

DELTA IN ZIMBABWE — THE HISTORY

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Delta Gold N.L. (Delta) is an active explorer, and developer of mineral resources. It has been in Zimbabwe for a decade. Like all areas of exploration, Zimbabwe has provided challenges and opportunities — some of which are “common”, and others which are specific to the area.

INTRODUCTION

Why? Why become involved in Zimbabwe. The attractions include:

- its geological prospectivity for precious and base metals;
- stable government since independence in 1980;
- an English-speaking population, which is well educated;
- excellent infrastructure; and
- exploration costs are comparatively low.

Challenges. There are, as anywhere, factors which require careful attention. Some challenges specific to Delta’s platinum interests in Zimbabwe include:

- the viability of the platinum projects;
- bringing on stream a major project in a country with no large-scale foreign investment since independence; and
- Delta’s relatively small size, compared to others in the platinum business.

Key Issues. For Delta and its involvement in Zimbabwe there were several matters which required careful attention:

- a cautious attitude toward Zimbabwe by potential lenders and investors;
- limited availability of local financing;
- the need to access expatriate expertise;
- approval or rights from the Government to market production other than through the State-owned Minerals Marketing Corporation.
- a stable investment regime to minimise the potential variables on what would be a long-life project; and
- a workforce that would require additional housing and social infrastructure.

Chronology

Delta commenced its major involvement in Zimbabwe in the latter half of the 1980s. A summary tabulation is presented here.

- 1986. Prospecting licence applied for covering part of the Hartley Complex.
- 1987. Prospecting licence granted, and Delta commenced assessment of the area now named Hartley Platinum Project.
- 1988. Delta commissioned an independent feasibility study of the Hartley Platinum Project area. The feasibility study was completed in 1989.
- 1990. Delta and BHP entered into a joint venture. BHP was to earn 67% by completing an updated feasibility study based on a trial mine and by committing to fund development of a mine.
- 1991. BHP started the trial mine and associated test work on the Hartley Platinum Project.
- 1992. Delta acquired the right to earn a 24% interest in the Mhondoro Platinum Joint Venture — JV partners, Rio Tinto Zimbabwe 38% and Anglo American (Zimbabwe) 38%. The joint venture is managed by Delta.
- 1993. Delta’s 24% interest in Mhondoro Platinum Joint Venture vested, Delta retained as manager. Drilling and evaluation work completed in the Selous platinum area, adjacent to the work done in the Mhondoro Platinum Joint Venture area. BHP completed feasibility study on the Hartley Platinum Project and committed to build a mine, contingent on Delta and BHP signing a Mining Agreement with the Government of Zimbabwe.
- 1994. Anglo American (Zimbabwe) sold its 38% of Mhondoro to RTZ (UK). Delta, BHP and Government of Zimbabwe signed Mining Agreement. Government of Zimbabwe agreed to issue first-ever Special Mining Lease. BHP decided to develop Hartley Platinum mine and earn a 67% interest in the project. Construction of Hartley Platinum Mine commenced in September (1994).
- 1995. Delta bought Ngezi platinum from Anglo American (Zimbabwe). First phase drilling program at Ngezi platinum completed. Good results encouraged Delta to prepare for a second phase drilling program. RTZ (UK) and Rio Tinto (Zimbabwe) sold their 76% interest in the Mhondoro Joint Venture to

Delta and BHP. Mhondoro Platinum Joint Venture became Delta 38.7% and BHP 61.3%.

1996. Evaluation of Mhondoro platinum recommenced after Delta and BHP approved work plan and budget. BHP appointed manager of Mhondoro Platinum Joint Venture.

Construction of the Hartley Platinum Mine neared completion and commissioning commenced.

Second phase drilling at Ngezi platinum area completed. Good results encouraged Delta to commence work on pre-feasibility study, scheduled for completion in early 1997.

1997. Hartley Platinum Mine plant commissioning. By mid-year, the concentrator and smelter commissioned, with matte being introduced into base metal refinery.

