 2000, approximately 8.4Mcts had been recovered out of the approximately 93.2Mt of kimberlite ore mined since the 1870s.



*Aerial view of the Koffiefontein pit and treatment plant*

The Koffiefontein pipe is the largest and most economic of a cluster of three pipes in the area, the others being Ebenhaezer and Klipfontein lying to the north-west. The Koffiefontein pipe consists of diatreme facies tuffisitic kimberlite emplaced in basement granite gneiss and Karoo shales and sediments. Koffiefontein is one of the smaller De Beers pipes in production and has an area of 11.1ha at the present day erosion surface, narrowing to 7.8ha at the 490mL, currently the lowest production level.

Kimberlite ore in the upper levels was extracted by the blast hole open stoping method and later with sub-level caving mining methods. Development and thereafter undercutting for the front cave began in mid 1997 to control and manage the waste dilution caused by dolerite sidewall failures of the pit. Full production from the front cave commenced in 2000.

Koffiefontein Mine has a 5 star NOSA rating and achieved 3 million injury-free hours during 2000. The mine also achieved a lost time injury frequency rate (LTIFR) of zero for 2000. The mine is planning to obtain ISO14001 accreditation during 2001 and Noscara (National Occupational Safety Accredited Award) status during 2003.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 70%. Jagersfontein dumps are included in the inferred resources and are presently being bulk-sampled. The completion of this program should move much of this resource into an indicated category.

### 6.3.2 Diamond Winning

#### 6.3.2.1 Extraction

Koffiefontein produced 0.15Mcts during 2000 from 2.2Mt of ore. Production comes from the upper 370mL using the sub-level caving method and from the

480/490mL front cave. Trackless equipment is utilised on the production levels with ore reporting to a haulage level, from which ore is transferred by rail to crushers adjacent to the shaft.

The front cave mining method was pioneered at Koffiefontein to manage anticipated waste dilution caused by pit sidewall failures, thereby effectively reducing and delaying the influx of dilution to the underground loading points.

The current reserves are expected to be depleted by 2013. The resources below the current infrastructure are currently being evaluated and, if proved viable, will extend the life of the operation by approximately 12 to 15 years.

**6.3.2.2 Treatment**

Commissioned in early 1970's, the 650tph plant has undergone minor upgrades to improve process efficiency and control functions. Process efficiency is good, and the plant is in a fair condition.

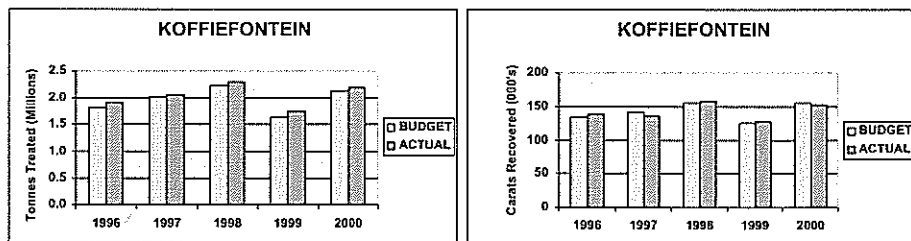
Ore is delivered directly from the shaft by conveyor or from the surface stockpile to the scrubbers, where it is subjected to a washing process and separated into the -2mm, 2 to 32mm and +32mm size fractions. The +32mm material is conveyed to the secondary crushers, whilst the 2 to 32mm material is conveyed to the secondary screens in the storage and screening section. The -2mm material is sent to the tailings dump. The secondary crushers process the +32mm material to a -32mm product, which then joins the -32mm material from the scrubbers and is conveyed to the storage and screening section.

The additional -2mm material generated by the crushing section is removed in the storage and screening sections for the DMS. The DMS floats or tailings are then separated into -12mm and +12mm size fractions. The -12mm fraction is conveyed to the tailings dump while the +12mm material is recycled to the tertiary crushers in an attempt to liberate any locked diamonds.

Diamonds are recovered by means of x-ray technology, which replaced the grease recovery system in an attempt to eliminate diamond loss due to theft and poor recovery efficiencies. Two additional x-ray machines will be installed during 2001 to improve fines recovery efficiency.

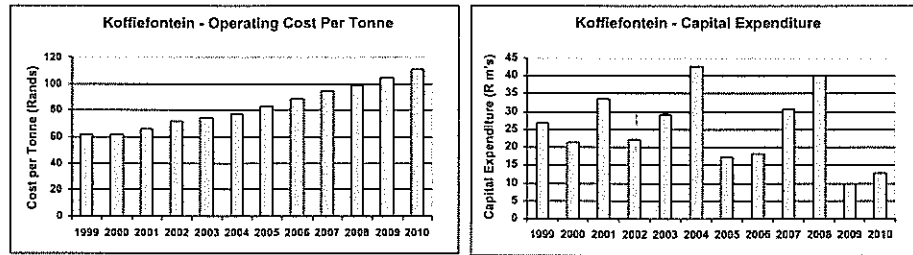
Opportunities to improve recovery efficiency through an integrated plant upgrade are currently under investigation.

**6.3.3 Current Production Trends**



A steady increase in tonnage and carats produced since 1996 has resulted from stretching and meeting the targets. There was a reduction in 1999 due to market conditions, with a return to 1998 levels in 2000. The mine converted to 3 shifts per day from a 2-shift operation during 2000. Production for 2001 has been planned at 2.4Mt.

### 6.3.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms with 1999 and 2000 depicted as actuals and 2001 to 2010 are forecasts. Capital expenditure fluctuations are due to the replacement of mining equipment.

### 6.3.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

Koffiefontein	Metric tonnes (millions)	Grade (cpht)	Carats (millions)
Probable reserves	21.0	8.6	1.8
Indicated resources	10.0	5.0	0.5
Inferred resources	130.0	3.1	4.0
<b>Total reserves and resources</b>	<b>161.0</b>	<b>3.9</b>	<b>6.3</b>

\*At a bottom cut-off size of 2mm, a planning revenue of US\$228 per carat and to a depth of 490m

\*In 1999, Jagersfontein dumps were quoted separately. This year they have been included in the Koffiefontein inventory

## 6.4 Marsfontein Mine

### 6.4.1 Background

Marsfontein Diamond Mine exploits the M1 kimberlite pipe that is located on the farm Marsfontein 91 KS and is situated in the Northern Province of South Africa, approximately 30 km east of Potgietersrus and 70 km south of Pietersburg.

SouthernEra Resources discovered the M1 orebody in 1997. At this time the mineral rights were privately owned. In April of 1998 De Beers entered into a Notarial Prospecting Contract with the mineral rights owners, in terms of which De Beers acquired the right to prospect and an option to purchase the mineral rights. Purchase of the mineral rights was dependent upon verification of warranties provided by the mineral rights owners by means of a due diligence study.

The Marsfontein Joint Venture was set up in mid-1998, between DBCM and SouthernEra Resources, to allow mining and treatment of the M1 kimberlite pipe. De Beers holds a 60% participating interest (of which 40% has been sold to an empowerment partner) and SouthernEra a 40% stake. De Beers maintains managerial control of the operation.

Owing to the very short life of mine, the NOSA grading system is not used in the safety evaluation of the mining environment. However, the safety record of Marsfontein is exemplary, with the mine recording just five lost time injuries during the life of the entire mining operation.

### 6.4.2 Diamond Winning

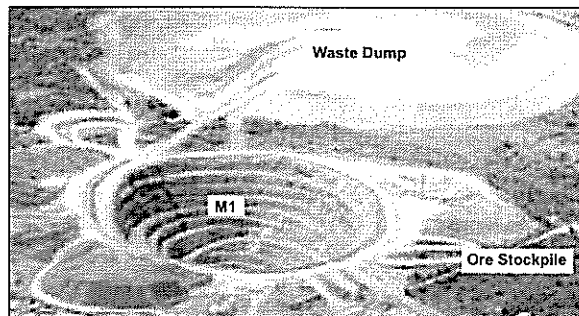
#### 6.4.2.1 Extraction

Mining of the M1 kimberlite ore body commenced on 31 August 1998 and was completed in November 2000 at a final pit depth of 150m. The mine is a conventional spiral open pit. To the end of December 2000, some 1.08Mt of diamondiferous ore has been treated and 1.83Mcts have been recovered.

Although mining of the pit is complete, the treatment of diamondiferous stockpiles created during mining is continuing and will continue into early 2002.

Potential additional gravel resources exist at Marsfontein, which could extend the mine life. Similarly kimberlite fissures have been identified both at Marsfontein and on neighbouring farms which could further extend mine life. Negotiations are currently underway

to extend the existing Joint Venture by bringing the nearby Klipspringer Mine under the umbrella of the Joint Venture. This will add at least another 13 years to the life of the Joint Venture – based on the Klipspringer Mine Feasibility Study.



*Aerial overview of the M1 mining operation*

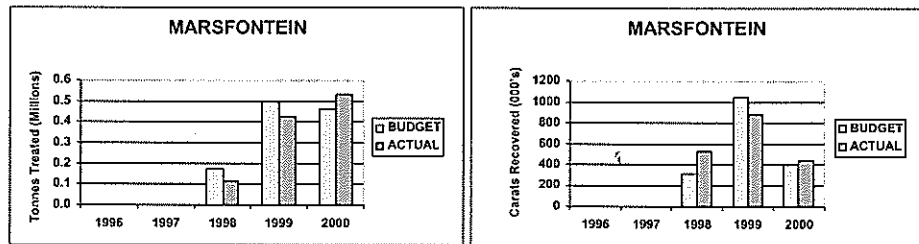
### 6.4.2.2 Treatment

This plant consists of two streams: a 100tph module and a 50tph module. Plant feed is crushed in a gyratory crusher to -75mm. This product is scrubbed and then screened to separate the oversize (+25mm) for secondary crushing. The secondary crusher has a nominal capacity of 80tph and operates at a closed side setting of 25mm.

The DMS has a nominal headfeed capacity of 150tph, and treats a product in the size range 1.5 to 25mm. The float fraction is screened to recover the +8mm material, which is then passed through a short-head cone crusher operating at a closed side setting of 8mm. This material is returned to the feed of the DMS plant.

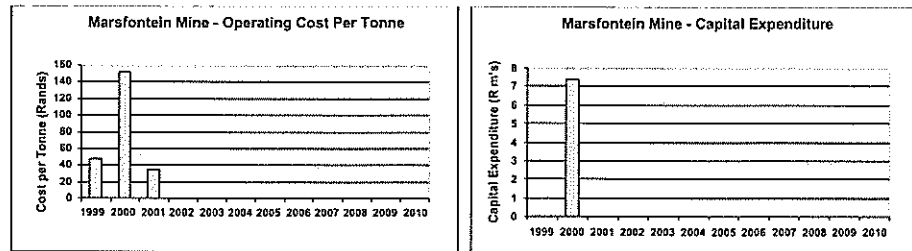
The concentrate reports to a recovery plant that makes exclusive use of x-ray technology for diamond recovery. Final sorting, weighing and packaging takes place in secure glove boxes.

### 6.4.3 Current Production Trends



The Marsfontein joint venture with SouthernEra has been in operation since 1998 and is presently close to exhaustion, with only stockpiles being treated until early 2002.

### 6.4.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms and are depicted as actuals for 1999 and 2000, while 2001 to 2010 are forecasts.

#### 6.4.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

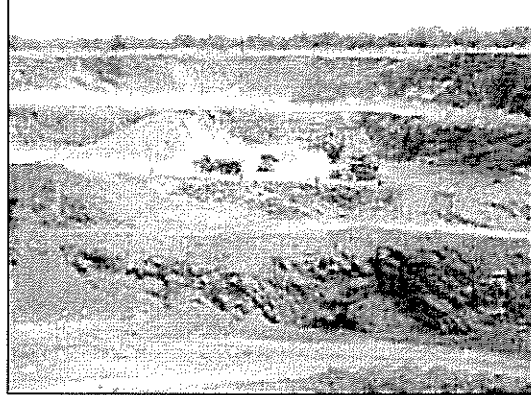
<b>Marsfontein</b>	<b>Metric tonnes (millions)</b>	<b>Grade (cpht)</b>	<b>Carats (millions)</b>
Probable reserves	0.0	0.0	0.0
Indicated resources	0.0	0.0	0.0
Inferred resources	0.3	12.1	0.04
<b>Total reserves and resources</b>	<b>0.3</b>	<b>12.1</b>	<b>0.04</b>

\*At a bottom cut-off size of 1.5mm, a planning revenue of US\$165 per carat and to a depth of 150m

## 6.5 The Oaks Mine

### 6.5.1 Background

The kimberlite deposit on The Oaks farm, located near Swartwater in the Northern Province, was first discovered in 1988. Further prospecting led to the discovery of diamonds in 1990. The orebody occurs as two kimberlite lobes joined by a connecting breccia and contains both hypabyssal and tuffisitic kimberlite. A fast track feasibility study commenced in September 1997, and the first diamond was recovered some 12 months later. Start-up capital was kept low with the acquisition and relocation of the Venetia bulk sampling plant. Production commenced in January 1999 and annual throughput is expected to exceed 350,000 tonnes as of 2002.



#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 70%. This factor is based on "mining" which started as a bulk sampling/trial mining exercise with very limited sampling and geological data. A drilling program to generate grade and geological data should be completed by mid-year and the resource will be reviewed.

### 6.5.2 Diamond Winning

#### 6.5.2.1 Extraction

Currently the mine has an estimated life of 8 years to a final open-pit depth of 200m. Good production results achieved in the first full year of production, 1999, were surpassed during the year of 2000. The mine treated a total of 0.21Mt and produced 0.12Mcts.

Mining production is carried out exclusively by contractors, which affords the mine a flexibility, in terms of machinery requirements, that is usually reserved for mines with larger fleets of equipment. This has resulted in the mine being able to operate flexibly without the associated high cost of keeping extra equipment on site.

The Oaks has a 4 star NOSA rating. The mine is planning to obtain ISO14001 accreditation during 2001.

#### 6.5.2.2 Treatment

The Oaks production plant began life as the Venetia Bulk Sampling Plant, and was relocated and commissioned in December 1998. Crushing was upgraded in 2000 to increase throughput to the current level. The plant has a capacity of 52tph and exhibits a high level of conventional automation.

Blasted ore (average 400mm) is hauled from an open pit and reduced to less than 40mm through three stages of Jaw crushing. Secondary crushing is effected by a 3ft cone crusher, providing a minus 25mm feed to the DMS.

Material in the 1 to 8mm size ranges reports to the fines DMS, and the 8 to 25mm fraction to the coarse DMS. Material less than 1mm is pumped to a degrit section.

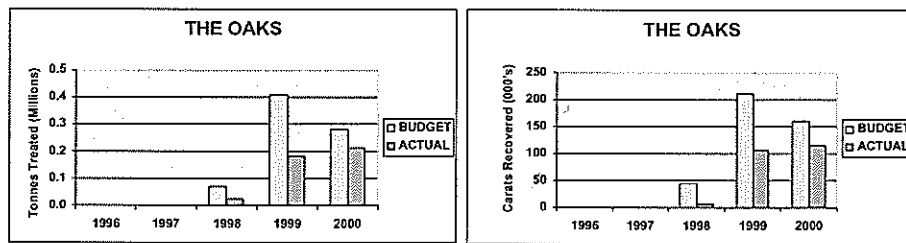
A 400-mm cyclone is used in the separation process and ore is separated into concentrate and tailings. Concentrate is dried and pneumatically conveyed into the recovery plant where it is classified into different size fractions. Tailings are screened and introduced into the recrush circuit.

The 8 to 25mm coarse DMS tailings are conveyed after screening to a 3ft short-head cone crusher, crushed to <12mm. This product is conveyed to a single-deck screen where the +8mm material is introduced into a roller crusher and crushed down to -8mm. The undersize of the screen as well as the crushed product from the roller crusher is conveyed to the scrubber for washing and screening.

The recovery plant is fitted with three x-ray units. All x-ray concentrate reports to the sorthouse into glove boxes where the final gangue is separated from the diamonds. The final product is weighed and recorded before storage and export.

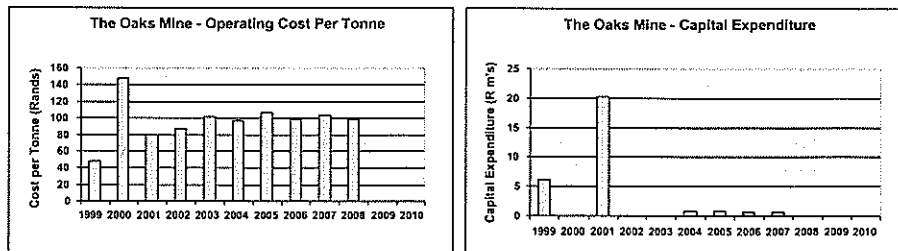
Rehabilitation of the slimes and tailings paddocks is carried out as an integrated part of the mining program. The recovery plant is being upgraded in mid-2001 to improve efficiency. Investigations are in process to evaluate opportunities to increase treatment plant throughput to 65tph.

**6.5.3 Current Production Trends**



Production began at this small operation in 1999 following a short commissioning period in 1998. It has suffered large deficits against budget during its build up as a result of some major problems with the plant. Being a small operation the goal was to keep both the initial capital and the operating cost at modest levels. To this end the Venetia bulk sampling plant was relocated to The Oaks. The suitability of the plant was not as expected, and difficulties were encountered with various sections of the plant.

**6.5.4 Operating and Capital Expenditure**



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms with 1999 and 2000 depicted as actuals and 2001 to 2010 as forecasts. Capital expenditure in 2001 is due to enhancements to the recovery plant.

### 6.5.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

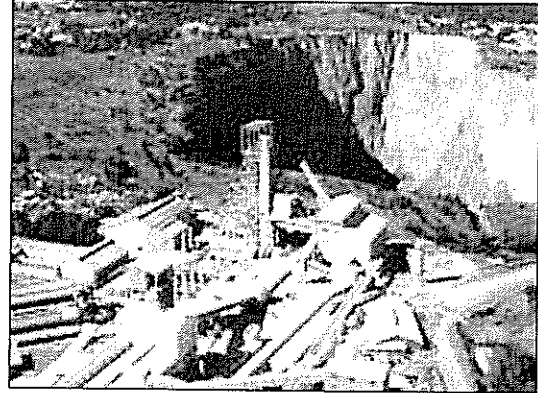
<b>The Oaks</b>	<b>Metric tonnes (millions)</b>	<b>Grade (cpht)</b>	<b>Carats (millions)</b>
Probable reserves	0.0	0.0	0.0
Indicated resources	0.0	0.0	0.0
Inferred resources	2.6	53.8	1.4
<b>Total reserves and resources</b>	<b>2.6</b>	<b>53.8</b>	<b>1.4</b>

\*At a bottom cut-off size of 1mm, a planning revenue of US\$127 per carat and to a depth of 200m

## 6.6 Premier Mine

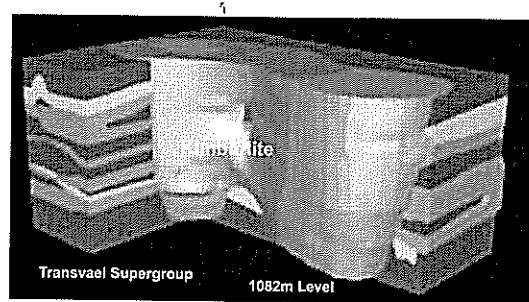
### 6.6.1 Background

The Premier kimberlite pipe, situated 37km north-east of Pretoria, is the largest known kimberlite in South Africa. It produced the largest gem diamond ever recovered, the Cullinan diamond, that weighed 3,106cts. It is one of eleven diatreme-zone kimberlites found in the Cullinan-Rayton area, with the orebody itself consisting of a mixture of tuffisitic kimberlite breccia and hypabyssal facies. Since mining operations started in 1902 a total of 326Mt of ore has been mined yielding 113Mcts (22.6 metric tonnes) of diamonds for an average grade of 35cpt. Since 1961, 68Mt of tailings dump material have been retreated yielding an additional 15Mcts of diamonds. Ore tonnes mined have varied between 7 and 2.4Mtpy, with grades varying between 29 and 60cpt.



*Aerial view of Premier pit and treatment plant*

Between 1902 and 1932 an open-pit mining method was used to mine ore down to a depth of 189m. The mine shut down in 1932 during the great depression and again during the Second world war. In 1945 de-watering of the open pit started in preparation for the development of an underground mine. Two vertical shafts were sunk to access the orebody and develop the sub-level open bench mining method, which is considered the



*Model of the C- Cut kimberlites showing the surrounding country rock*

optimal method for an open-pit to underground transition. In the following years, mining methods and systems were changed to suit differing ground conditions, with cave mining using scrapers in the early 1970s, sub-level open stoping in the early 1980s and mechanised trackless block-cave mining in the early 1990s.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 80%. This factor is based on an established and consistent mining history and a well-developed geological model, albeit with limited sampling data.

### 6.6.2 Diamond Winning

#### 6.6.2.1 Extraction

A mechanised block cave mining method is employed to mine the ore for treatment. The ore, once loaded from the draw points with the load-haul-dump units (LHDs), is tipped into a series of ore passes that direct the ore to a haulage approximately 133m and 31m below the BA5 and BB1E production levels respectively. A conventional rail system is used to draw the ore from the

ore passes and deliver it to either one of two underground crushing stations. The underground crushers crush the ore to -250mm before it is conveyed up two 14 degree winzes to the loading station, prior to being hoisted to the surface. Premier Mine currently produces approximately 2.6Mtpy from two blocks, the first, the BA5 is situated at a depth of 630m below surface and the second, the BB1E at 732m below surface.

Current reserves will be depleted in the year 2008, and in an effort to extend the mine life, an evaluation and feasibility study was conducted using the inferred resource below the current two mining blocks. The project, known as the C-Cut, has increased the mines resource by 170 million tonnes and 85 million carats. It is planned that a mechanised block cave mining method will be implemented, which, at a mining rate of approximately 9Mtpy, extends the operating life of Premier Mine to 2025.

Premier Mine has a 5 star NOSA (National Occupation Safety Association) rating and achieved 1 million hours without a lost-time injury during 2000. The mine has also received ISO 14001 accreditation for environmental management. The mine has also been accredited with the excellence in mining environmental management award for the Gauteng region, that is sponsored by the South African Department of Mineral and Energy affairs.

#### 6.6.2.2 Treatment

The current plant was commissioned in 1947 and has since undergone considerable modifications and additions. The plant is further characterised by a combination of new and old technology and a low level of conventional automation that results in high operating costs.

The main plant treats 850tph through crushers, scrubbers, large diamond x-ray and DMS. Concentrate is transferred to a 40tph recovery plant employing grease belts and x-ray for diamond recovery.

The plant has two sections, a main plant and a recrusher facility. At the shaft headgear there is a facility to divert material to a 60,000 ton stockpile. The stockpile not only serves as a buffer between the mine and plant, but also facilitates the blending of ore.

Primary crushing takes place underground, and a -250mm fraction is sent to the washing plant in 12t skips. A +32mm to -60mm size fraction is fed to the large-diamond x-ray recovery plant. Tailings from the x-ray plant are sent to one of two high pressure roll crushers that facilitate inter-particle crushing, which greatly improves liberation.

The products from the crushing section are scrubbed and screened in preparation for DMS. The 1 to 5mm size fraction is sent to a standard cyclone DMS, whereas the 5 to 32mm fraction is treated through a DMS cones plant with a design capacity of 600tph. The -1 mm fraction from scrubbing reports to two 100-foot thickeners, each with a rated capacity of 90tph. Total underflow pumping capacity is rated at 180tph.

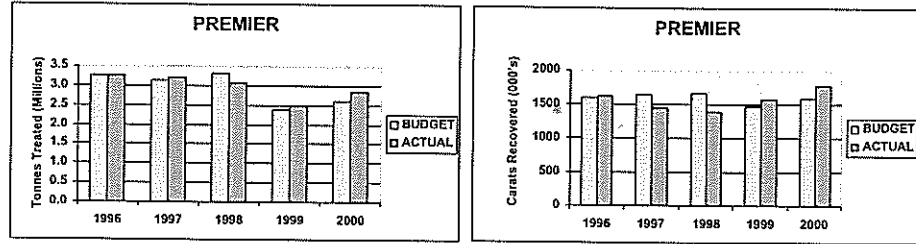
Tailings from the DMS cones plant are sent to the recrusher plant (400tph) for further crushing to -8mm through five cone crushers. The product from the recrusher is then fed through a standard DMS cyclone plant.

Concentrate from each of the DMS processes is treated in one recovery plant in separate streams. The total capacity of this plant is 40tph, and the primary method of concentration is grease. X-ray technology is used for the recovery of +10mm diamonds. The final recovery weighing and grading of the diamonds takes place in a sort-house.

### 6.6.2.3 C-Cut

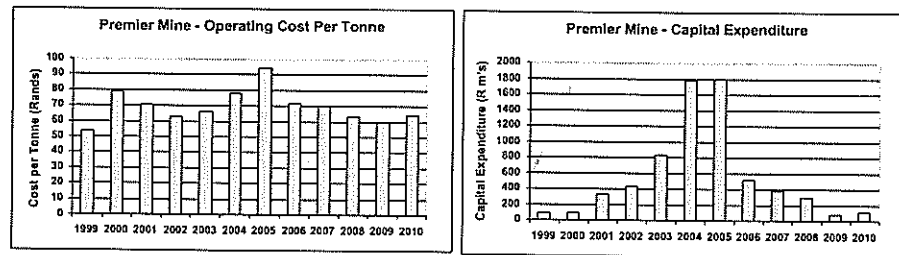
In order to reduce costs and position the mine competitively in a tougher global arena, Premier Mine has designed a mine for the C-Cut orebody that will be based on leading-edge technology. The C-Cut will include two new shafts, a new treatment facility, the underground infrastructure and all associated surface infrastructure necessary to support a 9Mtpy mining operation.

### 6.6.3 Current Production Trends



Premier displays fairly constant tonnage treated until 1999 when the production requirements were reduced in line with market demand. The carats have increased by 28% through 1999 and 2000 due to the higher grades of BBI East as it becomes the major ore source.

### 6.6.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms with 1999 and 2000 depicted as actuals and 2001 to 2010 as forecasts. Capital expenditure fluctuations are due to the establishment of the C-Cut. The operating cost graph shows the positive effect of the C-Cut from 2006 onwards.

