

ORE RESERVE REPORTING PRACTICES OF MAJOR AUSTRALIAN MINING COMPANIES

by

N. MISKELLY¹

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Abstract

In recent years stricter requirements imposed variously by the Companies Acts, auditors and the Stock Exchanges have resulted in annual financial statements of mining companies becoming more detailed, informative and useful.

Standards of reporting on ore reserves have not kept pace with the improvements in financial information disclosure, despite the fact that ore reserves are usually the most important asset of a mining company.

The ore reserve reporting practices of fifteen leading Australian mining companies are analysed against important specific criteria.

In terms of detailed and meaningful disclosure, there is scope for major improvements in annual ore reserve reporting practices.

Introduction

Ore reserves are the life blood of a mining company, since without them the mining enterprise would be unable to maintain a continuing existence. Economic exploitation of ore reserves enables the mining enterprise to generate a cash flow and so meet its financial obligations to lenders, to expand and diversify its operations, and to reward its shareholders in the form of dividends and/or capital growth. Ore reserves are also the cornerstone upon which the debt and equity funding structure of the enterprise can be built.

A comparison of any mining company's annual report in 1980 with that of 1970 will show that financial reporting (profit and loss account, balance sheet, source and application of funds, and notes to the accounts) is considerably more extensive and detailed now, while the non-financial narrative, for example the review of operations, is similarly more informative to investor and lender alike.

Disclosure of *simple* ore reserve information is also more commonplace than a decade ago.

¹Mining Research Partner, Ord Minnett, Members of The Sydney Stock Exchange Ltd.

Presentation of *supplementary* information about ore reserves is essential for an evaluation of the future viability and worth of a mining enterprise, but the disclosure of this further information (or, in some cases, any information at all) in the annual reports of most of Australia's leading mining companies still remains very limited.

Ore Reserves Disclosure Requirements

The various State Companies' Acts do not specifically require mining production or exploration companies to disclose ore reserves.

Further, the recommendations of the Aus.I.M.M. and A.M.I.C. Joint Committee on Ore Reserves (April 1972) stated that "The Committee believes that no mining company should be required to report an estimate of its ore reserves position at any time, but where it so chooses, it should do so in accordance with recommended definitions for ore reserves". Similarly, disclosure of ore reserves is not compulsory for mining companies under the Australian Associated Stock Exchanges listing requirements.

However, there is no doubt that in recent years the financial community, be they existing or potential shareholders, suppliers of debt finance, or providers of goods and services, has become more sophisticated and knowledgeable in its understanding of the concept, estimation and terminology of ore reserve statements and pressure will continue to grow for more meaningful disclosure. In the 1980's the elementary ore reserve statements of the 1970's and earlier will be judged as unsatisfactory.

Suggested Requirements

In earlier times it may have been sufficient for companies to report ore reserves merely as X million tonnes at y% grade, in many cases without designation as to whether they are proven, probable or whatever, and whether they are in situ or recoverable. Such statements are inadequate for the 1980's. What is required?

Particular circumstances will determine how relevant each specification is, and what may be relevant reporting standards for a small vein-type underground gold mine may be inappropriate for a large open cut iron ore mine. Coal reserves also need different specifications to metal mines, and an Aus.I.M.M. Committee has been established to examine and report on the procedure for the statement of coal reserves.

Annual Reporting

Companies should report ore reserves on an annual basis, although this should not inhibit reporting more frequently, if circumstances so warrant. For many investors the annual report is the only source of knowledge of the state of the company's affairs, and as new shareholders often do not have access to past annual reports which may have included ore reserves information, it is important that an indication be given of the ore position each year.

Tonnage

This should be on a standard metric basis with, for example, grade being expressed as percentage content for base metals, as grams per tonne for precious metals and as kilograms per tonne for uranium. Because it can be relevant to the realisation return on saleable output, the presence or absence of bonus or penalty minerals should be disclosed.

Proven/Probable/Possible Delineation

Ore reserves should show tonnage and grade under the headings of proven/probable/possible, or measured/indicated/inferred where relevant, and it should not be left to the investor to guess whether the reserves as shown are proven or otherwise.

To quote Barry J. Davies "There is also the question of whether disclosure should be only of proven mineral reserves or both proven and probable. Many, if not most, of the world's mining companies only 'prove' their mineral reserves for a limited period into the future to help with their production planning. To do otherwise, in most instances, is to needlessly invest funds which will not be realised for many years. Some of Australia's most famous mines, for example, have had only some five years' proven mineral reserves, at current production levels, for over fifty years, and it would surprise few people if they still had five years' proven mineral reserves in another fifty years time. Accordingly, proven mineral reserves alone are a relatively meaningless figure, even though they do have a greater degree of precision than probable mineral reserves. Therefore, probable reserves would obviously need to be included in any meaningful disclosure of mineral reserves. However, they are much more subjective than proven reserves, and could well have an error factor of plus or

minus 25 per cent or more, even in today's terms, let alone the future factors which can affect them due to changes in metal prices, exchange rates, production costs and mining methods."

