INDEPENDENT QUALIFIED PERSON'S REPORT

BARBROOK MINES LIMITED
MPUMALANGA PROVINCE, SOUTH AFRICA

Prepared by Applied Geology Services cc
on behalf of
Caledonia Mining Corporation
14th May 2004

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3. SUMMARY

Barbrook Mines Ltd holds title to a Mining Authorization covering 2,286 hectare in extent in the Barberton District of South Africa. The Mining Authorization area hosts numerous small gold deposits collectively known as the Barbrook Mine. Mining activities started in the area in 1885 and have continued intermittently since then, culminating in the consolidation of the Barbrook mines in 1975.

Following a period of extensive exploration involving surface diamond drilling and underground development, a state-of-the-art gold plant was commissioned in 1989. The mine operated for 16 months before being put on care and maintenance on account of the grade and tonnage forecasts not being met.

For a brief period Maid O' the Mist operated the mine before Caledonia Mining Corporation acquired control in 1995. Operations continued until 1997 when low head grades caused by the mass mining methods forced the mine to close pending a re-assessment of the reserves and resources. The mineral resources were re-evaluated in 2001-2 and following a recommendation to commence with trial mining, Caledonia re-started operations in 2002. For the period to December 2003, Barbrook produced 33,000 tonnes at a head grade of 6,8 g/t showing that the ore body could be mined successfully. However, metallurgical difficulties caused by mechanical breakdowns have necessitated a substantial re-engineering of the plant (in progress).

Barbrook ore bodies are typical Archean gold deposits occurring as near vertical shoots in the Barberton Greenstone Belt which is host to a number of significant gold mines, viz. Sheba, Fairview and Consort mines. The mineralized shoots tend to be vertically continuous in this environment and Barbrook is considered to have potential resources down to 1,000 m below existing levels. Some 60 mineralized structures have been defined by exploration, mainly on-reef development. While many of these are currently uneconomic, a number of large bodies along the Barbrook and Zwartkoppie lines contain substantial mineral resources. French Bob, Victory, Daylight and Taylors are the main bodies of economic interest. The ores are refractory on account of the fine dissemination of gold in sulphides as well as the associated organic carbon and metallurgical recoveries have generally been between 60% and 70%.

Mineral Reserves and Resources have been estimated as at 31 December 2003 based largely on data gained during previous periods of operation. Proven and Probable Reserves amount to 243,000 tonnes at 6.0 g/t while Measured and Indicated Resources are estimated at 1,760,000 tonnes at an in situ grade of 4.9 g/t. Relative to the 2002 estimate, 47% of the Reserves were transferred to the Resource category, mainly due to the application of more stringent criteria in estimating Reserves. Barbrook's reserves are sufficient to last the mine 27 months at planned production rates, during which time ongoing exploration is expected to convert part of the above Resources to Reserves as new zones are exposed.

Key activities at the mine include the sinking of an incline shaft at French Bob to access the next 150 m section of the ore body, deep diamond drilling to define shoot extensions and lateral development to establish further reserves. The mine plan is to expand the current production of 6,000 tpm to 12,000 tpm by 2005 while keeping the target head grade at 5.5 g/t.

4. INTRODUCTION AND TERMS OF REFERENCE

4.1 Scope of the Report

Applied Geology Services cc (AG) has been commissioned by Caledonia Mining Corporation (Caledonia) to prepare an Independent Qualified Persons Report on the Barbrook Gold Mine in the Mpumalanga Province, South Africa. This report is prepared to comply with disclosure and reporting requirements set forth in Canadian National Instrument 43-101, Companion Policy 43-101CP, and Form 43-101F1.

The report complies with Canadian National Instrument 43-101, for the 'Standards of Disclosure for Mineral Projects' of February 2001 (the Instrument). This report has also been prepared in accordance with the 'Code and Guidelines for Assessment and Valuation of Mineral Assets and Mineral Securities for Independent Expert Reports' of 1998 (the Valmin Code) as accepted by the South African Institute of Mining and Metallurgy (SAIMM). In case of conflict, Instrument 43-101 applies.

All monetary figures expressed in this report are in South African Rand (R) unless otherwise stated. At the applicable date of this report (31/12/2003) the US Dollar/ Rand exchange rate was 6.5.

4.2 Principal Sources of Information

In addition to site visits undertaken to the Barbrook Gold Mine in April of 2004 the author of this report has relied extensively on information provided by Barbrook Mine including technical reports, press releases and stock exchange announcements. This information is complimented by discussions with Barbrook management. A listing of the principal sources of information is included in Section 23 of this report.

Applied Geology Services cc has made all reasonable enquiries to establish the completeness and authenticity of the information provided and identified, and a final draft of this report was provided to Caledonia, along with a written request to identify any material errors or omissions, prior to lodgement.

4.3 Qualifications and Experience

The primary author of this report is Mr. David Grant, who is a professional geologist with 27 years experience in the mining and exploration industries including exploration and evaluation of mineral properties. He is registered as a Professional Earth Scientist with the South African Council of Natural Science, a Fellow of the Geological Society of South Africa, a Fellow of the Geological Society of London, and verified by this institution as a Chartered Geologist. The author is the Principal of AG, and has the appropriate relevant qualifications, experience and independence to be considered a Qualified Person as defined in Canadian National Instrument 43-101.

4.4 Independence

Neither Applied Geology Services cc, nor the author of this report, have or have had previously any material interest in Barbrook Gold Mine or related entities. My relationship with Barbrook is solely one of professional association between client and independent consultant. This report is prepared in return for fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the results of this report.

5. DISCLAIMER

This document contains certain statements that involve a number of risks and uncertainties. There can be no assurance that such statements will prove to be accurate; actual results and future events could differ materially from those anticipated in such statements.

The author of this report is not qualified to provide extensive comment on legal issues associated with the Barbrook Gold Mine included in Section 6 of this report. Assessment of these aspects has relied on information provided by Barbrook Gold Mine and Caledonia Mining Corporation and has not been independently verified by Applied Geology Services cc.

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Saturday 15 May 2004

This serves to confirm that the Independent Qualified Person's Report for Barbrook Gold Mine Limited, Mpumalanga Province, South Africa dated 31st December 2003 was prepared by me, with the assistance of Dr Trevor Pearton.

David Grant
Member
BSc(Spec Hons) MSc(Min Ex) Pr.Sci.Nat. FGS CGeol

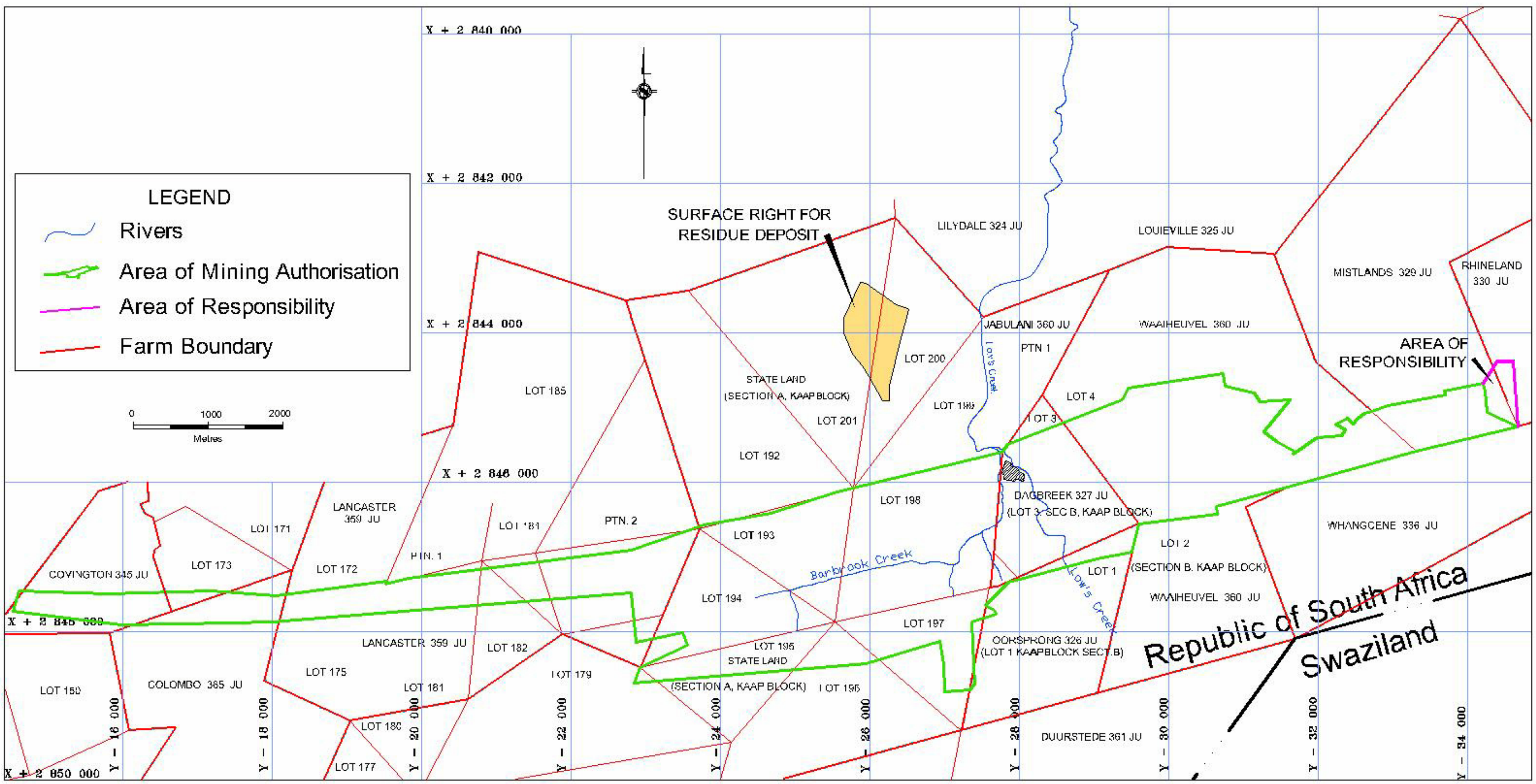

Figure 6.1 Mining Authorization Area for Barbrook Mine

6. PROPERTY DESCRIPTION AND LOCATION

The Mining Authorization held by Barbrook Mines Limited is situated in the Magisterial District of Barberton, Mpumalanga Province, South Africa and is located 25º 43' S latitude and 31º 17' E longitude (Figure 6.1).

The Mining Authorization area covers 2286 hectares in extent comprising portions of the farms Covington 345 JU, Colombo 365 JU, Lot 173 Section A Kaap Block, Lancaster

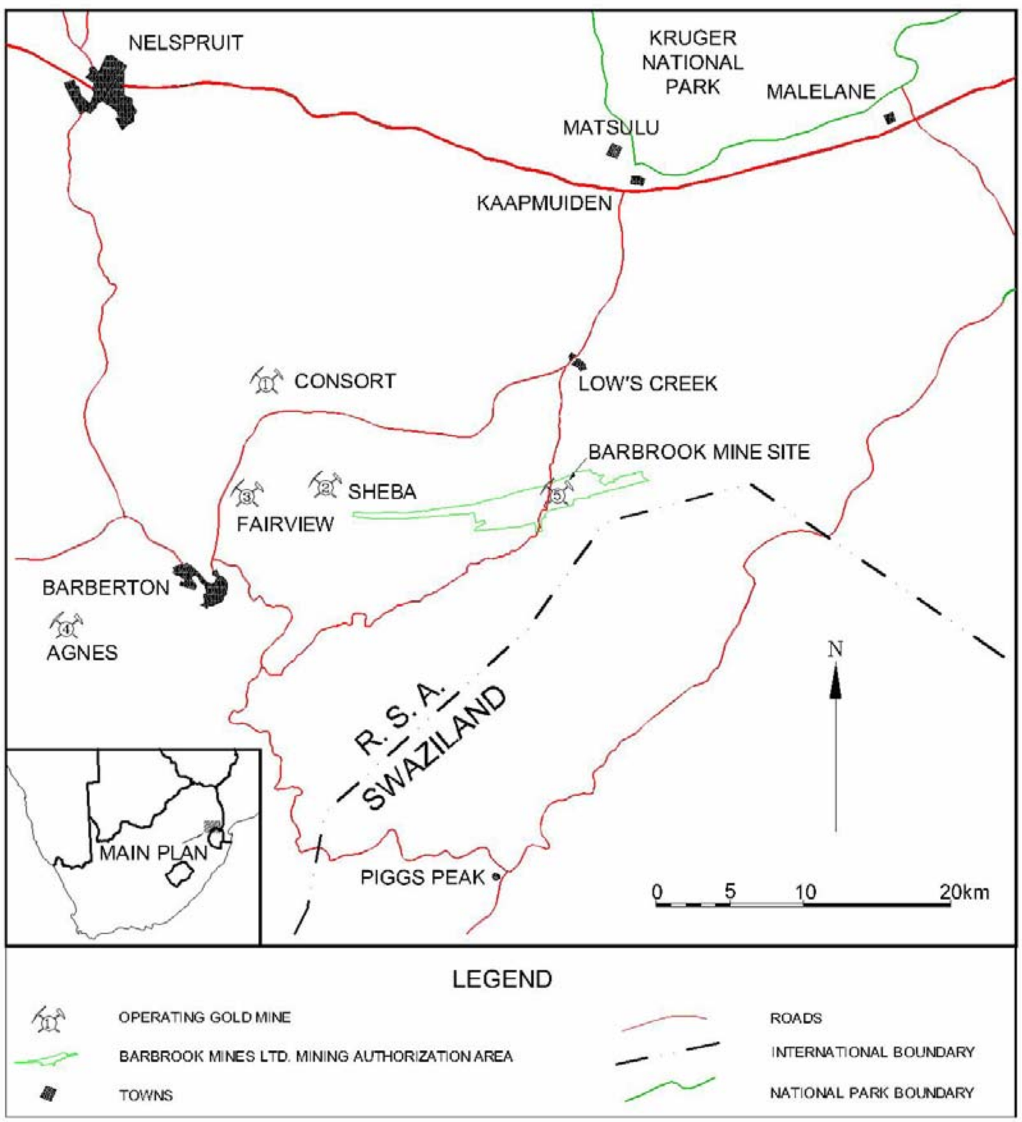

Figure 6.2 Locality Map of Barbrook Mine

359 JU, Lots 193, 194, 195, 196, 197, 198 Section A Kaap Block, Dagbreek 327 JU, Oorsprong 326 JU, Waaiheuvel 360 JU and Mistlands 329 JU (see Figure 6.2).

A plan showing claims held by Barbrook is depicted in Figure 6.3 overleaf while Table 6.1 provides a list of the claims held. In terms of the new mining law in South Africa, private mineral rights (including mineral claims) ceased to be in effect from 1st April 2003. In terms of the new legislation, valid title to claims held by Barbrook, have been converted to Mining Authorization Areas. Barbrook's mining plans have been approved by the Department of Mines & Energy, South Africa. Permission to proceed with mining activities is incorporated in the Mining Authorization and has been granted. Tenure has been granted for a period of ten (10) years, subject to Barbrook's continued lawful operation, and is automatically renewable for a further period of ten years.

Tenure is further subject to the acceptance by the various authorities of Barbrook's Environmental Management Programme Report. This report was approved by the Department of Mineral & Energy on the 27th April 2004 and a copy of the authorization is attached (see Appendix I). Although Barbrook does not have title to the surface area of the claims, surface rights sufficient for the mine's needs have been granted to the company.

The mineral rights holder is "Barbrook Mines Limited", a wholly owned subsidiary of Caledonia Mining Corporation, a Canadian registered company listed on the Toronto Stock Exchange.

The claims were surveyed at the time of pegging by the previous owner of the property and were further checked by an approved reconciliation survey in the period 1989-1990. Beacon coordinates are expressed according to the Gauss Conform Lo 31º based on the Cape Datum survey base. Co-ordinates have not been converted to the Hartebeesthoek 94 (WGS 84) datum.

The location of all known mineralized zones, mineral resources, mineral reserves and mine workings, existing tailing ponds, waste deposits and improvements are illustrated on the General Surface Plan (Figure 6.4) and Plant Site plan (Figure 7.3).

To the best of our knowledge, the property is not subject to any royalties, back-in rights, payments or other agreements and encumbrances. However, the South African government is currently considering a royalty system for the local mining industry, and it is possible that a royalty not exceeding 3% of gold revenue may be applied to the gold mining industry. This royalty could be implemented in 2008 at the earliest and the amount may be reduced in the case of smaller and developing mines.

Environmental liabilities arise mainly from the mine's sliming operations although smaller liabilities stem from the mine's previous open pit mining operations, rock dump sites and reduction works. While the main concern with the latter activities is the rehabilitation of the surface disturbances, the Main Residue Deposit, because of its high sulphide content, poses the risk of acid water drainage. This risk is, however, mitigated by the carbonate-rich nature of the ore which naturally buffers acid waters.