### 6.6.5 Mineral Resource and Reserve Classification

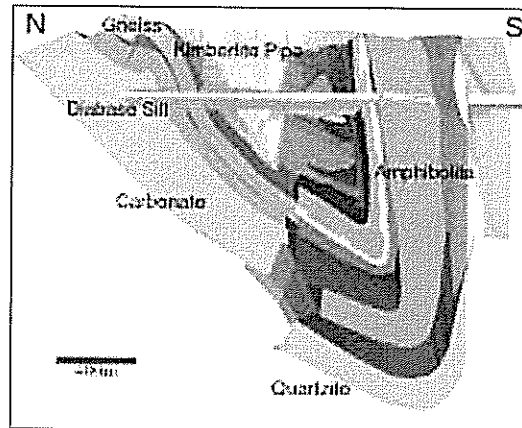
The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

Premier	Metric tonnes (millions)	Grade (cpht)	Carats (millions)
Probable reserves	39.0	53.8	21.0
Indicated resources	180.0	67.8	122.0
Inferred resources	117.0	9.4	11.0
<b>Total reserves and resources</b>	<b>336.0</b>	<b>45.8</b>	<b>154.0</b>

\*At a bottom cut-off size of 1.0mm, a planning revenue of US\$46 per carat and to a depth of 1,000m

## 6.7 Venetia Mine

### 6.7.1 Background



*Simplified cross-section of the Venetia orebody and complex surrounding geology showing the folded nature of the local country rock.*

Venetia, situated in the Northern Province, is the most recent major diamond mine to be opened by De Beers. It was officially opened by Harry Oppenheimer, former Chairman of De Beers, on 14 August 1992. The existence of diamondiferous gravels at Seta, 35km north-east of the mine, has been documented since 1903. In 1969, De Beers initiated an exploration program to locate the source of the Seta diamonds, culminating in the discovery of Venetia in 1980.

Venetia is a conventional open-pit mine, with the primary orebody comprising two adjoining kimberlite pipes with a combined surface area of approximately 13ha and a strike extent of 600m. The largest pipe is composed primarily of a diatreme tuffisitic kimberlitic breccia (TKB), crosscut by a series of later stage hypabyssal intrusions and dykes. The second largest pipe is an irregular elliptical body approximately 5ha in area, consisting of an altered TKB core rimmed by hypabyssal and transitional kimberlite facies. The initial sampling program consisted of a series of bulk samples used to establish the economic potential of the orebodies. Evaluation sampling was carried out utilising surface trenching, pitting, shafts, tunnels and jumper drilling. Core drilling was used to establish the internal geology of the pipes as well as to delineate their geometry. An advance sampling program utilising large diameter drilling was later implemented in order to sample the orebodies to a depth of 400m. Total exploration, delineation and evaluation drilling to date on Venetia exceeds 100km. De Beers acquired the Saturn Partnership which held the right to a royalty of 50% of Venetia's profits from Avmin (87.5%) and by way of ICH (12.5%) at the end of 1999.

Venetia Mine achieved Nascar status in 1996, a status that is still held by the mine. The mine was also granted ISO 14001 certification in 1998.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 80%. This factor is based on an established sampling programme and well-developed geological model. Uncertainties in volume (LDD caliper data) and recovery factors have retained this resource in the Inferred category.

### 6.7.2 Diamond Winning

#### 6.7.2.1 Extraction

Production began in 1992. In 2000, the plant treated a total of 3.7Mt and produced a total of 4.5Mcts. The mining method employed is hard-rock drilling and blasting combined with a shovel and truck load-and-haul operation. The mine operates on a continuous basis, seven days a week.

Currently the open pit is 120m deep, and current planning indicates a potential final pit depth of 420m below surface.

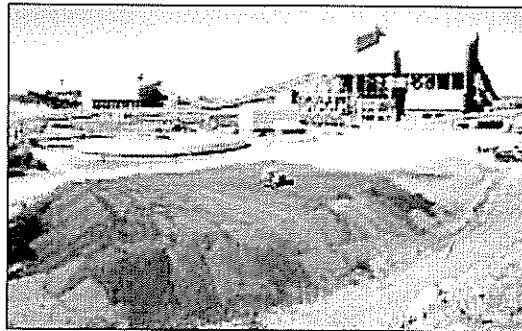
Venetia Mine utilises the latest technology in the mining environment. A large amount of time and effort goes into the development of systems and techniques that are focused on reducing the overall cost per tonne mined, thereby extending the current life of mine. The mine utilises state of the art fleet management technologies that are aimed at continuously improving the utilisation of the earthmoving fleet.

Mine planning at Venetia is of an advanced nature and utilises the latest mine software packages available. The split-shell (phased) mining technique is applied to reduce the peak waste mining rates and advance revenue profiles. The method further enhances NPV by reducing capital fleet requirements and improving operational efficiency in the mining operation. This concept is being migrated to the other open-pit mines within the group.

Currently the life of mine is stated as 2011. However, a fourth major cut is under review which would increase open pit life to 2016. Thereafter, underground mining is possible.

#### 6.7.2.2 Treatment

The 655tph plant was commissioned in 1992. During the last quarter of 2000 the plant at Venetia was converted to run on a continuous operation. The planned throughput in the plant for 2001 is 4.6Mt, which will be the plant throughput for the foreseeable future.



*The Venetia treatment plant*

The plant is designed to treat 655tph through crushers, scrubbers and a DMS section. Concentrate is transferred to a recovery plant employing both x-ray and grease belts for diamond recovery. The plant makes use of a medium level of conventional automation and a comprehensive computerised information system.

The ore delivered to the Primary crusher is below 1m x 1m in size, and a product smaller than 150mm is produced. The primary scrubbing and screening section consists of two identical modules, each designed to treat a maximum of 800tph. This section produces three products: 1) a -1mm fraction that is discarded, 2) a 1 to 25mm that reports to the DMS and 3) a +25mm fraction that is sent to secondary crushing.

Cone crushers are used for secondary crushing. The crushed material is then conveyed to the secondary scrubbers. The product from these scrubbers is split into two fractions: a minus 8mm and a + 8mm for feed to the DMS.

The DMS section is separated into coarse (8 to 25mm) and fines (1 to 8mm) sections. Both sections have two modules designed to treat a maximum of 200tph. The modules also contain sub-processes that are used to recover ferrosilicon from the process and to regulate the operational parameters.

Coarse DMS tails are sent to the re-crush section to liberate any smaller diamonds that are locked up in the coarse float fraction. High-pressure roll crushers, designed to treat 270tph, are used in the re-crush section, to crush the kimberlite without damaging the locked diamonds. The re-crush product joins the secondary crusher product and is fed to the secondary scrubbers.

All concentrate produced in the coarse and fines DMS reports to the re-concentration (recon) plant, that has a rated capacity of 40tph. The recon plant is designed to reduce the quantity of material fed to the recovery section by producing a higher-grade concentrate. The recon plant utilises DMS cyclones in its process. The product from the recon is sent to the recovery section, and the recon tails are sent to the re-crush stockpile.

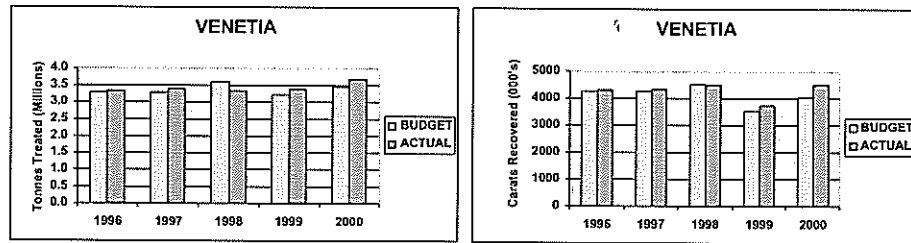
The concentrate from the recon plant is passed through the recovery plant, where the product is recovered using x-ray technology and grease belt technology.

The recovery plant concentrate then passes through the sorthouse, where the product is recovered using magnetic permrolls, x-ray technology, caustic soda and hand-sorting. The product is secured in a safe until it is transported under security to HOH in Kimberley.

The treatment and recovery plant are modern, efficient, highly automated and in excellent operating condition.

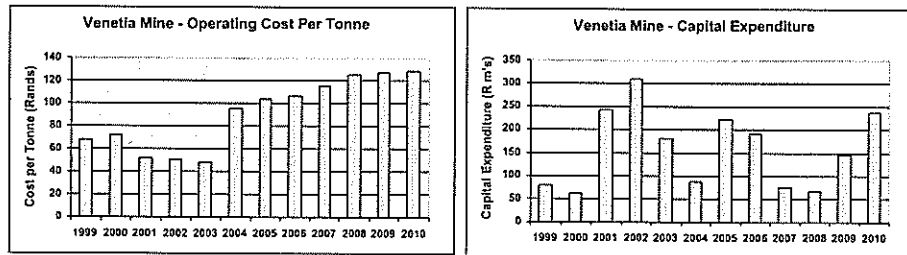
A recovery plant upgrade is currently under investigation. Thickening section capacity is currently being increased. Further upgrading is required to enable the processing of 725tph on a continuous basis.

**6.7.3 Current Production Trends**



Venetia regularly exceeds its tonnage treated budget, except for 1998 when it was originally planned to increase production, but market forces reversed that decision and also caused the reduced budget in 1999. With the renewed strength in the diamond market, the decision was again taken to increase production in 2000, and this target was exceeded due to the early introduction of continuous operations planned for 2001. The carat production has not varied by the same magnitude as the tonnage or always in the same direction. This is due to the variability in grade between different sections of the pit, with the final blend being determined by the mine plan and the scheduling of ore from the different sections.

**6.7.4 Operating and Capital Expenditure**



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms with 1999 and 2000 depicted as actuals and 2001 to 2010 as forecasts. Capital expenditure fluctuations are due to upgrading of the plant's red area in 2002 and purchasing of additional earthmoving equipment for the

increasing volumes of waste from 2003. The operating cost graph shows the effect of the increasing volumes of waste stripping from 2004.

#### 6.7.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

Venetia	Metric tonnes (millions)	Grade (cpht)	Carats (millions)
Probable reserves	43.6	121.6	53.0
Indicated resources	9.8	134.7	13.2
Inferred resources	64.0	77.3	49.5
<b>Total reserves and resources</b>	<b>117.4</b>	<b>98.6</b>	<b>115.7</b>

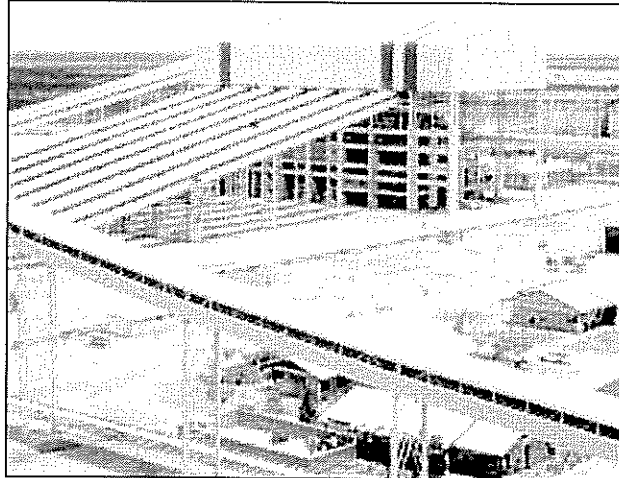
\*At a bottom cut-off size of 1mm, a planning revenue of US\$55 per carat and to a depth of 420m

## 6.8 Debswana - Orapa Mine

### 6.8.1 Background

The Orapa orebody, some 240km west of Francistown, was discovered by De Beers in 1967 after twelve years of prospecting. The De Beers Botswana Mining Company (Pty) Ltd. was incorporated in Gaborone on the 23 June 1969 to develop the mine. The company was restructured in 1992 and the name changed to Debswana Diamond Company (Pty) Limited (a company with a 50:50 partnership between De Beers and the Government of Botswana).

The Orapa kimberlite deposit consists of two intrusive pipes emplaced into basalt and sandstones approximately 93 million years ago. The two pipes coalesce near surface giving a bi-lobate expression to the pipe outlines. The deposit has no overburden, and the pipe in the northern half of the deposit was emplaced prior to the southern pipe. The pipe infill is predominantly crater facies and consists of fourteen geological facies, falling into four major groups: - basalt



*Part of the Orapa treatment plant*

rich units; epiclastic grits, sandstones and shales (containing fossils), talus deposits, and volcanoclastic deposits. Each unit represents a different phase of crater infill. The kimberlitic material is highly altered and contains a high percentage of swelling clays, which can cause material handling difficulties, but also results in high levels of diamond liberation.

The greater than 113ha crater facies kimberlite has been evaluated by a combination of pitting, bulk sampling and large diameter drilling to a depth of 260m.

The Orapa mine opened in 1971 and has been mined by the open pit method to date. The treatment capacity was doubled during 1978 and again in 2000. Continuous mining and treatment operations were introduced in 1997. An automated diamond recovery plant was introduced in 2000. The Orapa treatment plants have recovered 146Mct from the treatment of 199Mt of crater facies kimberlite at an average grade of 73cpht. Mining is expected to continue for at least another 29 years at current treatment rates. The mining lease for Orapa was renewed for a further 25 years in 1996, effective from 1992.

Orapa has a 5 star NOSA (National Occupational Safety Association) rating. The environmental management programme of Orapa mine is based on ISO 14001 accreditation in respect of which full certification has been obtained.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 70%. This factor is based on an established and consistent mining history with a well-developed geological model. The geological model is greatly simplified at the depths associated with inferred resources (Diatreme as opposed to Crater facies). There is limited sampling data in the inferred resource and global facies grades based on micro-diamond data have been used. A sampling program will be

carried out at Orapa prior to the exhaustion of the current probable reserve in 2018.

## **6.8.2 Diamond Winning**

### **6.8.2.1 Extraction**

The Orapa Mine is a conventional open pit mine utilising a shovel and truck fleet that sequentially miners progressive benches. To date no significant waste stripping has occurred. The first waste stripping at Orapa will begin in 2001.

During December 1999 No. 2 plant, part of the Orapa 2000 project, was commissioned, which resulted in Orapa treating a record 14.7Mt, up from 9.6Mt in 1999. The mine produced a total of 12.2Mct for the same period. The open-pit is currently planned to a depth of 540m. There is potential for underground operations following open pit mining that is planned to end in 2030.

The Debswana board granted approval for the development of the Damtshaa Mine (BK9) resource in 2000. Construction of the mine will commence in 2001. The mine will be serviced from the infrastructure around Orapa.

Orapa will soon use state-of-the-art fleet management technology in an effort to improve the equipment utilisation on the mine, thereby driving down unit costs. The mines also make use of the latest technology in the recovery of diamonds in the treatment plant. The diamond concentrate produced at the mines is sent to Jwaneng where it is treated through the FISH (Fully Integrated Sort House) plant.

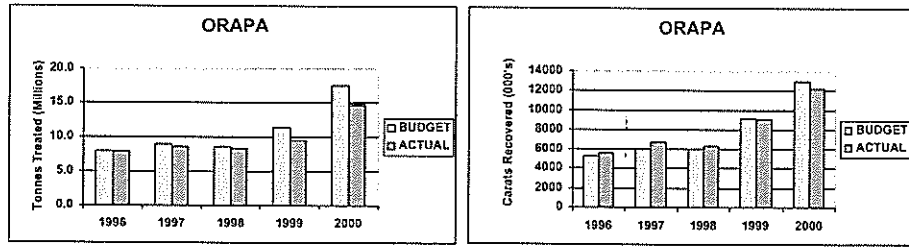
### **6.8.2.2 Treatment**

The additional plant has increased the installed processing capacity by 8.9Mtpy (from 8.6Mtpy for Orapa No. 1 plant), creating a total capacity of 17.5Mtpy. The No. 1 plant is a standard plant of the 1970s without either scrubbing or recrushing facilities, which produces a tailings product in the size range 1.6 to 25mm. The concentrates from this plant are fed to the new Completely Automated Recovery Plant (CARP).

The CARP is a state-of-the-art diamond recovery plant, incorporating modern Debex x-ray machine technology in a high security environment. The CARP treats final reconcentration DMS plant concentrate from the three existing treatment plants namely: Orapa No. 1 plant, Orapa No. 2 plant and Letlhakane plant. Once the BK9 (Damtshaa) mine is on line in 2002, concentrate from this plant will also be treated in the CARP. Excess capacity in the CARP is used to retreat tailings from the old recovery. The CARP is designed to treat 2,500tpm of concentrate and recover 97.5% of all diamonds sent to the plant. A portion of the CARP tailings is recycled back to Orapa no. 2 plant to improve the recovery efficiency above this.

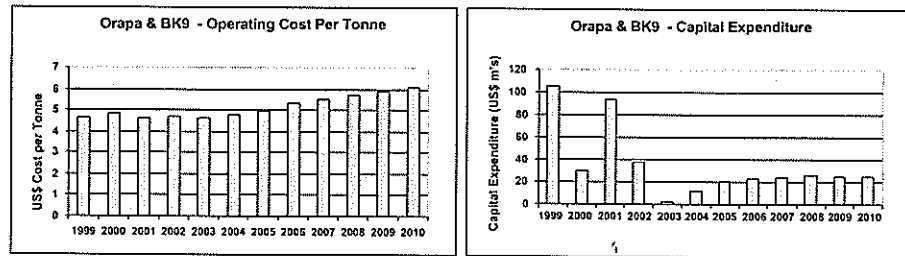
High-quality concentrate is shipped to the Jwaneng Fully Integrated Sort House (FISH) for hands-off final diamond recovery. This aspect is still in a transition phase and some CARP concentrate is hand sorted in the Orapa CARP sort house.

### 6.8.3 Current Production Trends



Orapa shows fairly consistent production until 1999. Thereafter the increase is due to the build up to the Orapa 2000 project that doubled production. The deficits seen in 1999 and 2000 are due to difficulties with the production ramp up.

### 6.8.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal terms with 1999 and 2000 depicted as actuals and 2001 to 2010 as forecasts. Capital expenditure for 2001 reflects the establishment of the new mine at the BK group of kimberlites. The operating cost graph shows the effect of the increasing volumes of waste from 2004 onwards.

### 6.8.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

Orapa	Metric tonnes (millions)	Grade (cpht)	Carats (millions)
Probable reserves	274.0	57.8	158.5
Indicated resources	105.9	34.5	36.5
Inferred resources	273.0	45.8	125.0
<b>Total reserves and resources</b>	<b>652.9</b>	<b>49.0</b>	<b>320.0</b>

\*At a bottom cut-off size of 1.65mm, a planning revenue of US\$47 per carat and to a depth of 660m

\* Note that the above table incorporates BK kimberlites (K9, K1, K12 and K15).

## 6.9 Debswana - Letlhakane Mine

### 6.9.1 Background

The 12ha Letlhakane D/K1 pipe was discovered by De Beers in 1971, and consists of a single intrusive pipe emplaced into basalt and Ntane sandstones at about the same time as the Orapa kimberlites. A smaller 3.6ha satellite pipe D/K2, occurs a few hundred metres to the south east of the D/K1 deposit. The D/K1 orebody consists of multiple tuffisitic kimberlites emplaced into the same vent at different times. A basalt rich breccia can be seen on the southern periphery of the pipe and represents the earliest phase of emplacement. The kimberlite, in contrast to that at Orapa, is a much harder rock and was originally masked by Kalahari sediments.



*View of Letlhakane Mine D/K1 pit*

The D/K1, diatreme facies kimberlite has been evaluated by a combination of pitting, bulk sampling and large-diameter drilling to a depth of 470m below surface.

The Letlhakane mine stage 1, opened in 1976 with the treatment of the ferruginous gravel deposits around the pipes. Stage 2, which saw the first increase in the plant in 1979, was constructed to treat the material from the pipes, which have been mined by open-pit methods to date. The treatment capacity was further increased by 20% in 1987. Continuous mining and treatment operations were introduced in 1997. The Letlhakane treatment plant has recovered 17Mct from the treatment of 63Mt of diatreme facies kimberlite at an average grade of 27cph. Mining is expected to continue for another 13 years at current treatment rates. Thereafter mining may continue through conversion to an underground operation depending on the results of a feasibility study to be undertaken in the next 2 years.

Letlhakane has a 5 star NOSA rating. The mine is planning to obtain ISO 14001 accreditation during 2001.

Letlhakane is owned by Debswana. The Letlhakane mine lease was renewed for a further 25 years in 1996, effective from 1992.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 80%. This factor is based on an established and consistent mining history with a well-developed geological model. Limited reverse circulation drilling for macro-diamonds has been carried out to depths of 400m and below.

### 6.9.2 Diamond Winning

#### 6.9.2.1 Extraction

Letlhakane Mine produced a total of 0.96Mct in 2000, after treating a total of 3.5Mt of ore. The D/K1 and D/K2 open pits have a remaining life of approximately 13 years. The feasibility of mining underground at Letlhakane is being investigated.

### 6.9.2.2 Treatment

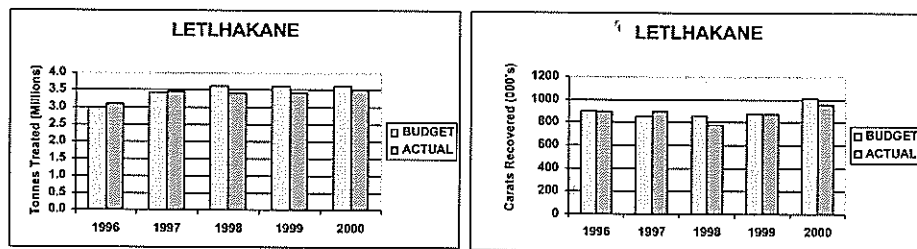
The plant was commissioned in 1975. The primary crusher has a rated capacity of 1000tph and operates with a 127mm gap. The normal feed rate for the plant is 525tph. The plant was fully automated in 1995.

The crushed ore is divided into three size fractions. The screen underflow (-1.25mm) is pumped to a de-gritting section, the middling (1.25 to 25mm) reports to a DMS stockpile and the oversize reports to a secondary crushing stockpile. Both stockpiles have a live capacity of 4,000t.

From the secondary stockpile material is fed to three secondary crushers with a rated overall capacity of 900tph. The crushed product reports to a standard DMS that has two parallel DMS modules, each consisting of two 610mm cyclones.

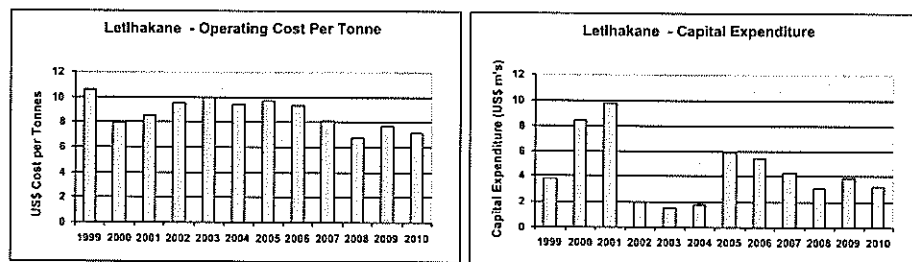
The float fraction (non diamond bearing) is washed in drain and rinse sections in order to recover the dense medium and then disposed of at the tailings dump. The sink fraction reports to a re-concentration DMS Plant for further concentration. Floats from the re-concentration plant are returned to the secondary stockpile for re-crushing and re-treatment. The final concentrate is transported by truck under security escort to the Orapa CARP.

### 6.9.3 Current Production Trends



Production at Letlhakane is at a fairly mature stage and does not vary considerably from year to year, with production being fairly close to budget.

### 6.9.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal US\$ terms with 1999 and 2000 depicted as actuals and 2001 to 2010 as forecasts. Capital expenditure for 2001 and for 2005 onwards is due to major equipment replacement. The operating cost graph shows the effect of the decreasing stripping volumes from 2003 onwards.

### 6.9.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

<b>Lethakane</b>	<b>Metric tonnes (millions)</b>	<b>Grade (cpht)</b>	<b>Carats (millions)</b>
Probable reserves	9.0	21.1	1.9
Indicated resources	6.2	30.6	1.9
Inferred resources	47.4	26.4	12.5
<b>Total reserves and resources</b>	<b>62.6</b>	<b>26.0</b>	<b>16.3</b>

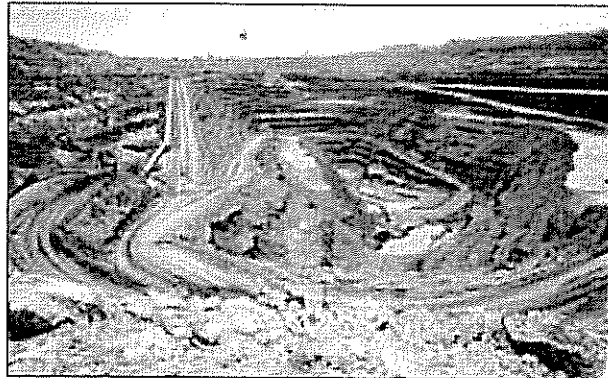
\*At a bottom cut-off size of 1.65mm, a planning revenue of US\$191 per carat and to a depth of 480m

## 6.10 Debswana – Jwaneng Mine

### 6.10.1 Background

Debswana's Jwaneng Mine is the third of the three diamond mines in Botswana owned and operated by Debswana Diamond Company, a company jointly owned by the Government of Botswana and De Beers. The Jwaneng kimberlite, located some 120km west of Gaborone, was discovered by De Beers in late December 1972. An associated deposit lies 8km to the east. The orebody consists of three intrusive pipes emplaced along fault zones within the Transvaal super group some 250 million years ago. The pipes are distinctive units below 150m from surface, but above this depth they coalesce to give a tri-lobate outline. The kimberlites were overlain by up to 50m of Kalahari deposits at the time of discovery.

The central pipe consists of crater facies kimberlitic infill, which contains rare tree fossils and is generally poorly sorted. In common with the northern and southern pipes, the central pipe displays a peripheral zone where an earlier infill, rich in quartzitic material, is preserved as lenses adjacent to the wallrock contact. The crater infill is similar to Orapa's in that the kimberlite is highly



*View of the Jwaneng pit*

altered in the upper levels and contains swelling clays. The southern pipe is similar to the central pipe with regard to infill, but appears to have more phases of infilling. The northern kimberlite consists of a central pyroclastic core, which is surrounded by a well developed peripheral earlier infill, rich in quartzitic material. The northern pipe infill is a more competent rock than that in the neighbouring pipes. This 54ha crater-facies deposit has been evaluated by a combination of samples from shafts, bulk samples and large diameter drilling to a depth of 400m.

The smaller pipe to the east has not been exploited. The deposit consists of two pipes, one of which is a tuffisitic kimberlite breccia and the other a hypabyssal kimberlite. It has been evaluated by a combination of samples from shafts, and large diameter drilling to a depth of 200m. This pipe is planned to be mined from 2010 onwards.

The Jwaneng Mine opened in 1982 and to date the main treatment plant has recovered 171Mcts from the treatment of 123Mt of crater-facies kimberlite at an average grade of 139cpht. A facility to re-crush tailings arising from the main treatment plant was added in 1990, and in 2000 an automated diamond recovery plant was introduced along with a fully integrated sorthouse to sort diamonds from all of the Debswana mines. Mining is expected to continue for at least another 28 years at current treatment rates, and will most probably be continued using underground mining methods.

The current Jwaneng Mine lease expires in 2004.

Jwaneng Mine has a 5 star NOSA rating and was also awarded the ISO 14001 certification at the end of 2000.

#### *Inferred Mineral Resources*

The inferred mineral resources were factored for technical risk using a sliding probability scale from 97% to 80%. These factors are based on the likely impact of

ongoing comprehensive drilling programmes designed to continually upgrade information on grade, geology and recovery factors. The first such programme will be completed in 2001 and upgrade a considerable proportion of the current inferred resources to indicated mineral resources and probable mineral resources is appropriate. The probability factor will reach 80% by 2021, should no additional sampling information be obtained in the interim.

