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MINING A PRELUDE TO AGRICULTURE

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ABSTRACT

Mining operations produce a great deal of wealth from small areas of land. Production values into the millions of dollars per hectare are common. Through government regulation the action of mining companies are now being directed towards the provision of a second land use following the completion of mining. This paper describes the legislative process for mining companies and provides specific information on works in the Cobar area. A case study of a typical mining development in Cobar is given, and the legislative and practical relationships with landholders are described.

OVERVIEW

There IS a number of clearly defined steps followed by all mining companies during the life of a mine. These steps are:

- Exploration, finding the ore body;
- Delineation and feasibility study;
- Mine construction and operation; and finally
- Rehabilitation and completion.

Mining is closely regulated, with input on each of these steps received from:

- Department of Mineral Resources
- Department of Water Resources
- Department of Conservation and Land Management
- Environment Protection Agency
- Local Council(s)
- Forestry Commission and Office of Fisheries

Environmental issues have risen to assume a priority in all mining operations. This is reflected in the amount of money invested by mining companies in environmental studies, site preparation and rehabilitation.

The end result - land available for a subsequent productive use following mining.

EXPLORATION

Exploration is the first step in the commencement of any mine. Old time miners (at the turn of the century) took pride in finding outcrops of valuable ore, sinking a shaft and "winning" the minerals from the ground. This was a hit and miss operation - many more holes were sunk which turned up nothing than those which struck "pay dirt".

Exploring for minerals today uses a wide range of technological tools. These include:

- Aerial photogrammetry and satellite imagery,
- Aerial magnetic and gravity surveys,
- Soil and rock geochemistry sampling,
- Geo seismic and induced polarity testing,
- RAB drilling,
- Diamond drilling, and
- Costeaming.

Only the last three of these methods have any physical impact on the ground being explored.

In most of the methods used, the mining companies must hold licences (1973 Act) prior to conducting any work. Primarily this requirement avoids duplicate claims over discoveries. Secondly, the issuing of licences ensures that:

- all licences have conditions to which holders must comply,
- notification of granted areas is distributed freely to the community (requirement to advertise),
- rehabilitation of any and all disturbing works occurs, and
- security deposits are lodged with the Department of Mineral Resources.

Once licenced, the next problem facing the prospective mining company is to find an ore reserve.

This is not easy.

Approximately 1 hole in a 100 will reveal the presence of any ore. Of this only 1 in 50 ore intersections are likely to "prove up" as an ore body. Of the ore bodies found only 1 in 30 is likely to be defined as a minable resource. Of these only 1 in 50 is a "world class" deposit.

The odds:

- 1 chance in 150,000 of finding anything worthwhile;
- 1 chance in 7,500,000 of finding something really worthwhile.

better than lotto - but only just.

FEASIBILITY OF MINING

After the company has discovered a mineable resource (hopefully "world class"), the next step is to mine it. The major factor influencing the decision to proceed with a mine is economics. If market projections show a strong enough price to sustain the mine over its life - then it is viable. For it to be feasible, there must also be a mining lease in place.

The Environmental Impact Statement (EIS) is the lynch pin in the approval process. The applicant must submit a detailed analysis of the current state of the area proposed to be mine. Mining operations are then assessed to determine the extent to which they will impact on the environmental features identified.

Regulating authorities can then make an informed decision on the desirability of the mine proceeding.

If the authorities approve the mine, then Development consent, an EPA licence and a Mining Lease can be granted.

Through all of the approval process, the opportunity exists for those affected by the proposal to be heard. A Public Awareness meeting is held at the proposed mine site, hosted by the applicant to address any concerns with the EIS, or the mine proposal.

Communication is the key to an applicant's success. Informing all of the affected parties - and highlighting the likely final state of the land, helps to establish a cooperative approach to setting compensation levels. (For more information on compensation issues the reader is referred to Guide-lines for Arbitrators and Others regarding access to lands for mineral exploration: Department of Minerals and Energy (now Department of Mineral Resources), October, 1990).