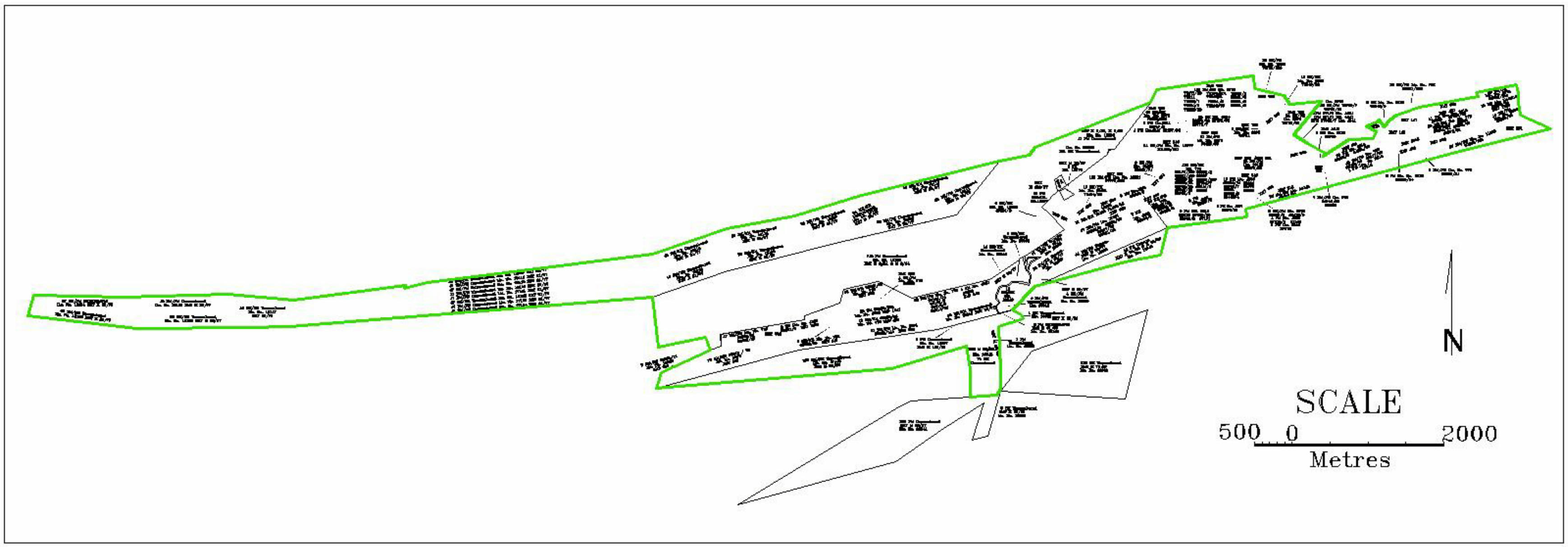

Figure 6.3 Plan Showing Claims Held by Barbrook Mines Ltd

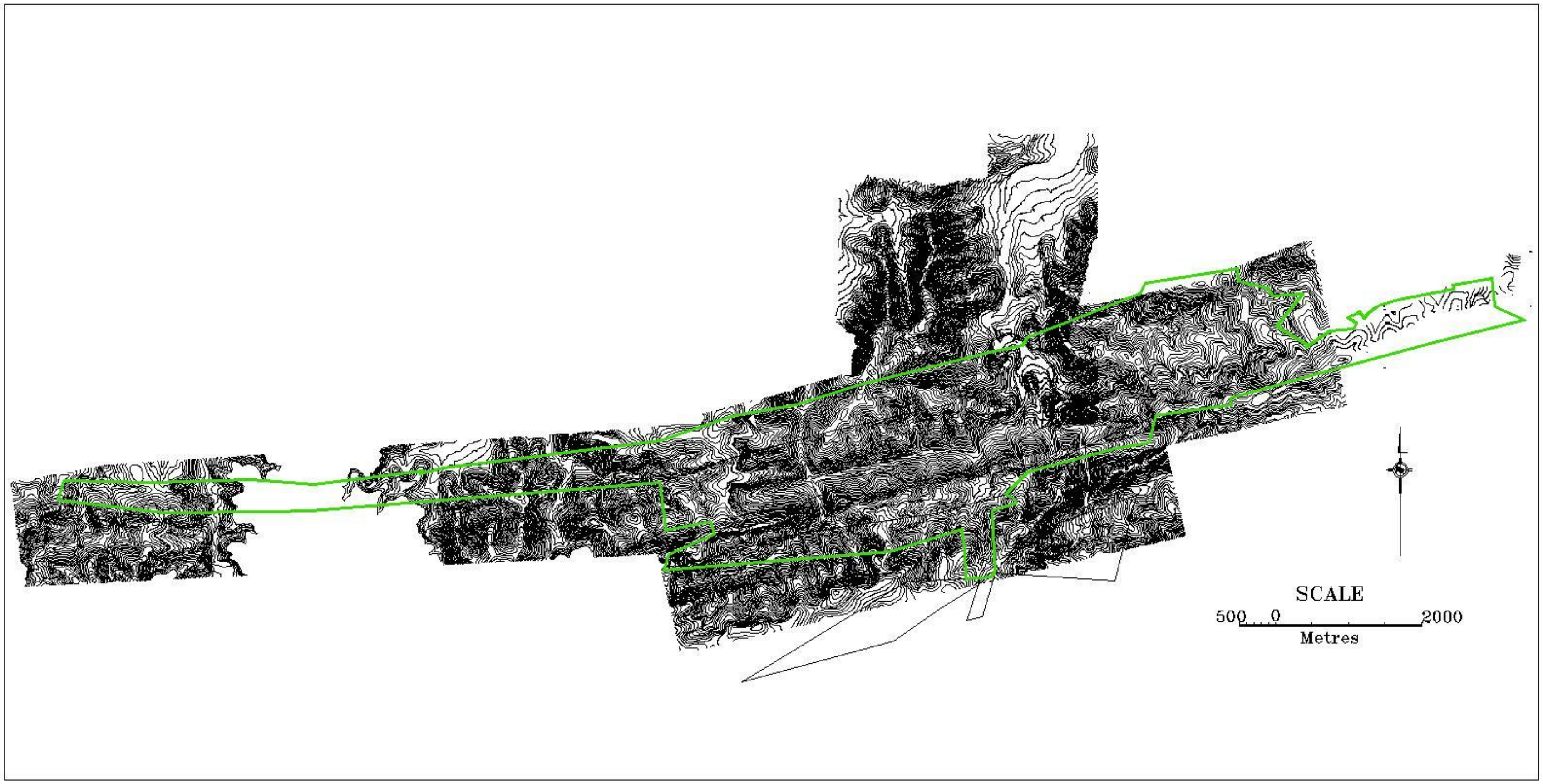

Figure 7.1 Regional Surface Contours for Barbrook Mine Area

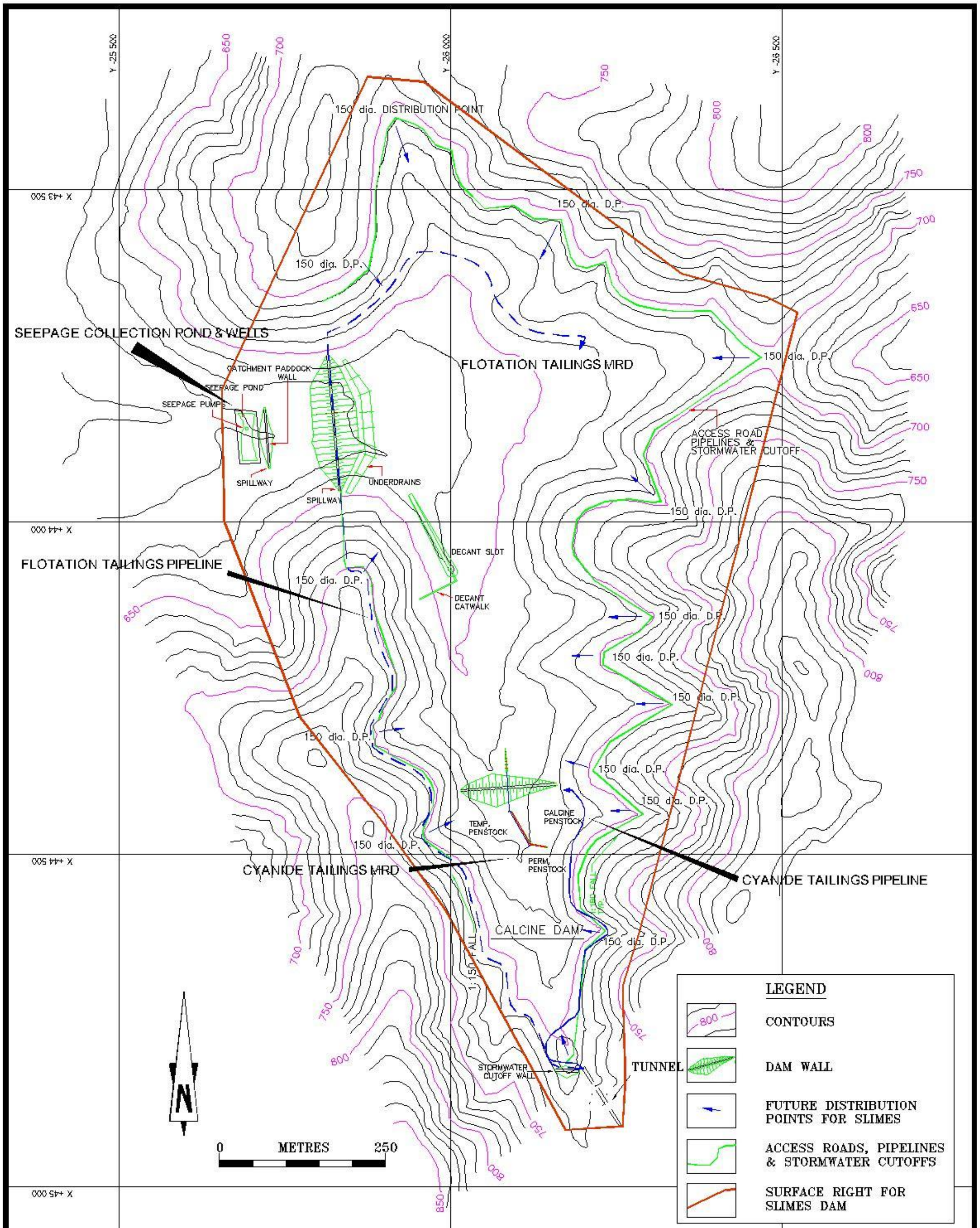

Figure 7.2 Residue Dump Contour Plan

7. ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE and PHYSIOGRAPHY

7.1 Topography and Accessibility

The Barbrook mining operations are located in a low altitude mountainous terrain. The lowest point on the mining lease area is 575 m and highest 1225 m above mean sea level, respectively. This vertical interval results in steeply inclined slope surfaces in most areas, viz. 1:10 to 1:2. To the south of the mine, east-west trending mountains (the Makonjwaan Range) rise to an elevation of 1450 m a.m.s.l.

The general topography of the central portion of the Mining Authorization Area comprises step sided to moderate sided valleys, bearing perennial streams, separated by hills and ridges as illustrated in the contour diagram, Figure 7.1 and the contoured orthophoto image (Figure 7.4) around the mine site. In addition, the topography of the area surrounding the slimes dam (MRD) is illustrated in Figure 7.2. The area is well drained by the Low's Creek river which flows northwards past the plant site to join the Kaap River some 10 km to the north.

The region has a well-established infrastructure. The mine lies 35 km south of the N4 Toll road that connects Johannesburg with Maputo in Mozambique via the provincial capital of Nelspruit (Figure 6.1). Access to the property is via a 7 km unpaved road that links the mine to a regional paved road that serves the valley to the north of the mine and d the N4. The unpaved road is used for haulage by the neighbouring mine and is maintained in and good state of repair. Sound bridges and a solid base layer ensure that access to the mine in times of heavy rain is possible with small two wheel drive vehicles.

Mainline rail links from the Witwatersrand to the Lowveld pass within 11km of the property. There are several airports in the area, viz. Nelspruit (international airport), Barberton and Malelane (35 km).

7.2 Climate and Weather

Mining operations are very seldom affected by the climate and weather and operations are normally carried out 12 months of the year.

On the whole, the region has a temperate climate, but distinct variations occur because of variations in topography. The high lying areas to the south of the property experience cool, moist escarpment conditions while the low-lying areas below the mine are subjected to hot, humid tropical weather.

In the low-lying areas of this region the average annual rainfall varies from about 500 mm in the north to about 700mm in the south. Against the escarpment, rainfall increases rapidly with altitude, locally reaching 2000 mm per year. The rainy season lasts from November to March with a maximum in January. On average 65 rain days per year occur over the Lowveld, while against the escarpment, over 120 rain days may be expected. The rain is mainly in the form of thunderstorms; heavy showers exceeding 300 mm in one day have been recorded. Against the mountains orographic rain and mists are a frequent occurrence. Hail storms may occur about once or twice a year.

The climate is warm to hot and a fairly high humidity makes summer days very oppressive though cooler weather occurs against the escarpment. Average maximum daily temperatures are of the order of 30°C in January and 23°C in July; extremes in the Lowveld can reach 43°C and 35°C for January and July respectively.

Average daily minima are 18°C in summer and 8°C in mid-winter while cold extremes can reach 7°C and –2°C respectively. Frost is seldom experienced and is generally confined to low-lying river valleys. In the winter, the skies are usually clear and sunshine duration is approximately 75% of the possible. During summer, however, the duration is around 50% of the possible. Prevailing winds blow from the SSE or NNW and reach gale force against the mountains, though this is infrequent.

7.3 Vegetation

7.3.1 Indigenous Dominant Species

In view of the great variation in elevation across the mine property, an abundance of floral species occur, representing an variety of habitats from riverine indigenous bush, through sour bushveld to mountain sourveld. The natural vegetation is largely undisturbed in the central claim area and around the mine. The natural vegetation (bush) has to a large degree re-established itself over the area of the actual mine workings.

7.3.2 Plantations and Invading Species

The eucalyptus plantations constitute a massive area of exotic vegetation covering the eastern portion of the property, under the control of local timber companies (HLH and Safcol). Locally these trees spread into the indigenous bush and become invader species. Small black wattle (acacia mearnsii) populations occur within the eucalyptus plantations. The government sponsored "Working for Water" programme is tasked with removing these trees together with other invader species such as conifers (pinus sp.), jacaranda (jacaranda mimosifolia) and seringa (melia azedarach).

The surrounding plant site is overgrown with lantana (lantana camara), a shrub-like thorn bush which invades low lying bush and strangles indigenous species.

7.4 Local Population and Transport Systems

Barbrook is situated in the Magisterial District of Barberton, a town 50 km by road to the west of the mine while the larger town Nelspruit is 65 km from the mine. Barberton has a population of 40,000 and owes its existence to gold mining in the area which dates back to 1884. Nelspruit is the capital of the Mpumalanga Province and has a population of about 100,000 and an economy based largely on the ideal agricultural conditions in the area as well as provincial government and tourism.

These centres and adjacent rural areas provide sources of both skilled and unskilled labour. Transport to both towns is by way of conventional motor vehicle, while busses are used to transport the unskilled rural workers to the mine. In addition to these two towns, there are smaller communities at Matsulu and Kaapmuiden (35 km).

7.5 Operational Resources

Surface right permits have been granted to Barbrook Mines Ltd for the purposes of shaft and adit development sites, waste rock disposal sites, plant tailings storage areas and processing plant site (Figure 7.3). These sites are all currently in use and are considered adequate for the long-term needs of the mine. No heap leach pad facilities are considered necessary at this time.

Electrical power is supplied to the mine via a dedicated 15 km long 132 kV power line operated by ESCOM, the national power company.

Water requirements of the processing plant are satisfied by the flow of groundwater emanating from the main adit level (10 Level). No rights have been obtained to extract water from the Low's Creek which flows through the mine property. Barbrook also has the right to take process water from two boreholes in the area. Potable water is extracted from a borehole on the property.

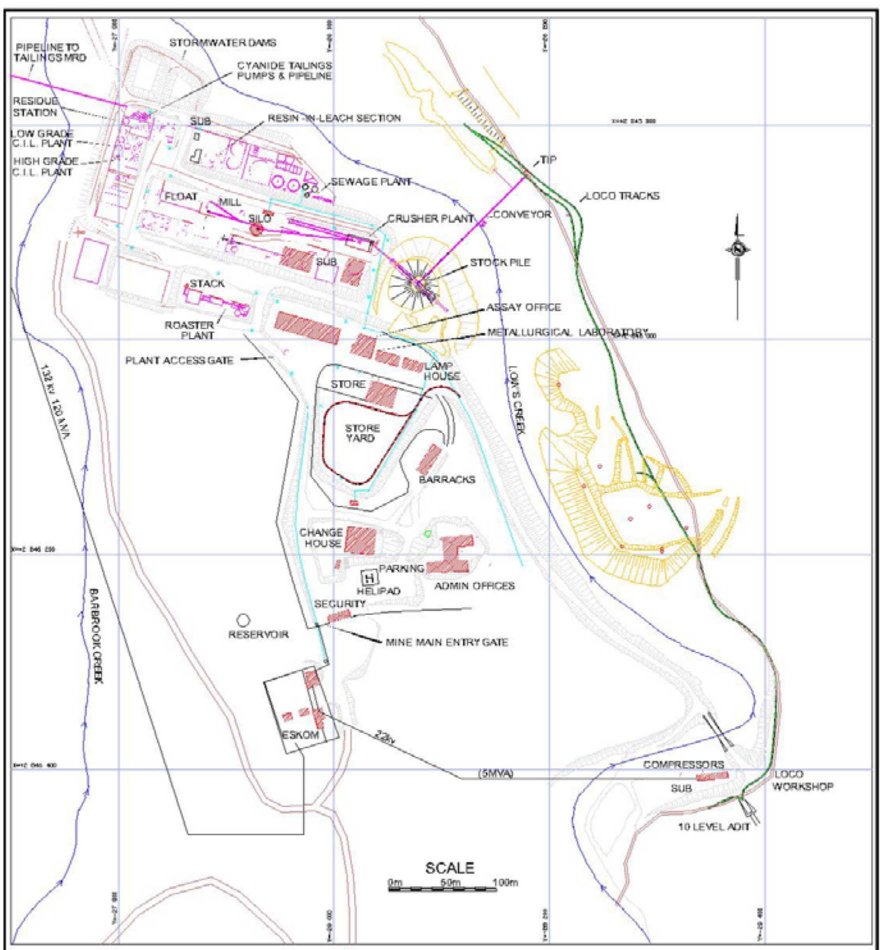

Figure 7.3 Barbrook Mines Plant Site

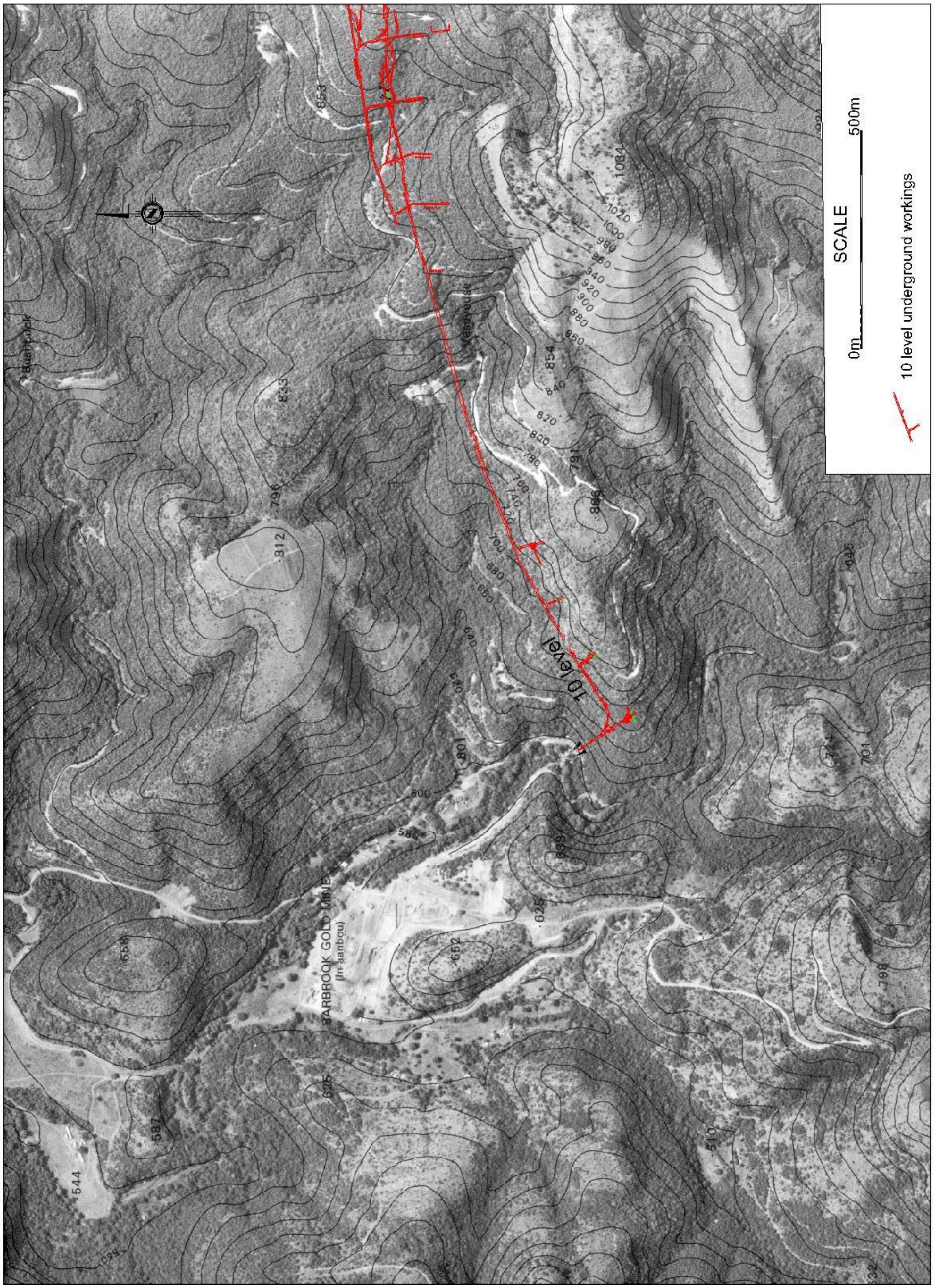

Figure 7.4 Orthophoto with Surface Contours over Plant Site of Barbrook Mine

Orthophoto published by Chief Directorate of Surveys and Mapping, Republic of South Africa, from aerial photography dated 1990. Contours are at 20m intervals.

8. HISTORY

Gold was discovered in the Barbrook area at about the same time as the discoveries elsewhere in the Barberton Mountain Land. Several of these old mines were consolidated by Barbrook Consolidated Gold Mines Limited which in turn ceded its rights to African Geophysical Exploration Company (Pty) Limited (African Geophysical) in 1940. African Geophysical subsequently acquired the Daylight Mine from the Daylight Syndicate in 1948. Operations up until this time were focussed on the oxide ores from which the gold was readily extractable. The higher-grade portions of these ores were eventually depleted in the mid 1950s, leading to a cessation of operations.