## 6.10.2 Diamond Winning

### 6.10.2.1 Extraction

Production rates in the 1980's were about 5Mtpy, and these were increased by 33% in 1994 upon commissioning of the Fourth Stream Project, whereby a fourth production stream in the main treatment plant was added to the then three streams. Production was further increased by about 14% in 1997 when the mine started continuous operations (CONTOPS) operating 24 hrs a day, seven days a week.

Jwaneng Mine is a conventional open-pit mine utilising a shovel and truck fleet. An in-pit ore crusher was established in 1994 to crush run-of-mine ore to -150mm prior to delivery to the treatment plant. In 2000 Jwaneng treated 9.2Mt yielding 11.5Mcts. The stripping ratio was 3.4t of waste per ton of ore.

The current mine planning work has indicated that it will be economical to mine the kimberlite pipe by open-pit methods to a depth of 720m below surface. At current production rates open pit mining will last until 2028, and thereafter operations may continue from underground.

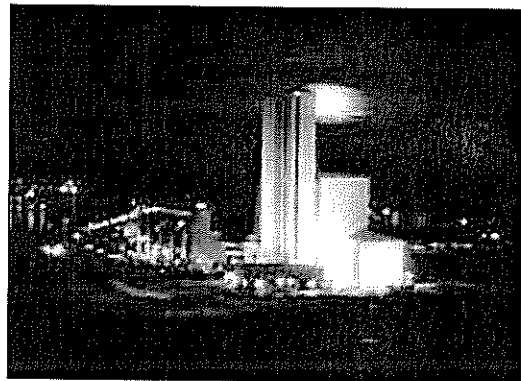
### 6.10.2.2 Treatment

The plant was commissioned in 1982 with a capacity of 1,040tph. An expansion project in 1994 increased the capacity of this plant to 1,400tph. The process control system was fully automated in 1994.

Material crushed in the pit is fed to the main treatment plant where it is cleaned and screened in the scrubbing plant. The fines generated during the scrubbing process are pumped to the slimes dams.

The ore is then sized to -25mm through screening and secondary crushing prior to concentration in the dense media separation (DMS) plant.

The treatment process is divided into a main plant and a re-crush plant. The main plant has a top feed size of 25mm and a bottom cut of 1.4mm. The tailings from the first pass DMS are fed to a re-crush plant. This plant is fitted with five high pressure roll crushers that operate in open circuit to produce a product that has a nominal size of 95% passing 12mm.



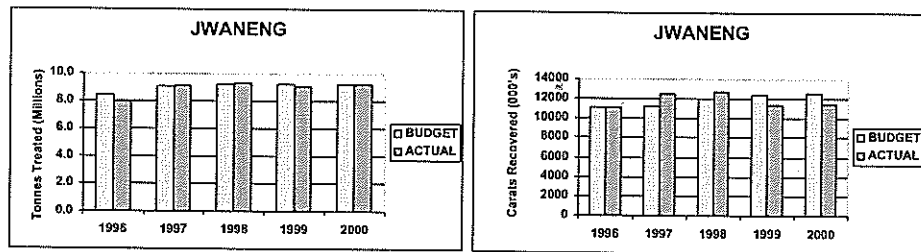
*Jwaneng's Aquarium*

The concentrate from the two plants are further concentrated and sorted in the new fully automated 'Aquarium' plant. This plant consists of an automated

recovery section where x-ray and magnetic separation processes are used to concentrate the product to 50% diamond by weight. The final section in the Aquarium is a fully integrated sorting facility where the product from the recovery section is finally cleaned and sorted by means of single particle sorters and automated acid cleaning processes.

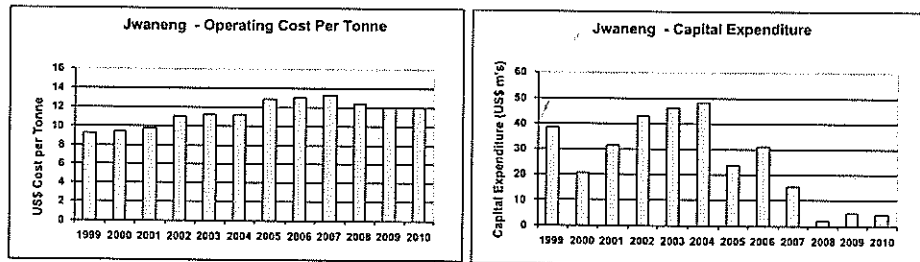
The plant is in good condition. Parts of the control system are approaching the end of their optimal technical and commercial lifecycle and are scheduled to be replaced or upgraded in the foreseeable future.

### 6.10.3 Current Production Trends



Since 1997 the tonnage produced has been consistent. Carat targets have been somewhat more varied due to the mine-planning grade varying from year to year. With increasing depth and the associated hardness of the ground, diamond liberation problems are being and will be experienced. This is one of the major reasons given for applying probability factors with depth as previously indicated.

### 6.10.4 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal US\$ terms with 1999 and 2000 as actuals, and 2001 to 2010 as forecasts. Capital expenditure increases from 2002 are mainly due to the purchasing of additional earthmoving equipment, for the increasing volumes of waste from 2003. The operating cost graph shows the effect of the increasing stripping volumes between 2002 to 2007.

### 6.10.5 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

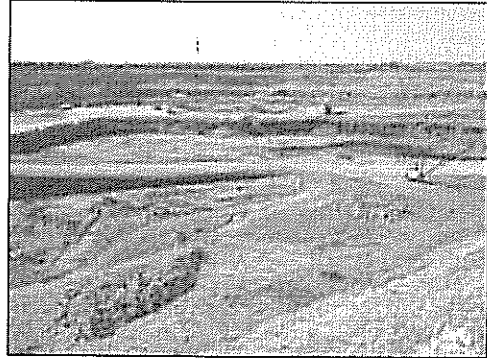
<b>Jwaneng</b>	<b>Metric tonnes (millions)</b>	<b>Grade (cpht)</b>	<b>Carats (millions)</b>
Probable reserves	44.0	90.9	40.0
Indicated resources	14.0	28.6	4.0
Inferred resources	229.6	160.7	369.0
<b>Total reserves and resources</b>	<b>287.6</b>	<b>143.6</b>	<b>413.0</b>

\*At a bottom cut-off size of 1.65mm, a planning revenue of US\$108 per carat and to a depth of 720m

## 6.11 Williamson Diamonds

### 6.11.1 Background

The Williamson Diamond Mine is situated at Mwadui in the Shinyanga district of Tanzania, about 130 km south of the port of Mwanza, on Lake Victoria. Dr. John T. Williamson a Canadian mining geologist discovered the diamond deposits at Mwadui in 1940. A private company, Williamson Diamonds was formed on March 19, 1942 with Dr. Williamson as sole and governing director and general manager.



*View of the Williamson pit*

The Mwadui kimberlite, is considered to be one of the largest diamondiferous kimberlites ever discovered, with a surface area of some 142ha. Mining operations have historically concentrated on enriched superficial deposits within and adjacent to the pipe. Exploration within the pipe to a depth of 500m below surface has confirmed the presence of pyroclastic kimberlite and extensive granite breccias to this depth. The pipe also contains an extensive internal sedimentary basin filled with shales, mudstones and inter-fingered pyroclastic kimberlite. Sampling of the resource has been carried out through trenching, pitting, underground development and focused mining.

Dr. Williamson died in 1958 and in August of that year the then Tanganyika Government and De Beers Consolidated Mines Limited became joint owners of the mine on a 50% basis. In 1974 the Tanzania Government took over the management of the mine until 1994 when De Beers negotiated a further 25% of the shares and assumed operating control.

### 6.11.2 Diamond Winning

#### 6.11.2.1 Extraction

Although this is one of the largest pipes in the world, due to its low grade, the mine has an estimated life of 5 years, to a final open-pit depth of 80m below surface.

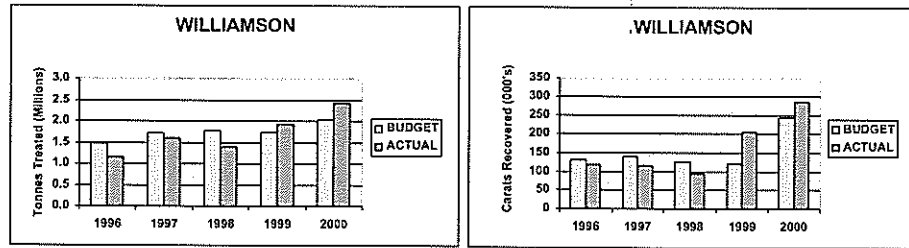
Mining production is carried out exclusively by contractors, which affords the mine a flexibility, in terms of machinery requirements, that is usually reserved for mines with larger fleets of equipment. This has resulted in the mine being able to operate flexibly without the associated high cost of maintaining extra equipment on site.

#### 6.11.2.2 Treatment

The new Williamson Plant has a head-feed capacity of 325tph. Feed material of minus 1,000mm is passed through a 2-stage crushing process, reducing to 150mm. This is followed by scrubbing and screening, producing 3 size fractions. The undersize fraction of minus 1.5mm is rejected to the slimes dam and the oversize fraction of plus 25mm is rejected to the tailings dump along with the DMS tailings fraction. The remaining material at minus 25mm plus 1.5mm is fed to two identical 100tph DMS modules utilising 420mm cyclones with extended barrels. The cyclone separation produces a concentrate and a tailings fraction. The tailings fraction reports to the tailings dump and the

concentrate is dried in a rotary drier before being dispatched to the Final Recovery Plant where it undergoes x-ray recovery treatment and final hand sorting.

**6.11.3 Current Production Trends**



Production recommenced in 1995 following a short commissioning period. Production rates have steadily improved, except during the summer of 1998 when the mine was effectively shut down for a month due to heavy rains. Production commenced with treating alluvial deposits and has moved to the open-pit kimberlites.

**6.11.4 Mineral Resource and Reserve Classification**

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

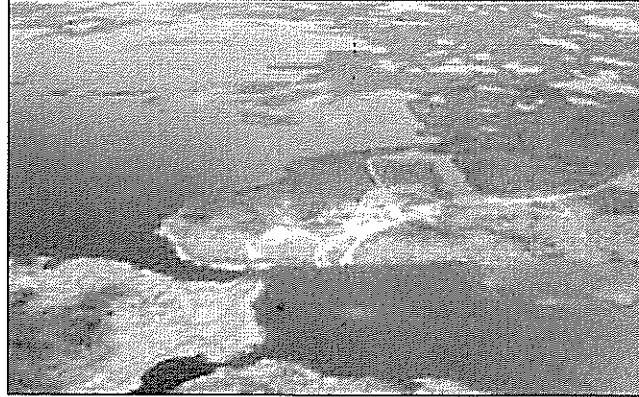
Williamson	Metric tonnes (millions)	Grade (cpht)	Carats (millions)
Probable reserves	0.0	0.0	0.0
Indicated resources	0.0	0.0	0.0
Inferred resources	114.0	5.7	6.5
<b>Total reserves and resources</b>	<b>114.0</b>	<b>5.7</b>	<b>6.5</b>

\*At a bottom cut-off size of 1.5mm, a planning revenue of US\$106 per carat and to a depth of 70m

## 6.12 Snap Lake

### 6.12.1 Background

The Snap Lake deposit is situated in the Northwest Territories of Canada, about 225km north east of Yellowknife. The deposit is described as a dyke but is actually a gently dipping intrusive kimberlite sheet which subcrops on a narrow peninsula located on the western shore of Snap Lake. The dyke extends over a distance of approximately 3.2km north south and 3.1km east west to a depth of 1km and is generally between 2m and 3m thick.



*Aerial view of Snap Lake site*

The Snap Lake dyke was discovered during the mid 1990's. The orebody subcrops beneath 2m to 3m of overburden and was therefore amenable to surface bulk sampling using trenches. Bulk sampling was carried out during 1998 and 1999 along with extensive core drilling to further outline the orebody.

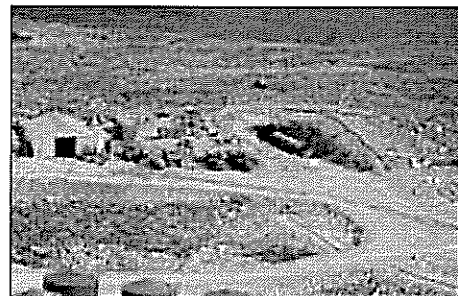
The results of a pre-feasibility study undertaken, by MRDI Canada, consultants appointed by Winspear Diamonds Inc., were released in April 2000 and reflected an indicated and inferred resource of 21.3Mt and some 42Mcts. The pre-feasibility study has focused on the development of an underground mine to extract 3,000tpd with an initial life of mine of approximately 12 years.

In the summer of 2000, Winspear initiated an advanced exploration programme to take underground bulk samples in the orebody. This involved approximately 1,200m of decline development to a depth of 320m below surface and approximately 600m of horizontal development along the strike of the dyke. Processing of these samples is nearly complete and preliminary results are as expected.

De Beers Canada Mining filed for a water license and land-use permit application with the authorities in February 2001 for a 3,000tpd operation, however, an optimisation study is currently underway which considers a larger resource base and the possibility of increasing the rate of extraction.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 70%. This factor is based on sampling carried out on wide grid spacing ( $\pm 200\text{m}$ ) which is insufficient for the two most important variables in this deposit, viz. grade and sill thickness.



*View of the Snap Lake portal*

## 6.12.2 Diamond Winning

### 6.12.2.1 Extraction

A Room and Pillar mining method with backfill paste and high strength concrete placement was selected by MRDI in a scoping study during July 2000, following on from the pre-feasibility study.

The basic process for the room and pillar method is broken down into two phases – primary and secondary stoping. Primary stoping, involves the development of on reef strike drifts, access raises and room development. Secondary stoping is the removal of the pillars between the rooms, once the rooms have been filled with paste backfill.

The Optimisation Study project team is evaluating the mining method, as new information becomes available from on-going drilling.

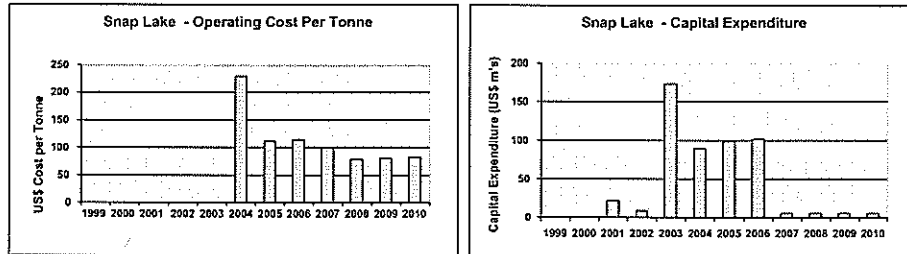
### 6.12.2.2 Treatment

In the April 2000 pre-feasibility study conducted by MRDI, designs were considered for a head feed of 3,000tpd using a traditional diamond treatment plant, taking in consideration that no proper Ore Dressing Studies had been conducted at the time.

The flowsheet includes an underground primary jaw crusher, and an off line covered surface stockpile with a Mineral Sizer to crush frozen ore. The ore is treated via scrubbing, screening and secondary crushing (cone crusher). The crushed ore in the fraction -25/+1mm is concentrated in a Dense Medium Separation plant. The rejects larger than 6mm are further crushed in a High Pressure Roll Crusher and the product recycle in the same DMS unit. The DMS concentrates are treated in a wet recovery section and the dried final concentrate hand sorted. The -1mm rejects are degritted and the slimes thickened. The rejects will either be combined with the coarse (+6mm) tailings to provide backfill material to the mining operations or disposed in a Processed Kimberlite impounding facility.

Ore dressing studies and diamond studies based on both samples taken in the deposit and on the treatment of large bulk samples are in progress. They are the foundation for the optimisation studies, which are presently underway. The flowsheet will be reviewed for optimum efficiency and cost.

## 6.12.3 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal terms with 1999 and 2000 depicted as actuals and 2001 to 2010 as forecasts. Capital expenditure for 2003 and 2004 reflects the establishment of the mine at 3,000tpd. Expenditure in 2005 and 2006 is the expansion to 6,000tpd. The operating cost graph shows the effect of the start up of operations in 2004 and decreases as full production is reached during 2005 and reduces again in 2008 when full production at 6,000tpd is reached.

#### 6.12.4 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

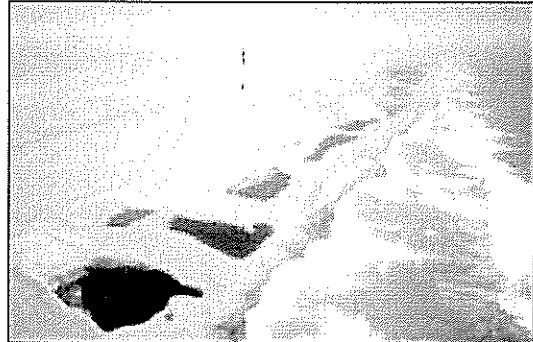
<b>Snap Lake</b>	<b>Metric tonnes (millions)</b>	<b>Grade (cpht)</b>	<b>Carats (millions)</b>
Probable reserves	0.0	0.0	0.0
Indicated resources	12.0	197.5	23.7
Inferred resources	9.3	196.8	18.3
<b>Total reserves and resources</b>	<b>21.3</b>	<b>197.2</b>	<b>42.0</b>

\*At a bottom cut-off size of 1.18mm and a planning revenue of US\$100 per carat

## 6.13 Namdeb

### 6.13.1 Background

Namdeb undertakes mining of diamond placer deposits onshore and offshore along the Namibian coastline. The majority of exploration and mining licenses held by Namdeb extend from the Orange River on the border with South Africa to Douglas Bay, north of the town of Lüderitz. The deposits contained within the southern Namibian licenses represent the greatest known concentration of placer diamonds in the world.



*Aerial view of coastal mining operations*

Namdeb also holds two offshore Exclusive Prospecting Licenses to the south of the Kunene River in northern Namibia.

Diamonds were discovered near Kolmanskop in 1908, and mining operations were widely established by 1912. Sir Ernest Oppenheimer consolidated the operations in 1920 under the Consolidated Diamond Mines of South West Africa (Pty) Ltd. (CDM). Namdeb Diamond Corporation, a 50:50 partnership of the Government of the Republic of Namibia and De Beers was formed to replace CDM in November 1994. The mining is carried out in terms of state mining licences that expire in 2020.

Diamond deposits associated with marine beaches extending to the north of the Orange River were discovered in 1928. A progressive shift in the focus of prospecting and mining occurred as the true enormity of the discovery was recognised. CDM moved its operational base from Kolmanskop to Oranjemund in 1943, when production expansion focused on the area now known as Mining Area One (MA1).

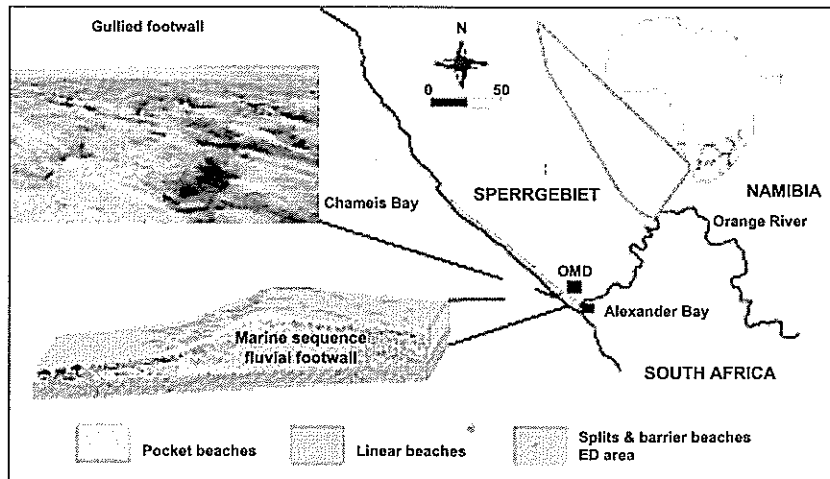
Given the mature state of mining operations in MA1, expansion projects have focused on the establishment of 'satellite' mines. A 100tph mobile plant previously used to evaluate some of the Orange River diamond resources was commissioned at Daberas during September 2000. The new Daberas Production Plant will be commissioned during 2001. Mining operations have been conducted intermittently at Elizabeth Bay since 1926 and most recently and up to the present since August 1991.

Namdeb currently has a business plan spanning 10 years, although prospecting continues, and the possibility of adding to the reserve base is good. Namdeb is currently on the NOSA safety system with MA1 being awarded a 5 star safety rating and the Northern Mining Area at Elizabeth Bay and the Orange River Mines both being awarded Noscara status. MA1 has been awarded the ISO 14001 accreditation for environmental management.

### 6.13.2 Geological Models Sampling and Resource Estimation

#### 6.13.2.1 Mining Area One (MA1)

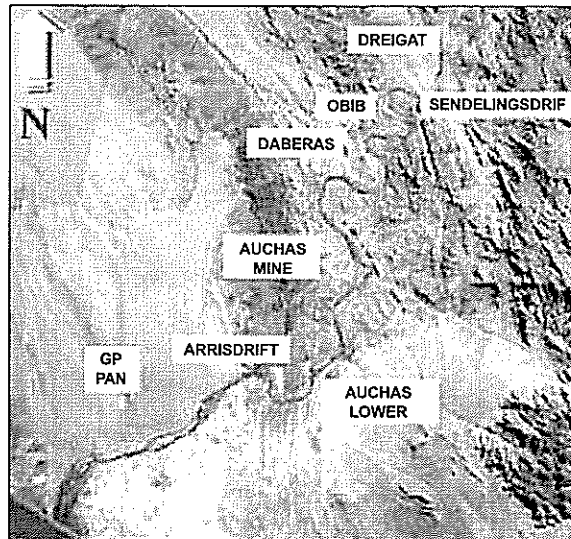
The MA1 geological model has been developed from a detailed understanding of factors that control the development of coarse gravel clastic beaches. In the south, spits and barrier beaches evolved in response to large volumes of material supplied to the coast by the Orange River. The physical character changes progressively to the north in response to less material being available.



*Geological model for onshore beach deposits in MA1*

Diamond concentration in the spit/barrier facies is controlled by the different natural processes that occur in the beach shoreface and back-barrier environments. These deposits are generally of lower grade but contain larger diamonds due to their proximity to the Orange River. Linear beaches are characterised by impressive footwall morphology consisting of wave-cut platforms with cliffs, gullies and potholes eroded in Precambrian schists. These features, called trapsites, locally enhance processes that concentrate diamonds to produce discrete high-grade zones. Pocket Beaches occur as discrete embayments. Diamond concentration within these environments is controlled by a combination of natural longshore transport and the presence of trapsites.

Strong emphasis is placed on the geological model in estimation of diamond resources in linear and barrier beach systems, where geological continuity can clearly be established. A moving average technique is used to interpolate between trenches to estimate the diamond resource. Estimation entails calculating grade (stones/m<sup>2</sup>), diamond size and resource thickness (volume) independently. Payability



*Spatial relationship of Orange River deposits*

and mineability scenarios are considered for conversion of resource to reserve. The only reserve category used on Namdeb mines is probable and in many instances the inferred category of resource is mined. The basic guidelines of the SAMREC code are followed, although the code is still in the process of being fully implemented on all of the Namdeb operations.

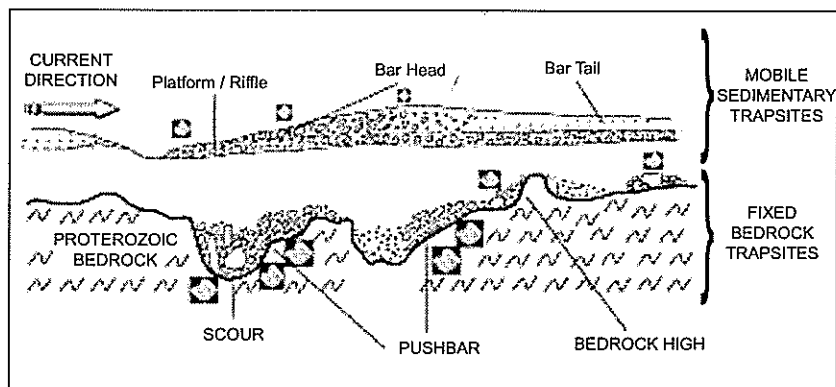
### 6.13.2.2 Inferred Mineral Resources

The inferred mineral resources were evaluated in the financial model using a probability of 60%. This factor is determined from years of mining notoriously difficult deposits due to their highly skewed diamond distributions and low grades. However, these mines have an established mining history and well developed geological models. The marine resources are highly dependent on recovery factors of both treatment and mining technology.

### 6.13.2.3 Orange River Mining Licence

The Orange River has deeply incised a course through the Richtersveld Mountains in response to base-level and climatic changes. Preserved as a number of terraces, the palaeovalleys consist of a series of sinuous reaches and meanders. Namdeb specialists and external consultants have studied the sedimentology and flow dynamics within the palaeovalley-fill sequences in great detail to construct a high-quality geological model.

The ancient Orange River system was characterised by extremely high-energy conditions at times. Two units are recognised in the Miocene-aged remnants. The basal unit consists of high-energy scour pool and riffle facies. The very high-energy conditions produced extremely rugged bedrock topography. Together with very large immobile obstacle clasts formed by slabs of bedrock eroded from valley walls, the irregular topography forms excellent fixed trapsites. Understanding of flow dynamics is important because the energy of the system was sufficient to periodically “flush” gravels out of scour pools, which were later filled by barren sands. The predictive model shows that diamond concentration is optimal in push-bar environments, immediately downstream of scour pools.



*Geological model for Orange River placers*

Reverse circulation drilling is used to define the palaeovalley morphology and to determine facies distribution throughout the sequences comprising the terraces. Strong emphasis is placed on the geological model in the estimation of diamond resources in the Orange River Mining Licence where geological continuity can clearly be established.

### 6.13.2.4 Elizabeth Bay Mining Licence

The Elizabeth Bay placer is contained within a basin that is open to the Atlantic Ocean in the south. Exotic pebbles prove that marine transgression has occurred into the basin in the past. It is possible that this has introduced diamonds supplied originally by the Orange River and carried northwards by

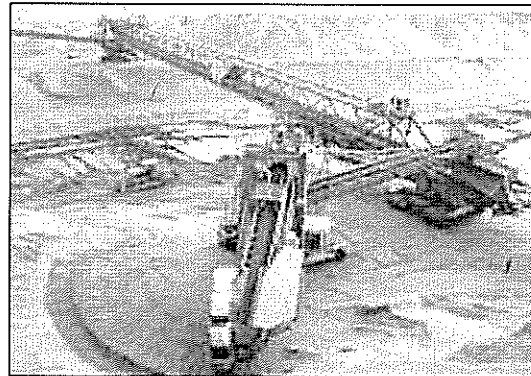
longshore transport. The weathering and erosion of now submerged palaeoshorelines preserved offshore of Elizabeth Bay, would also have provided diamonds for transport by the aeolian system during sea-level regression(s). Elizabeth Bay is the southern limit of the Namib Sand Sea (depositional) Basin. It is an important corridor for aeolian transport to the north, which has enabled the wind system to deposit a large body of aeolian grit containing diamonds within the basin. Periodically, ephemeral streams have operated, reworking the material.