Where disagreement still exists on the proposed mine, the matter can be referred to either the Mining Warden's Court for objections under Section 112 of the Mining Act or the Land and Environment Court for objections to the granting of Development Consent. Further, where the Department of Agriculture advises that the land is required for agricultural purposes, this will be considered. The presiding judge in these matters will hand down an award to either the applicant or the plaintiff - allowing or prohibiting grant of the Lease. Most applications for a mining lease are presented well, cooperating with landholders to allow for objection free granting of titles. It should be noted that with recent changes to the legislation, rights to object to a proposal are restricted to those who have made submissions during the approval process.

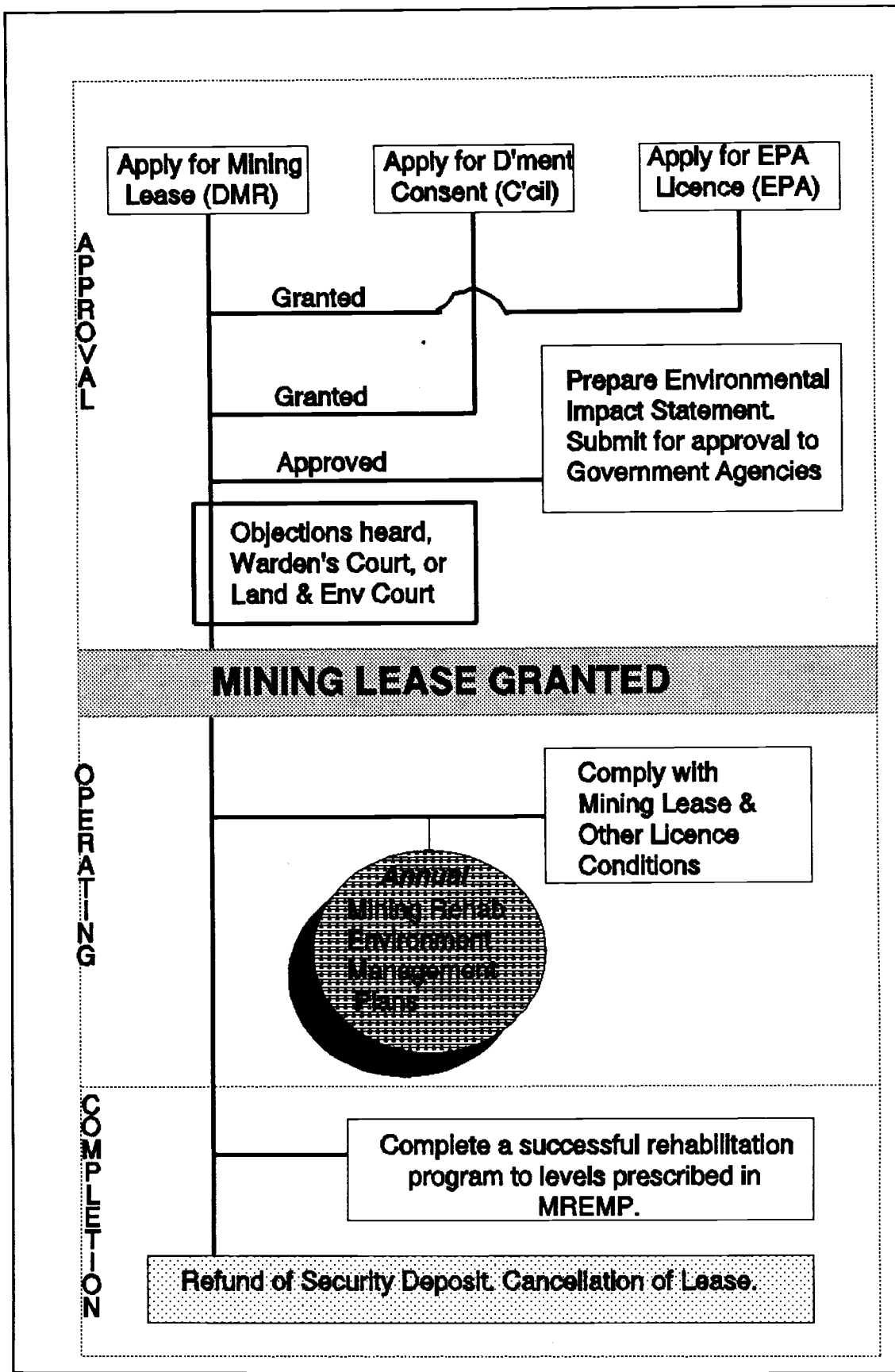


Figure 1 The approval processes required to obtain a mining lease and to keep it.

OPERATING THE MINE

Mines come in all shapes and sizes. Types of mine include:

- Open cut (taking up the largest surface area),
- Alluvial (mining only sediments),
- Dredging (mining underwater sediments), and
- Underground (with minimum surface disturbance).

An operating mine does have a significant impact on the landscape. Typically, large volumes (greater than 1,000,000 cubic metres) of ore and rock are moved around the mine site during the life of the mine. It is impossible to move this much material without causing a disturbance to the surface features.

This disturbance can be minimised - and conducted so as to enhance the final landform at the mine site.

A Mining and Rehabilitation Environment Management Plan (MREMP) is used to guide operations to achieve the optimum landform outcome after mining. The Lease holder has to prepare a MREMP each year of the mine operation. This is critically reviewed by a committee comprising all of the involved regulating bodies.

Issues addressed in a MREMP include:

- Compliance with EIS conditions,
- Performance relative to predictions (in the EIS),
- Monitoring results for the previous year and planned tests for the current period,
- Final landform goals,
- Compliance with Mining Lease conditions,
- Compliance with EPA Licence conditions, and
- Plans for actions through the coming period.

As a lease condition, the MREMP is critical to the lease holder. Failure to comply with the agreed plan can result in revocation of the mining lease(s), with the consequent loss of security deposits and income.

REHABILITATION AND COMPLETION