In 1960, Rand Mines Exploration Company (Pty) Limited (RME) negotiated an agreement with African Geophysical to prospect the claims. Included in the agreement was an option to acquire a 100% interest in African Geophysical which was exercised in 1963. RME, together with Anglo American Corporation of South Africa Limited (Anglo American) and Central Mining Finance, carried out limited exploration on the claims for a few years.

A share exchange and ceding of mineral rights in 1975 resulted in the formation of Barbrook Mining and Exploration Company (Pty) Limited (BME) which became the holder of all the claims on the property. RME and Anglo American each acquired a 50% interest in the new company, while RME retained management.

A rising gold price sparked a revival of exploration in 1979. During this program, a soil geochemical grid 7,000 m long by 1,500 m wide was established, followed by an extensive programme of diamond drilling (45,000 m) and mining development (6,500 m) mainly in the form of adits. This program resulted in a positive feasibility report in October 1985. Ore "reserves" estimated by RME amounted to 14.9 million tonnes at an *in situ* grade of 7.0 g/t gold.

Following a period of mine planning and civil engineering preparations, BMEC was listed on the Johannesburg Stock Exchange in 1987 and its name changed to **Barbrook Mines Limited** (BML). The listing was used to raise capital of R150 million (US$41 million) to finance underground development and construct a 25,000 tonne per month state-of-the-art gold processing facility.

Table 8.1 Production History of Barbrook Mine

Period	Operator	Ore Type	Tonnage Treated	Gold Produced	Recovered Grade
			tonnes	kg	g/t
Oct '89 - Jan '91	Rand Mines	Sulphide ores	220,630	500	2.31
Nov '93 - Jan '95	Maid O' Mist	Oxidized ores	490,533	645	1.31
Feb '95 - May '95	Caledonia	Oxidized ores	81,130	131	1.62
Jul '96 - Jul '97	Caledonia	Sulphide ores	166,397	311	1.87
Total Production			**898,058**	**1,487**	**1.66**

The first gold was produced in October 1989. However, BML ceased production only 14 months later in December 1990 on account of the mine being unable to achieve both tonnage and gold grade forecasts. During this period, the plant processed 220,630 tonnes at an average recovered grade of 2.31 g/t and producing 500.18 kg (16,081 oz) of gold (Table 8.1). The mine was placed on care and maintenance.

Maid O' the Mist Mining Company, in a joint venture with Rand Merchant Bank Limited, acquired BML in May 1993. Estimates of the quantity and quality of broken ore available for processing were provided by the previous owners. However, discrepancies were detected in these data to the extent that management decided to delay the mining of refractory ores until a full re-assessment of the reserves had been completed. The metallurgical plant was modified to handle low-grade oxide ores in order to give management time to re-evaluate and develop the underground sources of ore. The mine then proceeded to extract oxide ore from a series of open pit workings along the length of the mining area. In December 1994, Caledonia Mining Corporation (Caledonia) purchased 50% of BML from Rand Merchant Bank Limited and the remaining 50% from Maid O' the Mist in January 1995. During the period November 1993 to April 1995, 515,270 tonnes of oxide ore was treated at an average recovered grade of 1.31 g/t, yielding 676 kg of gold.

Production was interrupted for 12 months while modifications were made to the treatment plant in preparation for the mining of refractory ores from underground. During this period, a further 8,000 m of diamond drilling and approximately 4,000 m of flat development was completed which significantly improved the definition of the main ore zones. The treatment of refractory ores commenced in July 1996 and continued until July 1997. A total of 166,400 tonnes of sulphide ore was treated at an average rate of 14,464 tpm, and 311 kg of gold was produced at a recovered grade of 1.87 g/t. Both the head grade and the metallurgical recovery achieved over this period (~40%) were below target and the mine was again put on care and maintenance pending a re-evaluation of the mining method and metallurgical process.

We have reviewed the circumstances surrounding the above short-comings at Barbrook Mine including the evaluation documents and mining plans prepared by RME and Caledonia. In our opinion, the operational infrastructure and mining plan implemented by RME was not justified by the findings of the exploration programme. Influence of senior management was paramount in implementing the mine plan, even against the judgement of geoscientists within the organisation. The targeted ore tonnage and head grade could not be achieved with the infrastructure and geological exposure available. Caledonia's earlier attempts at mining the sulphide ore bodies, was based on being able to mass mine the more massive ore bodies with minimal attention to geological detail. The low ore grade achieved by this method was exacerbated by the poor metallurgical recovery rendering the mine uneconomic.

An ore "reserve" review was prepared by Caledonia at the end of December 1996 and the figures generated by this review are set out in Table 8.2. Extensive metallurgical tests were carried out by MINTEK (a state subsidized technical research organisation) on behalf of Caledonia between 1997 and 2001 and these showed that satisfactory recoveries could be achieved on sulphide ores from Barbrook. During the period March to December 2002, a complete re-evaluation was undertaken at French Bob (the main ore zone). This led to an estimate of Proven and Probable Ore Reserves amounting to

167,000 tonnes at an *in situ* grade of 6.0 g/t gold. Following these developments production recommenced in January 2003.

Table 8.2 Mineral Reserves and Resources 31 December 1996

RESERVES	**TONNES**	**GRADE**	**IN SITU GOLD**	
Category	metric	g/t	kg	k oz
Proven	335,600	4.99	1,680	53.8
Probable	496,400	7.96	3,950	127
Total Reserves	**832,000**	**6.53**	**5,630**	**181**

RESOURCES	**TONNES**	**GRADE**	**IN SITU GOLD**	
Category	metric	g/t	kg	k oz
Indicated	954,000	6.12	5,840	188
Inferred	9,202,000	6.51	59,900	1,926
Total Resources	**10,156,000**	**6.17**	**65,740**	**2,114**

8.1 Historical Ore Reserve and Resource Disclosures

Ore “reserve” estimation by RME in the 1985 Feasibility Study gave an overall “reserve” of 14.9 million tonnes of ore grading 7.0 g/t.

”Reserve” estimation followed a process of reef zone definition by way of diamond drilling, followed by horizontal development to expose the zones that were then intensively sampled at 2 m intervals along strike. Payable portions of the reefs (“stretches”) were delineated from the assay values. Ore “reserve” blocks were demarcated on the basis that near vertical payshoots of varying dimensions occur within the mineralised shears, although it was not always possible to define a payshoot by directly linking an ore body on one level with a corresponding ore body on another level. Ore shoots defined in this manner were projected down to a depth of 1000 m below the lowest level of mining, based on the fact that mining in similar structures in local mines has continued to depth and that it would be expected that the same would happen at Barbrook.

In our opinion, the above procedure was adequate only to determine a global Mineral Resource and locally a Probable Mineral Reserve in terms of the CIM Code, as currently applied, but could not be used to justify the ore reserves disclosed at that time. This estimate of “reserves” was, however, not material to the under achievement by the mine.

Watts, Griffis and McQuat (1994), mining industry consultants, have prepared and extensive review of ore estimation procedures over the early life of the mine. In their technical report (July 31, 1994), they reviewed the reserve and resource classification according to the Australian Institute of Mining and Metallurgy code (JORC) (Table 8.3).

Table 8.3 Summary of Barbrook Reserves and Resources – Watts et al. Review

RESERVES	TONNES	GRADE	IN SITU GOLD	
Category	metric	g/t	kg	k oz
Open pit oxides	270,000	1.9	513	15.9
Sulphides	361,000	3.8	1,370	42.7
Total Reserves	**631,000**	**6.53**	**1,883**	**58.6**

RESOURCES	TONNES	GRADE	IN SITU GOLD	
Category	metric	g/t	kg	k oz
Open pit oxides	2,000,000	1.2	2,400	75
Indicated	2,000,000	6.9	13,800	430
Inferred	8,000,000	6.9	55,200	1,720
Total Resources	**12,000,000**	**5.95**	**71,400**	**2,200**

The "reserves and resources" estimated by Caledonia as at December 1996 (Table 8.2) were prepared in a manner broadly consistent with the principles of the CIM Code. The most obvious discrepancy was the inability to assign a realistic metallurgical recovery required for the reserve estimation. It also depended on the ore body geometry defined by the early RME work.

9. GEOLOGICAL SETTING

Barbrook Mine is a greenstone gold deposit, analogous to those occurring in the Canadian and Western Australian Archean terrains.

The hilly terrain formed by the ancient greenstone succession that hosts the Barbrook deposit, is known as the Barberton Mountain Land, one of the best-known goldfields of its type in Africa. It hosts many gold mines, including the well-known Consort, Sheba, Agnes and Fairview mines (Figure 9.1). The belt trends southwest-northeast and has been intruded and deformed by various granite plutons at the margins. The belt consists of three main lithological components:

- the basal Onverwacht mafic to ultramafic volcanic sequence best preserved in the south;
- the Fig Tree Group comprising greywacke and shale sequences with minor banded iron formation units (BIF) and particularly well preserved in the north-east;
- an upper unit consisting of sandstone, quartzite and conglomerate (Moodies Group) well represented in the central Mountain Land.

Barbrook's ore deposits occur predominantly within the Fig Tree sediments. More specifically, mineralization is associated with BIF units at the base of the Fig Tree greywacke units and often in contact with altered ultramafic schists.

Regionally, auriferous ore bodies occur along two major east-west trending sub-parallel regional shear structures known as the Barbrook Line (to the South) and the Zwartkoppie Line (to the North). These prominent features are present over the length

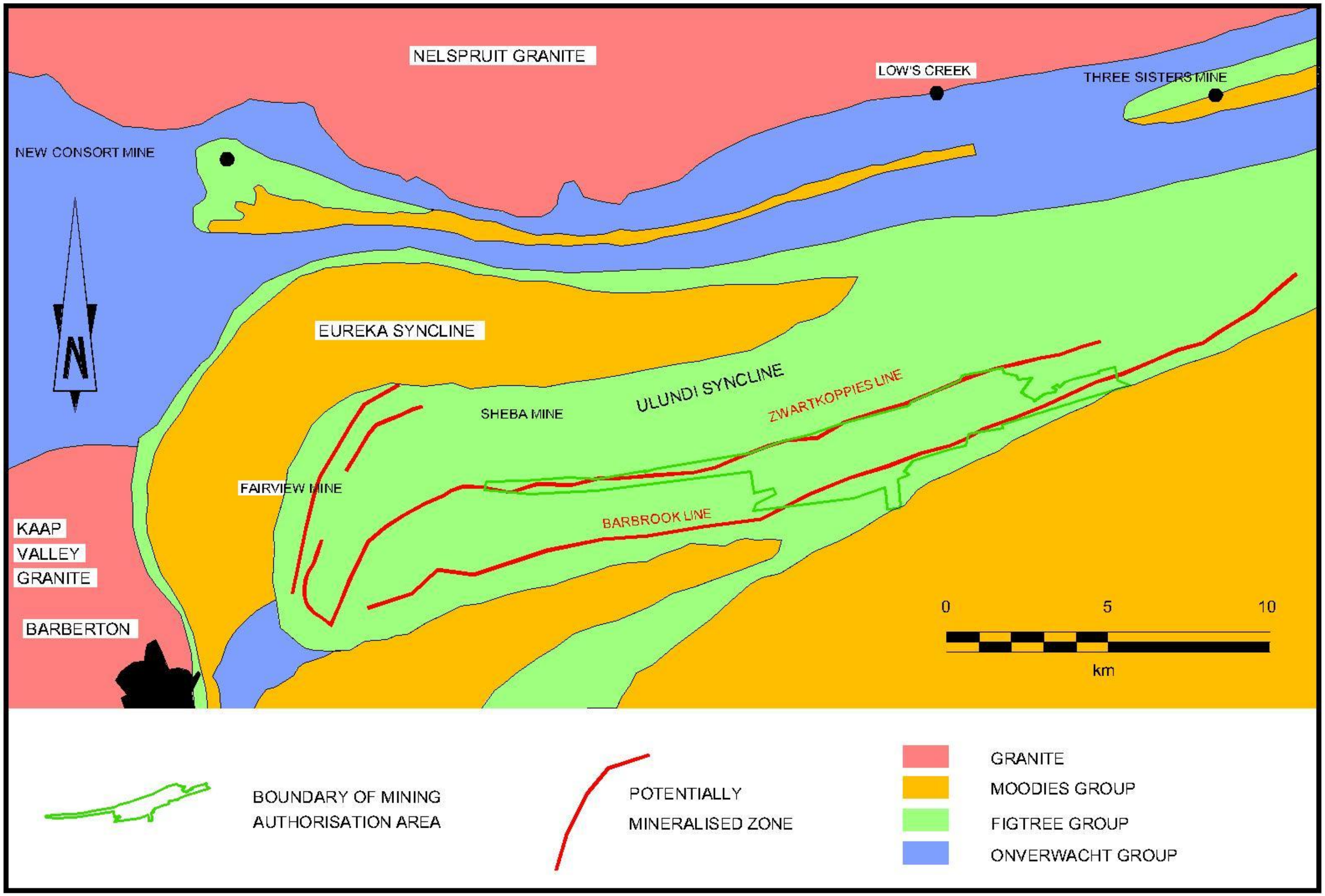

Figure 9.1 Simplified Structural Geology of the Eastern Portion of the Barberton Mountain Land

of the BML claims and are concordant with the ultramafic schist zones (Zwartkoppie Formation) believed to be footwall of the BIF units. The main Barbrook Syncline as well as the other smaller complimentary synclines in the area (Figure 9.2) have been truncated by listric faults and the stratigraphy youngs to the north.

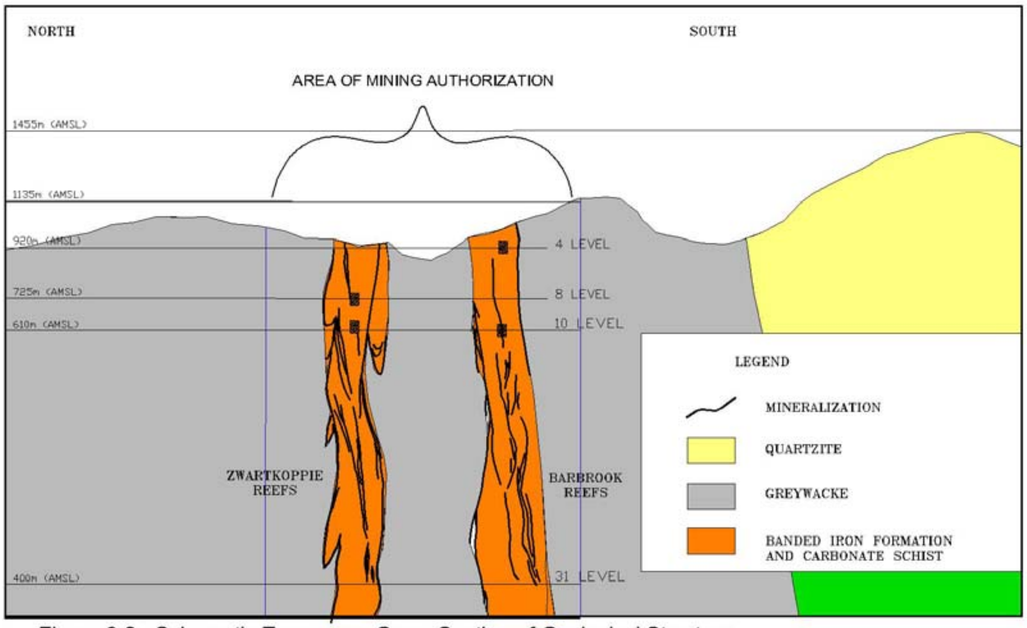

Figure 9.2 Schematic Transverse Cross Section of Geological Structure

10. DEPOSIT TYPES

Gold mineralization at Barbrook is essentially BIF-hosted and has been mined from ore shoots spread over the full extent of the mining area (Figure 10.1). Locally, mineralization also occurs in "greenschists" (altered ultramafic rocks) adjacent to the BIFs but these constitute only a minor portion of the mineralization.

The ultramafic schist zones referred to above are anticlinal structures consisting of talc schists and grey and green carbonate schists of the Onverwacht Group juxtaposed with BIF units of the Fig Tree Group along the bounding contact. The synclines consist of greywackes of the Fig Tree Group, which, because of their uniform nature, suffered only regional deformation. Shearing was focused along the Barbrook and Zwartkoppie lines on account of the ductile nature of the talcose schists and carbonaceous partings in the BIF. Gold-bearing fluids migrated along these major feeder fractures into zones where fluid reaction with the iron-rich host rock resulted in sulphide mineralization and gold precipitation.

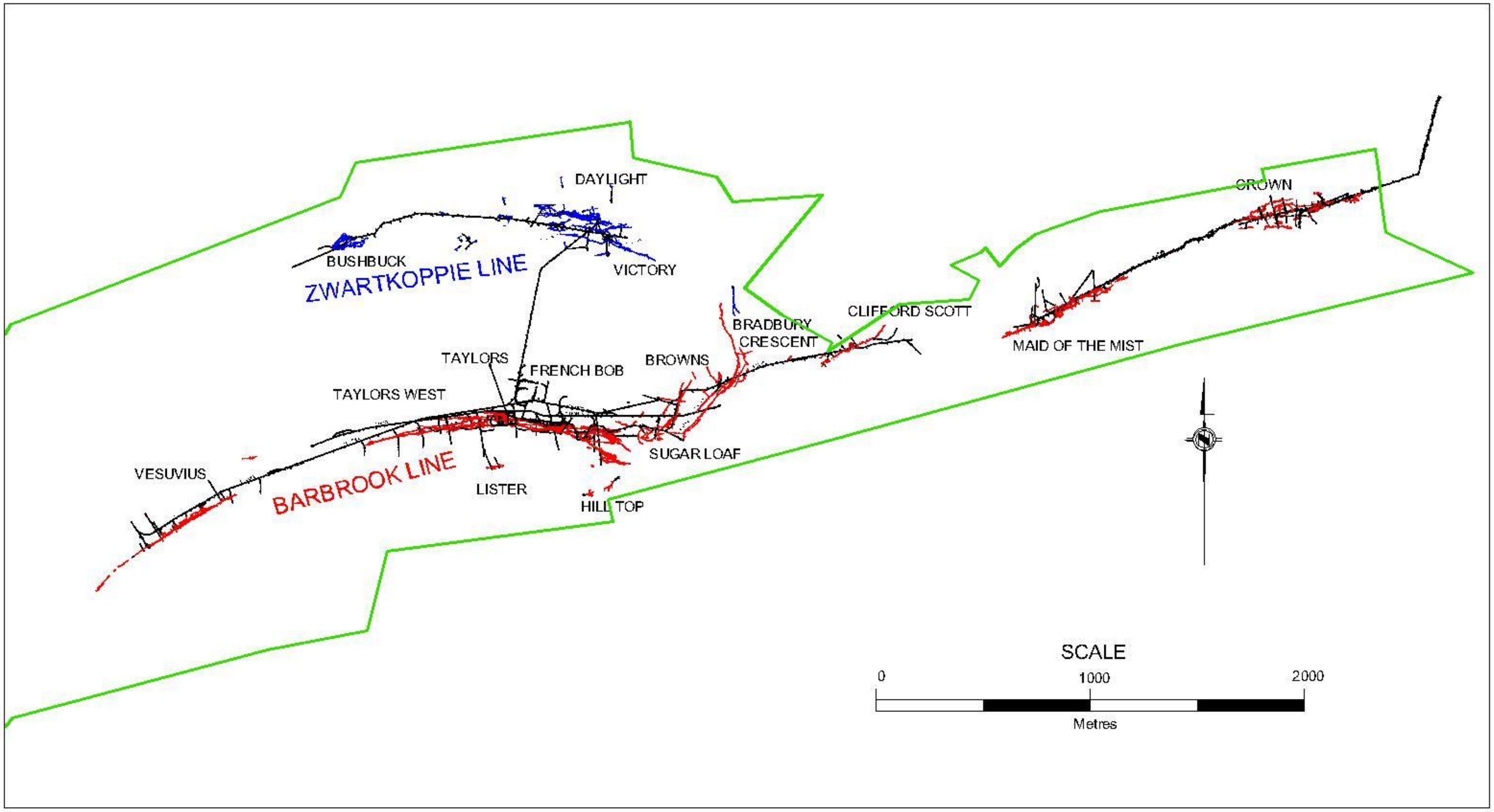

Figure 10.1 Plan Showing the Location of Ore Bodies along the Barbrook and Zwartkoppie Lines

10.1 General Geology of the Barbrook Line

The Barbrook Line deposits consist of the Vesuvius, Taylors, French Bobs, Sugar Loaf, Browns, Crescent, Clifford Scott, Maid of the Mist and Crown sections all situated to the east of the plant site. West of the plant site, the old workings of Cascades, Cookes, Barbrook (old) and Sofala lie to the west of the plant site. The bodies are aligned along a zone of BIF/chert and meta-ultramafics a short distance north of the Barbrook Fault (Fig 10.1).