A comprehensive re-evaluation of historical trench sampling data was undertaken between 1989 and 1990 using sample pits excavated with a hydraulic excavator. Samples were treated in a specially designed high-security sample treatment plant utilising dense media separation. Final recovery took place in a high-security prospecting laboratory. Onshore sampling pits in the vicinity of the Elizabeth Bay mine and surrounding deflation deposits are 10m<sup>2</sup> and mostly on a grid spacing of 100m x 100m. This sampling is generally of sufficient accuracy to enable estimation at an Indicated level of confidence. In the marine environment 4m<sup>2</sup> samples taken by divers are used to estimate the diamond content of specific sediment bodies in selected geological environments. In the deeper water (>30m) reverse circulation/percussion drill sampling has been used in a three sample per cluster arrangement making a total of 2.16m<sup>2</sup>. The latter is sufficiently accurate for estimation at an Inferred level and is supplemented by large rotary drill bulk sampling or 10m<sup>2</sup> sampling to increase confidence. No modifying factors are applied at Elizabeth Bay Mine.

### 6.13.3 Diamond Winning

#### 6.13.3.1 Extraction

The mining method is typical of the West Coast on-shore placers in that strip mining is applied using a variety of methods including truck and shovel, bucket wheel excavators and dredging. The overburden is stripped in successive cuts to expose the diamond bearing gravel beneath; once the ore is depleted, the next cut is stripped, with the overburden being deposited in the leftover void. The



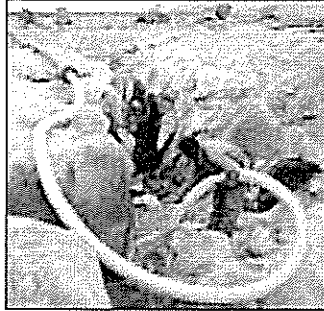
*Bucketwheel excavator at Namdeb, operating behind a seawall*

upper portion of ore (termed terrace ore) is pushed into piles or windrows by a large excavator or trackdozer and then loaded onto trucks for transportation to the nearest fixed treatment plant. The remainder of the ore in the gullies and potholes of the bedrock is removed by small excavators and manual sweeping crews, accumulated in piles and then also trucked to the nearest plant.

The stripping schedules planned at the mine site ensure that a variety of cuts are exposed at any one time to ensure that a good blend of material is available for the various plants.

Rehabilitation generally takes place concurrently with stripping as the voids are filled during the strip mining process. Dumps and voids that are left at the

beginning and end of a stripping sequence are profiled and smoothed by trackdozer to enhance their appearance and to facilitate re-vegetation. Elizabeth Bay, being a very shallow mine in an extremely windy environment, tends to require very little rehabilitation as it occurs naturally.



*Typical bedrock sweeping operations assisted by vacuum*

The treatment plants produce concentrates, which are transported to one of two main final recovery plants for x-ray separation and hand sorting. The dredge operation, which removes and treats very low-grade overburden while exposing ore, has a floating treatment plant. The small Orange River mines have integral recovery facilities at the treatment plants.

Long-term planning utilises a linear programme to assist in the selection of the stripping sequences and the blending of ore for each plant area. This ensures that the deposit is depleted in a responsible manner.

#### 6.13.3.2 Mining Area One (MA1)

##### Namdeb Mining Area No 1

##### *No 2 Main Treatment Plant*

The plant was commissioned in early 1970 and is in a fair condition, treating 620tph ROM through crushers, scrubbers and DMS. DMS concentrate is transported to the recovery plant by road. There is a medium level of conventional automation. The primary crusher section is due to be de-commissioned towards the end of 2001, after which only tailings material will be treated.

##### *No 3 Main Treatment Plant*

Originally commissioned in the mid 1970s, this plant has been shut down and re-commissioned several times. It was last re-commissioned in 1987. The plant is in a fair condition, and has capacity to treat 800tph. It has a unique system for separating barren boulders from the ore using a 'boulder bounce plant'. The plant also has 100tph dump treatment facility which treats dump material from screening plants. DMS concentrate is transported to the recovery plant by road. There is a medium level of conventional automation. The remaining life is 2-3 years and a plant closure plan is in place.

##### *No 4 Main Treatment Plant*

This plant was commissioned in 1964 and upgraded in 1973 when a milling complex and boulder bounce were added. The front-end was modified in 1999 to treat only conglomerate-free material received from in-field screening. The plant treats 700tph ROM through screens, scrubbers and DMS (there is no crushing section). DMS concentrate is transferred directly to the recovery plant. There is a medium level of conventional automation. From 2002 onwards only tailings dumps will be treated.

*Recovery Plant*

The plant was commissioned in the early 1970s, and last modified in 1989 when an x-ray plant annex was added. During the early 1990s the control function and surveillance was upgraded to medium-level automation. The plant is in good condition, and treats DMS concentrates from all the plants in MA1 utilising x-ray and permroll technology to produce diamond concentrate for hand sorting in glove boxes. There is a medium level of conventional automation. The final sorting facility is being modified to minimise diamond breakage.

*Dredge and Floating Treatment Plant*

The dredge and floating treatment plant were commissioned in 1997. The floating treatment plant was upgraded in October 2000 through the addition of an elutriator to improve throughput. The dredge has a semi-automated cutter dredge with dredging depth of 15m at 2,500tph. The dredge delivers product to a floating treatment plant for screening and DMS. DMS concentrate is transferred by barge and road to the recovery plant. A medium level of conventional automation exists on this plant. An improvement of trommel screen efficiencies to increase flexibility is currently under investigation.

**Orange River Mining License**

*Daberas Mine Treatment Plant and recovery*

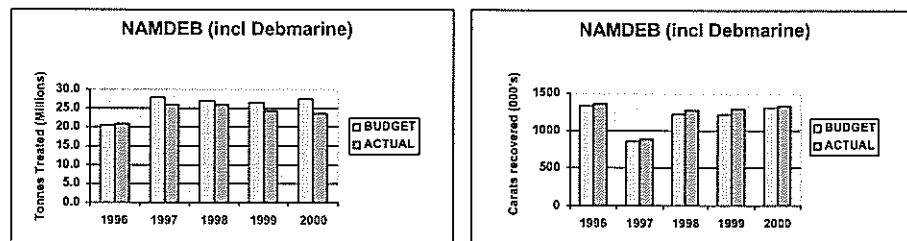
This plant is due to be commissioned early in 2001. It has been designed to treat 600tph ROM through screen, scrubber and DMS. The concentrate generated by this plant will be transferred directly to the recovery plant for x-ray recovery and canning. The plant will be fitted out with a medium level of conventional automation.

**Namdeb Elizabeth Bay Mine**

*Treatment and Recovery plant*

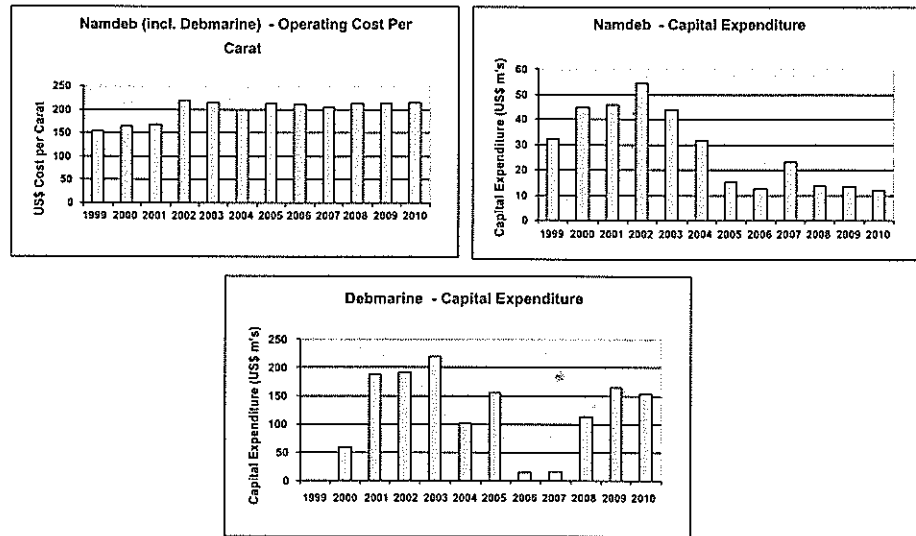
The plant was commissioned in 1990. A Recovery facility was commissioned in 1999, and a primary crushing section was installed in 2000. The plant is designed to treat 666tph ROM through crusher, scrubber and DMS. Concentrate is transferred directly to the recovery for x-ray and canning. There is a medium level of conventional automation. Opportunities to improve crusher efficiency are currently under investigation, and a resource extension evaluation is currently in progress.

**6.13.4 Current Production Trends**



Namdeb increased budget tonnage throughput in 1997 from around 20Mtpy to approximately 27Mtpy with the introduction of the dredge. Actual production has fallen somewhat short of the target due mainly to operational problems with the dredge. However, carat production has consistently achieved targets of approximately 1.3Mcts per annum.

### 6.13.5 Operating and Capital Expenditure



The graphs show the operating cost per carat recovered and capital expenditure for the operation in nominal US\$ terms with 1999 and 2000 depicted as actuals and 2001 and 2010 are forecasted. Capital expenditure fluctuations are due to the establishment of mining and treatment infrastructure at new mining areas, specifically the pocket beaches and overburden dumps in 2002 to 2003 and Sendelingsdrif in 2007. The operating cost per carat increases in 2002 due to a reduction in the overall recovered grade.

### 6.13.6 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mine is contained in the table below. Also shown is the planning revenue for the year 2001.

Namdeb incl. Debmarmine	Metric tonnes (millions)	Metric m <sup>2</sup> (millions)	Grade (cpht)	Grade cts/m <sup>2</sup>	Carats (millions)
Probable reserves	59.4	6.8	1.5	0.19	2.2
Indicated resources	73.6	18.8	2.3	0.20	5.4
Inferred resources	301.7	23.9	1.5	0.17	8.6
<b>Total reserves and resources</b>	<b>434.7</b>	<b>49.5</b>	<b>1.7</b>	<b>0.18</b>	<b>16.2</b>

\*At bottom cut-off sizes up to 3mm, a planning revenue of US\$322 per carat. Mining at Atlantic 1 has a bottom cut-off size of 2mm and a planning revenue of US\$298 per carat. Marine resources and reserves are based on a cut-off grade of 0.1 cts/m<sup>2</sup>. Namdeb is still in the process of fully implementing the SAMREC code. At the end of 1999 Namdeb had plans to mine deposits and resources (overburden dumps) which were believed to be payable, but now at best, are regarded as inferred resources, because more sampling is required. Since they are only estimated at inferred and deposit levels, they have been, in accordance with the SAMREC code, removed from probable reserves, and where applicable, added to inferred resources.

## 6.14 De Beers Marine

Namdeb employs De Beers Marine Namibia as its contractor to exploit its Atlantic 1 concession. An overview of the De Beers Marine operations, in a similar format to the other mines, follows.

### 6.14.1 Background

The diamond resources generated through deep-water exploration from 1974 to 1982 led to the formation of De Beers Marine in 1983. Deep-water mining operations commenced in 1991, when 29kcts were produced from Atlantic 1 Mining License. Production expanded rapidly with the development of the mining fleet. Diamond resources are developed annually as part of an ongoing contiguous exploration programme.

The diamonds and clastic gravels comprising the orebody were introduced to the continental shelf during sea-level regression(s) over at least the last 50 million years. High-energy shoreface erosion during repeated regression and transgression of the sea-level across the shelf resulted in the progressive concentration of diamonds. The final period of shoreface incision occurred 20,000 years ago and resulted in the formation of submerged coarse clastic beaches and lag gravel orebodies containing diamonds. The bedrock consists of Tertiary and Cretaceous-aged sequences of clay, sand, sandstone and conglomerate. Overburden consists of Holocene silt and fine-grained sand.

Although trapsites are associated with rocky outcrops formed by shoreface erosion of earlier shelf sequences, trapsites are not developed on the scale seen onshore at Namdeb's operations. Consequently, discrete, high-grade concentrations are less commonly developed, and diamonds are more dispersed. Although preserved beach sequences can be identified using remote sensing techniques such as sidescan sonar, the incorporation of diamonds into sheet-like bodies of lag gravels strewn over wide areas of the shelf produces extensive deposits characterised by lower diamond grade.

Reconnaissance sampling and the development of inferred diamond resources is achieved using a reverse circulation/percussion-type drill system that delivers a sample of 0.72m<sup>3</sup>. Three sample holes are clustered to produce an appropriate sample support size. Sample spacing is varied depending upon the level of confidence required. Inferred resources are generated using samples on a line spacing, which varies from 100m to 200m and a sample spacing of 30m.

Indicated diamond resources are developed using a large bore rotary drill deployed from the *M.V. Coral Sea*. This delivers a 10m<sup>3</sup> sample. Samples are taken on a 50m or 100m grid, depending upon the nature of the orebody being evaluated.

Sample material is airlifted directly to surface and treated under high-security in an onboard treatment plant. Final recovery is effected in a secure onshore prospecting laboratory.

The offshore diamond deposits are locally estimated using geostatistical methods specifically designed for discrete particle distributions. The estimation methodology is based on mapping homogeneous geological domains and geostatistically calculating stone density and stone size independently. All estimation methodologies and techniques have been evaluated and assessed by independent experts to ensure their applicability and correctness. For practical mining purposes, the orebody is assumed to be two-dimensional. The Atlantic 1 diamond resources are classified according to the guidelines specified in the SAMREC code. Standards and criteria for the density and quality of geological and sampling data have been defined to obtain the required confidence level for each resource category. Geostatistical simulation models have been used to confirm the confidence criteria for diamond resource categories.

For the various geological domains within the resource, the associated mining performance is assessed and extraction and recovery factors determined. The mining rate and associated mining costs are also estimated for the mineable portion of the resource. Consolidated mining units or panels (300m x 300m) are then created. The estimated contribution (estimated diamond revenue minus the estimated mining cost) of each panel is determined. An economic cut-off of positively contributing blocks is used. Complex linear programs are used to spatially optimise resources to maximise the diamond contribution from the reserve.

Debmarine operates on the NOSA safety system 5 star rating and has a Noscar award. They have also received ISO 14001 accreditation for environmental management.

## 6.14.2 Diamond Winning

### 6.14.2.1 Extraction

The Debmarine Namibian operations are fairly unusual, as diamond-bearing deposits of ancient marine beaches are mined at up to 140m water depth. Debmarine has pioneered these techniques over the last 20 years. The deposits that are currently mined lie off the Namibian coast, and the production is therefore under contract, and credited, to Namdeb. There are also deposits off the South African Coast, for which De Beers holds prospecting permits. However, these have not been prospected and evaluated to the extent of the Namibian deposits and have not as yet been demonstrated to be viable.

The mining methods applied are conducted from a fleet of four ships, mainly adapted from oil drilling and currently two mining techniques are available. These are the vertical and horizontal methods. The vertical method, the original one to be used, consists of a large-diameter drill bit lowered onto the seabed by a drill stem with weight and torque applied through a kelly on the ship, very similar to oil drilling technology. Airlift brings the drill chips and diamonds to surface where they are fed through a diamond recovery plant. The horizontal method involves a crawler mounted mining tool, connected to the ship by an umbilical electrical cable, which is capable of lateral movement along the seabed. The tool mines in strips airlifting the ore to surface via hoses. This method involves less movement of the vessel and is therefore potentially more productive.

Namdeb currently has resources in the main Atlantic 1 concession off the Namibian coast for approximately 10 years of production at current levels. Prospecting work continues in Atlantic 1, the outcome of which is uncertain. Mining of the deposit is complex and although every attempt is made to optimally exploit the deposit, high risk is prevalent as reflected in the low probability assigned in the factor used for evaluating inferred mineral resources.

### 6.14.2.2 Treatment

Debmarine Namibia owns 4 production vessels that operate in the Atlantic 1 licence area. In addition Debmarine South Africa owns a dual purpose exploration and production vessel and a survey vessel that supply prospecting services to Debmarine Namibia. Each vessel has a process plant aboard that has features to treat specific types of deposit, e.g. clay, sand, or high shell content.

The typical marine flowsheet, with the exception of the MV !Gariep, which has scrubbing prior to DMS, comprises four major sections:

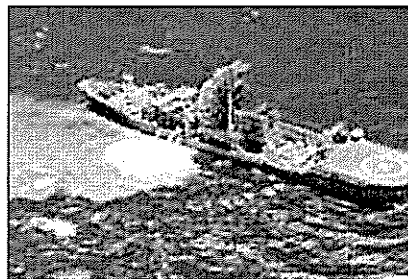
- primary screening;
- low density DMS plant;
- high density DMS plant; and
- recovery.

Material from the seabed is air-lifted to the surface, by the injection of air into the drill string just above the drill bit, for further processing in the vessel-based treatment plants. The airlift deposits the slurry into a de-aerating (DA) bin allowing air to escape to the atmosphere. Material from the DA bin gravitates to a primary screening section having a rated capacity of 400tph. In the primary screening section, fines (-2mm) and oversize removal (+19mm) takes place. The product stream (2 to 19mm material) from the primary section gravitates or is pumped to a de-watering prep screen prior to the Low Dense Medium separation (LDMS) circuit. The LDMS was originally instituted to remove excessive amounts of shell and clay, prior to proper material concentration.

Material from the prep screen is fed directly into a low-density medium sump, from which material is pump-fed to dense medium cyclones. The LDMS circuit has a rated capacity of 50tph. Separation effected by the cyclones splits the feed stream into floats and sinks. Floats material is ejected overboard, either by gravity or by means of conveyors. Sinks material, dependant on composition, will either be routed immediately to the high density medium separation (HDMS) circuit, or be routed to the milling and crushing circuit if a high shell content is observed.

The crushing circuit consists of a 30tph Barmac crusher and a 10tph ball mill. Material from this circuit, following the removal of crushed shell by screening, is routed to the HDMS circuit.

Product from the LDMS and crushing circuit is fed into the mixing boxes of the HDMS circuit that pump-feed smaller dense medium separation cyclones. The HDMS circuits are generally rated at 25tph. Floats material from this circuit is ejected overboard, whilst sinks material passes on to the enclosed recovery plant.



*MV Debmara Pacific*

Inside the recovery plants, rated at 0.6tph, material is dried in either hexagonal drum or pan fed infrared dryers. The dry material passes over a sizing screen separating the feed stream into 2 to 8mm and 8 to 19mm fractions. These fractions are allowed to cool in bins before being separately processed through an x-ray machine. Following one retreatment cycle, tailings from the x-ray machine are ejected overboard. Concentrate from the x-ray machine gravitates to the canning machine, where the final product is sealed in bar-coded cans by an automated canning process.

#### **MV Douglas Bay (Debmara SA)**

This vessel was commissioned in 1986 as a deep-water sampling vessel. The process is specifically designed for high efficiency recovery from samples. The equipment is in a fair condition. The vertical mining method is used to generate a headfeed of 300tph through screens, roll crusher, DMS, pan drier and x-ray recovery to canned product. A low level of conventional automation exists within the plant. A project to convert this vessel for mid-water mining is planned to commence in mid 2002.

#### **MV Coral Sea (Debmara SA)**

This vessel has the ability to be deployed in either a sampling or production

mode. It was commissioned in 1990 and upgraded in 1997. The vertical mining method treats 400tph through screens, crusher, ball mill, DMS, pan drier and x-ray recovery to canned product. A medium level of conventional automation is installed in the process plant. Process efficiency is good and plant condition is fair. The process plant is due for upgrading in the latter half of 2002.

#### **MV Grand Banks (Debmarmine Namibia)**

The MV Grand Banks was commissioned in 1990, and is scheduled for an upgrade during 2001/2002. Even though the plant is old, well-controlled operation has ensured a continued high level of process efficiency. A vertical mining method delivers 400tph, which is treated through screens, crusher, ball mill, DMS, drum drier and x-ray recovery to canned product. A medium level of conventional automation is deployed in the plant. A project is underway to install a ball mill and to upgrade the in line pressure jig during 2002.

#### **MV Debmar Atlantic (Debmarmine Namibia)**

This vessel was commissioned in 1995, and has a high process efficiency. The plant is in good condition. The vessel makes use of vertical mining methods and has a capacity of 400tph. The plant equipment includes screens, crusher, ball mill, DMS, drum drier, x-ray recovery and a final product canning machine. A medium level of conventional automation is used to control and operate the plant. Upgrade of the treatment plant for improved liberation and throughput is planned for 2002.

#### **MV Debmar Pacific (Debmarmine Namibia)**

This vessel which was commissioned in 1997, has good process efficiency and is in good condition. It is also a vertical mining vessel and has a capacity of 400tph. The onboard plant includes screens, crusher, ball mill, DMS, drum drier, x-ray recovery and a final product canning unit.

Conventional automation is used to monitor and control the process. Given the plant's good condition, an upgrade to improve liberation and throughput is only planned for late 2003.

#### **MV !Gariiep (Debmarmine Namibia)**

This vessel was fitted out and commissioned in 1999. The plant is still in very good condition. This vessel uses the horizontal mining method, and has a crawler which is capable of delivering 400tph to the on board plant. The plant equipment includes; screens, crusher, scrubber, ball mill, DMS, drum drier, x-ray recovery and a final product canning unit. Commissioning difficulties led to substantial modification to the underwater crawler and although production had improved there are further major modifications required to the mining tool to achieve the original specification with regard to throughput and carat recovery.

### **6.14.3 Current Production Trends**

De Beers Marine has consistently met budgeted carat production targets. Various improvements in mining technology as well as the introduction of a new mining vessel in 1999 have resulted in the progressive increase in carat production.

## 6.15 Namaqualand Mines

### 6.15.1 Background

Namaqualand Mines is responsible for exploration and mining operations within the mineral prospecting and mining licences held by DBCM from South of Port Nolloth to the Olifants River. The coastal licenses include the surf zone up to 100 cape feet (30.5m) from the high-water mark. Together with diamond placers in southern Namibia, these deposits contribute to the unique economic significance of the diamond placer province represented by the "Diamond Coast" of Southern Africa.

Diamonds were discovered on the Namaqualand coast at Oubeep in 1925. Further discoveries on the farm "Kleyne Zee" in 1927 led to the property being offered to the Government in 1928. This was rejected, and the Cape Coast Exploration Company (CCEC) purchased the property in 1928. Sir Ernest Oppenheimer chaired this company from 1929. Mining has occurred intermittently since 1930.

An aggressive primary exploration programme to locate and develop new diamond resources for Namaqualand Mines realised its first successful delivery in 1998.

The operations have a Chamber of Mines 5 star safety rating and are presently in the process of obtaining ISO 14001 environmental accreditation.

### 6.15.2 Geology and Sampling

#### *Buffels Inland and Marine Complex*

The Buffels River is one of the major Namaqualand fluvial systems supplying clastic material, including diamonds, to the high-energy Atlantic coast. Sedimentological observations indicate that the region has been considerably wetter in the past, when large volumes of material would have been transported to the coast. Discontinuous channel remnants representing different periods of fluvial incision since the Cretaceous period are preserved along the course of the river system. Changes in sea-level contributed to the system alternately aggrading and incising along its course, in addition to any influence of local tectonics.

Large boulders of gneiss derived from erosion of the escarpment form obstacle clast trapsites in the vicinity of Langhoogte on the Buffels River, but clast size diminishes rapidly downstream towards the west. Diamond concentration downstream of the escarpment is controlled by the flow dynamics through the sinuous river course and the presence of irregular bedrock topography, which forms fixed trapsites. Processes associated with the formation of gravel bars contribute to the presence of mobile or transient trapsites.

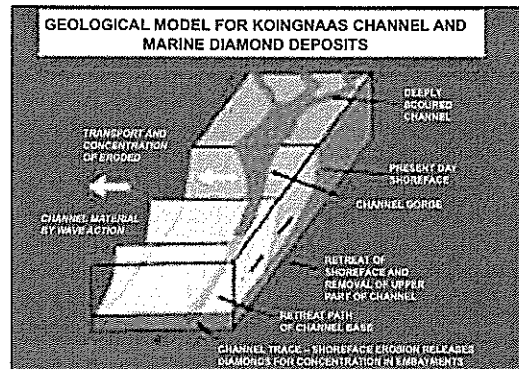
#### *Koingnaas Channel and Michell's Bay*

Fluvial systems in Koingnaas and Michell's Bay differ in character from the Buffels River. These systems are predominantly infilled with clay, but the basal gravels contain diamonds. The channels, which formed in the Cretaceous and early Tertiary periods, contain quartz-rich gravels typical of tropical climatic regimes, and the factors controlling diamond distribution resemble those associated with present-day fluvial systems in Ghana, for example.

Material supplied to the Atlantic coastline has been reworked extensively by the high-energy surfzone conditions and transported predominantly to the north by longshore currents. Fixed trapsites in the form of wave-cut platforms associated with gullies and potholes significantly enhance the capacity of natural processes to concentrate diamonds. Fluvial channels have locally cut through and eroded the

palaeoshorelines preserved onshore, redistributing diamonds out on to the continental shelf to the west.

The marine deposits at Koingnaas and Mitchells Bay are closely associated with the presence of channel remnants. Diamond concentration is upgraded considerably where the high-energy shoreline has been able to erode to the base of the channels, reconcentrating the diamonds within the resulting embayments. Large obstacle clasts derived from the gneissic bedrock form trapsites, further enhancing concentration processes.



#### *Sampling On-shore Deposits*

Remote sensing is used extensively together with probe drilling to locate and delineate palaeochannel remnants of the Buffels River. Historically, large diameter auger systems with a 1 m diameter auger head have been used to sample to 40m. Current targets at 60 to 80m are beyond its capacity. Following tests with a hydraulic grab system, a large diameter bucket auger system (2.5m diameter) is currently being used. Samples are treated in a specially designed sample treatment plant. Final recovery is completed in the high-security Namaqualand Mines Geolab.

Detailed geostatistical studies have demonstrated the criticality of sample support size due to the low grade of remaining marine sequences. Consequently, large bulk samples are used to assess the potential of remaining blocks of ground. The sample treatment plant is currently being upgraded with crushing facilities to improve the integrity of results from marine deposits affected by cementation. Emphasis is placed upon the reliability of knowledge incorporated in the geological model. In view of the high cost of sampling at depth, the geological continuity of facies is an important criterion for assessment of results and the classification of resources.

#### *Marine Deposits*

The fluvial systems preserved on the Namaqualand coastal plain have supplied diamonds to the continental shelf during marine regressions. Substantial erosion of terrigenous continental shelf sequences has released diamonds for concentration by shoreface and shallow-marine transport. Although trapsites are locally developed in outcropping cemented shelf sediments, sand and clay footwalls commonly occur. The region is characterised by a low-grade but widely distributed diamond resource.