As a good example of ore reserve reporting under the headings of proven/probable/possible, the 1980 annual report of The Mount Lyell Mining and Railway Company Ltd. clearly indicates in situ proven and probable ore reserves, and possible ore (not reserves) over some seven different orebodies. In addition, there is an explanation of changes in tonnage of both proven and probable reserves as follows:-

For proven reserves . . . "This year 1,139,000 tonnes were mined from reserves. The revision of reserve estimates for the Cape Horn, 'A' Lens and Intermediate Lens orebodies, in accordance with mine designs and additional drilling and development information, permitted the transfer of 503,000 tonnes from probable to proved reserves (Cape Horn 60,000 tonnes, 'A' Lens 231,000 tonnes, Intermediate Lens 212,000 tonnes). There was a reduction in proved ore reserves of 636,000 tonnes.

In addition to the transfer of 503,000 tonnes of proved reserves a further reduction of 198,000 tonnes in probable ore reserves arose from the consequential revision of ore outlines and mining operations. In the Cape Horn orebody 882,000 tonnes were transferred from the possible category to probable ore. Development has not yet made available drilling sites to complete the delineation of the Prince Lyell 30 Series stope block to allow the transfer of this ore from probable to proved reserves."

To assist better shareholder understanding the company also provides a brief explanation of the broad criteria applied in assessment of reserves.

"Proved ore has been delineated by close pattern drilling and developed preparatory to mining. Probable ore has been broadly drilled with consistent results and awaits final mine design and development. Possible ore (not reserves) has been projected from exploratory drilling or development."

In Situ/Recoverable

Many mining companies, such as Mt. Lyell, clearly indicate whether ore reserves as reported are 'in situ' or 'recoverable'. While the geologist may be vitally interested in what reserves or mineralisation may be in situ, this is of academic interest only to management, shareholders and lenders, who as a group, are primarily concerned with future cash flow and hence reserves which are *recoverable*.

While it may be satisfactory for companies in the exploration or development phase to report in situ reserves, companies which are in production or about to

commence production in the near future should report reserves on a recoverable basis.

To quote Sir Frank Espie in his keynote address to the Aus.I.M.M. symposium on Estimation and Statement of Mineral Reserves, in Sydney, October 1979

“The difference between an estimate of ore in the ground and an estimate of the mineable ore can be critical. It is the estimated grade of the mineable reserves which is in fact the critical grade in the evaluation of the deposit.”

In looking ahead in regard to changes or developments in the understanding and reporting of ore reserves Sir Frank, *inter alia*, made two points

“The first is in the directions already taken by some companies in that tonnes and grade stated for ‘mineable’ reserves will be the metal or concentrate expected to be recovered or shipped. It would seem that this is the only grade that has any reality.

The second is that, ore reserves will need to be more fully defined in a company report or prospectus and the relationship between ‘in situ’ reserves and ‘mineable’ reserves, and the assumption and reasons for that relationship, will need to be defined.”

Dilution Factor

As pointed out by Davies “Unrecoverable ore occurs principally in underground mining, where mining methods and safety requirements will often require some of the ore to be left in the ground, such as for pillar supports. Dilution arises because of the irregular boundaries of mineral reserves. During mining operations, in order to ensure that all ore containing minerals in excess of the cut-off grade is recovered, extraction usually errs on the side of taking slightly more rock than is necessary. This results in more ore being extracted, with the extra volume being of a lower mineral grade, and a consequent ‘dilution’ of the average grade. Both of these factors will vary from time to time, due to the nature of the orebody and/or changes in mining methods and techniques.”

Producing companies should report reserves on a recoverable basis since it is the ore which is recovered which provides the vital cash flow. The expected dilution factor should be clearly shown if in situ reserves only are reported.

Of the fifteen major listed mining companies analysed in this paper, only one, Energy Resources of Australia Ltd., indicated cut-off grade and the dilution factor used in its reserve estimates. However, this was not in an annual report, but in a prospectus for a public share offering which document is subject to more stringent disclosure requirements.

Cut-off Grade

The mineral content of reserves is seldom uniform throughout the orebody. Depending on the cost/price relationship the grade of ore which is economic to mine will vary over time, and consequently the tonnage of ore which is economically extractable will also change. What is regarded as ore this year at present metal prices and costs, may be worthless rock next year, and vice versa.