The Vesuvius, Taylors and French Bobs sections are formed by a number of dislocated ore bodies that are aligned along brittle-ductile shear zones demarcated by the presence of BIF enclosed within greywacke country rock. Gold is associated with disseminated pyrite, pyrrhotite and arsenopyrite, and to lesser extent base metal sulphides. Intense shearing, massive quartz veining, silicification of BIF and sulphide enrichment characterize the larger ore bodies.

The main mechanism of gold concentration is the sulphidation of Fe-rich (siderite) BIF. Reaction between dissolved sulphate complexes and iron to form iron sulphides removes the gold transporting agent from solution, resulting in precipitation of the gold. Zones of intense fracturing provide the largest reaction surface and hence chemical change while dilatational domains caused by the intersection of shear zones provide the ideal loci for the accumulation of gold and quartz.

East of the French Bobs section, meta-ultramafic units form the southern contact of the BIF and several E-W to NE-SW striking, brittle-ductile shear zones occur within the BIF. Fuchsite quartz-carbonate schists host, or are closely associated with, the gold mineralization. The main band of BIF host rock curves to the north towards the structure at the Crescent structure. There appears to be a link between this structure and the Victory fracture on the Zwartkoppie Line.

10.2 General Geology of the Zwartkoppie Line

A series of intercalated grey quartz-carbonate schists, green fuchsite-quartz-carbonate schists, talc-carbonate schists, chert and BIF units, form the host rocks of the Zwartkoppie gold mineralization. The intercalation is due to a series of large Z-folds which result in structural duplication and thickening. The Daylight shoot occurs along the margin of a fold while the Victory shear (and shoot) cuts through the hinge zone of a large sub-vertical fold in the BIF.

At Bushbuck section to the west and the Daylight-Victory area, a series of large tight folds with sub-vertical fold axes form the foci of mineralization. E-W oriented shears are developed at or close to the base of the BIF unit. Ore minerals are predominantly arsenopyrite and pyrite with minor pyrrhotite.

Several NNE-SSW dykes intrude this sequence. The dyke in the Daylight area has been offset by reactivated shears that complicate ore zone delineation in the area.

The schematic stratigraphy of the Barbrook area is illustrated in Figure 10.2.

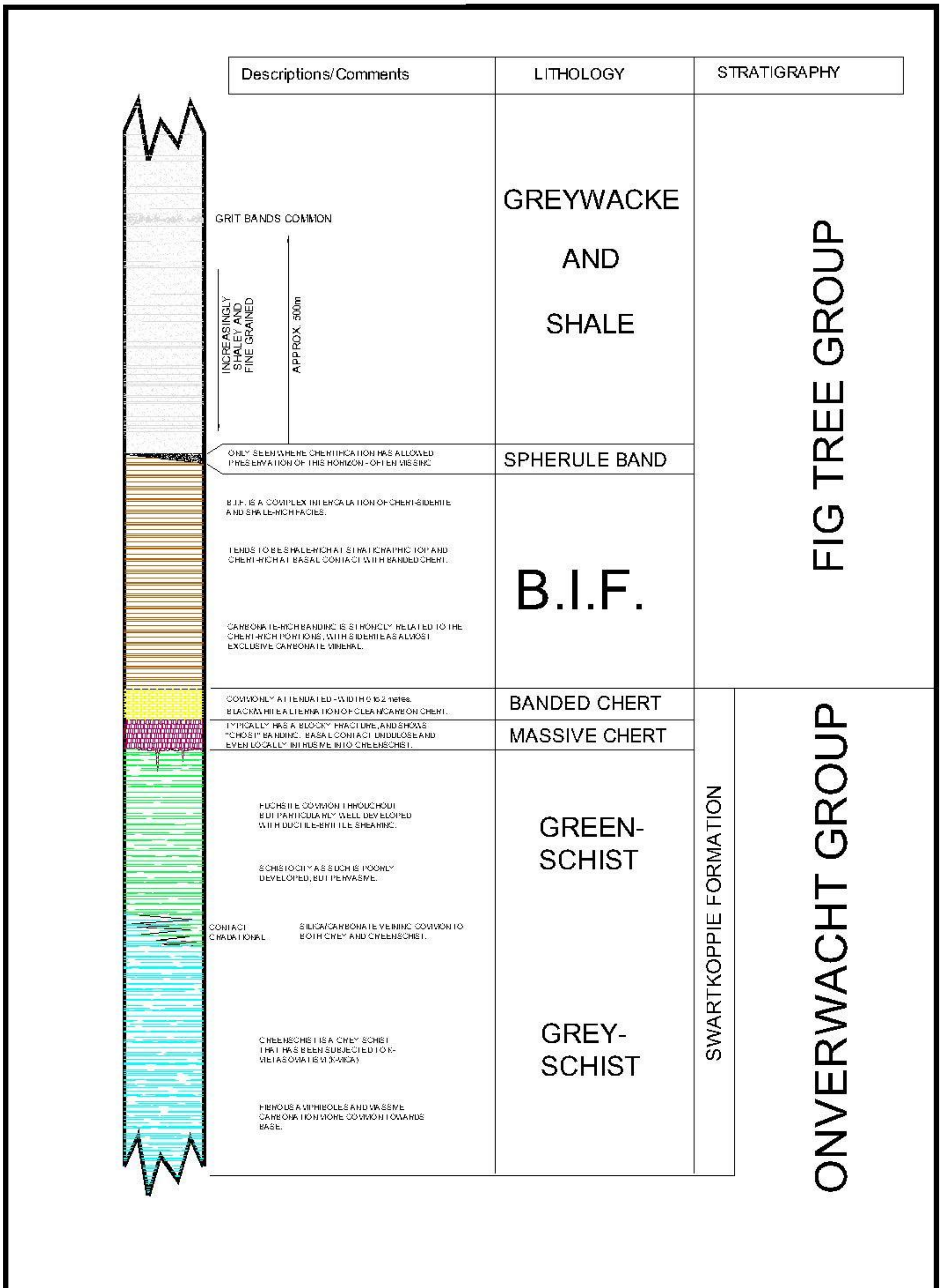

Figure 10.2 Barbrook Schematic Stratigraphy

11. MINERALIZATION

Within the mineralised centres listed above a total of some 60 ore shoots of varying dimensions and extent have been recognised. We believe that it is impractical to describe all these shoot characteristics in view of the fact that:

- many of the shoots are small and of negligible economic significance;
- most of the ore shoots have similar or overlapping characteristics;
- individual characteristics are insufficiently diagnostic to distinguish between shoots;
- subsequent dislocation may have increased the number of discrete ore shoots.

In view of the above considerations, detailed descriptions have only been given for mineralization that is currently identified as having potential economic significance.

11.1 Ore Body Characteristics of the Barbrook Line

11.1.1 Taylors Section Ore Bodies

The Taylors section consists of a 900m long stretch of disjointed ore bodies aligned along E-W trending shear zones within a BIF unit. The unit, with a general E-W strike and dipping steeply south (85º), is part of the overturned section of Fig Tree sediments. The structural hanging wall (northern contact) of the BIF is formed by an undisturbed sedimentological contact with Fig Tree greywackes, while the southern contact is formed by a major structural break against course clastic Fig Tree greywackes.

A discontinuous banded or massive chert unit varying in thickness from a few centimetres up to 14 m occurs along the northern contact of the BIF. Rapid fluctuations in thickness of the chert appear in part to be related to silicification of the contact zone with the greywacke.

The thickness of the BIF strongly controls the nature and localization of mineralization. In structurally thickened zones, large ore bodies up to 10 m thick occur ("massive" ore bodies), while in the pinched out zones mineralization is confined to single shears and is usually discontinuous ("narrow" ore bodies), see Figure 10.3. This variation in ore body geometry has led some researchers to classify the ore bodies into 1st order and 2nd order types. However, for the purposes of this report, they are regarded as extreme examples within a continuum of possible types.

Massive Ore Bodies:

Dimensions: *Wide bodies, up to 15 m wide and strike lengths 30 m to 80 m.*

Vertical Extent: *Continuous bodies, traceable over several 100 m.*

Structure: *Anastomosing multiple brittle-ductile shears, with dilation at shear junctions.*

Fluid characteristics: *High fluid-wall rock ratio.*

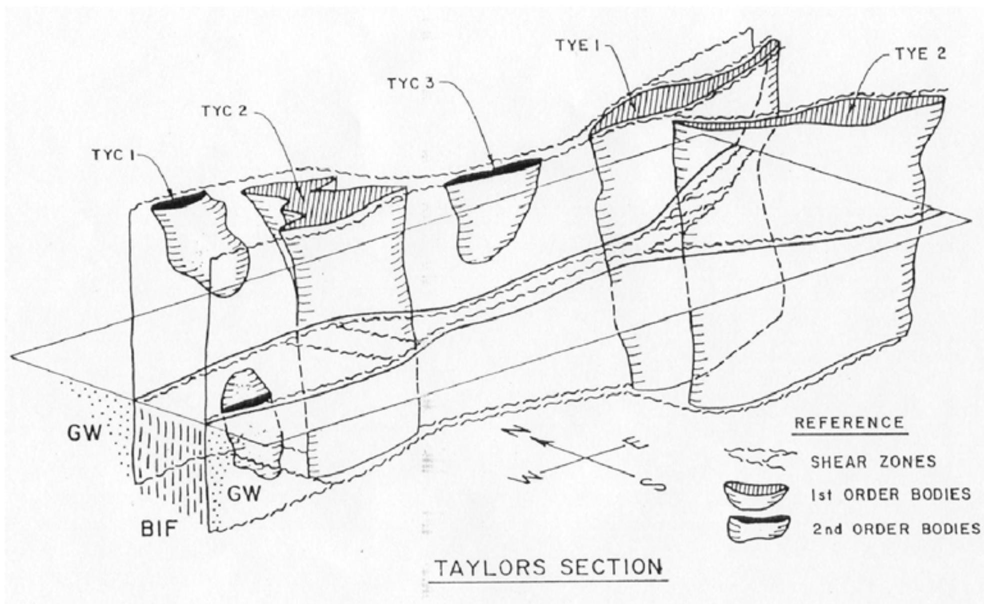

Figure 10.3 Barbrook Mines Ltd - Continuity and Geometry of Taylor Ore Bodies

Sulphide Mineralogy: *Pyrite, pyrrhotite, arsenopyrite, sphalerite, stibnite and chalcopyrite; pronounced zoning across and along the strike of the body.*

Quartz veins: *Massive veins and intensive impregnation.*

Au-distribution: *Erratically distributed over large volume with average grades of 3 – 6 g/t. Zones of high-grade (>20 g/t) are commonly arsenopyritic and occupy a discrete shear zone within the body.*

Narrow Ore Bodies:

Dimensions: *Narrow well defined bodies, pinching and swelling from 10 cm to 2.5m wide.*

Vertical Extent: *Patchy, discontinuous very erratic. Vertical blocking of high-grade stretches should not exceed 50% of the strike length with reasonable confidence.*

Structure: *Narrow brittle-ductile shear zones that pinch and swell from a few centimetres to more than 2 m and with a tendency to bifurcate.*

Fluid Characteristics: *Low fluid to wall rock ratio.*

Sulphide Mineralogy: *Pyrite, pyrrhotite and arsenopyrite. The latter locally in high concentrations. Sparse sphalerite, galena, chalcopyrite and stibnite in narrow quartz-ankerite veins.*

Au-distribution: *Erratic, from less than 1 g/t to greater than 15 g/t.*

Taylors West 1 (narrow ore body)
This comprises a ductile shear zone along the BIF contact with greywacke and chert and carries disseminated pyrite mineralization. Locally patches of arsenopyrite within shaly BIF occur close to the main fault at the eastern end of the pay stretch. Sulphidation of siderite bands in the sidewall chert can result in high grades (15 – 25 g/t).

Taylors West 2 (narrow ore body)
The pay stretch is formed by a very well defined brittle-ductile shear zone within the BIF, mainly along the northern contact of the BIF with chert and greywacke. At the eastern end, the shear zone terminates by splitting into numerous single shear planes, branching away from the main shear direction. The termination is frequently accompanied by ankerite veining and trace pyrite mineralization.

High grades are associated with pyrite and arsenopyrite and are usually confined to a zone a few centimetres either side of main shear planes.

A decrease in grade within this body can be anticipated when the well defined shear zone subdivides into a branching swarm of brittle shear planes, often associated with the increase of carbonate vein frequency. The absence of inter-banded siderite and chert in the sidewall is usually associated with lower grades.

Taylors central 1 (narrow ore body)
A brittle-ductile shear running along the northern contact of the BIF, and parallel to the main mineralized shear zone in the middle of the BIF, forms the pay stretch (Figure 10.3).

The narrow and usually well-defined shear zone follows the BIF/greywacke contact, pinching and swelling from a few centimetres to more than 2.5 m in width. Gold is associated with poorly disseminated pyrite mineralization and patches of arsenopyrite within shaly BIF close to major shear planes.

The gold distribution depends strongly on the dimensions of the shear zone. Wide shear zones are consistently well mineralized (average values above 5 g/t) while mineralization is absent where the shear zone pinches out.

Taylors Central 2 (massive ore body)
This body is located in the centre of the BIF immediately west of the main pinch out zone (Figure 10.3).

A wide shear zone with multiple interacting subshears hosts the mineralization. Massive quartz bodies introduced in dilatational domains are accompanied by intense silicification of the wall rock. Fuchsite and chlorite commonly occur in the sheared margins of the quartz veins while finer quartz and carbonate veining pervades the sidewalls.

The mineralization intensity varies widely within the body and is particularly well developed at the junctions of shears. The main sulphides are disseminated pyrite and pyrrhotite formed by sulphidation of siderite bands in the wallrocks, frequently preserving the original banding. Rich arsenopyrite concentrations are found along the margins of large sheared quartz bodies. These sheared margins carry gold grades of 15 – 30 g/t over 2 – 5 cm. Massive arsenopyrite (low in gold) is also observed in greywacke if the shear zone approaches the greywacke contact.

Base metal sulphides, mainly sphalerite, galena, chalcopyrite and rare stibnite are always associated with the massive quartz bodies and with late crosscutting quartz-carbonate veinlets. A strong correlation between galena and high gold grades exists, while sphalerite exhibits a more random behaviour.

Barren zones of BIF and slivers of strongly mineralized greywacke occur within the wide sheared body. The contacts of these bodies usually carry high grades over narrow widths. From a mining perspective, these low-grade inclusions are considered to be part of the ore body. Minor structures oblique to the trend of the main shear zone have been identified as spurs and very high grades of greater than 10 g/t over 10 – 20 m strike length and vertical extent have been outlined within this ore body.

Taylors Central 3 (narrow ore body)
A well-defined shear zone running through the centre of a narrow BIF unit carries the mineralization. The pay stretch appears to become smaller down dip due to the pinch-out of the BIF from 6A Level to below 10 Level.

On 6A Level a brittle-ductile shear zone with homogeneous pyrite mineralization was mined. No geological documentation exists. On 7A Level only a short poorly mineralized stretch of a ductile shear zone is preserved in the pinched out BIF zone. The single shear zone is lost towards the east by horsetail termination within a mainly shale BIF unit. Reef zones currently being exposed in development on sub-levels below 7 Level indicate that this reef zone thickens again east of the narrow pinch zone.

11.1.2 French Bobs (massive ore body)

This is the largest of the ore bodies on the Barbrook Line and is situated in the centre of the BIF east of the pinch out zone. The continuous thickening of the BIF towards the east leads to horsetail termination of the main shear zone where the width of mineralization increases and ultimately diluted along numerous, narrow, poorly mineralized shear zones in the east. The only payable eastern continuation of the branching shear system is the Thwalas ore body, a prominent splay of the southern flank of French Bobs.

A wide, mainly ductile shear zone consisting of lenses of tightly folded and sheared, sulphidized siderite BIF, together with silicified BIF and large black quartz veins, hosts the mineralization. The shear zone is narrow in the west but thickens eastwards where splays converge from the north. Further eastwards shears branch off to the south resulting in an overall decline in grade.

The branching zone shows the widest mineralization with the highest grades averaging up to 10 g/t over 8 m. Massive quartz bodies and intense silicification are typical of this ore body.

Pyrite and pyrrhotite, formed mainly by sulphide replacement of siderite layers, are the main sulphides. Arsenopyrite is restricted to the core shears within the ore body, usually concentrated along the contacts of sheared quartz bodies or in massive narrow bands along the main shear planes. Generally, pyrite occupies the main portion of the ore body with pyrrhotite occurring in lower grade eastern half of the body. Sphalerite, galena, chalcopyrite and stibnite are present mainly in the east, frequently in crosscutting quartz-carbonate veins.

Thwalas Splay (massive ore body)
This body occurs as a splay branching off the southern margin of the French Bobs lode and is exposed in the sill drive on 10 Level. Based on numerous exposures in drill cores and from the 10.30.33 crosscut south, similar geological characteristics to French Bobs are expected, although the body is smaller. Thwalas is dominated by quartz veins that tend to split the gold-bearing sulphide zones into disjointed high-grade patches.

11.1.3 Sugar Loaf Complex

The Sugar Loaf Complex occurs to the east of the French Bobs ore body. In this area of structural thickening, fuchsite quartz-carbonate schists, grey quartz-carbonate schists and talc-carbonate schists comprising the Zwartkoppie Formation occur as a thick accumulation adjacent to the BIF. Sheared lenses of BIF within the carbonate schists form the loci of four mineralized bodies, viz. Sugar Loaf Main, Sugar Loaf South, Greenschist and Sugar Loaf North.

Mineralised shoots consist mainly of gold-bearing fractures rather than shear zones. In the case of the Greenschist shoot, mineralization can be traced vertically from level to level, and occurs as a narrow fracture with hair-fine splays within the greenschists.

11.1.4 Browns Reefs

Browns Reefs occur in the roughly S-shaped folded area of BIF to the north of the Sugar Loaf Complex. A number of shear zones of economic interest occur here, i.e. Browns Main, Browns West and Browns East.

The BIF has been tightly refolded by left-lateral shearing resulting in a greatly thickened area of BIF. The mineralised structure dips 76° to the west and the fold plunges 76° south.

Mineralization occurs along narrow (up to 1 m) shear zones orientated parallel to the northeast-southwest strike of the BIF in the area. Pyrite and pyrrhotite are the main ore minerals while arsenopyrite is rare. This zone has not yet been exposed on 10 Level.

11.1.5 The Crescent Structure

Crescent is a curved continuous structure that truncates the main BIF east of the Browns fold. It cuts through various lithologies but generally includes a wedge of BIF or chert dragged in along it. The fracture has a dip that varies from 65° west to steeply east. In the stoped areas, dips of 70° west were encountered. Both sinistral and dextral movement can be observed on a small scale and a well-developed S-C fabric is evident. In the oxidized near-surface zone, the structure is characterized by a zone of gouge containing fragments of BIF and chert in a matrix of clay.

Several economically important areas on this structure have been identified, the most important of which are north of the area of BIF truncation. There is some quartz veining and the shear widens to over 1m. The ore is completely oxidized on 4 Level while on 7 Level only pyrite has been observed in the reef drive, which has not yet reached the area of interest.

The north-south orientation of this structure indicates a structural link between the Barbrook and Zwartkoppie lines.

11.1.6 Clifford Scott

East of the Crescent structure numerous shears and fractures are developed in greywackes. The orientation of these structures is varied and diamond drilling has located sporadic gold mineralization.

Still further east, the Clifford Scott ore body has been developed and partially stoped. This ore body is a large mineralized east-west trending siliceous body that has formed by silicification of ferruginous shales and greywacke. Mineralization is mainly pyrite although arsenopyrite is common. Sphalerite also occurs in minor quantities. All sulphides carry gold.