Sampling and estimation methodologies applied to the South African Sea Areas are identical to those applied in the Atlantic 1 Mining Licence by Namdeb. Diamond resource classification criteria are also similarly applied.

#### *Inferred Mineral Resources*

The inferred mineral resources were evaluated in the financial model using a probability of 60%. This factor is based on the fact that placers and marine deposits are notoriously difficult to evaluate due to their highly skewed diamond distributions and low grades. However these mines have an established mining history and well-developed geological models which are often highly indicative of grade.

### 6.15.3 Diamond Winning

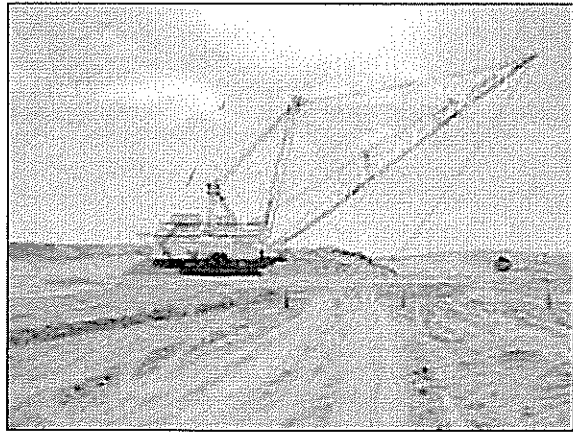
#### 6.15.3.1 Resource Estimation and Production Planning

Namaqualand Mines operates a unique ore resource accounting system which was specially developed to suit the two-dimensional nature of the deposit. It consists of two pieces of software, an off the shelf auditing module called Reserver which is combined with a locally developed graphical module called Shapes. The system combines the ore resource block model as defined by the geology department with a two dimensional graphical map (excavation model) to compute all the ore resource/depletion/rehabilitation information required by legislation.

The basic guidelines of the SAMREC code are followed, although the code has not been fully implemented. Only inferred and indicated resources are delineated, as the extremely erratic nature of alluvial diamond mineralisation makes measured resource delineation impractical. Due to the extremely high "nugget effect" in the deposit as a result of the erratic trap site development on the marine terraces and in the fluvial channels, arithmetic averages have traditionally been used to delineate aerial grade and stone size. Linear geostatistical methods are now being investigated for the new Inferred Resources that were added in 2000. Using these new methods, geological interpretation and additional sampling it is hoped much of this material can be upgraded to indicated resources in 2001.

#### 6.15.3.2 Extraction

The mining method is strip mining. Overburden, ranging in depths from almost zero to 40m, is removed in successive strips, or cuts, to expose the diamond-bearing gravels (ore) which lie on the bedrock and range in thickness from around 0.5 up to 2m. Stripping is conducted by two methods: 1) dragline, and 2) truck and shovel.



*Overburden stripping*

A total of approximately 28Mt is stripped annually. The majority of the ore is gathered into piles by bulldozer and loaded into trucks for transportation to one of 5 main treatment plants. Small excavators and manual sweeping crews remove the remainder of the ore, lying on the bedrock, until the bedrock is completely clean. The bedrock ore is also gathered into piles for transport to the treatment plant. A total of approximately 6Mt of ore is treated annually. Ore is mined from a variety of cuts at any one time to ensure a good blend of material for the plant. Once a cut has been depleted down to the bedrock the next cut can be stripped, with the overburden being deposited into the void of the previous one. A custom-designed linear programme assists in the selection of stripping cuts and the long-term ore blend for each plant area. The process ensures that the deposit is mined efficiently and responsibly.

The plants treat the ore down to a concentrate, which is transported to the final recovery for x-ray separation and hand sorting.

Currently the SBP predicts exhaustion of reserves in 2009. However, prospecting continues both within the current mine area and beyond. Renewed emphasis on areas of prospecting shows promise of replacing reserves within the next five years at a rate exceeding production.

### 6.15.3.3 Treatment

#### *Tweepad Treatment plant*

This plant was commissioned in 1978 and has been shut down and re-commissioned several times. It was last re-commissioned in 1996. This plant uses proven technology and is in good condition. The plant treats 550tph ROM through crushers and DMS. There is a medium level of conventional automation. Investigations are underway to install new crushers to reduce maintenance cost and improve liberation.

#### *AK3 Treatment Plant*

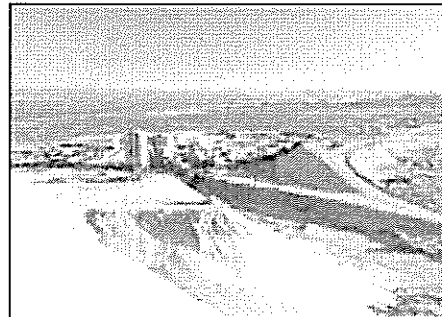
Originally this plant was commissioned 1972 and subsequently de-commissioned between 1982 and 1986. The plant is in good condition and currently treats 500tph ROM through crushers and DMS. There is a medium level of conventional automation.

#### *Langhoogte Treatment Plant*

This inland plant was commissioned in 1967 and utilises pan technology that, although old, is well suited to the wide variety of river sediments that it is required to treat. A DMS section was added in the mid 1990s, and a modern crusher was installed in 1999 to improve liberation. This plant is in good condition and has a headfeed capacity of 80tph. There is a low level of conventional automation.

#### *Koingnaas Treatment Plant*

Commissioned in 1978, this plant uses proven technology. The plant is in reasonable condition and treats 200tph ROM. There is a low level of conventional automation and investigations are currently underway to treat clay-rich ore and improve liberation to increase revenue per tonne treated.

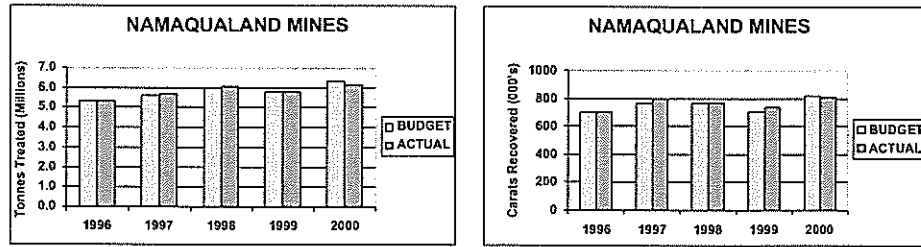


#### *Recovery and Sorthouse*

#### *View of Koingnaas*

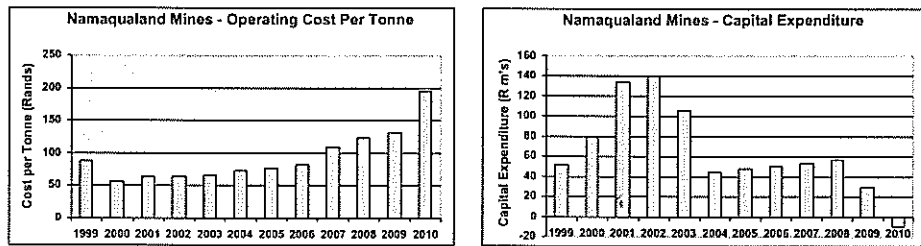
Commissioned in 1978 and modified in 1988 to improve recovery efficiency. In 1999 a new plant supervisory control and data acquisition (SCADA) system was installed. This has resulted in increased diamond recovery efficiency and enhanced product security. The plant treats DMS concentrates from all the plants upstream utilising x-ray and permroll technology to produce diamond concentrate for hand-sorting in glove boxes. A diamond transportation system has been installed in the final sorting section to reduce diamond breakage.

### 6.15.4 Current Production Trends



Improved efficiency and the introduction of infield screening has resulted in a 13% rise in tonnage treated between 1996 and 1998. The budgets were reduced in 1999 due to lower demand for diamonds. However, 2000 saw the tonnage treated target again increased beyond that of 1998. Carat production has also increased.

### 6.15.5 Operating and Capital Expenditure



The graphs show the operating cost per tonne treated and capital expenditure for the operation in nominal Rand terms with 1999 and 2000 depicted as actuals and 2001 to 2010 are forecast figures. Capital expenditure fluctuations are due to the replacement of mining equipment and exploration expenditure. The operating unit costs increase as the mine approaches the planned closure in 2010.

### 6.15.6 Mineral Resource and Reserve Classification

The mineral resource and reserve classification for the mines is contained in the table below. Also shown is the planning revenue for 2001.

Namaqualand Mines	Metric m <sup>2</sup> (millions)	Grade (cts/m <sup>2</sup> )	Carats (millions)
Probable reserves	17.4	0.37	6.4
Indicated resources	18.2	0.06	1.1
Inferred resources	16.1	0.34	5.4
<b>Total reserves and resources</b>	<b>51.7</b>	<b>0.25</b>	<b>12.9</b>

\*At a bottom cut-off size up to 2mm, a planning revenue of US\$127 per carat (including Koingnaas).

## 7. Sales and Marketing (DTC)

### 7.1 Overview

The DTC is the marketing arm of the De Beers Group of companies. It includes The Diamond Trading Company Limited, incorporated in England and Wales, The Diamond Trading Company (Pty) Limited, incorporated in the Republic of South Africa and associated companies within the De Beers Group. It purchases, sorts, values and markets rough diamonds mined by the De Beers Group as well as those from third-party sources.

The DTC operates a selling system known as Sights, which are held ten times a year. The DTC's clients are known as sight holders.

In July 2000, the DTC announced the launch of its Supplier of Choice strategy, aimed at driving growth in demand for diamond jewellery.

### 7.2 Extent of Operations

The DTC comprises a number of companies within the De Beers group that purchase, sort, value and market approximately two-thirds by value of the world's annual supply of rough gem diamonds. The DTC's primary sales outlet is in London; there are additional offices in Johannesburg and Luzern.

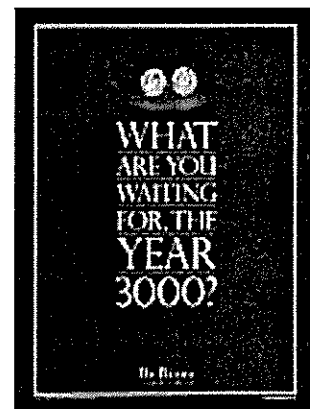
As well as marketing diamonds from the De Beers Group producers, the DTC also purchases and sells rough diamonds from third-party producers on a contractual basis. The most important of these arrangements are a trade agreement with the Russian state producer company, Alrosa relating to Russian production, and an agreement with BHP relating to the Ekati mine in Canada.

Whilst the DTC also used to purchase diamonds on the open market, it ceased all open-market purchases in December 1999 in order to ensure that, in compliance with United Nations Resolution 1173, it did not purchase diamonds from any area in Africa controlled by forces rebelling against the legitimate and internationally recognised governments of relevant countries (so-called 'conflict diamonds'). Furthermore, the DTC guarantees that no diamonds that it sells are in contravention of United Nations Resolutions 1173, 1176 or 1306.

The DTC seeks to implement the best working practices in relation to skills and technology. The company is currently developing a sophisticated stock management system that will increase its ability to monitor the flow of diamonds through its purchasing, sorting and valuing processes.

In addition to its sorting, valuation and sales activities, the DTC has for many years made significant investment in generic diamond marketing and promotional expertise. The De Beers Group began generic diamond advertising and promotional campaigns in 1939. Since then, its activities in this area have been successful in increasing diamond sales, creating new interest in diamond jewellery and developing new markets. This continues today through the DTC, which this year will spend approximately US\$180 million promoting diamond jewellery in 18 languages, in 16 countries around the world.

The Group, through its separately managed Diamond subsidiaries, also supplies goods on the secondary market to diamond dealers including those who wish to purchase smaller quantities of rough diamonds or who require specialist or niche assortments.

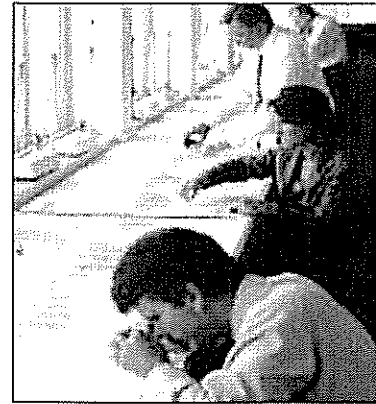


*Generic advertising*

### 7.3 Sorting, Valuation and Sales

Before marketing, diamonds are sorted and graded. The DTC has developed a highly skilled and sophisticated sorting process which ensures that a consistent range of products is supplied to its sightholders over time.

The DTC has major sorting offices in Kimberley, Windhoek and London, with additional facilities in Antwerp and Luzern. Debswana's diamonds are sorted in Gaborone by Debswana's diamond sorting subsidiary BDVC. Each month, the DTC's diamond sorters handle many millions of carats of rough diamonds that are sorted by size, shape, colour and quality into some 16,000 categories. Each stone is valued according to its individual characteristics and at the current DTC selling price for that category. Through its Research and Development department in Maidenhead in the UK, the DTC has developed a family of technically advanced machines that perform many of the sorting tasks required.



Once the diamonds have been sorted and graded, and automatically priced according to the DTC's price list, they are blended into a 'selling mixture' in order to give sightholders access to a range of goods which reflect the world-wide nature of the DTC's sources of production. The selling mixtures are divided into 'boxes' which contain specific and appropriate ranges of rough diamonds tailored to an individual sightholder's needs.

In compiling boxes, the DTC balances two imperatives. On the one hand it needs to manage its stock of rough and sell a balanced range of goods. On the other hand, it also needs to develop assortments that meet its sightholders requirements.

### 7.4 Sightholders

Sightholders can be categorised broadly into manufacturers, dealers and preparers. Some sightholders carry on a combination of these functions, and most sightholders are active at more than one level of the diamond pipeline. Rough diamonds are purchased by manufacturers (who cut and polish rough stones) and by dealers specialising in supplying rough diamonds to the secondary market. The majority are based in the traditional cutting centres of Antwerp, Mumbai/Surat, Tel Aviv, Johannesburg and New York. Some rough diamonds are purchased by specialist preparers who partially process the stones by sawing or cleaving them in preparation for the cutting and polishing process.

Most sightholders are represented by their brokers who act as the interface with the DTC. Around 80% of the DTC's sales occur at the London sights; the remainder are split between Johannesburg and Luzern. Only South African sightholders attend the Johannesburg sights.

The DTC is a 'cash' business; sightholders pay for their goods before they are despatched from the relevant Sight office.

### 7.5 Supplier of Choice and the "Forevermark"

De Beers recently announced a fundamental change in its approach to the market and the operation of the DTC. While the DTC was highly successful when it was first established (in enabling the industry to survive the economic crisis of the 1930s), market conditions are now significantly different.

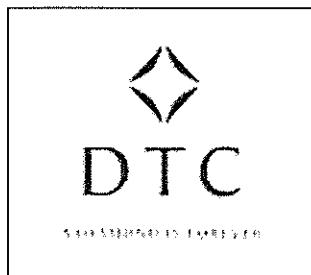
In response to these changes in market conditions, De Beers announced its Supplier of Choice initiative in July 2000. The focus of the initiative is to drive growth in consumer demand for diamond jewellery. One of its aims, therefore, is to develop DTC's business relationships with its sightholders in a manner which will encourage long-term growth at the retail level and will

produce a sustainable increase in rough diamond demand, with a focus on meeting the requirements and expectations of consumers. At the same time, the formalisation of these relationships will result in the introduction of greater transparency and certainty in supply terms.

One of the key aims of Supplier of Choice is to encourage sightholders to take a more proactive role in promoting diamonds as a product at the retail level. Under Supplier of Choice, the DTC will make its marketing expertise available and may provide financial support to assist clients to develop their own marketing campaigns. It will also offer technical support and act as a consultant, exploiting its extensive market research.

The Supplier of Choice initiative, which will be subject to review by the European Commission, will establish a fair and objective basis for the allocation of available supplies of rough diamonds. This will support the investment and development activity required to grow the diamond jewellery business and promote best practice principles thereby enabling diamond jewellery to compete effectively against other luxury goods and to ensure that consumers can rely with confidence on the skill and integrity of the diamond industry.

The long-term nature of the DTC's Supplier of Choice initiative means that the transition from the market perception of the CSO as a traditional 'market custodian' in its role as supplier of last resort will be evolutionary. Since Q4 2000, the gradual downturn in global economic indicators and consumer confidence, especially in the United States, has resulted in a reappraisal of the short-term diamond consumer market, recognising that Supplier of Choice is in a nascent stage.



*The DTC logo  
incorporating the*

As part of the De Beers Group's ongoing review of its operations, it is continually seeking to develop new programmes that are additional to the new Supplier of Choice arrangements. As part of this process, DTC intends to develop a new trademark, the Forevermark, from which it intends its sightholders, and their retail customers, will benefit.

The "Forevermark" will symbolise the De Beers Group's commitment to integrity by the adoption of the highest professional and ethical standards throughout a network of partnerships that will bring the best diamonds to the best retail outlets.

In addition to changes to its supply arrangements, the DTC has developed best practice principles to promote and encourage high industry standards; these principles and standards are a key element to the new supply arrangements. The DTC and its sightholders will be bound to observe principles designed to ensure that customers can rely with confidence on the professional and ethical standards and technical skills of the diamond industry. The following business practices have been defined as being unacceptable:

- buying and trading rough diamonds from areas where this would encourage or support conflict or human suffering;
- the use of child labour;
- practices which intentionally or recklessly endanger or harm the health or welfare of individuals; and
- conduct which conflicts with the highest professional, ethical and technical standards and which would undermine consumer trust and the reputation of the gem diamond industry.

## 7.6 Supply/Demand models and forecasting

### *Methodology*

In order to help plan its strategy for the future, De Beers formed the Supply/Demand Management Committee. One of the tools that it uses is a proprietary model designed to approximate the worldwide diamond business. The Committee is supported by a team that collects the best data available to De Beers and provides the Committee with relevant analysis.

Key data includes estimates of:

- production levels (both De Beers and non-De Beers);
- contractual third-party purchases;
- supply (rough stocking levels);
- pipeline (polished and retail stocking levels); and
- diamond consumer demand in terms of polished wholesale prices and its equivalent in rough diamond value (growth scenarios).

De Beers' production estimates are based on the current SBPs. Third-party group purchase estimates include appropriate probability factors attached to contract renewals where applicable. The model is used to evaluate the impact of various scenarios on the Group, using the combined interaction of the factors listed above.

There are a number of factors outside of general market considerations that need to be taken into account when evaluating output from the Supply/Demand model. Many of the inputs are difficult to measure, such as the level of third-party productions (especially alluvial), and the quality and value of the polished diamond content within a piece of jewellery.

Assumptions are made regarding the optimum stock levels, by category, to be held by the Group, expressed as a percentage of annual sales. Further assumptions are made, such as the level of pipeline industry stock cover, how these ratios might be affected by changes in consumer demand, and how third-party suppliers may react under varying market conditions.

Other factors, such as country risk, technical risk, and the provability of resources are taken into account in the financial model discussed in Section 11.

After computing the data for a given scenario, a process is undertaken whereby the output and the implications of the data produced are subjected to reasonableness tests, and a consensus view on the appropriate levels of production, stocks, sales and pricing is generated by the team and Committee, for recommendation to the De Beers Executive.

The model is therefore an indicator of the theoretical DTC sales figure that may be achieved under a given scenario, identifying where production constraints may affect sales, and where imbalances between supply and demand may exist.

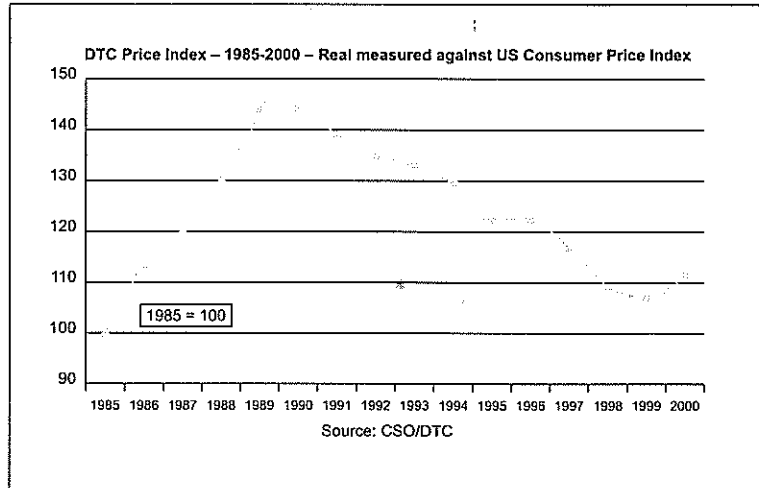
By measuring any potential imbalance in the pipeline, the model can then be used to estimate the level of price increases or decreases that would be required to restore market equilibrium under certain price elasticity assumptions. An estimate is then made of the implied price changes applicable to worldwide rough diamond supply, which will bring supply and demand back into balance.

De Beers has used output from the Supply/Demand model to indicate, for the period 2001 to 2010, where imbalances in supply and demand are expected to occur, and what adjustments to price levels of worldwide rough diamond supply are indicated. This is discussed in more detail in Section 11.3.2.

### Rough Diamond Prices

Rough diamond prices have always been exposed to the effect of changes in macro-economic factors.

The graph shows the overall level of price changes applied to the DTC rough diamond price book in real terms (deflated by the US Consumer Price Index) from 1985 to 2000. Prices rose as the global economy and consumer demand expanded in the latter part of the Eighties. Substantial incremental consumer demand



was experienced in Japan between 1985 and 1989 with the cost of diamonds steadily decreasing in Japanese Yen as a result of the strengthening of the currency against the US Dollar. There was a steady decline in diamond prices in real terms throughout the Nineties, caused, *inter alia*, by Russian de-stocking, unregulated supplies from Angolan alluvial areas, the Asian financial crisis, and a fall in consumer demand in Japan.

There has been an upturn in 1999/2000, brought about by a buoyant US economy and the effect of exceptional consumer demand for the Millennium. During 1999 growth in global diamond jewellery consumption was over 10%, compared to a global GDP growth, weighted towards the countries where diamond jewellery is consumed, of approximately 5%. This exceptional upturn has resulted in an increase in rough diamond prices during 2000.

With increasing competition in the diamond industry, it is reasonable to assume that the prices of rough diamonds will be subjected to the effects of market forces, both positive and negative, to a higher degree than has been witnessed in the past. This may lead to more frequent revisions to DTC prices. In addition, certain types of goods may experience a wider range of price fluctuations than has previously been the case. Furthermore, consumption in Japan, accounting for as much as 28% of the world-wide diamond jewellery market in 1991, continues to decline and recent macro-economic data gives further cause for concern.

The overall predicted year on year rough diamond price increases indicated by the Supply/Demand model will be a reaction to the need to bring industry supply and demand into equilibrium should the need arise. The predicted increases are estimates of the prevailing market price changes as shown by the model.

The Supply/Demand model, when considering the 'consensus' scenario, produces an estimated compound annual growth rate in nominal rough diamond prices of 4% between 2001 and 2010 (see section 11.3.2).

### 7.7 DTC Research Centre

The DTC Research Centre, based in Maidenhead in England, is a unique facility providing a world-class gem diamond research capability for the De Beers Group. The laboratory has a breadth of expertise spanning fundamental research through to applied research and development and equipment manufacture. It is responsible for the scientific aspects of the gem defensive programme, for the development of sorting and valuing equipment for rough gem diamonds, for technologies for cutting and polishing and for various branding technologies.

Integrity of natural, untreated diamonds and consumer confidence in De Beers' product is of paramount importance. As a consequence, highest priority activities are:

- researching discrimination characteristics for synthetic diamonds and diamond treatments;
- developing detection techniques and instruments; and
- ensuring that the diamond trade and gem grading laboratories world-wide are briefed on any issues that might affect consumer confidence in natural diamonds.



*A 'Diamondsure' tester*

Substantial progress has been made in developing new generations of discrimination instruments to identify synthetic diamonds, simulants and diamonds artificially treated to change their appearance (gem defensive programme). Should the need arise, these instruments can be rapidly deployed to the trade to maintain consumer confidence.

Production versions of a new generation of rough diamond sorting machine capable of high speed sorting of small diamonds for quality and colour are being installed in DTC sorting operations. Advanced technology equipment for sorting larger diamonds more accurately has been successfully developed, and production design has commenced. Weighing machines for sizing diamonds continue to be manufactured, and increased numbers of advanced sorting and weighing machines have been deployed in De Beers' Southern African sorting offices.

The Research Centre maintains an extensive intellectual property portfolio comprising a substantial suite of patents, trademarks and design registrations. This portfolio protects the investment made by DTC in its technology, but it is also available for commercial exploitation.

## 8. De Beers/LVMH Branding Initiative

### 8.1 Overview

On 16 January 2001, the De Beers Group signed an agreement with LVMH Moët Hennessy Louis Vuitton ("LVMH"), the world's leading luxury products group company to establish an independently managed and operated company to develop the global consumer brand potential of the De Beers name.

The new independent company will have the global rights to use the De Beers name in consumer markets and will position itself as a premium jewellery and associated luxury goods brand. The immediate focus will be on premium diamond jewellery and it is anticipated that, subject to regulatory approval, the business will commence within the next 12-18 months with a small number of flagship retail stores located in the world's most prestigious cities.

De Beers and LVMH will invest equal amounts of capital to establish the independent company, that they will own equally.

The expertise of LVMH both in developing luxury brands and rolling out premium retail concepts, combined with technical diamond expertise from a one-off transfer from the De Beers Group will help realise the value inherent in the De Beers brand and is expected to act as a catalyst for brand competition in the sale of jewellery products.

### 8.2 Evaluation

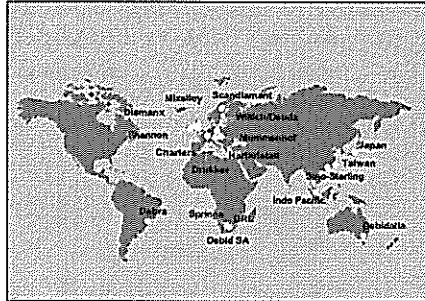
Although De Beers/LVMH has not yet fully developed the business plan, De Beers has prepared initial and preliminary estimates for the venture which may or may not correspond to the finally agreed upon business plan. The net present value range of the initial and preliminary estimates of the future cash flows is approximately US\$200 million to US\$500 million for De Beers' 50% interest in the company, and is based on the following assumptions and factors:

- The total global retail market for diamond jewellery (i.e. jewellery pieces containing at least one diamond) is currently estimated at approximately US\$56 billion and is estimated to grow over the next 10 years at an average annual rate of 2.5% in real terms. Of this total market, approximately two-thirds is represented by the United States and Japan.
- It will take the new company up to 10 years to achieve a share of 1.4% of the global retail market for diamond jewellery.
- Its principal markets will be in the United States and Japan and diamond jewellery sold by the joint venture will command a premium of 25% to 30% over diamond jewellery sold by unbranded, high-end independent diamond jewellery retailers.
- A probability factor has been applied to the preliminary estimate of future cash flows to reflect the fact that regulatory approvals has not been obtained, a business plan has not yet been fully developed and, at this stage, the new enterprise represents a concept yet to be launched as opposed to an ongoing business.
- A real discount rate of approximately 9% has been used reflecting the weighted average cost of capital of luxury goods companies.