Ngezi platinum pre-feasibility study completed and by mid-year under review by major South African mining house with a view to starting definitive feasibility study in August/September.

MINING IN ZIMBABWE

Mining in Zimbabwe has had a long history. Artisanal mining has been carried out for many centuries. Modern mining has been conducted since 1890.

Zimbabwe processes a variety of minerals which are attractive to the resources industry. More than 60 metals and minerals are produced in Zimbabwe. Zimbabwe boasts the largest platinum resources in the world outside South Africa, and is the third largest gold producer in Africa.

There is a well established Mines and Minerals Act for Zimbabwe, which means that exploration and mining law or control can be regarded as being "good". Once mineral title is vested in the exploration or mining company, it is secure and may be lost only through non-compliance with the regulations.

Good infrastructure

There is good transport infrastructure access to most of the country, to all neighbouring states and to the rest of the world. The infrastructure includes road, rail and air connections. Road, rail and air connections are available to South Africa. Access to the ports of Mozambique and South Africa is important for Zimbabwe, and for exports of mining products.

Electricity is available in all the main centres of the country and all major mines are connected to the national grid. Telecommunications are improving, with cellular telephones, internet and E-mail facilities becoming available.

An aggressive policy of dam construction and the implementation of a single water authority ensure that water is made available to all who need it.

Excellent health facilities exist in all major urban centres, and rural hospitals and clinics continue to be upgraded.

Mining supply companies, contractors, consultancy and analytical services are available.

Educated workforce

Zimbabwe has a well-educated workforce. Free or heavily subsidised primary and secondary education is available to almost all Zimbabwean children. Polytechnic and teacher training colleges have been established throughout the country in most urban centres. Zimbabwe has four universities, and the two State universities provide students with assistance to attend a wide variety of technical and academic courses.

As a result of the Government's tremendous emphasis since independence on upgrading the education facilities in the country, Zimbabwe boasts the highest literacy rate in Africa, including South Africa.

English is the language used in government and business.

Investment incentives

Zimbabwe Investment Centre. A one-stop investment approval process is provided by the Zimbabwe Investment Centre. Assistance and advice are available to new investors.

Government incentives. To encourage investment, the Government of Zimbabwe has:

- reduced corporate income tax to 37.5%;
- removed customs duties from all imported capital goods;
- increased dividend remittance to 100% of after-tax profits;
- provided for repatriation of capital;
- greatly relaxed exchange controls; and
- provided for "Growth Points" in rural areas, with a corporate rate of tax of 10%.

Investment protection. Zimbabwe offers a range of investment protection factors:

- it is a member of MIGA;
- it has entered OPIC protocol;
- it has acceded to the 1958 New York Convention on the recognition and Enforcement of Foreign Arbitral Awards; and
- has Bilateral Investment Protection Agreements with several countries.

Special Mining Leases. New mining investments exceeding US\$100 million may apply for Special Mining Leases. A Special Mining Lease enables the investor to negotiate with the Government for reduced levels of taxation, exemptions from mineral marketing regulations and for specific financial or other considerations applicable to the project.

Financial infrastructure

Commercial and merchant banking. International and local financial institutions provide a full range of financial services.

Auditing and accounting services. International auditing and accounting firms have offices in the main centres of Zimbabwe.

Insurance. Full insurance facilities are available for both local and international insurance requirements.

Zimbabwe Stock Exchange. Investment activities are conducted through the Zimbabwe Stock Exchange. Foreign investors are permitted to hold up to 35% in local companies.

Platinum market

Platinum has uses that can be placed into three groups (Figure 1).

Demand is driven by industrial uses such as automotive catalysts, electronics, chemical, glass and petroleum manufacture. Jewellery and bullion manufacture constitutes the other main demand. Demand in the next few years is seen as growing at about 8% per year.

Supply is dominated by South Africa and Russia (Figure 1), with North America maintaining a minor position with the production from the Stillwater mine.

Annual consumption of platinum is about 5 million ounces.