The ore body is up to 8 m wide, but in excess of 3 m wide for a strike distance of 35 m. Drilling has shown a sub-economic zone to occur over a strike length of 150 m. No pitch has yet been established but there is a quarry 140 m long and 12 m wide some 100 m to the west of the 4 Level exposure. A positive correlation with the 4 Level ore zone would indicate a pitch of 40° east.

11.2 Ore body Characteristics of the Zwartkoppie Line.

11.2.1 Bushbuck

This is the westernmost of the known Zwartkoppie Line ore bodies.

The Zwartkoppie horizon has been folded into a Z-shaped syncline inclined 76° to the south and plunging 55° to the west, with an east-northeast trending axial plane.

Arsenopyrite and to a lesser extent pyrite, occur as replacement laminae of siderite layers in banded cherts at the contact between the quartz-carbonate schists (altered ultramafics) and BIF. Gold grades are comparatively high but the strike length is short (< 30 m).

11.2.2 The Daylight Ore Bodies

The Daylight structure has discrete ore bodies located along 370 m of strike from Daylight West through to Daylight Extension. Where the shear forms the contact between BIF and fuchsitic schists, it is commonly mineralized and forms three separate ore shoots. Where fuchsite development is absent mineralization is sparse. The significance of the fuchsite association is that it is a K-mica coloured green by Cr already present in the rocks. Therefore, its presence indicates that K-metasomatism is an integral part of the mineralizing process and necessary to achieve ore grades.

Daylight West
This is a short strike length (<40 m) wide ore body situated at the western end of a lens of fuchsitic quartz-carbonate schists which are totally enclosed in BIF. Mineralization is dominantly arsenopyrite with only minor pyrite. The fuchsitic schists have been moderately silicified.

Daylight Main
This ore body was stoped to 140 m below surface even before Barbrook Mines Ltd commenced operations. The body has a strike of up to 160 m and widths varying between 1 m and 4 m.

The ore body is developed along the sheared contact between BIF to the north with fuchsite quartz-carbonate schists to the south. Mineralization is arsenopyrite and minor pyrite. Minor free gold has been found in the upper oxidized levels. The arsenopyrite is generally confined to the fuchsitic schist that has great significance with regard to the payability. Where fuchsitic schist is juxtaposed against the BIF, the gold grades are good, but where the shear occurs within BIF, it becomes very low grade. Large areas of almost barren arsenopyrite mineralization occur along the ore zones, apparently without any geological control.

The ore body has a dip of between 70° and 75° south on the upper levels. At depth, the dip appears to flatten off, as the shear appears to merge with the Victory shear to the south. While the ore body appears to pinch out below 6 Level, diamond drill intersections indicate a well mineralised, but probably separate zone between 8 and 10 levels.

Daylight Extension
A thin sliver of BIF tapering eastwards from approximately 4 m to 5 cm thick is totally enclosed by quartz-carbonate schists (meta-ultramafics). This east-west trending sliver of BIF is totally sheared when less than 1m wide but when thicker only its contacts with the schists are sheared.

Mineralization is dominantly arsenopyrite, which occurs close to the contact between the BIF and fuchsitic schists. Arsenopyrite impregnation can extend for over 2 m into the fuchsitic schists. Mineralization in the BIF is low-grade pyrite and pyrrhotite becomes dominant towards the west. Only the fuchsitic schists are mineralized.

Good arsenopyrite mineralization occurs to the east of the payable ore but this arsenopyrite carries no gold. The eastern limit of economic mineralization is therefore determined by a sampling cut off.

The body appears to pitch east at 58° and dips between 82° and 65° south further indicating a flattening with depth. The ore body is split by a N-S trending dyke that is approximately 30 m wide.

The Victory Reef

Victory is an east-west striking shear within a massive structural thickening of BIF. It was mined from surface but stopped when sulphides were encountered only 30 m below the surface. The shear pinches and swells from 10 cm to a 3 m wide system of interlinking shears with sub-shears usually splaying to the south. Mineralization is discontinuous and irregular over the full extent of the shear.

Where the shear is thin, usually only pyrite occurs and gold grades are low (±2g/t Au). However, where the shear widens, arsenopyrite may occur with associated high gold grades. Base metal sulphides, namely sphalerite and galena, occur mostly in quartz-carbonate veins. These sulphides are gold bearing and native gold has been found in the white quartz. Pyrrhotite-pyrite-arsenopyrite mineralization in quartz bodies can occur in the hangingwall but these are generally low-grade (±1 g/t Au). Towards the west of the ore body slivers of greywacke are sheared against the BIF and arsenopyrite rich ore is more common. Good mineralization occurs at the confluence of splay shears with the main shear.

The shear dips 80° to 85° south and no pitch has been established. However, the presence of a quarry immediately above the present mining indicates that there is no pitch. Three-dimensional (3D) contouring of stope grades suggests that there may be a westerly pitch to the high-grade shoots.

Two diamond drill holes have been drilled below 8 Level to intersect the Victory Reef at approximately 10 Level elevation. Borehole BDL75B intersected the reef 95 m below 8 Level at a grade 15.05 g/t over 90cm, and BDL75B1 intersected the reef 110 m below 8 Level at a grade of 15.32 g/t over 180 cm.

12. EXPLORATION

12.1 Phase I

Most of the exploration carried out on the property was undertaken between 1979 to 1985 by RME during the initial investigation. The work culminated in the feasibility study of December 1985 prepared by Rand Mines.

This exploration program consisted of soil geochemistry, geophysics, and diamond drilling conducted over the full extent of the property. Soil samples were taken at 25m centres along grid lines spaced 100m apart. From the suite of elements analysed, gold and arsenic proved to be the most useful in defining the areas of interest.

Geophysical surveys were conducted over the same grid and included self potential (S.P.) and magnetic techniques. S.P. anomalies were found to coincide with the geochemical anomalies in certain areas, probably on account of the sulphide concentrations. This led to the preparation of an F-factor plan, which combined the As, Au and S.P. data into a single vector. This plan has successfully delineated all the major mineralised zones as well as some less obvious targets.

A surface diamond-drilling program was implemented to test the anomalies as well as to examine the depth extent of the old mines. A total of 79 diamond drill holes were drilled totalling 23,147 m (average 293 m). The program was designed to intersect the reef zones below the oxide-sulphide interface. Although the program included two deep holes, which intersected payable reef zones at a depth of 600 m below surface, it is clear from the average depth that this program provided only limited information on the deeper mineralised zones.

Included in this program was the reopening, examination and evaluation of some 14,000 metres of old underground workings. This program was followed by underground exploration in order to establish ore reserves. Extensive haulages were driven on the major levels, 4 Level, 7 Level and 10 Level on the Barbrook zone and 8 and 9 Levels on the Daylight zone. Altogether 6,300 m of haulage was driven, from which 1,420 m of cross cuts and 4,960 m of reef drives was developed (total 12,680 m). The mineralized zones along with branching shears were exposed in the reef drives for sampling and mapping.

Underground diamond drilling was carried out from the haulages and reef drives at intervals of approximately 50 m. In areas of greater potential, lateral drilling was spaced as close as 25 m intervals. During this phase, 1205 boreholes were drilled totalling 48,506 m of core drilling.

Sampling of all reef and related development was carried out at 2 m intervals. All samples were assayed for gold by conventional fire assay at the Rand Mines facilities on the East Rand (East Rand Premier Mine).

Assay values above 3 g/t were linked together where practicable to give “stretches” of “ore” grade material or shoot cross sections. These shoots were linked to stretches above and, where possible, below to give ore shoots.

The above exploration programme culminated in a feasibility study prepared in 1985 by Rand Mines, and based on a reserve of 14.9 million tonnes of ore at an in situ grade of 7.0 g/t Au.

12.1.1 Interpretation

In our opinion the exploration programme carried out by Rand Mines was adequately funded and executed with due attention to detail and accuracy. Limitations, however, existed in that the drilling to define the down dip extension of the main ore bodies was not done. In addition, the follow up development and drilling was restricted to the eastern portion of the property and the assumption was made that a similar success rate would be achieved in the western portion. Having examined the information available for all areas, we believe that this assumption was not justified on account of the short strike length and scattered nature of early mining operations.

Concerns also exist regarding the use of the assay information to define economic zones. Stretch values were calculated based on the optimal selection of mining width. However, in many instances, it was simply not practical to mine the reef zone as defined. This was particularly true of narrow reef widths where the appropriate adjustment would be to increase the mining width at minimal grade to reflect the unavoidable dilution.

The ore "reserve" estimate of 14.9 million tonnes at 7g/t was determined at a time when ore reserve definitions were not clearly defined. In terms of current definitions, the "reserve" tonnage released at the time was essentially a "resource" figure. More recent estimates have sought to correct and replace the original figures. (see discussion below).

12.2 Phase II

A second major phase of exploration followed when Barbrook went into production. This phase consisted of ongoing development to expose new zones together with lateral diamond drilling to define the structure and full potential of the reef zones. These activities were part of normal mining operations and continued from 1986 until the cessation of mining activities in 1991.

The additional information gained during this period significantly improved the information and understanding of the mineralization. At the end of the period, BML prepared a summary report of all the zones of economic interest remaining at the time. These zones called "blocks" were assigned grades and tonnages based on the channel and stope sampling.

Zones were projected upward to the next level or to the old workings if the next level was within 60 m. If the next level was not within 60 m, the projection was made only if there was strong geological evidence for the projection. If there was not an upper indication of the zone, the blocks were projected 15 m if the strike length was <15 m, and 25 m if the strike length was >15 m. When the zone was on bottom level, it was projected a maximum of 25 m below the bottom level.

Only the channel samples and stope samples were used in this exercise and the data were not manipulated in any way. The block grade was reduced by 20% and the tonnage kept as calculated to account for dilution and ore tonnage lost to unrecoverable sections of the blocks.

12.2.1 Interpretation

The second phase of exploration was carried out in much the same way as the first and overseen by the same authority, Rand Mines. The closing tonnage inventory included all blocks with a grade above 3 g/t, which together amounted to 317,410 tonnes at an average grade of 5.45 g/t in situ. In all, 72 blocks or potential working places were defined. This shows that the reserve blocks were widely spread throughout the mine and it is doubtful whether such a decentralised mining operation extracting relatively small tonnages would have been viable for many of the blocks.

These considerations, as well as the narrow reef widths of some of the blocks, were not factored into the economics of mining the above blocks. In our view therefore, the closing tonnage prepared by BML overstated the then current reserve situation in that some of the blocks were sub-economic.

A number of the above blocks were mined in the subsequent period of mining carried out under the control of Caledonia Mining Corporation (1995 to 1997) while others too remote to mine have since been downgraded to the resource category. A comparison with current Reserve and Resource estimates can therefore not be attempted.

12.3 Phase III

Maid O' the Mist (Pty) Ltd, together with joint venture partner Rand Merchant Bank, restarted operations in 1993 and subsequently sold control to Caledonia Mining Corporation who operated the mine from 1995 to 1997. During this period the mine focussed initially on oxide ores while further development and exploration was conducted underground. The mine switched to mining underground refractory ores from June 1996 to July 1997.

The oxide ores were not previously evaluated in either Phase I or II. Maid O' the Mist therefore launched a trenching and reverse circulation drilling program in 1993 to assess the economic potential of the oxide resources. The program was successful and followed a process of ongoing exploration as the open pits were extended. During this period 572,000 tonnes were treated yielding 776 kg of gold at a recovered grade of 1.36 g/t. For the most part, the oxide ores were exhausted except for Maid of the Mist and Crown where a small resource remains.

The viability of the remnant oxides is questionable on account of the isolated nature of the high grades (i.e. excessive dilution) and lower metallurgical recovery that accompanies the deeper reef zones. No plans exist to treat this material as the plant has been set up to treat refractory ores. Consequently, although this material has been included in the resources, it does not form part of the mining plan and will receive no further attention in this report.

Underground exploration followed the same pattern as in the Rand Mines era except that much of the reef development was along sill drives above the haulage levels, providing additional exposure for use in estimating grades. Within the economically important zones, lateral drilling (short holes) was carried out at approximately 8 metre centres in order to improve ore zone definition, valuation and sidewall data. These cores were divided into 50 cm lengths (mostly) for assay at the mine assay laboratory. In the interest of more representative sampling, the entire core was assayed after logging. Although no core was kept the results of the drilling have in most cases been verified by on-reef mine development that has subsequently exposed the mineralization.

Assay values were cut to 15 g/t in both channel samples and sidewall drilling. However, the use of 50 cm core samples meant that such high values were seldom encountered. During this phase of the exploration, most of the development samples were cut by pneumatic diamond saw and chipped out.

12.3.1 Interpretation

This program contributed a great amount of information on the ore bodies. Sidewall drilling was successful in delineating the massive ore bodies, but in the case of the narrow bodies, the geology department was often unable to make use of the detail provided by this drilling, particularly with regard to keeping the stope face on reef. The quantity of drilling done and hence often brief logging, coupled with the fact that the core was destroyed, meant that the full benefit of the drilling was not achieved.

Geological maps prepared during this period, while being lithologically correct, lack structural and interpretive detail that would make them fully useful to the mining operation.

12.4 Phase IV

A primary consideration in the start of operations in January 2003 was the testing of the success of the planned mining method in extracting the complex ore bodies. During this phase, little additional exploration work was undertaken. Most development was focused around the current mining operations. Exploration development was started in January 2004 and continues to expose new areas of the mine.

13. DRILLING

Diamond drilling has always formed a critical part of the exploration and definition of the Barbrook ore bodies. The application of the drilling program is described above in the context of the various phases of exploration.

13.1 Past Drilling Programmes

Phase I drilling included both surface and later underground drilling. From surface, 79 diamond drill holes were drilled totalling 23,147 m. Most of these holes tested targets at elevations similar to or above that of the lowest adit level of the mine. Two deep holes intersected the reef at a depth of 600 m below surface (16.09 g/t over 110 cm at Crown, and 5.77 g/t over 303 cm at Maid of the Mist). The average depth for all these holes of 293 m did not provide much information on the deeper mineralised zones. This core was logged, split for assay and half retained. The core yard was, however, located outside the security area of the mine and the core has been vandalised. Consequently it has not been possible to validate any of the information from this drilling with the original core.

Underground diamond drilling was carried out from the haulages and reef drives at intervals of approximately 50 m. In areas of greater potential, lateral drilling was spaced as close as 25 m intervals. During this phase, 1205 boreholes were drilled totalling 48,500 m of core drilling. This core, being thinner and cheaper to acquire, was sampled as complete core for assay purposes. Only in the case of larger diameter long holes of a more exploratory nature was the core split and a permanent record retained. The bulk of this drilling was aimed at defining the reef zone and planning reef drive development. Good use was made of this information in compiling a geological model and borehole information was captured onto the geological plans.

Phase II diamond drilling consisted of the ongoing underground drilling which accompanied extensive development and the build up to production in 1989. This drilling was, for the most part, a continuation of the above drilling program and was carried out under similar controls. Approximately 10,000 m was drilled during this phase. As the development of the main extent of the Taylors-French Bob zone neared completion, a greater number of these boreholes were drilled up and down in order to confirm the vertical continuity of the higher-grade zones. The latter objective was complicated by the erratic nature of the mineralization as indicated by the gold grades.

Phase III drilling was again essentially underground, split roughly equally between lateral and down-dip stratigraphic drilling, and close spaced sidewall evaluation drilling. Almost 20,000 m was drilled during this period. Shortcomings in the information gathering and handling of this information have reduced the effectiveness of this drilling. In view of the fact that no core has been kept, it is impossible to verify the core logs and sampling results from these holes.

A standard sampling procedure was adopted for this core. Intersections of the BIF unit were divided into 50 cm samples and the full core was submitted for assay. By comparison, mineralised shear zones have widths of between 20 cm and 10 m. One outcome of this procedure is that mineralized units often straddle two or more samples leading to diluted and conservative grades for the intersection and wider planned mining widths, especially in the case of narrow zones.

13.2 Current Drilling – Phase IV

In June 2003 the mine commenced diamond drilling which was aimed at improving the definition of current mining areas and examining additional ore zones in the sidewalls. The core size is 32mm diameter (AQ) and the holes have been restricted to 25 m depth. This core is sampled according to lithology with particular attention being paid to sulphide bearing shear zones. Sample size varies between 20 cm and 50 cm long but is mostly approximately 30 cm. Whole core is sent for assay and only core logs are kept as a record of the holes. In view of the short length of the holes, only the collar of the hole is surveyed. This drilling program is carried out by Barbrook employees.

A deep drilling program was commenced in December 2003, to define the main French Bob mineralised zone between 50 m and 200 m below the lowest level of development. An independent contractor is carrying out this program but the responsibility of assessing the core passes to Barbrook staff once the core has been placed in core boxes in the core yard. The core size is BQ (48 mm diameter) and sampling is done on split core with half being retained as a permanent record. Hole lengths are generally in excess of 150 m and hence both collar and downhole surveys are conducted. Because of the importance of this zone to the future of the mine, the core is split, photographed and the hole surveyed. Sample preparation and gold and silver assays are performed by an independent commercial enterprise, SGS laboratories, at their Barberton branch. None of this information has been utilized in the findings expressed in this report.

At the time of writing, no additional information was available.

14. SAMPLING METHOD and APPROACH

Sampling programs over the history of the mine include:

a. soil sampling of the primary exploration grid;
b. chip sampling of all development ends;
c. sampling of diamond drill core;
d. chip sampling of advancing stope faces;
e. broken ore sampling in stopes and of trammed cars.

Much of this sampling has been described in a previous technical report (Watts et al., 1994) and is no longer material to the current operations.

Sampling relevant to this report is:

1. chip sampling in development ends since 1991;
2. diamond drill core sampling since 1994;
3. chip sampling of stope faces during the 1994 to 1997 mining period as well as current stope sampling.

14.1 Chip and Channel Sampling Since 1991

From the outset, Rand Mines instituted a practise of sampling all development ends that were of economic significance at intervals of 2 metres. Samples were taken in accordance with the standard practise on the Witwatersrand gold mines. These procedures have been carried over to the current operation and remain in effect.

Sample channels are cut from left to right across the hangingwall of the drives and perpendicular to the general strike of the reef. The individual sample length has been standardised at 30 cm in order to simplify grade calculations and reduce the chance of clerical errors. The last sample of each channel is commonly less than 30 cm if the width of the drive width is not a multiple of 30 cm. A sample channel is cut 10 cm wide and 2.5 cm deep, resulting in a sample of approximately 2 kg.

Since 1991, some 6,000 m of development has been sampled in this manner and all the assays carried out by the mine assay laboratory. The reef zones have on average a near vertical attitude and therefore a vertical attitude has been assumed for valuation purposes. Consequently, no adjustment to the sampling geometry is made in areas where strike and dip variations occur.

The nature of the BIF is such that it comprises an alternation of chert bands, siderite layers and carbonaceous shale. This gives rise to an uneven surface of varying hardness which makes chip sampling difficult to execute satisfactorily. A parallel program was therefore instituted in 1995 to cut samples with a pneumatic diamond saw before chipping out the centre. Both types of sampling were used thereafter depending on the nature of the sample locality and availability of compressed air.

Comment:
An examination of the sampling pattern underground has shown the sampling to be essentially in accordance with the above procedure. However, drives are never rectangular and hence there is a tendency for samples at either end of the channels (shoulders) to be measured oblique to the channel direction. In effect, this practise would increase the area of influence of marginal samples and, in cases where ore material was involved, increase the payable mining width marginally. In our view, this would not be of sufficient magnitude to have a significant impact on the valuation of the ore body.

The merit of saw cut versus chipped sample channels has often been debated at Barbrook, but without a clear result. In essence, while cutting the sample groove with a saw is about the only way one can sample a hard chert, the unevenness of the typical surface results in an uneven channel depth and sometimes even failing to cut. Comparisons in mineralised areas have shown no clear advantage of using either method in the Barbrook geological environment.