Without access to information which is available to management, it is difficult if not impossible, for the financial analyst to quantify and assess the significance of the complex variables which can produce quite large variations in tonnage and grade of reserves.

Energy Resources of Australia Ltd. in its prospectus dated 1 October 1980 stated on page 51 (Report of Geological Consultants) that the resource of the Ranger No. 1 orebody without having regard to mine design (that is, in situ) and calculated to a cut-off grade of 0.05% U_3O_8 was 22,159,000 tonnes at 0.259% U_3O_8 which contained 57,392 tonnes of U_3O_8 . The proven and probable ore reserves calculated to a cut-off grade of 0.1% were stated at 15,870,100 tonnes at 0.333% U_3O_8 .

The report of the General Manager on the No. 1 Orebody which allowed for mine design, 10% dilution and calculated to a cut-off grade of 0.1% U_3O_8 , estimated recoverable ore reserves at 16,972,000 tonnes at 0.313% U_3O_8 containing 53,187 tonnes of U_3O_8 .

Although some members of the public may be a little confused by the fact that there were in this instance several figures given for ore reserves, surely it is in the long term interests of management and outsiders alike for the company to indicate that ore reserves, no matter how closely calculated, are still estimates and are subject to a wide range of factors and influences which are not static but dynamic over time.

Emperor Mines Ltd. in its 1980 annual report gives tonnage and grade figures for measured, indicated and inferred ore based on three gold cut-off grades of 15 g/t, 10 g/t and 5 g/t.

Such a detailed statement is to be commended, particularly as the variations in tonnage and grades between the three categories are quite substantial.

Metal Price

Implicit in any ore reserve estimate is a metal price which has been employed in the calculation. Obviously the use of different metal prices will result in different cut-off grades being used which, in turn, will alter tonnage and grade figures.

Where a mine is high grade, a considerable change in metal prices may have little influence on the economics

of working the mine or in the ore reserve estimate. However, where the mine is low grade and only marginally economic, a relatively small change in the metal price could have a major impact on the tonnage of reserves which is regarded as economic.

Imagine two copper mining companies with, for all intents and purposes, comparable geological orebodies in terms of tonnage and grade, and cost structures which are marginally profitable. Depending on the metal price implicit in the ore reserve calculation, one company using a low copper price and hence a lower cut-off grade may report ore reserves many multiples larger than the other. Can anyone claim in the absence of disclosure of the assumed metal price that such ore reserve statements give a "true and fair view of the state of the company's affairs"?

In South Africa, where reporting of ore reserves is under strict Government supervision, the gold mining companies when reporting ore reserves invariably include the gold price assumed in their calculations.

Reconciliation

Until recent years, financial statements in annual reports were confined to the balance sheet and the profit and loss account. Eight years ago the source and application of funds was introduced into annual reports and this is now seen as a particularly useful inclusion, especially when perspective analysed over a period of years.

A similar statement of movements in ore reserves should be included.

Changes in tonnage and grade estimates can and are affected by a number of internal and external factors.

These variously include new discoveries, additional exploration and development, changes in metal prices, alterations to the cost structure, and ore tonnage/grade extracted.

The presentation of a reconciliation statement similar to that shown in Table 1 will aid interested financial parties in their evaluation of mining enterprises.

Major Company Ore Reserves Reporting

Table 2 analyses the reporting of ore reserves in their 1980 annual report by fifteen of Australia's largest stock exchange listed mining companies. The selection was based on market capitalisation (number of shares on issue at the current market price) at 17 April 1981, but excluded companies which:-

1. Were not in production at the date of the annual report (e.g., Queensland Mines in 1979 for its Nabarlek uranium deposit).
2. Were oil and gas producers (e.g., Santos, Ampol Exploration).
3. Had relatively small minority interests in mining operations (e.g. Umal Consolidated).

These companies had a total market capitalisation of \$18 billion or 35% of the total market capitalisation of *all* listed companies.

The fifteen annual reports examined covered, inter alia, 29 instances of ore reserves statements (some companies

TABLE 1
Ore Reserves Reconciliation¹

	PROVEN RESERVES		PROBABLE RESERVES		POSSIBLE ORE	
	Tonnes	Grade %	Tonnes	Grade %	Tonnes	Grade %
Reported last year	xxxxx	y.y	xxxx	y.y	xxxx	y.y
New discoveries	xxxx	y.y	-	-	xxx	y.y
Reclassified due to development and evaluation	xxxx	y.y	(xxx)	y.y	-	-
Regraded due to recovery/cost/ price factors	(xxx)	y.y	xxx	y.y	(xx)	y.y
Extracted during year	(xxxx)	y.y	(xxxx)	y.y	(xxx)	y.y
Balance year end	xxxxx	y.y	xxxx	y.y	xxxx	y.y

NOTES: Reserves as shown are recoverable, after 10% mining dilution, and assuming \$aaa per tonne for final metal product. Cut-off grade is estimated at b.b%.