## 9. De Beers Industrial Diamonds

### 9.1 Profile

De Beers Industrial Diamond Division (“Debid”) is one of the world’s leading manufacturers and suppliers of industrial diamond materials, including synthetic and industrial-grade natural diamonds used in industry for their unique and extreme properties.



*Debid has global presence*

De Beers’ interests in industrial diamonds was spearheaded by former De Beers Chairman, the late Sir Ernest Oppenheimer in 1946. Shortly thereafter, the Diamond Research Laboratory (“DRL”) was established in South Africa to support the use of diamonds in industry.

Debid has been central to the evolution from conventional abrasives to more cost effective diamond solutions, and provides the basis for continual developments in diamond technology.

### 9.2 Applications and End Markets

The application and major end-markets for Debid’s products is set out in the table below.

	Grit	Polycrystalline Diamond Cutting Tool Inserts	Polycrystalline Diamond Drill	Polycrystalline Boron Nitride	CVD
<b>Applications</b>	<ul style="list-style-type: none"> <li>Saws and grinding wheels</li> <li>Micron powders for fine grinding</li> </ul>	<ul style="list-style-type: none"> <li>Diamond cutting inserts for non-ferrous cutting</li> </ul>	<ul style="list-style-type: none"> <li>Diamond drill bits</li> </ul>	<ul style="list-style-type: none"> <li>Cutting tools</li> </ul>	<ul style="list-style-type: none"> <li>Non-abrasive applications using the thermal and optical properties of diamonds</li> </ul>
<b>Major End Markets</b>	<ul style="list-style-type: none"> <li>Construction</li> <li>Stone</li> <li>Automotive</li> <li>Aerospace</li> </ul>	<ul style="list-style-type: none"> <li>Automotive</li> <li>Wood</li> </ul>	<ul style="list-style-type: none"> <li>Deep sea oil and gas drilling</li> </ul>	<ul style="list-style-type: none"> <li>Automotive</li> <li>Aerospace</li> </ul>	<ul style="list-style-type: none"> <li>Communication</li> <li>Lasers</li> <li>Other</li> </ul>

Debid’s Chemical Vapour Deposition (“CVD”) diamond film products development is oriented towards high-technology applications which use the unique advantages of diamonds, particularly diamond’s optical and thermal properties. Success in introducing diamond film products into the market in demanding application areas involving lasers and high powered optics, as well as thermal management, have demonstrated the commercial viability of these materials in different forms.

### 9.3 Financial Information

Selected historic financial information for Debid for the years ended 31 December 1998 to 2000 is set out in the table below:

US\$m nominal	1998	1999	2000
Sales	249	272	248
Diamond Account	50	55	19
Own earnings	32	32	7
Total net earnings	32	32	7
Headline earnings	28	32	7

Increasing price pressure from low cost entrants and continuing product commoditisation in most markets is expected to result in declining profit margins. In light of this trend, Debid is taking steps to reduce its costs. It has recently announced consolidation of synthesis operations into three plants and closing the press shop in Shannon. In addition, there are plans to move the Charters Research & Development Centre to a new lower cost location.

## 10. Corporate Services

### 10.1 Human Resources

#### 10.1.1 Introduction

De Beers and its partner companies across the world employ over 23,000 people.

De Beers' leadership in the diamond industry has been achieved largely as a result of its people. De Beers places high value on the attraction, development and retention of human capital, which will drive and shape the business in the years ahead. To this end, active strategies are in place to develop core competencies in a variety of technical, support and leadership disciplines which, when combined, will enable De Beers to remain at the forefront of exploration, mining, extraction and marketing of diamonds.

However, there are a number of current and potential challenges, which De Beers is addressing. These include:

- competition for talent;
- retention and development;
- provision of equal opportunities;
- HIV/AIDS; and
- the development of transformational leaders.

#### 10.1.2 Competition for Talent

A strategic intervention has been initiated with the primary purpose of attracting and retaining talent to meet operational and strategic objectives. A dynamic approach is used to attract and retain skilled people – particularly those with strategically competitive competencies. Proactive recruitment methods such as internal talent-scouting exercises, referral systems and the Internet are being enhanced.

#### 10.1.3 Retention and Development

Employment turnover (excluding transfers and secondments) within the skilled and managerial levels is relatively stable within De Beers. During 2000, turnover in South Africa, Botswana and Namibia ranged from 4.8% to 8.9% at the skilled/professional levels, from 5.3 % to 8.9% at the middle management levels, and from 0 to 8.3% at the senior management levels.

At the core of retaining and developing talent are systems to quickly and effectively match employee aspirations with organisational needs. Group development and succession programmes are the major components of human resources management. Employees are able to develop their core competencies through deployment to projects and assignments that will add value to the organisation, or are seconded/transferred to other parts of the business to acquire broader technical, management and/or leadership experiences.

The extent to which De Beers is operating across the globe provides an additional dimension to personnel deployment and development. Transfers and secondments to other parts of the business are important cornerstones of meeting organisational needs, and addressing developmental opportunities.

Significant levels of investment are channelled across a variety of training and development activities. Total training-spend during 2000 amounted to over R93 million in South Africa, R64.7 million at Debswana, and R21.3 million in Namdeb. These activities include bursary schemes, apprentice and artisan training, technician

development, and initiatives relating to employment equity (South Africa), affirmative action (Namibia) and localisation (Botswana). Formal development programmes at junior, middle and executive management levels provide further opportunities for the retention and development of people. During 2000, over 50 current and prospective middle managers attended appropriate management development programmes, and 10 senior managers attended a global executive development programme. Capacity is being further developed during 2001 with the targeting of over 65 managers to participate in a De Beers and partner companies programme, and 35 senior managers participating in various executive development programmes.

Succession review processes are also important to gauge the relative “health” of the various disciplines or functions and to develop proactive human resources strategies to address problems identified.

A strong performance culture, supported by reward and recognition systems, provide a further stimulus to employees at a variety of levels making meaningful contributions to operational and strategic objectives.

#### **10.1.4 Equal Opportunities**

De Beers is sensitive to the different environments in which it conducts its business. Whilst core competencies and skills have been developed over many years, active strategies have been implemented to develop the skills profiles within the employee base of the host countries and regions within which De Beers operates. Deployment or secondment of core skills from the corporate centres are therefore supplemented by local training and development initiatives. Localisation programmes in Debswana, affirmative action initiatives in Namdeb, and employment equity plans in South Africa, are examples of employment strategies and practices being adapted to local conditions. Similarly, equal opportunities policies and practices are applied in other organisational settings such as the UK, Canada and Australia.

Remuneration and reward structures are fairly and equitably administered, and employee benefits are in place to address the health and retirement needs of employees via medical assistance, and pension plans.

De Beers complies with all forms of employment legislation in the countries where De Beers operates. Constructive relationships have been forged with recognised employee representative bodies to negotiate wages and conditions of employment, and to engage employees in workplace change and improvement strategies.

#### **10.1.5 HIV/AIDS**

Active HIV/AIDS programmes have been in place for many years. HIV/AIDS is an increasingly serious threat, particularly in Southern Africa. A high-level project team has been formed to develop active strategies to manage and minimise its impact. Best practice guidelines are being developed, and prevention and management strategies are being pursued. With the impact of HIV/AIDS expected to continue to increase over the next few years, determined measures to reduce further infections across workforces are being taken. A policy framework to ensure that HIV sufferers are treated fairly and equitably is being finalised.

#### **10.1.6 Transformational Leadership**

Strong and dynamic leadership at a number of levels has been responsible for De Beers' growth and development and adoption of leading technologies: both have required transformation of De Beers business practices and organisation. Continued growth will require development of operations in new countries such as Canada hand-in-hand with modernisation and expansion at existing operations such as the Premier C-Cut, and increasing production from the sub-sea environment. Recently, the new Supplier of Choice strategy was developed to increase value for all of De Beers'

shareholders. All of these initiatives have required capable leaders that can make the organisational changes needed to implement them and to realise their benefits. Strategies to develop and sustain a pipeline of transformational leaders continue to be implemented. During 2000, over 50 current and prospective middle managers built further their competencies through appropriate management development programmes, and over 10 senior managers were exposed to global executive development programmes. Capacity is being further developed during 2001 with the targeting of over 65 managers to participate in a De Beers and partner companies programme, and 35 senior managers participating in various executive development programmes. A development programme targeted at De Beers' future leaders - the De Beers Achiever Programme - was launched in 2000 with 50 employees attending. During 2001, a total of 150 achievers will be trained to further develop critical mass.

## 10.2 Legal and Environmental

### 10.2.1 Legal

#### 10.2.1.1 Ownership and the right to mine

De Beers' operating mines in South Africa include mines discovered as far back as the late 19th century (such as Kimberley Mines) through to The Oaks in the Northern Province which was discovered in the 1980s. The De Beers mining portfolio, therefore, spans various historical legal regimes, e.g. from pre-Union of South Africa statute law, (in the form of various Acts and Ordinances of the old Transvaal, Orange River and Cape colonies), through to the Precious Stones Acts of 1927 and 1964 and the current Minerals Act of 1991. The legal format and content of De Beers' portfolio of mining rights is therefore a faithful representation of the evolution of the law relating to mining and mineral rights in South Africa. Although De Beers' rights to mine were granted under different laws, all of these rights are recognised as valid rights to mine in terms of current legislation.

The De Beers portfolio includes mines in respect of which the underlying mineral rights are held by the State, as well as mines in respect of which the rights to diamonds are held by De Beers. In those cases where the underlying mineral rights are held by the State (Finsch, Namaqualand (with the one small exception of Michell's Bay, where the rights to diamonds are held by De Beers) and the Oaks Mines), De Beers is obliged to make lease payments to the State. Namaqualand pays about 25% of taxable income, Finsch and the Oaks pay according to sliding scale formulae, that approximate 27% and 5% of taxable income respectively. Because these payments are not imposts on gross revenue or on working costs, they have no impact on pay limits.

A draft Minerals Development Bill, which will revoke the current Minerals Act of 1991 and vest all mineral rights in the State, has been published by the South African Government for public comment by 31 March 2001. It is expected that the new legislation will be enacted in either 2002 or 2003 and that there will be a five year window period during which holders of old order mining rights will need to apply for new forms of licence, which will be granted for a maximum period of 25 years and upon such terms as the Minister may determine. The Bill makes provision for royalties on mining rights and export duties on diamonds, both at unspecified rates. The contentious issues of the Bill are the subject of discussions between the industry and the Ministry and it is not advisable to speculate on the outcome thereof.

The laws of Botswana and Namibia do not recognise private mineral ownership. The rights of Debswana and Namdeb to mine in these countries are constituted by Mining Licences issued by the government for periods of twenty-five years, renewable for further terms of similar duration.

### **10.2.1.2 Legal Risk**

De Beers has managed its business so as to avoid any undue legal risk arising out of US antitrust laws in the United States since its business policies have not required systematic contacts with the United States. De Beers is therefore not aware of any material exposure to its business under the laws of the United States. However, in 1994 the United States District Court for the Southern District of Ohio issued an indictment alleging that DBCAG and the General Electric Company conspired to fix the prices of industrial diamonds for a nine month period between 1991 and 1992. While the indictment has never been served upon DBCAG, the case against General Electric was dismissed. There have also been two private class action lawsuits filed in the US District Court for the Southern District of New York relating to the same claims. De Beers believes that with respect to both the indictment and the private suits that the US courts lack jurisdiction over the company and that therefore these suits do not subject De Beers to significant legal risks. Except as referred to De Beers is not aware of any material litigation or material pending litigation.

### **10.2.1.3 Taxation**

For over a year, the revenue authorities in South Africa and the UK have been engaged in general enquiries into the tax affairs of De Beers in their respective jurisdictions. These enquiries are general and wide ranging and include matters such as deductibility of expenses and transfer pricing. De Beers has answered all questions promptly and has responded to and supplied all requests for information, and has no reason to believe that any material exposure exists in this regard.

## **10.2.2 Environmental**

### **10.2.2.1 Introduction**

In caring for the environment and the communities in which it operates, De Beers requires all of its mines to attempt to meet the ISO 14001 Environmental Corporate Governance Management System. This covers the legal obligation to have a governmental approved environmental management programme (EMP) that covers construction, operating and closure phases of the mine. The issuing of a South African mining authorisation is subject to an approved EMP report (EMPR).

The EMP includes the bio-physical and social environments and would include land disturbance, water management, mining waste (waste rock, tailings and slimes), industrial and domestic waste disposal, infrastructure and associated (access, power supply) impacts.

### **10.2.2.2 Environmental risk and liability**

The approval of the EMPR (RSA mines) and issuing of a Mining Authorisation are subject also to the ability to undertake rehabilitation of surface disturbances, and the financial provision for the rehabilitation of such disturbances after closure of the mine. Chapter 6 of the EMPR requires that a closure plan be formulated, costed and that a financial guarantee for this amount be lodged with the DME.

The requirements for closure and pecuniary provisions for all South African mines are reviewed and updated annually and the provision adjusted accordingly. In addition, environmental management and rehabilitation are being addressed continually under annual operating and capital budgets. This covers staffing, consultants, pollution control, water and energy management, waste management and rehabilitation.

Closure provision is not a legal requirement in Namibia or Botswana. However, estimates for closure have been determined for Namdeb operations and are being prepared for Debswana operations.

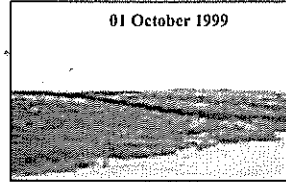
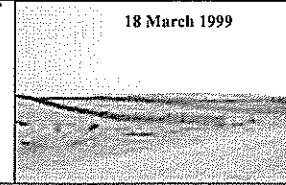
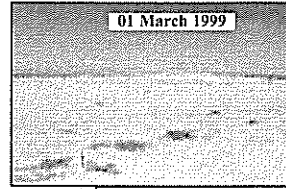
### 10.2.2.3 Rehabilitation

The goals for closure are to leave a safe, stable and self-sustaining post-mining environment ("zero aftercare") and restore the land to a productive land use. The major challenges are making safe the open-pits and rehabilitating and revegetating mining residues and disturbances.

Towards these goals at every mine a number of initiatives are in progress. For example:

- At Kimberley Mines redundant treatment plant has been removed; concrete structures have been demolished; and the slopes of the slimes dam wall are being flattened, topdressed and vegetated. Most of the old kimberlite tailings dumps will be removed, retreated in the CTP and the residues deposited in the open pits. This will reduce considerably the environmental liability and risk.
- At Koffiefontein, the Eskom dump has been regraded and topsoiled. The slopes of the waste rock dump are being flattened, topsoiled and revegetated.
- At Finsch Mine redundant treatment plant has been removed. Special attention has been given to improving industrial waste management. The slopes of the waste rock dump are being regraded, and the entire dump will be topsoiled and revegetated.
- At The Oaks Mine, innovative dump development makes use of waste rock to establish paddocks into which the processed kimberlite is deposited. This method enables a stable pollution-free slope to be constructed which is easily revegetated and allows for rehabilitation and revegetation concurrent with mining operations, reducing the closure cost and liability.
- At Premier Mine the focus has been on formulating an emergency response strategy in the unlikely event of a failure of No. 7 dam. The stability of the dam is carefully monitored and subject to independent external audit. The probability of such a failure is extremely low.
- At Venetia, special attention has been given to topsoil requirements for life of mine. Topsoil is pre-stripped within the footprint of future waste and tailings dumps and stockpiled for later use. Water is a precious resource, and storage of flood water from the Limpopo River ensures the sensitive Limpopo riparian system is not damaged during periods of no surface flow in the river.

- At Namaqualand Mines special attention has been given to addressing previously unmanaged disturbances as well as managing current mining operations. Topsoil resources are very limited and considerable effort has been given to determining and mapping available topsoil resources so as to ensure their efficient use.
- In the BMC mining area dragline overburden dumps are flattened, and areas of previously exposed bedrock have been backfilled.
- At Koingnaas impressive results have been obtained with rehabilitation of disturbed areas. Topsoil is carefully removed and stockpiled for later reinstatement, and stripped overburden is replaced immediately into the adjacent mined block. On completion a nursery oats crop is sown which provides shelter for the return of indigenous vegetation.



#### 10.2.2.4 Staffing and Accountability

Corporate environmental policy and practice is co-ordinated by the Manager, Environmental Services (Support Services). Environmental responsibility at each operation ultimately rests with the General Manager/Mine Manager. However, at all major operations there are one or more environmental specialists responsible for implementation of environmental management programmes.

## 11. Finance and Economic Evaluation

### 11.1 Assets

The following assets have been valued in this report:

- the core gem diamond mining and marketing business;
- exploration activities or projects;
- the industrial diamond business (Debid);
- the De Beers/LVMH branding initiative;
- the listed investment portfolio; and
- working capital (including stocks and cash) and other assets.

### 11.2 Valuation Methodology

The methodology used to value the various assets of De Beers is set out below.

#### 11.2.1 General Principles

De Beers' core diamond business has been valued on a going concern basis, with all the mines in which De Beers has an interest, the DTC and their related capital assets and working capital assets being treated as an integral and non-divisible part of that core business.

The nature of De Beers' core diamond business and factors such as pre-emption rights and marketing rights relating to various parts of the business deem it inappropriate to value the business on a break-up basis.

The valuation has been prepared as at 31 December 2000 and, where appropriate, cash flows have been discounted back to this date.

#### 11.2.2 Operating Mines and DTC Sales

De Beers' operating mines have been valued using discounted cash flow methodology. A financial model has been constructed which incorporates the life of mine cash flows for each mine and extends out to the year 2030. The production rates and costs for the mines have been based on the SBPs, as refined by De Beers' three-year rolling forecasts.

DTC sales, which include sales of diamonds produced from De Beers' and its partners' mines as well as sales of diamonds purchased under third party contracts, and changes in diamond prices have been estimated using the De Beers Supply/Demand forecasting model, capped by forecast limits on the availabilities of certain ranges of goods. Three supply/demand scenarios have been computed; 'upside', 'downside' and 'consensus'. A detailed description of these scenarios is set out in Section 11.3.2.

It should be noted that the De Beers Supply/Demand model seeks to forecast DTC sales and changes in diamond prices over a 10-year period but not specifically on a year by year basis. Accordingly, this impacts on the financial projections set out in this report which are not therefore intended to be year by year specific but intended to cover a period of years. The financial projections have been prepared by De Beers on the basis of current assumptions and have not been reported on independently.

### **11.2.3 Exploration**

A valuation range of between US\$0 and US\$100 million has been placed on De Beers' exploration activities. The range indicated takes account of the three scenarios computed in this report. A maximum value of US\$60 million was assumed for advanced exploration projects and a maximum of US\$40 million for all other assets.

### **11.2.4 De Beers/LVMH Branding Initiative**

Although the venture has not yet received regulatory approvals or fully developed a business plan, it has been valued using discounted cash flow methodology on the basis of initial and preliminary cash flow projections estimated by De Beers. Given the current conceptual nature of the venture, the cash flow projections have not been incorporated into the financial model and a separate, standalone NPV has been estimated.

### **11.2.5 Debid**

Debid has been valued using discounted cash flow methodology. The estimated future cash flows for Debid have been incorporated into the financial model.

### **11.2.6 Listed Investments**

De Beers' interest in listed investments (other than its investment in Anglo American) have been valued based on market values as at 31 December 2000.

### **11.2.7 Other Assets**

With the exception of adjusted net cash, De Beers' working capital, including diamond stocks and cash, has been valued on the basis that it is an integral part of De Beers' gem diamond and industrial diamond businesses and has therefore been incorporated into the financial model. De Beers' current diamond stocks are considered strategic and necessary for the ongoing conduct of its business as is its cash (other than adjusted net cash).

The adjusted net cash has been estimated having regard to the current level of De Beers' working capital and its future needs (and includes cash resulting from the exercise of options).

De Beers' other diamond industry investments have been valued on the basis of future estimated dividend streams and such dividend streams incorporated into the financial model.

### **11.2.8 Discount Rates**

NPVs have been calculated using real discount rates ranging between 10% and 15% having regard to De Beers' weighted average cost of capital ("WACC") for its diamond business, (adjusting for the impact of its shareholding interest in Anglo American) the estimated WACCs of other mining companies, implied discount rates estimated for comparable transactions and academic papers on the estimation of discount rates.

## **11.3 Assumptions**

### **11.3.1 Economic Assumptions**

- The US consumer price index (CPI) has been forecast to grow at a rate of 2.5% per annum from 2001 onwards, and the RSA CPI has been forecast to grow at a rate of 7.0% per annum from 2001 onwards.

- The exchange rate forecast assumes purchasing power parity rules from a base of US\$/ZAR = 7.90 for 2001. Therefore, the US\$/ZAR exchange rate has been depreciated at the differential between the US and RSA CPIs on an annual basis.

### 11.3.2 DTC Sales and Diamond Price Assumptions

Future DTC sales and price changes have been estimated using, *inter alia*, the De Beers Supply/Demand model. For the purposes of this section, GDP growth is defined as consensus forecasts of GDP growth, weighted for diamond jewellery consuming countries. The following broad scenarios have been evaluated:

- 'Consensus' – based on consensus forecasts of GDP growth, and the historic relationship between the economy and demand for diamonds. Consensus economic forecasts currently assume a slowdown, but not outright recession, this year, with some recovery in 2002. Appendix III contains a combined estimated cash flow and income statement based on this scenario.
- 'Upside' – based on the same economic forecasts as the 'consensus' scenario but with more optimistic market expansion targets. These targets result in significantly higher prices, increasing at a compound annual nominal growth rate of almost 6% over the next decade. This scenario also assumes a more optimistic view for contract third-party purchases by the DTC, modelling these in perpetuity, and lower costs involved in mining lease renewals.
- 'Downside' – based on a more negative economic outlook, with recession in the US during 2001/2 and correspondingly lower growth in the rest of the world, with a further cyclical slowdown in 2007/8. The compound annual growth rate in prices from 2001-2010 is a nominal 2%. Similar assumptions are made regarding third-party contractual purchases and mining lease renewal costs as with the 'consensus' scenario.

Of the three scenarios, the 'consensus' case shows the most probable outcome assuming GDP grows as consensus economic forecasts. Alternative outcomes currently tend towards the 'downside' case given the present position of the US economy, while the 'upside' scenario is regarded as very much a stretched target.

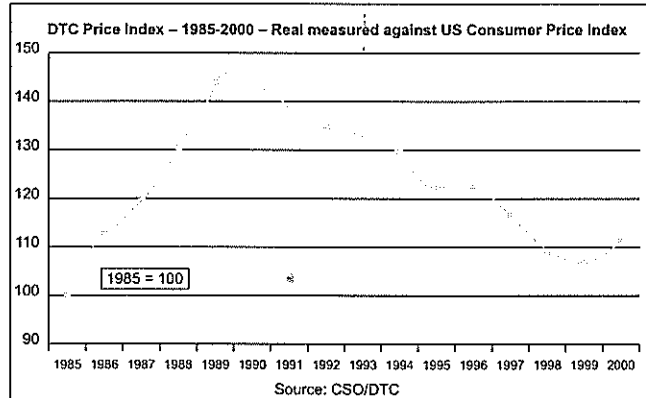
De Beers has announced a 2001 DTC sales target of US\$4.8 billion, subject to the world economy following consensus projections. This target, 15% lower than 2000, is driven largely by the impact of slowdown in the US, the current stock overhang at retail level caused by the disappointing Christmas season in 2000, and a slight increase in third-party supply during the year. Under the 'consensus' scenario, as generated by the De Beers Supply/Demand model, demand for polished diamonds is assumed to grow at 5.7% CAGR for 2001-2010, with DTC rough sales growing at 4.5% CAGR for the same period. However, due to the limits on the availabilities of certain ranges of goods, this indicative percentage growth in DTC sales does not flow into the valuation model in which DTC sales have been capped at levels commensurate with forecast diamond availabilities.

In considering a 'downside' scenario, previous experience has indicated that DTC sales could fall sharply if a fall in retail demand is accompanied by pipeline destocking. Limited experience of the effect of the Supplier of Choice initiative suggests that under this scenario sales in 2001 and in subsequent years should not fall as low as historical levels. Accordingly, US\$4.1 billion is regarded as being a more likely sales floor unless the economic recession is unduly severe. Growth in polished demand would be assumed to rise at 3.5% CAGR for 2001-2010.

### Rough Diamond Prices

Rough diamond prices have always been exposed to the effect of changes in macro-economic factors.

The graph shows the overall level of price changes applied to the DTC rough diamond price book in real terms (deflated by the US Consumer Price Index) from 1985 to 2000. Prices rose as the global economy and consumer demand expanded in the latter part of the Eighties. Substantial incremental consumer demand was experienced in Japan between 1985 and 1989 with the cost of diamonds steadily decreasing in Japanese Yen as a result of the strengthening of the currency against the US Dollar. There was a steady decline in diamond prices in real terms throughout the Nineties, caused, *inter alia*, by Russian de-stocking, unregulated supplies from Angolan alluvial areas, the Asian financial crisis, and a fall in consumer demand in Japan.



There has been an upturn in 1999/2000, brought about by a buoyant US economy and the effect of exceptional consumer demand for the Millennium. During 1999 growth in global diamond jewellery consumption was over 10%, compared to a global GDP growth, weighted towards the countries where diamond jewellery is consumed, of approximately 5%. This exceptional upturn resulted in an increase in rough diamond prices during 2000.

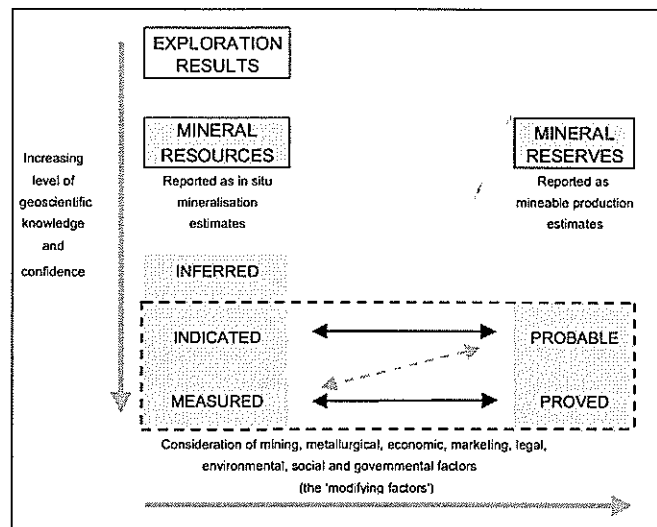
With increasing competition in the diamond industry, it is reasonable to assume that the prices of rough diamonds will be subjected to the effects of market forces, both positive and negative, to a higher degree than has been witnessed in the past. This may lead to more frequent revisions to DTC prices. In addition, certain types of goods may experience a wider range of price fluctuations than has previously been the case. Furthermore, consumption in Japan, accounting for as much as 28% of the world-wide diamond jewellery market in 1991, continues to decline and recent macro-economic data gives further cause for concern.