This the final phase in the operation of a mine - and critical for the area to be ready for a subsequent land use.

Historically, the community has considered mines to be only important for the ore and wealth produced. Changing attitudes and increasing environmental awareness requires a better approach to ending a mine.

Mine life is variable. Small open cut gold mines may only be in production for 2 years - while large underground base metal mines may continue to operate for 100 years or more. The "average" mine life is around 10 to 15 years.

Mines operating under an MREMP condition are well placed to fully rehabilitate the site - making the area safe and available for another land use. Rehabilitation will normally include:

- Stabilising and revegetating any remaining rock or waste (ie finely ground rock or low grade ore) stock piles.
- Protecting against any water, wind or chemical erosion risks.
- Ensuring all hazardous substances are stabilised, removed or confined safely.
- Isolating any sub-surface contaminants from the water table.
- Capping any open holes.
- Covering and revegetating any tailings dams present.
- Consulting with the likely future holder of the area to assess the best use of site roads, buildings, old equipment and stockpiles.

Once the rehabilitation works have been completed they are assessed. This will lead to a number of possible outcomes:

- Successful rehabilitation approved by Department of Mineral Resources and the MREMP committee (representatives from all involved regulating bodies), allowing release of security deposit, cancellation of lease and disposal of site area.
- Best practice rehabilitation is completed. If there is a "time dependent" component to the rehabilitation, then the area will be isolated until it is sure that rehabilitation is successful. (This is common on many sites, where techniques are used for the first time, and revegetation success needs 3 to 5 years undisturbed growth.) Once an agreed assessment period has lapsed the rehabilitation will be declared successful (or unsuccessful), leading to release of security deposit and cancellation (or a repeat of works to achieve success).
- Inadequate rehabilitation results (now rare thankfully). The Department of Mineral Resources retains the security deposit, and may pursue the lease holder for additional monies to effect a suitable rehabilitation program.
- Significant mineral wealth remains on the site but current techniques are unsuited to its recovery. Critical assessment is made of this type of claim. If valid, a modified rehabilitation program is preferred, which allows a subsequent access to the area by later miners.