For simplicity of presentation in this paper, the comparative figures for the previous year have not been included.

¹Adapted from Coopers & Lybrand (U.S.A.) "Financial Reporting in the Mining Industry, an International Survey," 1979.

such as BHP, CSR, Peko-Wallsend had multiple exposure).

Ore tonnage was included in 17 instances out of 29 (58%), yet only 41% (12 out of 29) included grade (or for coal companies some indication of the type of coal).

Less than half (48%) of the instances clearly indicated whether reserves as shown were proven/measured, while for the probable/indicated category the figure was only 31% (9 out of 29). Only 10% (3 out of 29) included possible/inferred ore.

A clear indication of whether reserves as reported were in situ or recoverable occurred in only five cases or 17%.

Apart from Energy Resources of Australia which, in any event, was a prospectus not an annual report, there were no instances of dilution factor and cut-off grades being shown.

No company included the metal price assumed in calculations.

There were only two instances (one in a prospectus) of any attempt at an ore reserves reconciliation.

TABLE 2

**Ore Reserves Information for Producing Mines
Disclosed in 1980 Annual Reports**

Company	Minerals	Ore Tonnage	Grade	Proven/Measured	Probable/Indicated	Possible/Inferred	In situ Recoverable	Dilution Factor	Cut-off Grade	Metal Price	Reconciliation
Bougainville	Copper/gold	Yes	Yes	Yes	No	No	No	No	No	No	No
BHP	Coal, iron ore, manganese	No	No	No	No	No	No	No	No	No	No
Comalco	Bauxite	No	No	No	No	No	No	No	No	No	No
CSR	Coal, iron ore	No	No	No	No	No	No	No	No	No	No
	Bauxite	Yes	No	Yes	No	No	No	No	No	No	No
	Tin	Yes	No	Yes	Yes	Yes	No	No	No	No	No
CRA	Lead/zinc, copper	Yes	Yes	Yes	No	No	No	No	No	No	No
	Coal	No	No	No	No	No	No	No	No	No	No
ERA (Prospectus)	Uranium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Part
EZ Industries	Lead/zinc	Yes	No	No	No	No	No	No	No	No	No
Hamersley	Iron ore	No	No	No	No	No	No	No	No	No	No
Howard Smith	Coal	No	No	No	No	No	No	No	No	No	No
MIM	Copper, lead/zinc	Yes	Yes	No	No	No	No	No	No	No	No
	Coal	No	No	No	No	No	No	No	No	No	No
North Broken Hill	Lead/zinc	Yes	No	Yes	Yes	No	No	No	No	No	No
Oakbridge	Coal, tin	No	No	No	No	No	No	No	No	No	No
Peko-Wallsend	Copper, gold, scheelite	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
	Coal	Yes	No	Yes	Yes	No	Yes	No	No	No	No
Renison	Tin	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Part
Western Mining	Nickel	Yes	Yes	Yes	Yes	No	No	No	No	No	No
	Gold	Yes	Yes	Yes	No	No	No	No	No	No	No
Totals	Yes	17	12	14	9	3	5	1	1	Nil	Part 2
	No	12	17	15	20	26	24	28	28	29	27

Conclusions

Major Australian stock exchange listed mining companies, with a few exceptions, have a very poor standard of reporting ore reserves per medium of their annual reports.

This is surprising since detailed information on reserves is in some instances available from Government publications (e.g., Queensland Coal Board annual reports), from overseas sources (the Tex Report, published in Japan), and from debt raising prospectuses issued in the Euro-dollar market.

Mining company management which believes that present disclosure standards are sufficient and satisfactory should

contemplate requirements which must be fulfilled by oil and gas production companies in U.S.A. under the rules and regulations of the Securities and Exchange Commission (SEC).

The SEC requires disclosure of mineral reserve quantities for oil and gas, together with their net present value, using a 10% discount rate. This disclosure is to be accompanied by a supplementary earnings summary, using reserve recognition accounting which shows the changes in the net present value of the mineral reserves and the financial period.

Clearly, major Australian mining companies have much ground to make up before annual ore reserve reporting practices can be judged to be satisfactory.

REFERENCES

- Davies, Barry J., 1980. Practical problems preclude meaningful disclosure, *The Chartered Accountant in Australia*, Vol 50, No. 9, April 1980: 19-25.
- Espie, Sir Frank, 1979. Keynote Address, *Estimation and statement of mineral reserves*, Australas. Inst. Min. Metall, October 1979: 1-5.
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