The overall predicted year on year rough diamond price increases indicated by the Supply/Demand model will be a reaction to the need to bring industry supply and demand into equilibrium should the need arise. The predicted increases are estimates of the prevailing market price changes as shown by the model. Rough diamond prices in the 'consensus' scenario are assumed to grow by 4% CAGR reflecting the projection that there will be an excess of demand over supply during 2001-2010.

### 11.3.3 Mineral Resource Assumptions

De Beers' methodology used in estimating mineral resources and reserves is as follows: –

- When a potentially economic deposit is discovered, an in-situ mineralisation resource estimate is developed using appropriate sampling techniques and sampling density. Empirically derived conversion factors are applied to the estimated grades to allow for the bottom or lower diamond size cut-off which might be used in a commercial scale metallurgical plant, also taking into account the difference in the degree of diamond liberation between the sampling and commercial recovery processes.
- The baseline category for resource classification, which requires a minimum level of geological knowledge and confidence, is the inferred mineral resource. Increased sampling of the resource will lead to an improved level of geoscientific knowledge and confidence, and upgrading of the resource to an indicated category and ultimately to a measured status. However, diamond resources rarely achieve this level of classification because of the complex nature of diamond deposits and the large expenditure that would be required to achieve the high level of confidence as stipulated in the SAMREC Code.
- Mineral reserves are a modified sub-set of indicated and measured resources where mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors are applied as appropriate to define that part of the resource that is economically mineable.



*Framework for classifying tonnage and grade estimates reflecting different degrees of geoscientific confidence and technical and economic evaluation.*

- It is assumed for modelling purposes that probable mineral reserves are mined first, followed by indicated mineral resources and then inferred mineral resources.
- No account has been taken of any residual or in perpetuity value attributable to any mineral resources after the last year of the DCF model (being 2030) due to the inherent uncertainties associated therewith.

### 11.3.4 Operational Assumptions

- The SBPs have been used as the basis for the key mine operating assumptions, being:

- treatment plant throughput (ore tonnes);
  - production costs;
  - capital expenditure; and
  - capital recoupments (sale of obsolete plant and equipment).
- The latest three-year rolling forecast, as presented at the November 2000 De Beers board meeting, refines the SBPs for years 2001 to 2003 inclusive.
  - Although annual projections for the period 2001 to 2010 have been shown, the financial model extends to 2030. Post 2010, income and cash flow projections based on the remaining lives of De Beers' mining operations have been evaluated.
  - Operating costs for research and development, prospecting and all other relevant overhead costs have been included in the financial model.
  - It is assumed that all capital expenditure is funded on a 100% equity basis.
  - Estimates of future levels of marketing expenditure, sorting and selling costs, exploration, research and new business development costs, and corporate overheads are based on 2000 actual figures adjusted by appropriate factors to take into account both anticipated inflation and changes in overall activity levels. Marketing expenditure has been limited to 4% of DTC sales.
  - Trade investment income comprises De Beers' estimated future share of its financial interests in Debswana, Namdeb and Sibeka.
  - Other income comprises De Beers' estimated future share of Debmarine contracting revenue and sundry income.

#### **11.3.5 Mineral Lease Renewals**

- For South African mines the assumption has been made that that the mining leases will be extended in perpetuity for the life of the mines.
- In the case of Debswana, the Jwaneng mining lease expires in 2004. Although no application has been submitted yet to renew the lease and the Botswana Government will consider a renewal application on its merits at the time of its submission, it has been assumed that the lease will be renewed but a risk weighting has been introduced and applied to future cash flows to reflect the appropriate degree of commercial uncertainty. The Orapa and Letlhakane mine leases were renewed in 1996, effective from 1992.
- For other operations, the consequences of the loss of leases is considered to be not material.

#### **11.3.6 Contractual Agreements**

- A diamond purchase agreement with Russia obliges De Beers to buy from Russia diamonds with a value up to 26% of the DTC sales, subject to a minimum off-take of just over US\$500 million per annum. This agreement expires on 31 December 2001. A diamond purchase agreement also exists with BHP's Ekati mine, whereby 35% of the output is sold via the DTC. This agreement expires at the end of 2002. In the case of both contracts, a probability factor has been applied against cash flows to reflect the commercial uncertainties involved.
- Open market purchases of diamonds by De Beers ceased in late 1999. It has been assumed that these purchases will not re-commence.

- Sales agreements exist with Namdeb and Debswana which commit them to sell their output through the DTC at prices that are determined with reference to the DTC price book. These contracts are renewed every five years. The present Namdeb agreement expires in 2004, while the Debswana agreement expires in 2005. These contracts have been treated as being evergreen, and their terms have not been changed.

### 11.3.7 Diamond Stockpile Assumptions

A minimum working capital diamond stock level of 50% of DTC sales has been assumed. Excess diamond stocks have been assumed to be sold to the extent that production and outside purchases in the relevant year are effectively less than estimated demand. The final stockpile value at 2030 has been assumed to be sold in 2031, and such value discounted back for purposes of calculating NPVs.

### 11.3.8 Adjusted Net Cash

As at 31 December 2000, De Beers' net current assets amounted to approximately US\$1.6 billion. After taking account of long and medium term liabilities of US\$570 million and the final combined dividends payable for the year ended 31 December 2000 of US\$400 million and cash inflow from the exercise of options of approximately US\$150 million, adjusted net cash is estimated at approximately US\$750 million.

### 11.3.9 Taxation

The following tax rates have been used:

- South Africa : Company tax of 30% and STC of 12.5%.
- South African mine lease formulae : Finsch : 30.5% – (244/x)  
Namaqualand : 27.0% – (135/x)  
The Oaks : 5.0% – (40/x)  
*Where X = profit to revenue ratio*
- Botswana : Company tax of 15%. Additional Company tax of 10%, royalty of 10% of gross revenue and withholding tax on dividends of 15%.
- Namibia : Company tax of 35%, diamond mining tax of 55%, royalties of 10% of gross revenue and withholding tax on dividends of 10%.
- Canada : Federal tax 28% plus 4% surcharge, NWT taxes 14%, NWT royalty as a percentage of profit on a sliding scale from 0% – 14%  
0% of first C\$10,000  
5% of C\$10,000 to C\$5M  
6% of C\$5M to C\$10M  
7% of C\$10M to C\$15M  
8% of C\$15M to C\$20M  
9% of C\$20M to C\$25M  
10% of C\$25M to C\$30M  
11% of C\$30M to C\$35M  
12% of C\$35M to C\$40M  
13% of C\$40M to C\$45M  
14% above C\$45M
- United Kingdom : Corporation Tax of 30%.

### 11.3.10 Industrial Diamond Business (Debid)

The projections for Debid incorporated in the financial model assume that Debid continues as a full product supplier and grows in line with all of its respective markets (estimated to be in the order of 4.5% per annum for most grit products). However, increasing price pressure from low cost entrants and continuing product commoditisation in most markets is expected to continue to result in flat overall revenues and declining profit margins. Initiatives which De Beers anticipates will be undertaken in the near future, including changes in press type and replacement raw materials, near net sizing and improved capsule utilisation, are expected to result in cost reductions.

## 11.4 Strengths, Opportunities and Risks

Strengths, opportunities and risks with respect to De Beers' diamond business are set out below.

### 11.4.1 Strengths and Opportunities

*General:* De Beers and its partners are the largest diamond producer by value in the world. The DTC is the world's leading marketer of rough diamonds.

De Beers benefits from a sound operating base, efficient use of assets, good relationships with its major stakeholders, and a management team aimed at growing the diamond business to a value of US\$10 billion by the year 2004, in line with a carefully considered strategy.

As a fully integrated group focused wholly on the diamond business, De Beers believes it possesses the strengths required to maximise the opportunities that present themselves, while being aware of the risks that exist.

*Workforce:* De Beers has a dedicated and loyal workforce which takes great pride in its work, De Beers and De Beers' company values. This workforce is motivated and capable of growing the company, and has contributed significantly to the increase in profits realised over the last three years and to the strategic transformation of the company. De Beers continues to invest in the development of staff at all levels.

*As Is Plus:* As a result of the strategic review started in 1998, De Beers has implemented a number of initiatives that have reduced unit costs and improved efficiencies. Further progress in this area continues to be made in the Southern African operations. The threat of AIDS and the employment equity issue, and their associated financial costs do, to an extent, limit the potential gains from these initiatives.

*Technical Ability:* De Beers has invested heavily in research and development of new, leading edge technology in many areas of the diamond business. For example, this has led to the successful implementation of deep-water mining of marine placer deposits off the coast of Namibia. De Beers is the only mining company involved in large-scale underground mining of kimberlite pipes and has unrivalled expertise in large, block cave excavations. Ongoing research and development has resulted in cutting edge plant design with a high degree of automation. The newly commissioned Aquarium Plant at Jwaneng contains the completely automated recovery plant ("CARP") for the recovery of diamonds from x-ray concentrate and the fully integrated sort house ("FISH") where the sorting and acid cleaning processes have been automated.

*Exploration:* De Beers has an extensive exploration programme both on existing mines and in extensive greenfield sites on five continents and is committed to securing new sources of supply through exploration on its own and in joint ventures with others.

*Resource Base:* De Beers and its partners have a large mineral resource base, unrivalled by any other diamond mining company, currently standing at approximately 2.6 billion tonnes amounting to some 1.2 billion carats. The majority of these resources

occur in large scale, low cost mines where the current life of mine expectation is in excess of 20 years.

*Supplier of Choice:* In July 2000, De Beers announced the launch of the DTC's Supplier of Choice initiative, a move away from the market perception of the CSO as custodian of the market in its role as supplier of last resort. The focus of the initiative, which will be subject to review by the European Commission, is to drive long-term growth in consumer demand for diamond jewellery by developing the DTC's business relationships with its sightholders. Successful implementation of this long-term strategy will result in a sustainable increase in rough diamond demand. An important component of Supplier of Choice is the subscription of the DTC and its sightholders to a set of best practice principles to promote and encourage high industry, ethical and business standards.

*Client base:* The DTC sells its goods to approximately 120 client companies or sightholders. These companies represent the highest levels of expertise in diamond manufacture and distribution, in addition to proven financial strength. The Supplier of Choice initiative is designed to enable clients to grow their own businesses through successful marketing strategies. Supplier of Choice will also ensure that sightholders subscribe to the highest professional and ethical standards.

*Brand Power:* De Beers recognises the latent power of branding, and is encouraging the development of a competitive multi-brand jewellery consumer market. It believes that this will significantly increase consumer choice and re-invigorate the diamond jewellery category.

In January 2001 De Beers signed an agreement with LVMH Moët Hennessy Louis Vuitton, the world's leading luxury goods company, to establish an independently managed and operated company to develop the global consumer brand potential of the De Beers name.

#### 11.4.2 Risks

*Mining Titles:* Currently, De Beers owns or leases from the state all of its South African mineral rights in perpetuity. However, the South African government has publicised its intention to take all mineral rights into state ownership. The resulting uncertain issues of tenure and fiscal regime may have an influence on the viability of present and future operations and new projects. De Beers is actively involved in discussions with the South African government to provide sound minerals legislation and to ensure that the economic viability of its future investments in operations is not jeopardised.

In Botswana and Namibia, the Debswana and Namdeb mining rights are held by way of 25-year mining leases. Upon lease expiry, there is no obligation on these states to renew the existing licenses on similar terms. The Jwaneng mining lease falls due for renewal in 2004.

*Political:* All of De Beers' current producing mines are situated in Southern Africa. Accordingly, De Beers is subject primarily to Southern African political risk and to risk of disruption as a result of localised events. This would also include ongoing differences of opinion and interpretation with various authorities with regard to the valuation and export of De Beers' diamonds from South Africa.

*Dependence on Botswana:* A substantial proportion of De Beers' production and profits is sourced from Debswana's mines located in Botswana, exposing De Beers to any actions which impinge upon Debswana's ability to recover and deliver diamonds to the DTC.

*Legal:* An indictment, issued in 1994 by the United States District Court for the Southern District of Ohio, remains unserved upon DBCAG. Two related private class action lawsuits have been filed in the Southern District of New York. De Beers believes

that these suits do not subject it to significant legal risks and, having managed its business so as to avoid undue legal risk arising out of US antitrust laws, is not aware of any other material exposure to its business under US law.

*Investment Portfolio:* In the past, De Beers has raised debt finance to finance stocks and to exploit opportunities at difficult times in the diamond market. The raising of this debt finance has been facilitated by the existence of De Beers' shareholding in Anglo American. Without the portfolio, De Beers' ability to raise capital could be restricted and growth prospects limited.

*Earnings Cyclicity:* Retail demand in the diamond business responds to changes in economic activity. The lag in the diamond pipeline's response to changes in consumer demand has tended to accentuate the cyclical nature of the rough diamond business. The single product nature of De Beers' business and the volatile nature of the rough diamond business has been cushioned to an extent by the investment in Anglo American and the income stream relating thereto.

*Health:* HIV/AIDS is prevalent in Southern Africa. De Beers has developed education and prevention programmes.

*Workforce:* There has been a steady emigration of skilled personnel from Southern Africa in recent years. De Beers has developed innovative programmes to recruit, train and retain personnel. Parts of the diamond industry require advanced technological skills, and De Beers has developed an aggressive development and remuneration strategy, directly tied to individual performance, in order to retain core competencies. The retention of people will be dependent on the financial, economic and political stability of the region.

*Contractual Agreements:* De Beers' diamond purchase agreements with Russia and with BHP (in respect of the Ekati mine in Canada) expire in December 2001 and December 2002 respectively and are therefore subject to negotiated renewal. In addition, sales agreements with Namdeb and Debswana are subject to five-yearly negotiated renewal.

As is usual in mining industry practice, pre-emption rights and change of control clauses exist between De Beers and its joint venture partners. De Beers' joint venture agreements provide for sharing of expenditure. These agreements tend to limit choices available to De Beers while introducing uncertainty as to the terms of contract renewal.

*Additional Diamond Supply:* As evidenced in 1992 in Angola, additional unexpected supply of diamonds has the capacity to disrupt the industry. Additional diamond supply from African alluvial sources could occur as a result of the exploitation of new deposits and changes in the socio-political climate in certain of these countries.

*Market:* The market for diamonds, a high-fashion luxury product, is sensitive to changes in the global economic climate, affected particularly by the US economy. The US currently accounts for approximately half of world-wide consumer consumption of diamond jewellery in value terms. In 2001 De Beers, through the DTC, plans to spend approximately US\$180 million world-wide on generic diamond advertising.

*Conflict diamonds:* De Beers has taken a strong stance on this issue to ensure that the diamonds it markets are conflict-free. It has adopted a code of practice that also requires its shareholders to adopt the same policy. In the future, the DTC Forevermark may be used to distinguish diamonds as being sourced from conflict-free areas.

*Cuttable Synthetic Diamonds:* Synthetic diamonds, particularly industrial grit products, have been produced since the late 1950s. The technology to manufacture synthetic diamonds of sufficient size and quality for cutting and polishing has existed since 1970. However, production costs are high and it is only in the last few years that cuttable synthetics have been produced in commercial quantities albeit small: a few

thousand carats (cf 30Mcts per annum of polished natural gem diamonds). Nevertheless, any suggestion of synthetic diamonds being fraudulently sold as natural diamonds could have a disproportionate effect on consumer confidence. For this reason the DTC has an on-going research programme investigating the characteristic features of synthetic diamonds that can be used for identification and communicating this information to leading gem grading laboratories.

*Exchange Controls:* De Beers' operations in South Africa and Namibia fall within the Common Monetary Area ("CMA"). Although the South African government has committed to easing exchange controls, restrictions remain in force and any movement of funds outside the CMA remains subject to South African Reserve Bank approval. As a result, surplus cash flows from the South African and Namibian operations are not freely available for use in growing the business internationally.

*Taxation:* For over a year, the revenue authorities in South Africa and the UK have been engaged in general enquiries into the tax affairs of De Beers in their respective jurisdictions. These enquiries are general and wide ranging and include matters such as deductibility of expenses and transfer pricing.

## 11.5 Discount Rates

### 11.5.1 Weighted average cost of capital

De Beers has calculated its weighted average cost of capital ("WACC") for its diamond business adjusted to reflect the impact of its investment in Anglo American. As the level of gearing in the business is currently low, this calculation is heavily weighted by the cost of equity. The calculation utilises the Capital Asset Pricing Model ("CAPM") and assumes a global equity market risk premium of 6%.

De Beers' level of risk (beta) when compared to the market as a whole is statistically derived for the listed De Beers Linked Unit. However, as De Beers' investment in Anglo American makes up a substantial proportion of De Beers' market capitalisation, a 'diamond beta' must therefore be derived in order to remove the impact of the Anglo American investment in the De Beers beta. On this basis, De Beers estimates that its 'diamond beta' ranges between 1.3 and 1.5.

### 11.5.2 Mining company discount rates

The recommended real discount rate for an operating base metal mine mid-life is 8% in an environment deemed to have little or no country risk (L. D. Smith: 'Discounted cash flow analysis methodology and discount rates'; CIM – PDAC Mining Millennium, 2000). It is felt that where discount rates are concerned, a base metal mine can be used as a proxy for a diamond operation.

### 11.5.3 Country risk premium

Country risk can be assessed in a number of ways, such as through the analysis of bank forfaiting rates, and through surveys of persons involved in international mineral economics and project assessment. L. D. Smith conducted such a survey of Canadian Institute of Mining and Metallurgy Mineral Economics Society members for his 2000 paper. He found consensus for a 6% country risk premium for South Africa, and a 10% country risk premium for Africa in general.

A country risk premium should be added to discount rates used for investments in environments considered to have little or no country risk. Assuming the correct country risk premium for a mining company with most of its producing assets in Southern Africa is 6%, and adding the accepted discount rate for mid-life mining operations of 8%, a discount rate of 14% is derived.

#### 11.5.4 Discount rate range for valuation

Estimated WACCs for other mining companies comparable to De Beers and the implied discount rates estimated for comparable transactions have been considered.

On the basis of the above and for the purposes of presenting a valuation for the De Beers diamond business, a range of real discount rates of 10%, 12.5% and 15% has been used.

### 11.6 Results of Financial Analysis

#### 11.6.1 Income and Cash Flow Projections

Income and cash flow projections for De Beers for the period ending 2030 have been prepared on the basis of three supply/demand scenarios as follows:

- A 'consensus' case based on the consensus supply/demand scenario including a proportional amount of inferred mineral resources;
- A 'downside' case based on the downside supply/demand scenario including a proportional amount of inferred mineral resources; and
- An 'upside' case based on the upside supply/demand scenario including a proportional amount of inferred mineral resources.

These projections for the 'consensus' scenario are set out in Appendix III and are shown in nominal (money of the day) terms, and the net cash flow is converted into real (today's money) terms. These tables have been provided in both US dollars and South African Rands.

#### 11.6.2 Net Present Values and Asset Valuations

##### 11.6.2.1 Diamond Business

The NPVs, at real discount rates of 10%, 12.5% and 15% of the estimated future cash flows generated by De Beers' core diamond business, industrial diamond business and other assets incorporated into the financial model are set out in the table below. The NPVs have been prepared on the basis of the 'consensus', 'upside' and 'downside' supply/demand scenarios and appropriately factored inferred mineral resources.

Description of scenario	10%		12.5%		15%	
	US\$M	RM	US\$M	RM	US\$M	RM
'Consensus' scenario	7,159	55,352	6,117	47,296	5,329	41,204
'Downside' scenario	4,967	38,403	4,246	32,829	3,699	28,598
'Upside' scenario	8,736	67,547	7,355	56,869	6,321	48,877

**11.6.2.2 Other Assets**

With respect to assets not incorporated into the financial model and valued separately, the estimated value of these assets is as follows:

<b>Assets</b>	<b>US\$M</b>
Exploration Properties	0-100
De Beers/ LVMH Branding Initiative	200-500
Listed Investments	300
Adjusted Net Cash	750
<b>TOTAL</b>	<b>1,250-1,650</b>

**11.6.2.3 Aggregate Asset Evaluation**

The aggregate values of the gem and industrial diamond businesses and De Beers' other assets excluding its shareholding interest in Anglo American on the basis of the various scenarios are as follows:

<b>Scenario</b>	<b>Value Range</b>	
	<b>US\$M</b>	<b>RM</b>
'Upside' scenario at 10%-15% real discount rate range	7,971-10,386	61,912-80,582
'Consensus' scenario at 10%-15% real discount rate range	6,779-8,609	52,659-66,807
'Downside' scenario at 10%-15% real discount rate range	4,949-6,217	38,473-48,278

On the basis of a real discount rate of 10.5% to 11.5% which Rothschild independent financial adviser to the Independent Committee, has advised is an appropriate basis on which to value the gem and industrial diamond businesses, the value of the gem and industrial diamond businesses and De Beers' other assets excluding its shareholding interest in Anglo American is as follows:

	<b>US\$M</b>	<b>RM</b>
Gem and Industrial Diamond Businesses	6,498-6,925	50,239-53,545
Other Assets	1,450-1,450	11,455-11,455
<b>TOTAL</b>	<b>7,948-8,375</b>	<b>61,694-65,000</b>

**11.6.2.4 Sensitivity Analysis**

The NPVs stated in Section 11.6.2.1 above are not particularly sensitive to variations in mine operating costs, capital expenditure and exchange rates. Sensitivity of the NPVs to diamond pricing, diamond production and demand is reflected in the scenarios in the table in Section 11.6.2.1.

On the basis of the 'consensus' scenario comprising only probable mineral reserves and indicated mineral resources, the NPV at a 10% to 15% real discount rate range amounts to US\$4,460 million to US\$5,638 million (or ZAR34,483 million to ZAR43,597 million).

## 12. Conclusion

A copy of the report has been provided to the committee of independent directors of De Beers and the committee's independent financial advisors, Rothschild. A copy of the financial model together with supporting working papers and relevant documentation has also been provided to Rothschild, which has used this report and the financial model as part of the basis of the preparation of its fair and reasonable opinion prepared in relation to the offer by DBI for De Beers.

## APPENDIX I

### Responsible Persons

#### **Dr W.J. Kleingeld**

Dr W.J. Kleingeld holds a doctor's degree in Mining Engineering from the Grand École Nationale Supérieure Des Mines De Paris. He is a member of SACNASP and is registered as a Competent Person in the evaluation of mineral resources and reserves. He is also Chairman of the Diamonds Sub-Committee for SAMREC. His title is Group Manager Mineral Resources and is responsible for Mineral Resource Management in De Beers.

#### **Mr M.L.S. De Sousa-Oliveira**

Mr M.L.S. De Sousa-Oliveira is Head of De Beers Corporate Finance and a member of the De Beers Executive Committee. Mr De Sousa-Oliveira is both a Chartered Accountant and a Chartered Management Accountant and has extensive experience in mergers, acquisitions, new company flotations and project financing. He was appointed Head of De Beers' newly established Corporate Finance Department in January 1998.

#### **Mr G.P.H. Penny**

Mr G.P.H. Penny has assumed the role of Responsible Person for DTC Sales and Marketing issues discussed in this report. Mr Penny was a Rhodes Scholar at Oxford where he obtained an MA in Philosophy, Politics and Economics. He is a 'director' of the DTC and a member of the De Beers Executive Committee, and will assume overall responsibility for De Beers' worldwide sales and marketing activities with effect from July 2001.

#### **Mr W.F. McKechnie**

Mr W.F. McKechnie obtained a B.Sc (Hons) degree in Geology from the University of Aberdeen in 1974. He is a member of the Geological Society of South Africa and South African Council for Natural Scientific Professions (SACNASP). He has 26 years experience covering most aspects of diamond exploration, evaluation and mining and holds the position of Group Manager Exploration responsible for De Beers' global exploration and associated laboratory support activities.

#### **Mr A.P. Guthrie**

Mr A.P. Guthrie obtained a National Higher Diploma (Metalliferous Mining) from the Witwatersrand School of Mines in 1982. He is a member of the Association of Mine Managers, the South African Institute of Mining and Metallurgy, a Director of the Mine Rescue Services Pty (Ltd) and was the previous Chairman of the Northern Cape Association of Mine Managers. He is the General Manager Mining responsible for mining practices, mine planning, mining projects, surveying practices, safety, health and environmental practices within De Beers and has 25 years experience of a variety of mining methods.

#### **Mr A.C. Rowan**

Mr A.C. Rowan is the General Manager Metallurgy and is responsible for metallurgical discipline. He obtained a M.Sc (Organic Chemistry) from UOFS in 1970. He has held several senior positions including that of General Manager (DebTech) from 1994 to 1996. He is a member of the Advisory Board of the Engineering Faculties of both the Stellenbosch and Pretoria Universities.

#### **Mr G.D. Scott**

Mr G.D. Scott obtained a BSc in Electrical Engineering in 1986. He is currently the Manager Engineering and has held several senior positions in De Beers. He is a member of the Chartered Engineers Institute (MIEE).

#### **Mr J.G. Hughes**

Mr J.G. Hughes manages Southern African producer relations at De Beers. He obtained a BSc. in Civil Engineering from the University of Cape Town and an M.Phil. in Management Studies from Oxford as a Rhodes Scholar. He has 16 years experience in the mining industry with Anglo American and De Beers. He

is a member of the Executive Committee, he chairs the Administrative Committee and he oversees the Legal Services Department.

**Mr L.J. Gatherer**

Mr L.J. Gatherer is the Group Manager Human Resources. He obtained a BA (Hons) in Psychology 1972, an advanced Diploma in Personnel Management/Training Management in 1975, and completed a certificate program in Industrial Relations in 1984. He is a member of the South African Board for Personnel Practice and is an associate member of IPM (1974). He has 26 years experience in the field commencing at Anglo American's gold division then joining De Beers in 1989. From 1995 to 1999 he was Training Consultant at Maccauvlei Training and Conference Centre and was appointed Group Manager, Human Resources in August 1999.

**Dr M. Berry**

Dr M. Berry has a BSc in Biological Sciences, a MSc in Wildlife Management and a PhD in Resource Ecology. Mark Berry was appointed in 1992 as ecologist responsible for formulating and directing environmental management programmes at all De Beers' Southern African mining operations, including Botswana and Namibia. Presently he holds the position of Manager Environmental Services responsible for corporate environmental policy and practice consulting to De Beers' diamond mining operations world-wide. Areas of expertise include wildlife management, environmental impact assessment and management of diamond mining, and restoration ecology.

## APPENDIX II

### Definitions, Terminology and Abbreviations

Unless otherwise defined in this report, capitalised terms referred herein shall have the same meaning as ascribed to them in the Circular.