Most of the operating Mining Lease holders are companies. They make a commitment to abide by the regulating authorities conditions, with breaches enforceable against the company and its directors. Cooperative processes such as the MREMP, Planning Focus and Public Awareness meetings all enhance understanding of the mine's operations and its environmental performance.

CASE STUDIES: Mines in the Cobar Mining District

The way in which the legislation, approving and regulating process works is best shown by example. A new mine has recently been established in the Cobar Mining District, Peak Gold Mines.

The mine was discovered near the site of old mine workings dating back to the late 1800's. An exploration program was conducted over the area from 1976 to 1986 to delineate an ore reserve.

This area was held by the proponent company as an Exploration Licence - combined with a number of small (and old) Private Land Leases.

An exploration shaft was then sunk to a depth of 730 metres from 1988 to 1990. Drives (underground tunnels) were driven from the shaft through the ore body to obtain a "bulk sample" of the ore. Metallurgical testing was conducted on this material for six months, determining the best processing method for the mine to implement.

Specific approval was sought by the company to sink the exploration shaft under the Exploration Licence. This approval was granted by the Department of Mineral Resources in concert with notifications to other regulating authorities (local council, Soil Conservation Service (at the time), etc).

In 1989, an EIS was commissioned, and completed in 1990. 18 separate consultants were employed to determine features and likely impacts of the mine's operation. Development consent, an EPA licence and subsequent Mining Lease were issued in November 1990.

Each of these documents contain conditions which must be complied with. On these matters the Department of Mineral Resources acts as the determining authority, with the greatest regulatory involvement in the operation of the mine.

Compensation agreements were reached with all affected land holders. These agreements address issues of loss of amenity, access and income - with a premium paid to the land holders for the use of their lands. An annual sum is set on a per hectare basis, adjusted for inflation and changing conditions of mining.

The MREMP condition was included in the Mining Lease conditions, and the first MREMP committee meeting was held in February 1992. The MREMP addressed:

- Variations to and non-compliance with conditions (due to impracticality).
- Results of ground water and other tests (forming background monitoring information).
- Status of top soil stockpiles.
- Underground operations, water in-flows and water output quality.
- Tip location, operation and condition.
- Plans for conduct of operation.
- Heritage considerations (on old mine site).
- Rehabilitation plan, setting end goals and progressive schedule of works.
- Monitoring program for coming 12 months.

Production at the mine is due to commence in late 1992, and continue until 2004 (on current reserves).

Early predictions on the rehabilitation program indicate that an eighteen month program will be required to stabilise / remove dumps; restore topsoil from stockpiles; demolish buildings and make the area for safe for subsequent use as unimproved pasture land.