Platinum in Zimbabwe

Platinum in Zimbabwe is contained within the Great Dyke, which stretches in an approximate north–south direction across most of the country. The Great Dyke contains a number of platinum occurrences, with the Hartley Complex containing the major known platinum resource in the country.

Ownership of Hartley Complex

The Hartley Platinum project occupies only a small part of the Great Dyke, and is only a small part of Delta's substantial resource base (Figure 3).

The potential for expansion of the Hartley Platinum mine has been accommodated in the operation's design. The Northern limb of Mhondoro has potential to be a high-grade ore source for Stage 3 of Hartley Platinum, taking Hartley to 6 million tonnes per annum. Ngezi is Delta's 100% owned platinum project and the pre-feasibility study indicates that a 3 million tonne per annum project can be supported.

Delta has 33% ownership of the Hartley Platinum mine in joint venture with BHP, 38.7% ownership of the Mhondoro project in joint venture with BHP, and 100% ownership of the Ngezi and Selous projects (Figure 3). Delta has the largest stake in Zimbabwe's major platinum resource.

Hartley Platinum is part of a layered igneous intrusion that contains a gradational zone of platinum mineralisation (Figure 4). Within that zone is a layer of concentrated PGMs (platinum group minerals). In turn, within that layer, Hartley Platinum is mining a horizon that is 1.2m thick.

Mining of stopes follows a marker horizon in the middle of the face.

Hartley Platinum commenced commissioning in 1996 and is expected to reach full production in late 1998.

The resource at Hartley Platinum was given in the 1996 Annual Report of Delta as: 168.2 million tonnes at 4.9 g/t platinum group minerals plus gold and nickel, copper and cobalt; and that resource contains reserves of: 50.9 million tonnes at 5.1 g/t platinum group minerals plus gold, and nickel, copper and cobalt. (In the reserves the Pt grade was given as 2.6 ppm; Pd as 1.81 ppm; Au as 0.47 ppm; Rh as 0.21 ppm; Ni as 0.17%; and Cu as 0.14%.)

Delta's platinum and platinum equivalent resources in the Hartley Complex are:

		150 000	ounces platinum
		110 000	ounces palladium
Hartley Platinum	5 million oz Pt or 10 million oz Pt Eq	11 500	ounces rhodium
		23 000	ounces gold
Mhondoro Platinum	21 million oz Pt or 42 million oz Pt Eq	3 200	tonnes nickel
		2 300	tonnes copper
		87 000	pounds cobalt
Ngezi Platinum	29.5 million oz Pt or 59 million oz Pt Eq		
Selous	57 million oz Pt or 114 million oz Pt Eq		
Total	112.5 million oz Pt or 225 million oz Pt Eq		

It must be noted that for every platinum ounce in the resource an additional ounce of platinum-equivalent value is contained in the resource in the form of palladium, rhodium, gold, nickel, copper and cobalt.

Comparison to Impala's resources

The total Impala (in the Bushveld Complex of South Africa) mineral inventory (cf. Figure 5) equals about 120 million Pt equivalent oz. The Hartley Complex mineral inventory equals over 300 million Pt equivalent oz (includes BHP's share). The resources in the Hartley Complex are relatively shallow in depth.

Mining systems at Hartley Platinum

Mining at Hartley Platinum (Figure 6) combines the narrow-vein stoping techniques used in South Africa with the flexibility of rubber-tyred trackless haulage. Stopes mined are 1.2 metres high on the shallow-dipping (18°) reef. Stopes are delineated on all four sides before mining. Broken ore is scraped from stopes into raises and to a boxhole. LHDs (load haul dump units) pick up the ore from draw points and load it into trucks, which haul ore to a bin which feeds a conveyor to the surface processing facility. Mine infrastructure has been installed for 4.4 million tonnes per annum capacity, but will only be operated at half of this capacity in the first stage of the project.

Process circuit at Hartley Platinum

The process circuit (Figure 7) is similar to any conventional sulphide flotation circuit where ore is milled via SAG (semi-autonomous grinding) and ball mills prior to flotation to produce a concentrate for smelting. Smelter matte is refined on site to produce nickel and copper ingots. The residual concentrate containing the precious metals is sealed in drums and shipped to the United Kingdom for refining.