14.2 Diamond Drill Core Sampling since 1994

The BIF units host the gold mineralization by virtue of the fact that they are the focus of shear zones. This shearing has resulted in an intensely complicated structural pattern and highly erratic shear zone behaviour. For this reason, diamond drilling has been employed primarily as a mapping tool. Mineralized intersections were sampled to give an indication of the tenor of the reef while ore reserve calculations generally only followed after the zone had been exposed by development. In inclined drill holes, a positive intersection value was used more as a justification to extend an adjoining shoot than to weight the tenor of the shoot itself. This practise stems from the high variance of the gold grades and the assumption of vertically continuous mineralised zones.

The deeper holes were drilled with BQ rods (48 mm core diameter) while the short sidewall evaluation holes were AQ (32 mm core diameter). In general, BQ core was split, with half going to assay and half being retained for metallurgical purposes, while AQ core was sampled as whole core. Sample lengths in the case of BQ core were governed by geological units and contacts but seldom exceeded 50 cm in length. AQ core, however, was sampled in standard 50 cm lengths regardless of the geology. One outcome of this procedure is that mineralized units often straddle two or more samples leading to diluted and conservative grades for the intersection and wider planned mining widths, especially in the case of narrow zones.

Comment:
While drill hole intersections were previously not a critical element of the valuation of ore zones, it has become necessary to use these data especially in the valuation of the massive French Bob section. This body has a strike of about 100 m and is continuously mineralised from surface down to at least 50 m below 10 Level elevation. Information is sparse beyond this level. Since the French Bob body contains most of the current Mineral Reserves on the mine, it is important that the supporting information be examined.

14.3 Chip Sampling of Stope Faces

Sampling of stope faces represents a special category of chip sampling because one does not have a second chance to verify and correct errors. In addition, as a production zone, there is generally insufficient time to take a better quality sample (e.g. saw cut). The information acquired in this way can be used to reconcile the ore mined with the *in situ* ore, as well as to guide stoping operations. As such this information is seldom used in ore valuation, it is consequently not subject to the same rigorous checks.

Stope chip sampling is, nonetheless, subject to the same sampling procedures and controls as the development sampling. The use of these data in valuing the remnant areas is, however, questionable. Partially mined old stopes generally reflect the lowest grade reached on that zone. On Barbrook mine grade commonly peters out vertically while laterally high grades have been identified a short distance into the faces. The complex structure defined in the horizontal plane also affects the ore zone in a vertical sense. Shrinkage stopes are by nature blind developments and commonly lose the reef on pinch outs or splits. Once the stopes are drawn down, it is not possible to correct the stoping direction and hence the remaining values are not necessarily a fair reflection of the zone's potential.

Re-sampling the same channel can often lead to large discrepancies in channel values and sometimes even result in the delineation of a variation in reef geometry. Test chip sampling was conducted in a particularly problematic section of the French Bob body on 10E Level Drive West. Assay values obtained agreed relatively closely with the original sampling, confirming the distribution of mineralization, and the quality of the sampling. . The results are plotted in Figure 14.1 and reveal a satisfactory correlation between the two sample sets. The success of this exercise is probably attributable largely to the absence of free gold

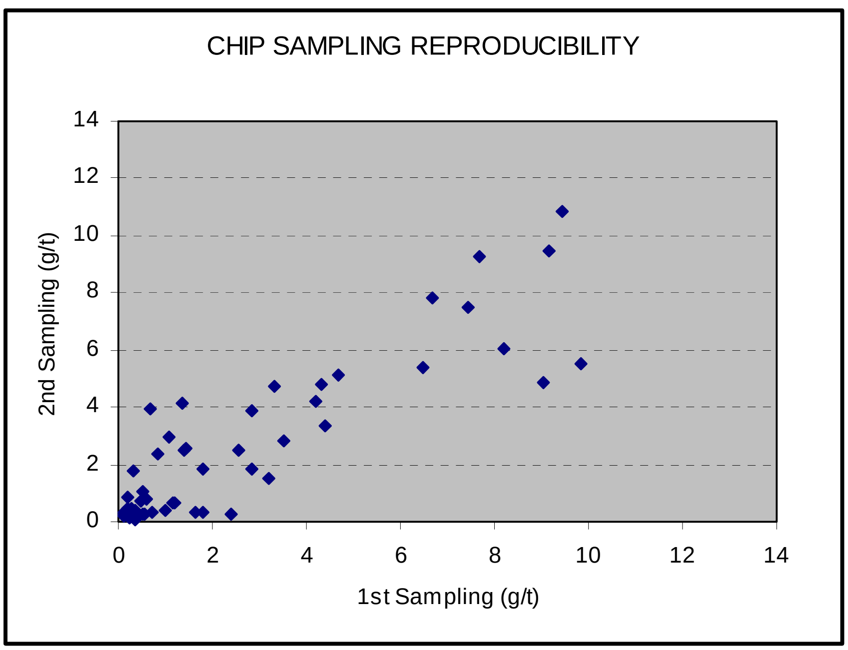

Figure 14.1 Correlation between primary and repeat chip sampling (10 Level West)

15. SAMPLE PREPARATION, ANALYSIS and SECURITY

The sampling, preparation and analytical procedure followed in the initial geochemical survey in 1979 is described by Watts et al., (1994) and is not considered material to the current activities on the property and therefore will not be dealt with in this report.

Consideration will be given to the assay procedure, a critical aspect of both the valuation of the deposit and the effective operation of the mine. From the time of the construction of the mine (1989), all routine assays were carried out by the assay laboratory on the mine. This laboratory is a Barbrook department and staffed by Barbrook personnel. Although capable of 500 fire assays per day, the laboratory is currently operating at approximately 100 assays per day.

Chip samples:
Samples arrive at the laboratory in plastic bags and weigh between 1.5 and 3 kg each. The samples are batched according to the sampler and origin. The samples are crushed to minus 1 mm in a disc pulverizer that is "cleaned" with clean quartz and compressed air before starting each batch. The resulting fines are split twice through a riffle splitter to quarter the sample (±500 g). The excess is sent to the mill feed. The pulverized material is further milled in a swing mill to minus 200 mesh (25 μ). From this fraction, a 50 gram aliquot is taken for analysis by conventional fire assay. The remaining powder is retained for 6 weeks before being discarded, unless a specific instruction is received.

Over the years the mine has employed a standard procedure of controls and checks. All samples carry duplicate ticket numbers. On average every fifteenth sample is repeated as an inline duplicate which also checks for errors in the sample sequence and for gaps. The layout of pots and cupells in the furnace is marked with a copper pattern key to avoid errors in orientation. Should an error arise in this procedure, the entire batch is assayed again. On a regular basis, sample material is sent to the adjoining mine for assay. The results are compared to check for any base line variances between the two assay laboratories.

Core samples:
Diamond drill core is handled with additional controls. Before starting a batch the pulverizer is cleaned with clean quartz stripped and blown clean with compressed air. Between each sample it is blown clean to minimise contamination. The coarse discard after splitting (usually about half) is retained until the assays have been verified. Milled reduced samples (-200 mesh) are retained for one year in paper packets at which stage the geologist either sanctions disposal or assumes responsibility for long-term disposal.

Comment:
The above sample procedures are consistent with those in practise on similar mines in the area. The quality of assays over this period can best be illustrated by the plot of original versus repeat assays over the period 2002 to 2003 (Figure 16.1). The good correlation between original and repeat assays is considered to be primarily due to the very fine grained, disseminated distribution of gold.

16. DATA VERIFICATION

Free gold is rare at Barbrook mine and the ores are highly refractory with gold occurring as extremely fine grains occluded in the sulphide grains. As a result of this fine dissemination, gold is readily homogenised during sample preparation resulting in assay values with a high degree of precision compared to other lode gold deposits.

It is not known to what extent the assay data obtained during the period 1994 to 1997 was subjected to verification measures.

Standard measures of data verification post 1997 include:

a. statistical and graphical correlation of repeat assays (Figure 16.1), i.e. every 15th sample;

b. repeat sampling exercises carried out resolve assay discrepancies (Figure 16.3).

Both the above exercises were prepared from assay data obtained over the past two years and were supervised by the Consulting Geologist, Dr T. Pearton.

Sample data is also verified by comparing geological plans at a scale of 1:100 with the assay plans. Zones of elevated gold grade are examined for their continuity and coincidence with geological structures and alteration patterns. Likewise, prominent structures are examined to see if they are gold-bearing. Re-sampling the areas in question checks discrepancies detected in this way.

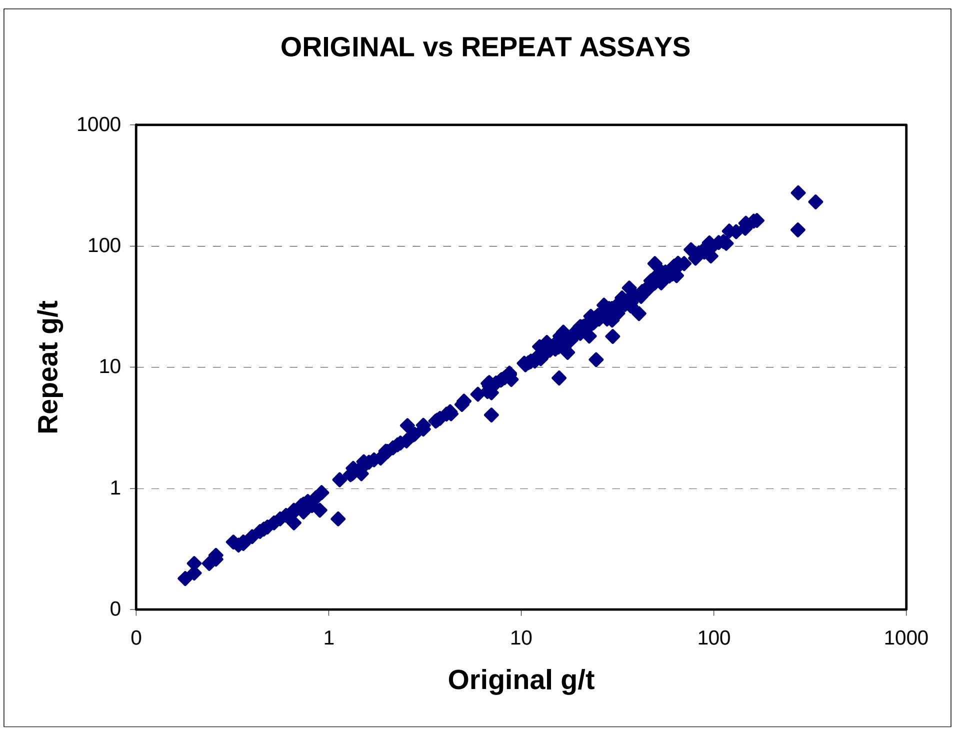

Figure 16.1 Plot of original versus repeat assays (number of samples = 267)

The correlation between original and repeat assays is remarkably good when compared to ores from many other Greenstone gold deposits.

17. ADJACENT PROPERTIES

Makonjwaan Imperial Mining Company (MIMCO) holds the mining title to the Makonjwaan mine to the south-west of Barbrook. Although the mineralised zone exploited on this property is also hosted by BIF, it does not occur on Barbrook's claims or along the strike extension of any of the Barbrook orebodies. Consequently no reference is made to that property with regard to the mineralised potential of the Barbrook reefs.

BML ceded certain mining rights over the western half (1,386 ha) of the property to a company jointly owned by it and MIMCO. The right to mine oxide ores in this area down to a depth of 80 m below surface was ceded to MIMCO in order to settle a dispute that arose during negotiations to purchase the Barbrook property in 1992. BML has the exclusive right to mine ore below 100 m in the joint venture area.

This right has been exercised by MIMCO which mined the old Barbrook mine pit, removing some 50,000 tonnes at a grade of about 1.3 g/t for milling and heap leach treatment at their plant site. Mining operations by MIMCO have now ceased.

MIMCO also operates the Lily Mine, an open pit working 7 km to the north of the Barbrook plant site. Besides the common use of the access road to the mine, the two operations are geologically unrelated, entirely independent and separated by state owned mineral rights.

Barberton Mines Limited operates the combined Sheba and Fairview Mines to the west of Barbrook. Although Barberton Mines and Barbrook are contiguous over a small section in the west, the mining operations are separated by approximately 15 km and there are no joint issues involving both companies.

18. MINERAL PROCESSING and METALLURGICAL TESTING

The Barbrook mill was built in 1989 and designed to treat 25,000 tpm of refractory ore by:

- crushing, grinding and production of a sulphide concentrate by flotation;
- two stage roasting of the concentrate;
- cyanide leaching of the calcine (from the roasting of the flotation concentrate) and the flotation tailings in separate CIL units.

The plant was commissioned in October 1989 and operated until January 1991 when the mine was put on care-and-maintenance. Over this period, the plant throughput averaged 17,000 tpm and 500 kg of gold was produced.

The Simon Carves roaster operated for only 2 months during this period on account of the lower than expected sulphur content of the ore. On re-commissioning the underground operations in 1996, management considered the roaster too expensive to operate for the benefit it delivered and decided not to re-commission it.

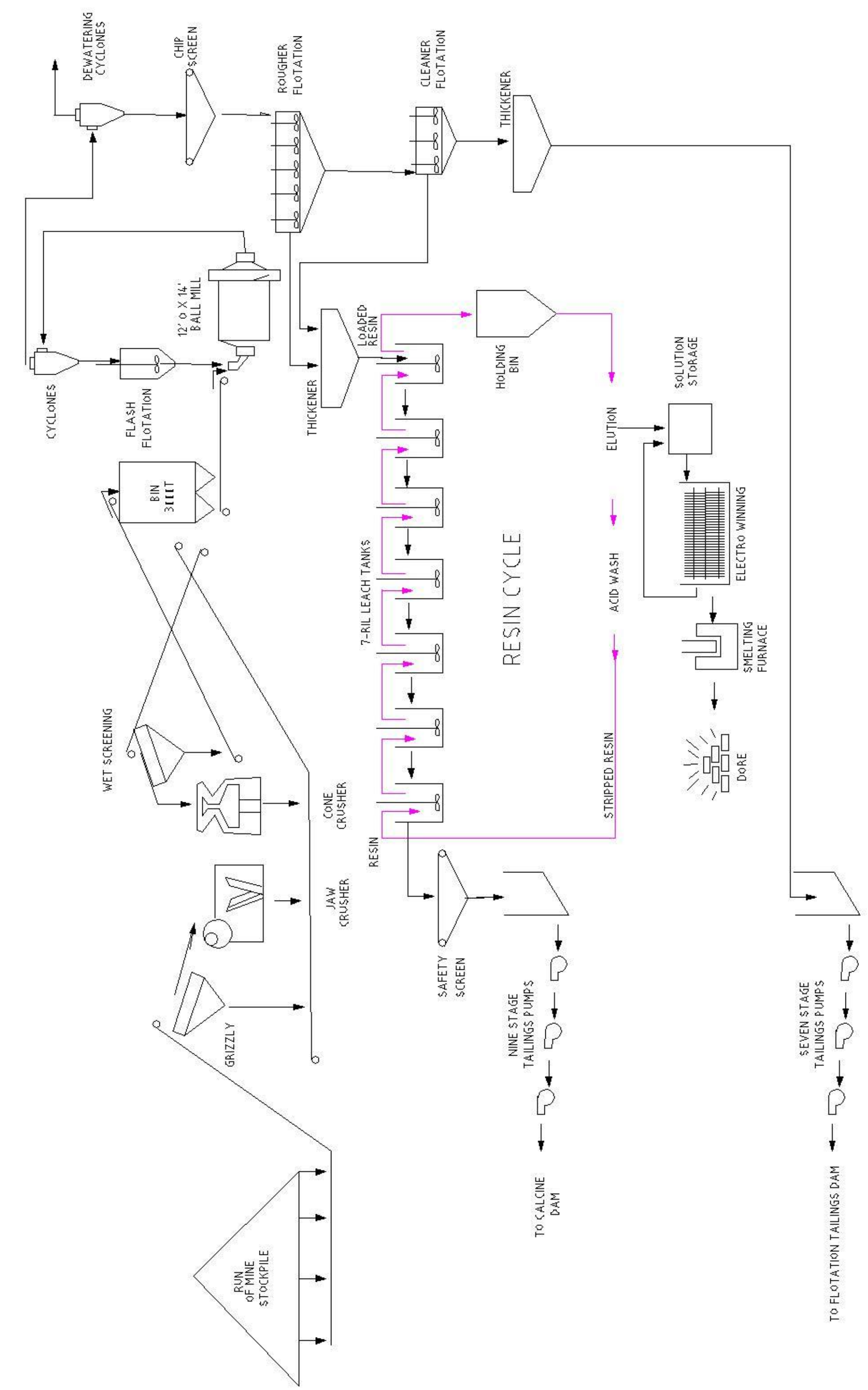

Figure 18.1 SUMMARIZED ORE PROCESSING FLOW SHEET

Barbrook ores are refractory and the gold is very finely distributed within the sulphide minerals. Consequently, a very fine grind is required to liberate the gold for cyanidation. Metallurgical tests (Tout and Bosch, 2001; Scriba, 1997) have shown that the most economical gold extraction on Barbrook ores can be achieved by direct cyanidation of a float concentrate milled to 80% minus 38 μm. The flowsheet for the Barbrook reduction plant is illustrated in Figure 18.1.

The main elements of the gold extraction process are:

- crushing and grinding to 80% minus 75 μm;
- flotation of organic carbon which is a preg-robber;
- production of sulphide concentrate by flotation;
- regrind of the float concentrate (FC) to 80% minus 38 μm;
- *upgrading of the FC via a "*G cell*" gravity concentrator;
- *oxygenation of the FC in two nested *Aachen* reactors;
- addition of cyanide and collection of gold onto active resin;
- elution of the gold from the resin via an alkali leach;
- smelting of dorè bars for sale to refiners.

* Installed in 2004.

Over the period July 1996 to July 1997, refractory ores were treated through this plant. Although the head grades were lower than targeted, an overall recovery of 66% was achieved. During the ensuing shut down period, a contract operator used the plant to treat oxidized materials for a short period. These operations damaged the plant leading to its recommissioning in January 2002, following which a number of machinery failures occurred and caused erratic and low recoveries. This plant has subsequently been refurbished and upgraded by the addition of two proprietary metallurgical processes. The "G cell" is a cyclo-gravity concentrate cleaner while the "Aachen" is a reaction vessel that improves the reaction efficiency between the float concentrate and oxygen.

The current mining plan is based on a metallurgical recovery of 65%. In view of the fact that the impact of the above changes are still being evaluated, we believe that a quantitative comment regarding the final metallurgical recovery is premature and beyond the mandate (terms of reference) of this report.

19. MINERAL RESOURCE and MINERAL RESERVE ESTIMATES

This section has been estimated by David Grant BSc(Hons), C Geol, FGS, Pr. Sci. Nat. assisted by Trevor N. Pearton BSc(Eng) Mining Geol., PhD, FGSA
Director, Barbrook Mines Limited.

19.1 Key Assumptions, Methods and Parameters

19.1.1 Geological

Greenstone gold deposits are known from the Archean terranes of Canada, Australia, Southern and Northern Africa and India. These deposits have broadly similar characteristics and were formed in essentially the same manner. Consequently, the principles governing their valuation are generally applicable to deposits of this type.

Archean gold deposits are characterised by:

- extreme fluctuations in grade;
- irregular ore body geometry;
- vertically continuous zones of mineralization;
- dismemberment of the ore body into discrete shoots;
- erratic free gold concentrations.

Some or all of the above characteristics need to be taken into account in the evaluation of mineral resources and reserves for a particular deposit. In assessing the potential of an undeveloped mineralised zone, careful consideration is taken of the nature of gold occurrences in nearby mines with similar lithological associations especially the behaviour of gold mineralization with depth.

19.1.2 Economic Factors

Reserves and Resource estimates have been estimated based on current information as at 31 December 2003. The gold price prevailing at the time was US$ 390 per ounce and the Rand/US$ exchange rate 6.5, thus equating to a Rand gold price of R81,500 per kilogram.

19.1.3 Mining Factors

Dilution:
Reserve tonnages are expressed inclusive of internal waste and diluting materials. In the case of the broad ore bodies that are mined by underhand methods, tight controls are exercised over sidewall stability and dilution. A combination of roof bolting and tight grade control has contained dilution to a minimum. For reserve estimation purposes, a dilution of 6% at the average residual grade of the block model has been used in the calculations.