Life of a Mine

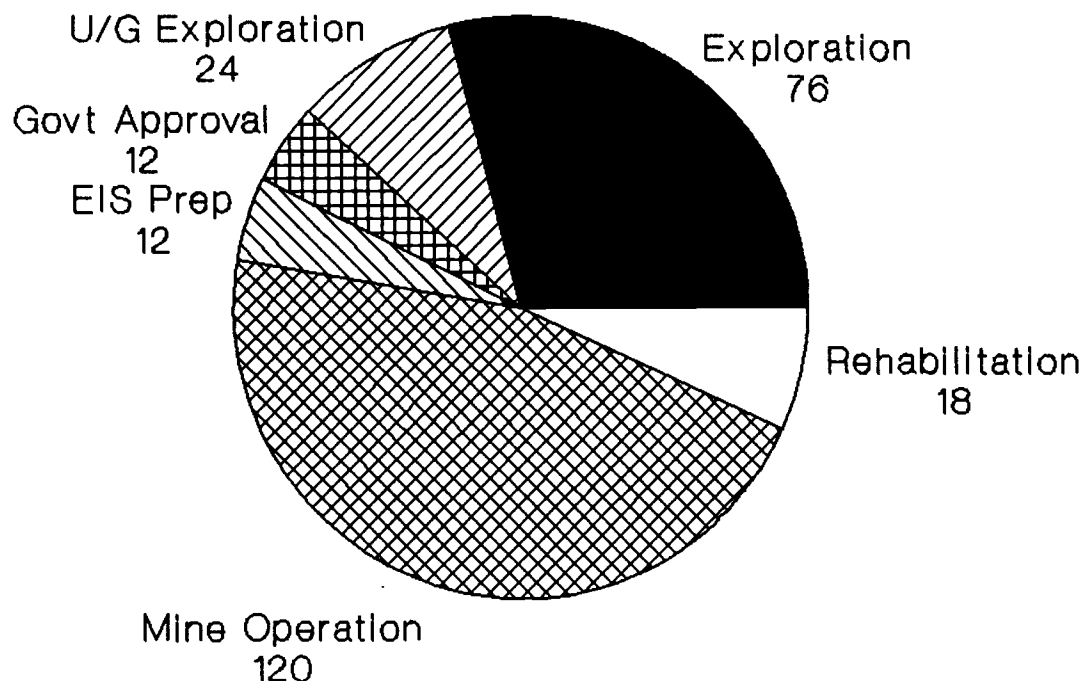


Figure 2 shows the breakdown of this work. Clearly exploration, approval and rehabilitation are significant factors in the larger view of the mine's life.

At the completion of mining the lands sub leased from the land holders will be returned - in a condition equal to or better than that at the time of the mine commencing.

CONCLUSIONS

The new goal of all mining operations is to produce more than ore -it is also directed to producing a site for another land use(r). Some of the outcomes which the mining industry can be rightly proud of include:

- Re-establishment of the Bridge Hill Ridge high dune (at Myall Lakes);
- Recreational facilities (Penrith Lakes Scheme);
- Revegetated frontal dunes (Gosford sand mining areas);
- Restored farm lands (Hunter valley coal mines); and
- Available grazing lands (some rehabilitated mines in the Western NSW rangelands).

All new operations and most current operations are committed to the preparation of MREMPs, which, with security deposits, will ensure that the goal of available sites for subsequent land users is achieved.

ACKNOWLEDGEMENTS

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Thanks also to the geologists at CRA Exploration for their "ball park" probabilities of succeeding in exploration programs.

FURTHER READING AND REFERENCES

If you would like more information on matters relating to the granting of mining titles over farming lands, I would refer you to:

Guide to Understanding Exploration and Mining Titles; Department of Mineral Resources, September 1991,

Exploration and Mining on Rural Land in NSW. Common Questions and Answers; Department of Mineral Resources, September, 1991

Guide-lines for Arbitrators and Others Regarding Access to Lands For Mineral Exploration; Department of Minerals and Energy, October, 1990

All these are available from any office of the Department of Mineral Resources. Further specific information on titles can be obtained from any Mining Registrar.

The relevant statutes, available from the NSW Government Information Service, Sydney are:

Mining Act, 1976 (New act due for release 1st August, 1992).

Relevant Land Planning Acts
Clean Air Act
Clean Waters Act
Environment Protection Act

For those interested in technical information on mining and exploration methods, a good overview can be gained from:

SME Mining Engineering Handbook. Port City Press, Baltimore, Maryland, 1973
Library of Congress Catalogue Card # 72-86922

A comprehensive study of tailings dams management is presented in:

Ritcey, Gordon M: Tailings Management, Problems and Solutions in the Mining Industry. Elsevier Science Publishers, 1989. ISBN 0-444-87374-0

More references are available on request to the author, PO Box 157, Cobar NSW 2835. Ph (068) 366 635 or Fax (068) 366 637.