The first stage of this plant will process 2.16 million tonnes per annum to produce:

The process facility has been built to facilitate expansion to 4.4 million tonnes per annum, while expansion to 6.5 million tonnes per annum and beyond is envisaged.

Where is Hartley Platinum on the cost curve?

Within that portion of the Hartley Complex that is being developed in joint venture with BHP — the Hartley Platinum Mine — reserves of 4.3 million ounces from within the 14-million-ounce resource (platinum only) have been delineated. That reserve will provide the first 20 years of production for the joint venture. While the Hartley Platinum cost of production is only a forecast at this stage, it is expected to be at the lower end of the cost curve (Figure 8). That cost includes all shipping, refining and marketing costs. Costs are calculated on a platinum-equivalent revenue basis and do not incorporate "crediting" of co-product revenues.

Figure 9 shows the forecast revenue obtained for the metal from a tonne of ore, compared with the cost of production for a tonne of ore from the Delta-BHP Hartley Platinum mine. Figure 9 also compares these forecast revenue and costs with three South African producers, which altogether account for 70% of the world's platinum production. For Hartley Platinum, in addition to nearly US\$30 worth of recovered platinum from each tonne of ore, a further US\$30 worth of recovered palladium, gold, rhodium, nickel, copper and cobalt is produced.

The Hartley Platinum mine is expected to have a cash operating margin of US\$20, significantly higher than the major producers in the industry (Figure 9).

The low cost at Hartley Platinum is due to the relatively shallow mining depths of the new mine, 100 m to 500 m below the surface over the next 20 years, versus the current mining depths of 800 m to 1500 m in the mature South African operations. In addition, the new Hartley Platinum mine takes advantage of the latest equipment and technology available for the project.

Figure 1. The demand and supply components of the platinum market. (Traditional units are used. Thus 1 ounce (oz) Troy = 31.103477 grams.)

Figure 2. Map showing the main known platinum-bearing areas in Zimbabwe.

Figure 3. The distribution of exploration and development interests in the Great Dyke of Zimbabwe.

Figure 4. Schematic representation of the main sulphide zone of the Great Dyke (note scale distortion).

Figure 5. A comparison of the Hartley Complex platinum deposits in the Great Dyke of Zimbabwe with those in the Bushveld Complex of South Africa.

Figure 6. Schematic representation of mine development at Hartley Platinum.

Figure 7. Diagramatic ore processing circuit for Hartley Platinum.

Figure 8. Production cost for Hartley Platinum compared to cost of other producers (based on platinum equivalent revenue).

Figure 9. Comparison of mining costs (per tonne of ore) and revenue (metal produced from a tonne of ore) for Hartley Platinum and major South African mines.

Figure 10. Comparison of grades for ores at Hartley Platinum and the three major South African producers.

Recovered grade comparison

To complement the revenue and costs data shown in Figure 9, Figure 10 shows that the recovered grades of the Hartley Platinum mine are comparable to those of South Africa's major producers. The resultant grade is after mine dilution and metallurgical recoveries are taken into account. Information has been presented in this way because the present differences in the Australian and South African reserve codes make comparison of quoted reserves confusing at best.

Ngezi Platinum

Ngezi Platinum area (Figures 2, 11) is a substantial resource 100% owned by Delta. The northwestern area of the Ngezi resource is of a grade and tonnage similar to that of the Hartley Platinum reserve. Geotechnically and metallurgically Ngezi is at least as good as Hartley Platinum.

CONCLUSIONS

Working in southern Africa has provided Delta with an opportunity to secure a world-class resource. Platinum in the Hartley Complex represents substantial long-term growth for Delta. Hartley Platinum is only a beginning for Delta in platinum and is low cost. The mine under development at Hartley Platinum represents only 5% of Delta's platinum resources.

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Figure 11. Simplified map of the Great Dyke at the Ngezi Platinum Area (Hartley Complex).