#### 1. Definitions

“Competent Person”	A person who has a minimum of five years experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which that person is undertaking, as defined under the SAMREC Code for reporting of mineral resources and reserves.
“Debid”	De Beers Industrial Diamonds Division
“DTC”	The marketing arm of the De Beers Group, now known as the Diamond Trading Company, previously known as the Central Selling Organisation
“Responsible Person”	For the purposes of this report, a person who is a delegated head of a technical, financial, or legal discipline with responsibility for the information contained in this report.
“TFR”	This Technical and Financial Report as prepared by Dr W.J. Kleingeld, Mr M.L.S. De Sousa-Oliveira and Mr G.P.H. Penny

#### 2. Units

°	degree (measurement of angle)
%	percent
°C	degrees Celsius
c, ct	carat (5ct = 1 g)
cm	centimetre
cpcm	carats per cubic metre
cpsm or cts/m <sup>2</sup>	carats per square metre
cpht	carats per hundred tonnes of ore treated
g	gram
h,hr	hour
ha	hectare
kg	kilogram
km	kilometre
km <sup>2</sup>	square kilometre
m	metre
M	million
m <sup>3</sup>	cubic metres
Ma	million years ago
mamsl	metres above mean sea level
mLs	metre levels
mm	millimetre
ppm	parts per million
R or ZAR	South African Rand
t	tonnes
tpa	tonnes per annum
tph	tonnes per hour
tpm	tonnes per month
tpy	tonnes per year
US\$	United States dollar
US\$/ct or US\$/ct	United States dollar per carat

### 3. Terms

Aeolian	Erosion features and deposits which are due to the action of wind and transporting action of wind
Aggradation	To build up sequence of sediment through deposition
Arena	Simulation package – used to simulate mining processes
Audit	Check or procedure to see if events have been conducted orderly
Bedrock	Term for rock, usually solid, that underlies soil or other unconsolidated, superficial material
Bottom cut-off Screen Size	The size of the screen used to separate the product to be treated for diamond recovery from undersize material
Bulked	Material not insitu – has been excavated and has expanded by a bulking factor
Carat	Unit of weight for diamonds, pearls and other gems. Metric carat or international carat = 0.2 g
Clastic	Sedimentary particles consisting of fragments of rock
Coarse discard	Discard material from the processing plant that is greater than the bottom cut off size and less than the top cut off size
Comminution	Size reduction of ore by means of crushing, milling, scrubbing to liberate minerals
Concentrate	Material that has been separated from an ore and which has a higher concentration of mineral values than the mineral values originally contained in the ore
Contribution	Revenue less the cost per unit of resource
Cost	Cost of activity per unit of resource
Cretaceous	65 to 135 Ma
Cut-off grade	i) The lowest grade of mineralised material considered economic to extract; used in the calculation of the ore reserves in a given deposit ii) Grade used to maximise NPV against a specific set of economic criteria (eg. planning, operational, breakeven)
Density	Measure of quantity of mass in unit volume – kg/m <sup>3</sup>
Deflation	Erosion and removal of particles by transporting action of wind
Diamond footprint	An assortment of diamonds required to depict consistent trends in diamond characteristics (e.g. size, quality)
Diamond Grade	the content in carat weight per unit volume of resource or per unit weight of reserve
Diamond Mass	the carat weight of a diamond, one carat being equivalent to 0.2gram
Diamond Resource	Mineral Resource, for the purposes of this report
Diamond Reserve	Mineral Reserve, for the purposes of this report
Diamond value	The estimated average value of the diamonds in the deposit expressed in terms of US\$ or US\$/ct at a stated bottom screen cut-off size

Dilution	Impact on mined grade through the contamination of non ore species entering the extracted rock
Dumps	Heap or pile of treated material – should be barren or of low value
Estimation	Quantitative judgement of worth (eg. grade, size, revenue)
Exotic	Derived from beyond a local area and introduced from afar
Exploration	Exploration entailing prospecting, sampling, mapping, diamond drilling and other work involved in the search for mineralisation
Facies	Term used to distinguish part or parts of a single geological entity
Factorised grade	Grade which has been modified by applying relative factors like dilution, liberation and recovery
Feasibility study	A comprehensive engineering estimate of all costs, revenues, equipment requirements and production levels likely to be achieved if a mine is developed. The study is used to define the technical and economic viability of a project and to support the search for project financing
Fluvial	Of or pertaining to rivers, produced by the action of rivers
Gangue	The unwanted or waste material, minerals or rock, in which diamonds are contained
Garnet	A group of silicate minerals which are used as a gem and as an abrasive, reddish brown in colour, of formula : $A_3B_2(SiO_4)_3$ , where A = Ca, Mg, $Fe^{+2}$ and $Mn^{+2}$ , and B = Al, $Fe^{+3}$ , $Mn^{+3}$ and Cr
Gemcom	Geological modelling/mining software package
Geometric crushing	This mode of crushing occurs in most crushing devices where the volume of space around a particle is reduced to cause uniaxial stress and subsequent breakage
Geostatistics	Development and application of mathematical and statistical models which take specific account of the spatial structure of a regionalised variable
Grade	The concentration of diamonds in the ore, or stream in the processing plant, typically measured in carats per hundred tonnes
Granulometry	Pertaining to a distribution of particle sizes eg. tailings
Grease belt	A device that exploits the hydrophobic properties of diamonds to separate it from the other mineral components found in the concentrate
Grit	Particles ranging in size from 2mm to 4mm in diameter
Grizzly	A robust form of sizing screen designed to remove oversize boulders from crusher feed, some are static and others are vibrated to improve efficiency when there is a lot of material that is near the size of the apertures in the grizzly
Gulley	Linear erosional feature created by fluid flow and aligned with current direction worn into rock or consolidated sediment
Hanging wall	The overlying side of an orebody or underground mine opening
Hardness	The resistance of a rock to indentation. Several tests exist to determine this property, as it is a primary determinant of the energy requirement in comminution

High Density DMS	Usually a secondary process to a low density DMS, whereby excessive quantities of concentrates are reduced by using a high/medium density between 3.8g/cm <sup>3</sup> and 3.9g/cm <sup>3</sup> to float-off diamonds whilst sinking the heavier minerals (mainly zircons and garnets)
Holocene	Recent (10,000 years or less)
HPRC	High Pressure roll crusher
Incision	Cut down into, as a river cuts into a plateau or valley floor
Indicated Mineral Resource or Indicated Resource or Indicated Diamond Resource	That part of a Diamond Resource for which tonnage, densities, shape, physical characteristics, grade and diamond value can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed and sufficient diamonds have been recovered to allow a confident estimate of average diamond value
Indicator minerals	Garnet, chrome spinel, ilmenite, chrome diopsides
Inferred Mineral Resource or Inferred Resource or Inferred Diamond Resource	That part of a Diamond Resource for which tonnage, grade and diamond value can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified by geological and/or grade continuity and a sufficiently large diamond parcel is not available to ensure a reasonable representation of the diamond assortment. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that may be limited or of uncertain quality and reliability
In situ	In its original place ie in unblasted or unbroken rock
Inter particle crushing	A mode of crushing where the ore particles are subjected to multiaxial stress in order to create a stress boundary around minerals of value and improve their liberation
Kimberlite	A porphyritic alkalic peridotite containing abundant phenocrysts of olivine and phlogopite and possibly geikielite and chromian pyrope in a fine grained groundmass of calcite and second generation olivine and phlogopite and with accessory ilmenite, serpentine, chlorite, magnetite and perovskite
Kriging	A mathematical statistical method of estimating the value of a regionalised variable at a point or in a block in space, using observations of the variable in and around the point or block. Various forms of kriging include – normal, ordinary, dis-junctive, iso-factorial etc
Lag Gravel	Residual accumulation of coarser particles from which finer material has been removed
Lerch-Grossmann	Lerch-Grossmann algorithm used in the Whittle and NPV-Scheduler software package which is an approximation to an optimum economic pit shell given revenue, costs and slope angles
Level	The workings or tunnels of an underground mine which are on the same horizontal plane. Level numbers usually designate depth below the shaft collar
Liberation	Freeing of mineral from gangue material

Low Density DMS	Also deemed as a normal DMS process used to eliminate low density constituents such as organic material. Ferrosilicon medium having a density of 2.2g/cm <sup>3</sup> and a cut-off of 2.65g/cm <sup>3</sup> is used to float-off the light density material allowing approximately 50% of the heavy density material to sink to the bottom forming a concentrate
Macro-diamonds	Diamonds not passing through 0.5mm square mesh.
Marine Regression	Relative fall in sea-level
Marine Transgression	Relative rise in sea-level
Measured Resource	That part of a mineral resource for which tonnage, densities shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are paced closely enough to confirm geological and grade continuity
Mechanised mining	Mining operations which are partly or fully conducted using machines powered by electricity or diesel fuel
Metallurgy	The process whereby minerals of value are extracted from host ore for marketing
Micro-diamonds	Recovered diamonds less than 0.5mm
Middle Cut-off Screen Size	The size of the screen used to separate oversize material to be re-crushed prior to re-treatment for diamond recovery
Mining Licence	An authorisation issued by the department of Minerals and Energy Affairs in terms of section 9 of the Minerals Act 50 of 1991, allowing the holder of the common law rights to mine to exercise some rights
Mining Area	The geographic area in respect to which a mining licence is granted
Models	An accurate simulation, by means of description, statistical data or analogy of a thing or process that cannot be observed directly
Multivariate discriminant analysis	The simultaneous measurement of a large number of geochemical variables in order to classify and interpret rocks of the same nature
Nominal terms (values)	The value of money quoted in money of the day, i.e. adjusted to compensate for inflationary changes
Open-pit	Surface mining in which the ore is extracted from a pit. The geometry of the pit may vary with the characteristics of the orebody
Optimisation	Creating the best scenario (eg. money, profit) against a given set of physical constraints
Ore	Implies an accumulation of gravels (placers) and/or kimberlite material comprising a quantifiable portion/or concentration of diamonds. According to the SAMREC Code, it implies that a technical feasibility study has been conducted resulting in economic viability. (In a diamond context)
Orebody	A continuous well defined mass of material of sufficient mineral content to warrant investigation
Overburden	Waste material overlying the ore body
Palaeoshoreline	Fossil shoreline or coast

Palaeo-valley	Fossil river valley
Placer deposits	Aeolian, eluvial, fluvial, beach or marine
Pothole	Circular erosional depression caused by fluid flow worn into rock or consolidated sediment
Price book	Price per diamond size, colour, shape and quality drawn up by the DTC
Primary deposit	Kimberlite pipes, dykes, blows or fissures, lamproites
Probable Mineral Reserve	The economically mineable material derived from a Measured and/or Indicated Diamond Resource. It is estimated with a lower level of confidence than a Proven Diamond Reserve. It is inclusive of diluting materials and allows for losses that may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, including consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is reasonably justified
Prospecting Permit	An authorisation issued by the department of Minerals and Energy in terms of section 6 of the Minerals Act 50 of 1991 to the holder of a mineral right or to a person who has obtained the consent to prospect from the mineral rights holder, allowing such person to prospect on the land to which the permit relates
Proven Mineral Reserve	The economically mineable material derived from a Measured Diamond Resource. It is estimated with a high level of confidence. It is inclusive of diluting materials and allows for losses that may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, including consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is reasonably justified
Real terms (values)	Costs and revenues given in constant money terms, i.e. established at a given point in time, then kept constant for the life of the project
Reconciliation	Show compatibility by argument or in practice
Recoverable grade	Grade with modifying factors applied (eg. dilution, liberation, recovery)
Recovery	Final separation process of diamonds from non-diamonds in the concentrate
Recrush size	Size of material used to separate oversize material to be re-crushed prior to re-treatment for diamond recovery
Refractory ore	Any ore that does not respond to conventional mineral processing to produce acceptable product recoveries without an intermediate step to address its refractory attributes
Reserve	The reserve is that part of the measured or indicated mineral resource which can be mined, inclusive of dilution, and from which valuable minerals could be recovered economically under conditions realistically assumed at the time of reporting
Resource	Is a concentration or occurrence of material of intrinsic economic interest in or on the earth's crust (in-situ and bulked eg. stockpiles), in such a form or quantity that there are reasonable prospects for eventual economic extraction
Resource grade	In-situ, unfactorised grade of a diamond resource

Revenue	Revenue in US\$/ carat
Sample	Individual part taken from something (eg. orebody, dump) illustrating something about the qualities
Sample chips	Samples that have been broken by percussion or other means
Sample core	Solid core from down-hole samples
Sampling	Taking small pieces of rock at intervals along exposed mineralisation for assay (to determine the mineral content)
SAMREC	South African Mineral Resource Committee under the auspices of the South African Institute of Mining and Metallurgy
SAMREC Code	South African Code for Reporting of Mineral Resources and Mineral Reserves, prepared by the SAMREC
Sand Sea	Large agglomeration of sand dunes formed by wind action
Scour Pod	Overdeepened section of a river valley
Scrubber	A drum-like device lined with rubber that rotates the charge in order to remove mud and fine ore from the surface of the rock
Sea Wall	Barrier built with overburden sands to create access to submerged deposits for diamond winning
Secondary mineralisation	Mineralisation resulting from the weathering of primary ore, usually leading to an increase in the concentration of the mineral of interest
Sedimentary	Formed by the deposition of solid fragmental material that originates from weathering of rocks and is transported from a source to a site of deposition
Sedimentology	The study of sediments
Shaft	A mine-working (usually vertical) used to transport miners, supplies, ore, or waste
Simulation	Representation of a physical system by a device (eg. computer, model) that imitates the behaviour of the system
Size distribution	An array of the instances of the size variable arranged by classes according to their value
Slime	Discard material from the processing plant that is less than the bottom cut off aperture
Slimes dam	A dam used to create an impoundment basin within which to deposit fine slurry like tailings
Spit	A small point of land or narrow shoal projecting into a body of water from the shore
Stockpile	A store of unprocessed ore or marginal grade material
Stockpiles	Piles of broken or bulked ore which contains grade and value
Stone size	Size of a stone measured as ct/stn
Stripping	Mechanical removal of overburden

Sub Level Caving	A mining method whereby ore is allowed to cave into drifts located on sub-levels from which the ore is extracted
Sub Level open stoping	A mining method whereby ore is blasted from horizontal workings placed at intermediate levels (sub-levels) into drawpoints located on main levels, from which the ore is hauled away
Tailings	That portion of the ground ore from which valuable minerals have been extracted and is rejected or floated during concentration, changes in technology or economic circumstances can sometimes make the tailings economic to reprocess at a later date
Tectonic	Pertaining to or designating the rock structure and external forms resulting from deformation of the earth's crust
Tertiary	2 to 65 Ma
Thickener	A mineral processing unit for water reclamation that works by settling out the contaminant fine ore and hence "thickening" it
Three Halves	An approach to design in which the team drives towards halving the key resources consumed in the design and operation of a process e.g. half the time half the cost and half the size for the same throughput
Title to mine	The underlying common law right to mine coupled with the necessary mining authority, issued by way of a mining licence, to mine the deposit to which the right to mine relates
Top cut-off	The size of the screen used to separate oversize material to be crushed prior to treatment for diamond recovery
Top Cut-off Screen Size	The size of the screen used to separate oversize material to be crushed prior to treatment for diamond recovery
Tracer	Substance used in a process to trace its course
Trapsite	A feature in a palaeochannel that leads to the concentration of dense minerals and rocks
Un-factorised grade	Grade with no modifying factors
Waste	Country rock that does not contain economic mineralisation grades
Whittle	Open Pit optimisation package using the Lerch-Grossmann algorithm
Winze – HIVIS	The blasted material from a one-metre advance in the winze that was treated through the HMS
X-Ray Machine	A unit that separates diamonds from gangue utilising the luminescent characteristics of diamond
Yield	Amount yielded or produced through a process as a function of input

#### 4. Abbreviations

ADT	Articulated Dump Truck
BHOS	Blast Hole Open Stopping
BHP	BHP Limited
CARP	Completely Automated Recovery Plant

CHQ	De Beers' corporate headquarters in Johannesburg
CMA	Common Monetary Area
CMMI	Council of Mining and Metallurgical Institutions
CTP	Combined Treatment Plant in Kimberley
DCT	Diamond Control Team, a multidisciplinary audit team that carries out annual visits to each operation to evaluate the status of security control systems
DMS	Dense Media Separation, usually using a medium of water and ferrosilicon to achieve an apparent medium density of 3.1 g/cm <sup>3</sup>
DRL	De Beers' Diamond Research Laboratory
DTM	Digital Terrain Model
DVM	Diamond Value Management, a strategic initiative to optimise the recovered value of diamonds
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPR	Environmental Management Programme, a document setting out the company's plans to rehabilitate the surface of land disturbed during mining operations, as required by the Minerals Act 50 of 1991
FISH	Fully Integrated Sort House
FY	Financial Year
G2	Simulation software package used to simulate mining and treatment processes
GDP	Gross Domestic Product
GPM	Group Production Model
GSC	De Beers' GeoScience Centre
GSPS	De Beers' Geological Sample Processing Services Laboratory
JORC	Joint Ore Reserve Committee (Australia)
ISO	International Standards Organisation
KPA	Key Performance Areas, the principle components and areas of responsibilities of an employee's function
KPI	Key Performance Indicators, standards and targets against which employees are measured on a quarterly basis
LARA	Lower Acquisition Recovery Automation
LHD	Load-Haul-Dump Units
LDD	Large Diameter Drilling
LOM	Life of Mine
LP	Linear Programming

LTIFR	Long Time Injury Frequency Rate
MCF	Mine Call Factor (volumetric, tonnage, areal)
MINRAS	Mineral Resource Auditing System
MRIM	Mineral Resource Information Management
MRM	Mineral Resource Management
NOSA	National Occupational Safety Association
NPV	Net present value
NPV-Scheduler	Optimised scheduling software package
ODS	Ore Dressing Studies – define characteristics of different ore types that could occur in an ore body
PEP	Project Execution Plan
PLC	Programmable Logic Controller
RDBMS	Relational Database Management System
ROC	Required Operating Capability, a document which details the functional performance of a unit process or platform
ROM	Run-of-mine; ore feed from mine which includes mining dilution
SACNASP	South African Counsel for Natural and Scientific Professions
SADC	The Southern African Development Community
SAIMM	South African Institute of Mining and Metallurgy
SBP	Strategic Business Plan per operating mine, herein reference is made to the SBP compiled in mid-2000
SCADA	Supervisory Control and Data Acquisition
WACC	Weighted Average Cost of Capital

## APPENDIX III

## De Beers' Diamond Business Combined Forecast Income and Cash Flow Statements attributable to De Beers' Linked Units

## Consensus Scenario

ZAR millions - nominal terms	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011 to 2015	2016 to 2020	2021 to 2030	2001 to 2030
<b>Diamond Business Forecast Income Statement</b>														
Sales	40,728	43,950	43,994	44,818	48,003	52,178	52,188	55,995	60,215	65,013	330,709	332,869	770,041	1,940,700
Trade investment income	3,646	3,579	4,408	4,377	4,514	5,046	5,231	5,776	6,397	6,650	34,026	36,442	82,404	202,496
Other income	984	1,022	1,119	1,246	1,321	1,518	1,595	1,738	1,860	1,974	11,722	15,467	10,175	51,740
	45,357	48,550	49,521	50,441	53,839	58,742	59,014	63,508	68,472	73,638	376,457	384,778	862,619	2,194,935
<i>Deduct:</i>														
Purchases	26,311	24,505	27,076	27,914	29,662	32,016	27,879	30,205	33,013	34,532	182,493	204,588	477,000	1,157,193
Depreciation and amortisation	922	1,170	1,346	1,699	2,191	2,271	2,448	2,222	2,252	2,171	11,146	8,713	5,722	44,273
Production costs	3,712	3,878	4,175	5,444	6,450	7,033	7,734	8,265	9,066	9,645	56,186	53,944	111,785	287,317
Decrease (increase) in stocks	2,984	5,445	1,314	269	(534)	(798)	1,091	(322)	(567)	(589)	4,750	5,792	36,509	55,343
Marketing expenditure	1,385	1,482	1,585	1,673	1,770	1,897	1,889	1,991	2,136	2,307	11,579	11,633	25,770	67,096
Sorting and selling costs	1,857	1,987	2,127	2,275	2,435	2,605	2,788	2,983	3,191	3,415	17,099	16,603	36,219	95,584
Exploration/Prospecting	495	530	567	607	649	694	743	795	851	910	4,558	4,425	9,654	25,477
Research and new business development	364	390	417	446	478	511	547	585	626	670	3,353	3,256	7,183	18,746
<b>Net Diamond Account</b>	<b>7,327</b>	<b>9,163</b>	<b>10,913</b>	<b>10,113</b>	<b>10,739</b>	<b>12,513</b>	<b>13,897</b>	<b>16,783</b>	<b>17,904</b>	<b>20,578</b>	<b>85,294</b>	<b>75,824</b>	<b>152,858</b>	<b>443,905</b>
<i>Add:</i>														
Investment income	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest income	561	579	605	631	659	688	718	750	783	686	3,911	4,849	11,756	27,176
Surplus on realisation of fixed assets and investments	(16)	0	0	0	0	0	0	0	0	0	0	0	0	(16)
<i>Deduct:</i>														
Interest payable	741	712	690	689	689	704	724	745	766	573	3,087	3,522	7,553	21,196
Corporate overhead	307	328	351	376	402	430	460	492	527	564	2,822	2,741	5,978	15,777
<b>Net income before taxation</b>	<b>6,824</b>	<b>8,702</b>	<b>10,477</b>	<b>9,680</b>	<b>10,307</b>	<b>12,066</b>	<b>13,431</b>	<b>16,296</b>	<b>17,394</b>	<b>20,128</b>	<b>83,295</b>	<b>74,410</b>	<b>151,082</b>	<b>434,092</b>
Taxation	2,386	2,450	2,830	2,972	4,557	3,676	4,246	4,910	5,651	6,504	25,472	20,626	37,583	123,863
<b>Net income after taxation</b>	<b>4,438</b>	<b>6,252</b>	<b>7,647</b>	<b>6,708</b>	<b>5,749</b>	<b>8,391</b>	<b>9,184</b>	<b>11,386</b>	<b>11,743</b>	<b>13,624</b>	<b>57,823</b>	<b>53,784</b>	<b>113,500</b>	<b>310,229</b>
Attributable to outside shareholders in subsidiaries	66	101	84	64	61	42	21	1	26	28	174	244	824	1,737
<b>Total net earnings</b>	<b>4,372</b>	<b>6,151</b>	<b>7,564</b>	<b>6,644</b>	<b>5,688</b>	<b>8,349</b>	<b>9,164</b>	<b>11,385</b>	<b>11,716</b>	<b>13,596</b>	<b>57,649</b>	<b>53,540</b>	<b>112,676</b>	<b>308,492</b>
<b>Diamond Business Forecast Cash Flow Statement</b>														
<b>Operating activities</b>														
Net income before taxation	6,824	8,702	10,477	9,680	10,307	12,066	13,431	16,296	17,394	20,128	83,295	74,410	151,082	434,092
Non cash items (add back depreciation and amortisation)	1,090	1,311	1,472	1,740	2,356	2,426	2,617	2,404	2,274	2,355	10,291	7,755	3,379	41,470
Dividends and interest	(3,465)	(3,446)	(4,323)	(4,319)	(4,484)	(5,030)	(5,226)	(5,781)	(6,413)	(6,763)	(34,850)	(37,769)	(86,607)	(208,476)
(Increase) decrease in diamond stocks	2,816	5,304	1,189	227	(699)	(954)	922	(504)	(589)	(773)	5,605	6,751	38,851	58,146
(Increase) decrease in working capital	(5)	(19)	(17)	(22)	(13)	(29)	(25)	(39)	(52)	(29)	(175)	(245)	(529)	(1,199)
<b>Cash generated by operations</b>	<b>7,260</b>	<b>11,852</b>	<b>8,797</b>	<b>7,307</b>	<b>7,466</b>	<b>8,480</b>	<b>11,719</b>	<b>12,377</b>	<b>12,613</b>	<b>14,918</b>	<b>64,167</b>	<b>50,901</b>	<b>106,177</b>	<b>324,034</b>
Dividends received	3,646	3,579	4,408	4,377	4,514	5,046	5,231	5,776	6,397	6,650	34,026	36,442	82,404	202,496
Net interest received (paid)	(180)	(133)	(85)	(58)	(30)	(16)	(6)	5	16	113	824	1,327	4,203	5,980
Taxation (paid)	(2,148)	(2,385)	(2,850)	(3,097)	(3,236)	(3,660)	(4,150)	(4,464)	(5,431)	(7,170)	(28,104)	(22,414)	(37,511)	(126,622)
<b>Cash available from operating activities</b>	<b>8,576</b>	<b>12,913</b>	<b>10,270</b>	<b>8,529</b>	<b>8,714</b>	<b>9,849</b>	<b>12,795</b>	<b>13,694</b>	<b>13,595</b>	<b>14,511</b>	<b>70,912</b>	<b>66,257</b>	<b>155,272</b>	<b>405,888</b>
<b>Investing activities</b>														
Property, plant and equipment	3,285	1,869	3,547	3,241	3,585	2,255	1,009	1,021	952	1,080	4,984	5,005	8,497	40,331
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Cash utilised in investing activities</b>	<b>3,285</b>	<b>1,869</b>	<b>3,547</b>	<b>3,241</b>	<b>3,585</b>	<b>2,255</b>	<b>1,009</b>	<b>1,021</b>	<b>952</b>	<b>1,080</b>	<b>4,984</b>	<b>5,005</b>	<b>8,497</b>	<b>40,331</b>
Distributions to minorities	(3)	(106)	(101)	(86)	(67)	(59)	(26)	(31)	(47)	(50)	(310)	(435)	(1,270)	(2,591)
<b>Net cash flow attributable to linked unit holders from the diamond business</b>	<b>5,288</b>	<b>10,938</b>	<b>6,622</b>	<b>5,202</b>	<b>5,063</b>	<b>7,535</b>	<b>11,760</b>	<b>12,642</b>	<b>12,596</b>	<b>13,381</b>	<b>65,618</b>	<b>60,817</b>	<b>145,506</b>	<b>362,966</b>
Ending cash balance	0	0	0	0	0	0	0	0	0	0		20,108		20,108
<b>Net cash flow attributable to linked unit holders from the diamond business plus ending cash balance</b>	<b>5,288</b>	<b>10,938</b>	<b>6,622</b>	<b>5,202</b>	<b>5,063</b>	<b>7,535</b>	<b>11,760</b>	<b>12,642</b>	<b>12,596</b>	<b>13,381</b>	<b>65,618</b>	<b>60,817</b>	<b>165,614</b>	<b>383,074</b>
<b>Net cash flow attributable to linked unit holders from the diamond business (real terms)</b>	<b>5,112</b>	<b>9,882</b>	<b>5,592</b>	<b>4,105</b>	<b>3,734</b>	<b>5,194</b>	<b>7,575</b>	<b>7,611</b>	<b>7,087</b>	<b>7,036</b>	<b>28,362</b>	<b>18,750</b>	<b>29,454</b>	<b>139,493</b>

## Real terms NPVs with base date 1st January 2001

Discount rate	Including inferred resources	Excluding inferred resources
10.0%	55,352	43,597
12.5%	47,296	38,486
15.0%	41,204	34,483

Note: The De Beers Supply/Demand model seeks to forecast DTC sales and changes in diamond prices over a 10-year period but not specifically on a year by year basis. Accordingly, this impacts on the financial projections set out in this report which are not therefore intended to be year by year specific but intended to cover a period of years. The financial projections have been prepared by De Beers on the basis of current assumptions and have not been reported on independently.