Shrinkage mining has been practiced in the past and will be used again for the narrow ore bodies. Production data over the period of one year has shown that dilution contributes 12% on average to these tonnages. A new reef, Thwalas Splay, has been defined by sidewall drilling to be of the narrow reef type and will be mined by shrinkage methods. For the purposes of reserve calculation, a higher than normal dilution of 20% at zero grade has been applied to this reserve estimate in order to cater for the narrow width of the orebody.

Specific Gravity:
The banded iron formation rock type which hosts the mineralization is essentially a combination of two minerals, siderite (SG 3.9) and quartz (SG 2.7) in roughly equal proportions. The high iron content of the ore leads to the formation of large amounts of sulphide minerals that also have a high specific gravity. As a result the ores are more dense than the country rock. A weighted average of the various ore types encountered gives an average SG for the ore of between 2.9 and 3.0. A value of 2.9 has been used in all mineral resource and reserve calculations.

19.1.4 Sources of information

Barbrook mine has been operated since 1989, during which period much drilling and development has been accomplished. These exposures have provided ample opportunity for the previous operators of the mine to define zones of mineralization. Subsequent mining of selected "ore zones" further increased the amount of information available for assessment of the mineralised zones. In the preparation of the mineral resource estimate, use has been made of the information obtained by previous operators of the mine, viz. mining widths, stretch lengths, and grades. While in many instances it has not been possible to verify the information on account of the inaccessibility of the workings, a review of the procedures followed by the previous operators, particularly with regard to re-sampling of the old workings confirms the validity of this information. These data are captured on plans stored on the mine. As far as the following estimates are concerned, historical information of this type has been used only in the estimation of Resource categories especially those classified as indicated and inferred.

19.1.5 Data Processing

In April, 2002 Caledonia Mining Corporation initiated a program to reopen the Barbrook Mine. Integral to this program was an assessment of the mineral reserves and resources of the mine. The exercise focussed on the largest mineralised body on the mine, known as French Bob, which had previously been mined unsuccessfully. Re-opening of the mine would be dependent on the ability to mine this section successfully. It was decided to model this body using a proprietary computer software package (Surpac Vision).

Inputs into this programme consisted of diamond drill hole data containing grade and geological information and chip sampling data from development exposures. Data was captured on Excel spreadsheets, all information being checked against records. Chip sampling channel data dominantly generated by Caledonia with some date from RME was entered in the form of short borehole data so as to facilitate subsequent calculation and normalization of the data. A total of 16,200 assays were captured in the French Bob area. The data were obtained from 824 chip-sampled sections as well as from 331 diamond drill holes.

Subsequent to the validation of the data, gold assay data was normalised to 0.50 m intervals (input sample lengths ranged essentially between 0.3 and 0.5 m). The data were not cut or modified in any way other than the above normalization. A block model was configured around the French Bob mineralised zone, extending from an elevation of 540m above sea level to 830m a.m.s.l., including the full vertical extent of detailed sampling information of the body. Block grade estimation was performed using the inverse distance square method. The maximum block size for this exercise was 2 m along strike by 5 m down plunge by 1 m across strike, i.e. a volume of 10 cubic metres with a mass of 29 tonnes. The software had the facility for sub blocking down to two levels, i.e. a minimum sub block of 1.25 x 0.5 x .25 m with a mass of 0.45 tonne. The dimensions and orientation of the block unit was designed to approximate the orientation of the mineralised shoots and provide a realistic search ellipsoid in the estimation of the gold grade of the individual blocks.

The normalised gold assay data was then displayed on the screen at various lower cut off limits, thereby enabling the viewer to link the mineralised zones by viewing the model in three-dimensional space. For each level of information that included borehole and channel samples, the **zone of mineralization** defined by contiguous high grades was outlined with a perimeter defined by a Surpac string file. A strict minimum grade cut off was not applied in order to preserve the continuity through weakly mineralised zones. The "perimeters" were then connected vertically to form a "solid" simulating the shape of the best-mineralised section of the French Bob shoot. This "solid" was situated within the block model and is therefore fully defined by the blocks of the model. Since portions of the ore body had already been mined out, the solid was adjusted to exclude those portions. A general enquiry as to the gold grade and tonnage of the "solid" returned a tonnage of 417,000 tonnes at a grade of 3.95 g/t (see Table 19.1). Since this defined mineralised zone has a grade significantly lower than the economic grade for the mine, it can only be considered as a Measured Resource.

Table 19.1 Block model report for the total "solid" less stoping.

Grade Interval	Volume	Tonnes	Grade (g/t)
0.0-1.5	19810	57448	0.99
1.5-3.0	49582	143788	2.28
3.0-4.0	25651	74388	3.43
4.0-6.0	22124	64159	4.81
6.0-999.0	26676	77361	9.03
Total	**143843**	**417145**	**3.95**

In order to define a Proven Reserve, a more detailed analysis of the mineralised zone was undertaken. Based on the distribution of grades in the block model, a high-grade zone continuous from level to level was defined. This high-grade zone was delineated in such a manner as to simulate practical mining of the zone and was inclusive of all waste and low-grade material. The test for Proven Reserve status was that the contained material would have an overall grade of 5.83g/t excluding dilution of 6%. Those blocks that satisfied this constraint were included in the Proven Reserve category while those sections not qualifying remained in the Measured Resource category.

19.2 Mineral Resources

A Mineral Resource is a concentration or occurrence of natural, solid, inorganic or fossilized organic material in or on the Earth's crust in such form and quantity and of such a grade or quality that it has reasonable prospects for economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge.

The resource base of Barbrook mine is an estimate of the total amount of gold bearing rock that has the potential to be recovered under circumstances of economic recovery from all known occurrences over a realistic life of the mine. No account has been taken of potential additional sources that may arise as a result of current or planned exploration programmes.

Inferred Mineral Resource

An 'Inferred Mineral Resource' is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.

Inferred Mineral Resources are the broadest category of resource. In determining the extent of the material to be included in this class, consideration is given to the depth extent of economic mineralization at the neighbouring mines in similar geological environments. At both the Consort and Sheba complexes, mineralised zones have continued to depths in excess of 1500 m below surface where mining is currently taking place. On this basis it has been assumed that the established mineralised zones at Barbrook could also continue to similar depths. A depth of 1000 m below 10 Level adit elevation has been used in the past as the limit for inferred mineral resource estimates at Barbrook mine. BML carried out a preliminary test for vertical continuity in 1984. Two deep holes, one each at Crown and Maid of the Mist, were drilled to test the reef zone at 600 m below surface. The holes intersected 16.09 g/t over 110 cm and 5.77 g/t over 303 cm respectively, confirming that deep mineralization does exist. In view of the above findings and experience in this terrain, 1000 m below 10 Level is used as the limit for the estimation of Inferred Resources.

Materials included are the individual shoots defined by "stretches" of values above 3 g/t as defined by sampled underground development. Isolated zones exceeding 3g/t that have been indicated by diamond drilling alone have not been included.

Reef zones which are known to be discontinuous in a vertical sense, have been discounted by between 20% and 75% depending on the estimator's confidence in the reef continuity. Those portions of the Mineral Resource that fall into other categories are excluded from the inferred resources.

The inferred resources are scattered throughout the Barbrook mining property.

INFERRED RESOURCES	**TONNES**	**GRADE**	**IN SITU GOLD**	
SECTION	metric	g/t	kg	k oz
Oxides (near surface)	840,000	1.85	1,550	48.2
Above 7 Level	338,300	5.35	1,810	56.3
7 Level to 10 Level	563,700	6.11	3,450	107
Below 10 Level	7,040,000	6.22	43,700	1,359
TOTAL	**8,782,000**	**5.76**	**50,510**	**1,570**

Indicated Mineral Resource

An 'Indicated Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough for geological and grade continuity to be reasonably assumed.

Indicated Mineral Resources refer to those areas of gold enrichment that lie beyond the areas of current mining, or occur in shoot extensions of areas currently known to be economic. In quantifying these resources, a maximum distance of 100 m down dip of a Proven Reserve or Measured Resource is used in conjunction with the measured parameters of the material in the exposed areas. Typically, in the case of a new mine, Inferred Resources can be an order of magnitude greater than Indicated Resources.

The greater part of this category of resources lies in the Daylight and Victory sections of Barbrook which have been defined by underground development and incomplete drilling on 50m centres by RME. Basic infrastructure remains and there are plans to connect the underground development from Taylors and French Bobs with the underground workings. A mine plan has not yet been established for the Daylight and Victory Sections. Other sources included in this category are those mineralized zones exposed by development in sections of the mine which are not currently open for examination and which do not have installed services to allow for exploitation in the current mining plan.

INDICATED RESOURCES	**TONNES**	**GRADE**	**IN SITU GOLD**	
SECTION	metric	g/t	kg	k oz
Oxides (near surface)	383,600	2.95	1,130	35
Above 7 Level	436,600	6.83	2,980	93
7 Level to 10 Level	264,600	7.88	2,080	65
Below 10 Level	200,000	4.84	970	30
TOTAL	**1,284,800**	**5.58**	**7,160**	**223**

Measured Mineral Resource

A 'Measured Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, physical characteristics are so well established that they can be estimated with confidence sufficient to allow the appropriate application of technical and economic parameters, to support production planning and evaluation of the economic viability of the deposit. The estimate 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 that are spaced closely enough to confirm both geological and grade continuity.

Measured Mineral Resources constitute that portion of the resource for which reliable information has been obtained but which has not yet been demonstrated to be economic. As such they are restricted to the lower grade and sub-economic peripheries of Mineral Reserves that are currently being mined or developed. Also included are previously developed lower grade materials that have been quantified but not mined.

Resources in this category occur mostly in areas of intense mining and drilling activity that have defined significant tonnages of mineralization but at grades that are currently subeconomic.

MEASURED RESOURCES	TONNES	GRADE	IN SITU GOLD	
SECTION	metric	g/t	kg	k oz
Oxides (near surface)	285,000	2.29	650	20
Above 7 Level	34,500	3.95	136	4.2
7 Level to 10 Level	84,000	4.17	350	11
Below 10 Level	70,000	3.58	250	7.8
TOTAL	**473,500**	**2.94**	**1,390**	**43.2**

19.3 Mineral Reserves

A Mineral Reserve is the economically mineable part of a Measured or Indicated Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified. A Mineral Reserve includes diluting materials and allowances for losses that may occur when the material is mined.

In keeping with the definitions, the key test for reserves is economic viability. This implies that grade criteria be satisfied as well as ground conditions and accessibility, such that there is every likelihood that the material will be economic.

Probable Mineral Reserve
A 'Probable Mineral Reserve' is the economically mineable part of an Indicated, and in some circumstances a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified.

Probable Mineral Reserves include those resources for which sufficient information is known to be reasonably sure that the material exists as estimated and that it has been demonstrated to be economic under these parameters. Typically, this material forms the extension of Proven Reserves or has been exposed on at least one side and is defined by a cut off grade of 3.5 g/t.

Where reserves are considered below the lowest level of mining, payable shoots are extended 50 m below the lowest level, if supported by drill hole data, and with provision having been made for a 10 m crown pillar (5 m in the case of narrow ore bodies). These reserves lie in the French Bob Section.

PROBABLE RESERVES	TONNES	GRADE	IN SITU GOLD	
SECTION	metric	g/t	kg	oz
Above 7 Level	45,200	5.95	269	8,370
7 Level to 10 Level	0	0	0	0
Below 10 Level	10,000	8.16	82	2,550
TOTAL	**55,200**	**6.35**	**350**	**10,900**

Proven Mineral Reserve
A 'Proven Mineral Reserve' is the economically mineable part of a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction is justified.

Proven Mineral Reserves, being that material reported at the highest level of confidence, are restricted to those portions of the ore zones that have been fully investigated and which have been demonstrated to be economically viable. An estimate of grade and tonnage is made based on all available assay data, both from chip sampling of development ends and from diamond drill core. A total of approximately 16,200 assay data points, about half from diamond drilling, was used in the block model generation for the mineral reserve calculation.

Using the Surpac system, a "solid with elevated gold content" was defined in three dimensional space. This body represented a measured resource on the grounds that the average grade was uneconomic (3.9 g/t). Based on a statistical treatment of the assay data (modal and spatial distribution analysis), as well as on an intricate understanding of BIF mineralization, it was established that, at 38% extraction, a higher grade portion of this solid could be mined with a 6% dilution at an average grade (R.O.M.) of 5.5 g/t. This percentage extraction was used to define the Proven Mineral Reserve, while the residual material was classified as Measured Mineral Resource.

Included in the Proven category is material, which although well defined, is immediately unavailable for mining because of its strategic location, e.g. slusher and crown pillars. This material will, however, be mined in future when its current function is no longer required. Only those portions which can be safely mined in this way have been included in the Proven category.

PROVEN RESERVES	**TONNES**	**GRADE**	**IN SITU GOLD**	
SECTION	metric	g/t	kg	oz
Above 7 Level	21,800	4.85	106	3,300
7 Level to 10 Level	108,400	5.67	614	19,100
Below 10 Level	57,800	6.53	377	11,730
TOTAL	**188,000**	**5.84**	**1,097**	**34,100**

19.4 Discussion

The reduction in reserves relative to the previous year is due to a number of factors, the most important being the application of more stringent constraints in determining the Reserve and Resource status. The extraction of 33,000 tonnes from the French Bob ore body in 2003 was offset by the addition of 35,000 tonnes of Proven Reserves in Thwalas Splay which is situated immediately to the south of French Bob. Approximately 220,000 tonnes of material was transferred to the Resource category mainly on account of the lack of a mining plan for Taylors reefs (180,000 t) but also due to the lack of demonstrable continuity of higher grades in some of the French Bob zones (40,000t).

Resources (Measured and Indicated) increased by 260,000 mainly as a result of the above transfer. Included in this difference are the amounts of 70,000 tonnes of lower grade resource in the French Bob area added to the inventory, and an approximately 40,000 tonne reduction in the resources for the Taylors reef zone based on a lower estimate of continuity for some of the reefs.

RESERVE SUMMARY	**TONNES**	**GRADE**	**IN SITU GOLD**	
Category	metric	g/t	kg	k oz
Proven Reserve 2002	229,200	6.00	1,375	42.8
Proven Reserve 2003	188,000	5.84	1,097	34.1
Year on year change	-41,200		-278	-7.6
Probable Reserve 2002	237,000	4.98	1,180	36.7
Probable Reserve 2003	55,200	6.35	350	10.9
Year on year change	-181,800		-830	-25.8
Reserve Change	**-223,000**		**-1,108**	**-33.4**

RESOURCE SUMMARY	**TONNES**	**GRADE**	**IN SITU GOLD**	
Category	metric	g/t	kg	K oz
Measured Resource 2002	486,000	4.92	2,390	74
Measured Resource 2003	474,000	2.94	1,390	43
Year on year change	-12,000		-1,000	-31
Indicated Resource 2002	1,012,000	4.98	5,040	157
Indicated Resource 2003	1,285,000	5.58	7,170	223
Year on year change	+273,000		+2,130	+66
Resource Change	**+261,000**		**+1,130**	**+35**

19.5 Related Issues

The above Reserve and Resource estimates have been considered in the light of possible effects from environmental, permitting, legal, title, taxation, socio-economic, marketing and political issues. In our assessment, these issues are unlikely to have a material effect on the above estimates.

19.6 Other Factors

Mining:
Barbrook mine currently employs the underhand benching method of mining in the wide ore body sections. Management is currently investigating long-hole mining techniques that have the potential to reduce unit-mining costs but increase dilution. Should this method prove to be economic and be implemented, an increase in estimated reserves can be expected.

Metallurgical:
Following a period of metallurgical difficulties, the reduction plant at Barbrook has undergone a complete refurbishment. In addition, two Aachen oxygen reactors have been installed. However, management is considering the viability of converting to the BIOX process. While achieving a substantially better gold recovery, this process is more costly. In the event of this process being implemented, a material change in the Reserves could be expected.

20. OTHER RELEVANT DATA and INFORMATION

Appendix I: Approval of the Environmental Management Programme Report for Barbrook Mines Ltd.

DME 12

Head office Copy.

DEPARTMENT: MINERALS AND ENERGY
REPUBLIC OF SOUTH AFRICA

Private Bag X7279, Witbank, 1035, Tel: 013-656 1448, Fax: (013) 656 0932
Province Building, Cnr Botha & Paul Kruger Streets, Witbank, 1035

Enquiries: Mr. R MUDAU **Ref:** OT6/2/2/266
Subdirectorate: Mine Environmental Management

BY HAND

The Director
Barbrook Mines Limited
P.O.Box 587
JOHANNESBURG
2000

ATTENTION: Mr. S E HAYDEN

Dear Sir

APPROVAL OF THE DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME FOR BARBROOK MINES LIMITED IN RESPECT OF A MINING AREA SITUATED ON VARIOUS FARMS IN THE MAGISTERIAL DISTRICTS OF BARBERTON: MPUMALANGA REGION.

In terms of Section 39 (1) of the Minerals Act, 1991 (Act 50 of 1991), the draft Environmental Management Programme submitted by you, has been approved. Your attention is directed to the fact that:

1. This approval doesn't purport to absolve Barbrook Mines Limited from its common law obligations towards the owners of the surface of land affected.
2. This approval provides no relief from the provisions of any other relevant statutory or contractual obligations.
3. Environmental management must conform to the Environmental Management Programme as approved.

4. Mining activities must conform to all legislation and such other conditions as may be imposed by the Director: Mineral Development or any other official of this office, duly authorized thereto.

5. Rehabilitation of the disturbed surface caused by mining activities at all times must comply with the said Programme and Act.

6. The financial provision provided in terms of Regulation 5.16.1 of the Act must be periodically, in accordance of the Act be adjusted to conform with the abovementioned mining activities.

7. Any alteration or deviation from the Programme must be reported to the Director: Mineral Development for his approval or consideration.

8. The approved Environmental Management Programme that is attached is for implementation and compliance to the conditions stipulated therein.

9. Your attention is also directed to the requirements of Section 54 of the Minerals Act, 1991. A copy of the Environmental Management Programme must always be available on the mine premises for inspection by duly authorized officers.

Yours faithfully

M. A. OBERHOLZER
DIRECTOR: MINERAL DEVELOPMENT
MPUMALANGA REGION

DATE: 2004/04/27

ACKNOWLEDGEMENT OF RECEIPT: S DU PLESSIS (Name)

DATE: 28/4/2005

UNDERTAKING

I JACQUES DU PLESSIS, GM of SA OPERATIONS FOR BARBROOK MINES LTD

the undersigned and duly authorised thereto by

S E HAYDEN, CEO CALEDONIA MINING CORP.

Company/Closed Corporation/ Municipality (Delete whichever is not applicable) have studied and understand the contents of the Environmental Management Programme and signed by me under today's date, duly undertake to adhere to the conditions as set out therein, unless specifically otherwise agreed to.

Signed at WITBANK on this 28th day APRIL ~~19~~2004

GM, SA OPERATIONS

Signature of applicant/holder of mining authorization

Designation

APPROVAL

Approved in terms of section 39 of the Minerals Act, 1991 (Act 50 of 1991).

Signed at Witbank on this 27th day of April ~~19~~ 2004

DIRECTOR: MINERAL DEVELOPMENT, Mpumalanga Region

DEPT. VAN MINERALE EN ENERGIE
PRIVAATSAK/PRIVATE BAG X7279
2004 -04- 27
WITBANK 1035
DEPT. MINERALS AND ENERGY

21. INTERPRETATION and CONCLUSIONS

Barbrook Mines Limited holds Mining Authorisation to 2286 hectares of land over a number of hydrothermal gold deposits in the northeast part of an Archean greenstone belt referred to as the Barberton Mountain Land. The deposits lie on two sub-parallel structural lines referred to as the Barbrook and Zwartkoppies lines and are distributed over a strike of almost 20 km. The Barberton Mountain Land is host to a number of gold deposits that over a period of 120 years produced 130 tonnes of gold. Most of this gold was produced by the Sheba, Consort, Fairview and Agnes mines situated in the central and western parts of the Barberton Mountain Land.

Barbrook Mines Limited (BML) is a wholly owned subsidiary of Caledonia Mining Corporation listed on the Toronto Stock Exchange. BML acquired the claims now held as a Mining Authorisation from Barbrook Mining and Exploration Company (Pty) Ltd when the project was listed on the Johannesburg Stock Exchange in 1987. Rand Mines Exploration Company (Pty) Ltd and Anglo American Corporation of South Africa Ltd consolidated the claims and mineral rights from numerous holders during their joint venture exploration activities along the Barbrook and Zwartkoppies lines between 1975 and 1990. The resulting Barbrook mine was unable to meet both grade and tonnage forecasts and was placed on care and maintenance in January 1991. The Maid O' the Mist Mining Company (Pty) Ltd (50%) and Rand Merchant Bank Ltd (50%) acquired BML in 1993 and by the end of 1995 Caledonia Mining Corporation had purchased both shareholders interests.

Early attempts to mine the ore bodies at Barbrook were based on unrealistic tonnage and grade targets and attempts by Caledonia to bulk mine the larger bodies of disseminated mineralization were thwarted by dilution as a result of not paying adequate attention to geological detail. The lower grades were exacerbated by poor metallurgical recoveries. Metallurgical test work undertaken between 1997 and 2001 has subsequently showed that satisfactory recoveries can be achieved on Barbrook sulphide ores by cyanide leach of a finely ground float concentrate. The ore mill at the mine is being modified to accommodate this process.

In the order of 60 different bodies of gold mineralization have been recognised in the Barbrook Mines Limited Mining Authorisation. Many of these are small with negligible economic significance while others may be the same body that has been structurally dismembered. Other bodies are larger with good economic potential and these have attracted the attention of both early and current exploration and mining.

The larger bodies of mineralization include those of Taylors section, French Bob, Thwalas splay, Sugar Loaf, Browns reefs, the Crescent and Clifford Scott on the Barbrook line and Bushbuck, Daylight and Victory reefs on the Zwartkoppie Line. BML and its predecessors extensively explored all of these deposits prior to 1993 during which nearly 80 km of core was drilled. The data generated by this work is available to Caledonia although most of the core has been vandalised. Limited exploration work was undertaken between 1993 and 1995 and focussed on defining oxide resources as well as underground side-wall drilling in the vicinity of the known ore bodies. Since 2003 exploration has been limited to some underground exploration development and drilling.

Surface and underground drilling as well as mapping and sampling underground mining and exploration development have delineated reserve and resource blocks in the French

Bob ore body, as well as resource blocks in and around the other major deposits. Proven and probable reserves amount to 243,000 tonnes at 5.96 g/t and measured and indicated resources amount to 1,758,000 tonnes at 4.87 g/t. Measured resources consist mostly of blocks that are peripheral to the reserve blocks but with sub economic grades whereas indicated resources include higher grade blocks in deposits other than French Bob and for which no mining plan exists. Inferred resources depend mostly on projections of existing mineralization to a depth of 1,000 m below 10 Level supported by two deep boreholes drilled prior to 1993, and the depths reached by neighbouring mines.

Barbrook Mine consists of a plant and operational underground workings accessible via adits on 7 and 10 levels. There are approximately 40 km of underground workings servicing the various deposits within the mine with a further 12.5 km of development on 10 level including a cross-cut from the Barbrook line to the Daylight ore bodies on the Zwartkoppie Line. The elevation of 10 Level is essentially the same as that of the plant and all ore is hauled to the plant on this level. The plant has a capacity of 12,000 tpm but is currently processing ore at the current mining rate of 6,000 tpm. At full plant capacity, currently defined reserves will last for 20 months. Currently, ore is mined by underhand stoping methods but other techniques may be applied where appropriate in the future.

22. RECOMMENDATIONS

Exploration should continue along the Barbrook and Zwartkoppie line with the objective of replenishing the reserves established for the French Bob's deposit. A mining plan needs to be drawn up for the Daylight and Victory sections.

Continuing exploration of the Barbrook mineralization should include measures that will verify the data collected by the joint venture between Rand Mines and Exploration Ltd and Anglo American of South Africa Ltd, especially where this data is relied upon to determine the tonnages and grades of blocks within the measured and indicated resource categories, as well as the equivalent reserve categories.

Most of the BML assays are undertaken in house with repeat assays undertaken by outside laboratories on a reciprocal basis, but procedures and discipline for batch rejection in cases of substandard results are uncertain. Whilst we have no reason to suspect that the analytical data upon which the BML reserve and resource estimates are based are any less accurate than other gold assays in general, there is room to improve quality control. Blanks and standards should be added frequently to the sample batches, and statistics rigorously applied to the results, with strict batch rejection where quality control minimums have not been achieved.

23. REFERENCES

De Nooy C.,1997; Mode of Occurrence of Gold in a Sample of CIP Residue., Ref. EXT/MINLAB/423., AVMIN Mineralogical Laboratory, Johannesburg, South Africa.

EM Technologies Inc., 1999; Scoping Tests Results: Final Report for Caledonia Mining., Project number 969-1.

Environmental Management Programme Report (EMPR), Barbrook Mines Limited., 2003; Report submitted to the Department of Minerals and Energy, Republic of South Africa., 89pp.

Lewis G.O. and Bouwer W., 1994; Resin-in-Leach: an Effective Option for Gold Recovery from Carbonaceous Ores., MINTEK, Johannesburg , South Africa.

Scriba H. W., 1997: Possible Process for Barbrook., Anglo American Research Laboratories (Pty) Limited., Johannesburg, South Africa.

Tout P. J. and Bosch D. W., 2001; Laboratory Testwork to Evaluate Processing Options for the Barbrook Mine., MINTEK Communication C3261M, Johannesburg, South Africa, 47pp.

Watts, Griffis and McQuat Limited, 1994; Report on Barbrook and Eersteling gold mines for Greenstone Management Services (Pty) Limited., Toronto, Canada.129pp.

24. DATE

The effective date of this report is 31st December 2003. It was completed, reviewed and revised by 15th May 2004.

25. ADDITIONAL REQUIREMENTS for TECHNICAL REPORTS ON DEVELOPMENT PROPERTIES and PRODUCTION PROPERTIES

25.1 Mining Operations

25.1.1 Current Infrastructure

Barbrook Mine has a well established infrastructure and extensive underground development (> 50 km). Access to the mine is via two main adit levels 150 m apart vertically, 7 Level which is used for men and materials, and 10 Level, the main access to the mine and ore tramming level. All reserves lie within areas already accessed by development except for the lower portion of French Bob (below 10 Level) which is currently being accessed by an incline shaft. The mined ore falls through a series of ore passes to draw points on 10 Level from where it is trammed to the main plant tip.

The Barbrook ore zones have a near vertical attitude and hence require appropriate mining methods. For reasons of safety and effective grade control, the wide ore bodies are mined by means of underhand benching. This method has been demonstrated to be effective in extracting the irregular shaped ore body at the required grade or better.

25.1.2 Mining plan

A mining plan has been devised with the objective of feeding the refurbished plant with high-grade ore at a rate of 12,000 tpm when fully operational. This plan involves a build-up from 6,000 tpm to 12,000 tpm by January 2005 from three stoping areas and a twin rail sub-incline shaft is currently being sunk to provide access to the next three levels of mining below French Bob and Taylors. All sources of ore will come from above 10 Level elevation until the French Bob 11 Level stopes come into production in October 2005.

Narrow ore bodies will be mined by means of conventional shrinkage mining. In order to minimise dilution and off-reef mining, lateral raises and sub levels will be developed ahead of the shrinkage face in order to provide adequate direction.

Metallurgical recoveries for the mining plan are based on 65% overall recovery achieved by the addition of Aachen Units, G-Cells and Fine-Grind, together with rigid metallurgical controls and maintenance on the whole plant.

The mine infrastructure required to meet the 12.000 tpm production target of the mining plan is in place, adequate and operational, and being used to meet the current production targets of 6,000 tpm.

25.2 Recoverability

Gold is very finely distributed in the Barbrook ores, occurring as sub microscopic particles within the sulphide grains (de Nooy, 1997). This requires a very fine grind of the floatation concentrate in highly oxidising conditions to break down the sulphide particles. Although only 3% of the gold has been shown to be associated with the organic carbon that forms part of the ore, up to 25% of the gold can be "robbed" from the system by this carbon. A pre-float has been added to the circuit to remove the carbon, which is being stockpiled for later treatment when quantities warrant it.

Metallurgical recoveries achieved on the Barbrook sulphide ores are affected by their refractory nature and over the period 1989 to 1990 ranged between 60% and 70%. The plant again treated sulphide ores in 1996 and 1997, during which time an average of overall recovery of 66% was achieved.

Following the re-commissioning in 2002, a series of mechanical failures affected recoveries negatively with the result that the 65% target was not achieved. In order to correct the difficulties encountered, the plant was shut down in January 2004 for a period of 12 weeks in order to overhaul certain parts of the plant and install specialised equipment.

The mining plan is based on a recovered grade of 3.5 g/t (65% recovery on a head grade of 5.5 g/t) for the foreseeable future (see Table 25.1).

25.3 Markets

Gold with by-product silver is the only commercial product produced by Barbrook Mine. The metal is dispatched in the form of a doré bar to Rand Refineries in Johannesburg and payment is effected the following day based on the afternoon fix of the London gold price. Marketing the gold is not the responsibility of Barbrook Mine.

25.4 Contracts

Barbrook mine has no contracts affecting the production of the mine except that between the mine and a labour broker responsible for sourcing the unskilled mine labour. Neither gold production nor currencies have been, or plan to be, hedged by Barbrook mine.

25.5 Environmental Considerations

Barbrook's Environmental Management Programme Report (EMPR) has been approved by the South African authorities, the Department of Minerals and Energy (see Appendix I). The rehabilitation programme makes provision for the restoration of disturbed surface areas and the removal of all mine structures (essentially the metallurgical plant).

The following quotation for rehabilitation of sites as agreed between BML and the Department of Mineral and Energy Affairs has been supplied by Welgedacht Exploration Co (Pty) Ltd, who contract rehabilitation work, in support of a financial provision that has been made for the rehabilitation:

* Sealing of Shaft/Adit - recent -	R 52 000
* Demolishing plant and offices -	R 208 000
* Rehab. of recent open pits -	R 80 000
* Rehab. of old open pits/quarries -	R 115 000
* Rehab. of tailings dam -	R 115 000
* Re-vegetate adit &disturbed areas -	R 35 000
Total -	**R 605 000**

The above estimates relate to the current operations at Barbrook and are expressed in July, 2003 money terms. A deposit of R250,000 into the Barbrook account in the Greenstone Rehabilitation Trust was required by the Department prior to acceptance of the EMPR. Details of the current status of the Barbrook Trust account can found in the company's audited financial statements. The mine's Business Plan makes provision for an ongoing contribution of R180,000 per annum to this rehabilitation fund.

25.6 Taxes

The effective tax rate for mines of this type in South Africa is 30%. However, since Barbrook mine has been in operation since 1989 and has not operated profitably for an extended period of time, the mine has accumulated a substantial assessed tax loss. In addition, unredeemed capital expenditure over this period has escalated by the capital allowance factor of 10% per annum. Consequently, Barbrook mine has allowances for redemption that will exempt the mine from paying any tax over a period considerably in excess of the next 10 years.

25.7 Capital and Operating Cost Estimates

Barbrook management has prepared a 10 year business plan for the mine based on their assumption that exploration and exposure of the various reefs underground will result in an ongoing conversion of mineral Resources to Reserves at a rate sufficient to provide for the intended 12,000 tpm production rate. A breakdown of the forecast capital and operating costs estimates for the 10 year period to 2014 is given in Table 25.1.

25.8 Economic Analysis

A summarised base case economic analysis for Barbrook Mine is set out in Table 25.1. For the purposes of this base case, the following assumptions were made:

-the starting gold price is US$400/oz and US$/R exchange rate 6.5;
-the gold price in US$ is escalated at 3% per annum;
-working costs are escalated at 6% per annum;
-devaluation of the Rand against the US$ by 5% p.a.;
-labour costs escalated by 6% p.a.

Savings have been reflected on stoping by introducing bulk stoping methods on the French Bob upper section; engineering as a result of reduced maintenance after the plant shut down; administration by virtue of improved cost and labour controls and proper financial systems.

Apart from capital development, R30,000 per month escalated, has been allowed for exploration purposes, e.g. drilling , geological modeling etc. R50,000 per month of the engineering costs have been allocated to an annual maintenance provision account and reef tonnage to mill has been smoothed at 12,000 tonnes per month at a head grade of 5.5g/t.

AG has not attempted to verify the soundness of this financial model prepared by Barbrook management as it is outside the terms of reference of this Report. For further information, the reader is referred to Barbrook's Audited Financial Statements published on this site.

AG has, however, prepared a sensitivity analysis on the model to investigate the impact of variations in gold price, grade and working costs. In terms of the mine plan Barbrook's Proven and Probable Reserves are sufficient for approximately three years but the large capital expenditure in year one distorts the cash flow to the extent that a meaningful sensitivity analysis is not possible for a three-year period. For this reason a sensitivity analysis has been carried out over the 10 year plan period for illustrative purposes, assuming that reserves can be replenished adequately during this time. This analysis is illustrated in Figure 25.1.

25.9 Payback

Barbrook has no outstanding loans, the R38 million spent on re-commissioning that is reflected in year one capital expenditure was raised from shareholders by means of a rights issue and equity placements. According to the base case financial model, the payback period of this capital expenditure is 34 months.

TABLE 25.1 **BARBROOK MINE SUMMARISED BUSINESS PLAN for the PERIOD 2004 to 2014**

		Year 1 Annual Total	Year 2 Annual Total	Year 3 Annual Total	Year 4 Annual Total	Year 5 Annual Total	Year 6 Annual Total	Year 7 Annual Total	Year 8 Annual Total	Year 9 Annual Total	Year 10 Annual Total
Tons milled	tons	55,500	137,500	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000
Yeild (recovered grade)	g/ton	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
Gold smelted	kg	188.70	468	490	490	490	490	490	490	490	490
Gold sold	kg	187.76	465	487	487	487	487	487	487	487	487
	oz	6,036.51	14,955	15,662	15,662	15,662	15,662	15,662	15,662	15,662	15,662
Gold price	R/kg	88,860	94,704	102,430	110,946	120,169	130,159	140,980	152,700	165,395	179,145
Revenue	**Rands**	**16,684,063**	44,052,604	49,899,182	54,047,500	58,540,684	63,407,405	68,678,716	74,388,252	80,572,444	87,270,753
On mine costs	**Rands**	**15,141,000**	27,513,360	29,164,162	30,914,011	32,768,852	34,734,983	36,819,082	39,028,227	41,369,921	43,852,116
Salaries & wages	Rands	5,411,000	9,832,560	10,422,514	11,047,864	11,710,736	12,413,380	13,158,183	13,947,674	14,784,535	15,671,607
Expenses	Rands	8,400,000	15,264,000	16,179,840	17,150,630	18,179,668	19,270,448	20,426,675	21,652,276	22,951,412	24,328,497
Maintenance provision	Rands	13,811,000	636,000	674,160	714,610	757,486	802,935	851,111	902,178	956,309	1,013,687
Electricity	Rands	980,000	1,780,800	1,887,648	2,000,907	2,120,961	2,248,219	2,383,112	2,526,099	2,677,665	2,838,325
Overhead costs	**Rands**	**2,763,136**	4,849,592	4,978,003	5,159,507	5,367,398	5,611,620	5,909,721	6,297,647	6,871,770	8,271,395
Environmental rehabilitation	Rands	105,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
Depreciation	Rands	2,308,136	4,069,592	4,162,003	4,305,347	4,472,788	4,674,134	4,926,786	5,266,536	5,789,592	7,135,087
Exploration costs	Rands	350,000	600,000	636,000	674,160	714,610	757,486	802,935	851,111	902,178	956,309
Income (Loss) before taxation		-1,220,073	11,689,652	15,757,017	17,973,982	20,404,434	23,060,802	25,949,912	29,062,377	32,330,754	35,147,242
Taxation		0	0	0	0	0	0	0	0	0	0
Distributable Income (Loss)	**Rands**	**-1,220,073**	11,689,652	15,757,017	17,973,982	20,404,434	23,060,802	25,949,912	29,062,377	32,330,754	35,147,242
Capital expenditure	**Rands**	**38,710,000**	400,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Cash flow budget											
Net Income (Loss)	Rands	-1,628,918	11,689,652	15,757,017	17,973,982	20,404,434	23,060,802	25,949,912	29,062,377	32,330,754	35,147,242
Adjustment for non cash flow items	Rands	2,308,136	4,069,592	4,162,003	4,305,347	4,472,788	4,674,134	4,926,786	5,266,536	5,789,592	7,135,087
Cash flow from operations	Rands	679,218	15,759,244	19,919,020	22,279,328	24,877,223	27,734,936	30,876,698	34,328,913	38,120,345	42,282,328
Taxation paid	Rands	0	0	0	0	0	0	0	0	0	0
Captial expenditure	Rands	-38,710,000	-400,000	-1,000,000	-1,000,000	-1,000,000	-1,000,000	-1,000,000	-1,000,000	-1,000,000	-1,000,000
Net cash flow	**Rands**	**-38,030,782**	**15,359,244**	**18,919,020**	**21,279,328**	**23,877,223**	**26,734,936**	**29,876,698**	**33,328,913**	**37,120,345**	**41,282,328**
PV of cash flow		-37,647,840	13,536,298	15,456,266	16,051,261	16,629,660	17,192,125	17,739,284	18,271,727	18,790,013	19,294,668
Present value of cash flow	**Based on Reserves:**		**R -8,655,277**				**NPV Based on 10-year Plan:**		**R 115,313,462**		
Discount Rate 8.0%											

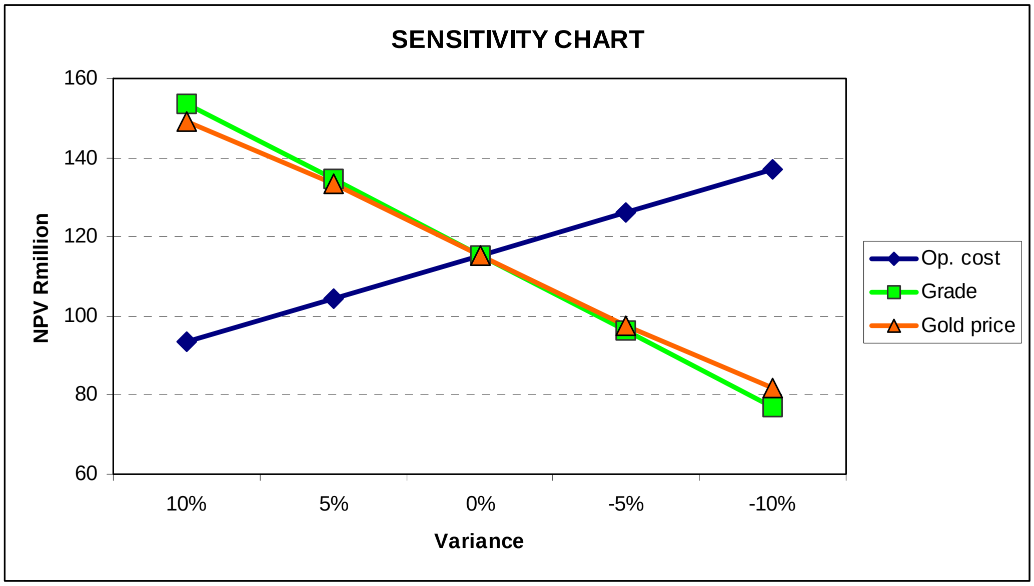

Figure 25.1 Sensitivity analysis for Barbrook based on management's 10 year forecast.

25.9.1 Mine Life

Based on the Proven and Probable Reserves disclosed in Section 19 and the base case model illustrated in Table 25.1, Barbrook has a "life" of 27 months. However, the nature of greenstone gold deposits is such that Reserves alone seldom provide for significant life of mine. Exploration activities on the mine are currently aimed at upgrading Resources to Reserves as more information becomes available. In our opinion therefore, if the 10 year plan objectives can be adhered to, Barbrook would be expected to have a life in excess of 10 years.

26. ILLUSTRATIONS