



**BEST PRACTICE
ENVIRONMENTAL
MANAGEMENT
IN MINING**

Environmental Auditing



ACKNOWLEDGMENTS

The Environment Protection Agency wishes to thank the following people for their assistance in producing this module: the principal authors, Graham A. Brown and Robyn A. Laurenson of Graham A. Brown & Associates; the review team comprising Graham Terrey, Stewart Needham and Dr Tony Milnes; and the steering committee comprising representatives of the mining industry, government agencies and peak conservation organisations — the Minerals Council of Australia (MCA), the Australian Petroleum Exploration Association (APEA), the Australian Institute of Mining and Metallurgy (AusIMM), individual mining and energy companies, research institutions, the Australian Conservation Foundation (ACF) and the Australian Minerals and Energy Environment Foundation (AMEEF). The steering committee assists the authors without necessarily endorsing their views.

Cover Photo: North Stradbroke Island, Queensland, Consolidated Rutile Ltd. Supply and disposal of water is an important subject for environmental audit. Photo: Graham A Brown & Assoc.

© Commonwealth of Australia

Information in this document may be reproduced provided that any extracts are fully acknowledged.

ISBN 0 642 19438 6 of the series 0 642 19418 1

The Environment Protection Agency is an agency of the Australian Federal Environment Department

ACKNOWLEDGEMENTS

The Environment Protection Agency wishes to thank the following people for their assistance in producing this module: the principal authors, Graham A. Brown and Robyn A. Laurenson of Graham A. Brown & Associates; the review team comprising Graham Terrey, Stewart Needham and Dr Tony Milnes; and the steering committee comprising representatives of the mining industry, government agencies and peak conservation organisations — the Minerals Council of Australia (MCA), the Australian Petroleum Exploration Association (APEA), the Australian Institute of Mining and Metallurgy (AusIMM), individual mining and energy companies, research institutions, the Australian Conservation Foundation (ACF) and the Australian Minerals and Energy Environment Foundation (AMEEF). The steering committee assists the authors without necessarily endorsing their views.

© Commonwealth of Australia

Information in this document may be reproduced provided that any extracts are fully acknowledged.

ISBN 0 642 19438 6 of the series 0 642 19418 1

The Environment Protection Agency is an agency of the Australian Federal Environment Department

FOREWORD

Environment protection is a significant priority for our society. For government, a major role is setting environment standards and ensuring individuals and organisations meet them. Also, government, industry and community organisations are working increasingly as partners in protecting our environment for present and future generations.

Representatives of the mining industry in Australia and the Environment Protection Agency, an agency of the Australian Department of the Environment, have worked together to collect and present information on a variety of topics that illustrate and explain best practice environmental management in Australia's mining industry. This publication is one of a series of modules aimed at assisting all sectors of the mining industry — minerals, coal, oil and gas — to protect the environment and to reduce the impacts of mining by following the principles of ecologically sustainable development.

These modules include examples of current best practice in environmental management in mining from some of the recognised leaders in the Australian industry. They are practical, cost-effective approaches to environment protection that exceed the requirements set by regulation.

Australia's better-performing mining companies have achieved environmental protection of world standard for effectiveness and efficiency — a standard we want to encourage throughout the industry in Australia and internationally.

These best practice modules integrate environmental issues and community concerns through all phases of mining from exploration through construction, operation and eventual closure. The concept of best practice is simply the best way of doing things.

The case studies included in these modules demonstrate how best practice can be applied in diverse environments across Australia, while allowing flexibility for specific sites. They achieve this through including practical techniques, recommendations, guidance and advice from Australia's leading mining practitioners.

I encourage mine managers and environmental officers to take up the challenge to lift performance in environment protection and resource management and to apply the principles in these modules to their mines.

Barry Carbon
Executive Director,
Environment Protection Agency,
and Supervising Scientist

EXECUTIVE SUMMARY

Current environmental legislation, marketing requirements and community expectations reflect an increased awareness of the need to protect the environment that requires all aspects of the mining industry to be undertaken in an environmentally responsible way. Environmental audits can help the industry to become environmentally responsible and demonstrate this responsibility to the community.

Environmental audits help in assuring the accuracy and relevance of environmental monitoring. They also measure an organisation's environmental performance and can encourage continual improvement. Procedures for conducting an environmental audit vary from simple checklists to complex standards or programs. These procedures use a systematic approach to record whether an operation is meeting its environmental objectives.

The steps include: pre-audit planning; site activities (interviews and inspections); gathering and evaluation of audit evidence; development of audit findings; and recommendations, documentation and reporting of the findings and audit follow-up (action plans, revisions etc.).

In their most basic application, environmental audits help mining companies demonstrate to regulatory authorities that they are complying with legislation, regulations and the conditions contained in pollution control approvals, discharge licences and mining leases. Identifying issues through the audit process may also lead to more efficient operations that go well beyond regulatory requirements.

Unlike environmental impact assessment, environmental auditing as a separate process is not regulated in Australia. Environmental auditing protocols are not written into legislation so there is no set method. However, many companies and government organisations have been developing standard procedures for undertaking environmental audits.

Most environmental audits currently undertaken in the mining industry are voluntary (initiated by the company). However, there is an increasing trend toward statutory audits (required by legislation) and mandatory audits (required as a condition of an approval, licence or lease). All of these may be undertaken either by the company and presented to regulators, or undertaken by regulators at company or public expense.

There is also a trend towards developing standards for environmental management systems (EMS), of which audits are a part. These standards are similar to established quality systems standards, based on the International Standard ISO 9000 series, that many mining companies have adopted. The draft International Standards on environmental management, ISO 14001, were adopted in Australia in November 1995 as interim Australian Standards.

Best practice in the mining industry is rapidly moving to an acceptance of certified EMS and will lead to an increasing number of environmental audits being undertaken for this purpose.

The case studies included in this module demonstrate a range of current practices demonstrating the role of environmental auditing in the evolution of best practice for the mining industry.

Environmental auditing in Australia is an evolving technique. It has had a relatively short history of about five to ten years in most major mining companies. Most mining companies now accept that environmental auditing is necessary in all mining operations, both large and small. Environmental auditing is essential to continual improvement in environmental performance as the mining industry moves towards ecologically sustainable development.



Photo: Graham A Brown & Assoc.

Consolidated Rutile Ltd, North Stradbroke Island, Queensland. Plants being grown in a company nursery for rehabilitation of heavy mineral sand mining areas on the Island. Planning for revegetation can avoid potential problems revealed by environmental audit.

CONTENTS

1. WHAT IS AN ENVIRONMENTAL AUDIT?

- 1.1 INTRODUCTION
- 1.2 DEFINING AN ENVIRONMENTAL AUDIT
- 1.3 ESSENTIAL TERMS
- 1.4 HISTORY OF ENVIRONMENTAL AUDITING
- 1.5 COMPARISON WITH FINANCIAL AUDITING
- 1.6 COMPARISON WITH ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

2. WHY CONDUCT AN ENVIRONMENTAL AUDIT?

- 2.1 INTRODUCTION
- 2.2 MINING COMPANIES
- 2.3 MULTINATIONAL COMPANIES
- 2.4 RISK MANAGEMENT
- 2.5 GOVERNMENT ORGANISATIONS
- 2.6 FINANCIAL INSTITUTIONS
- 2.7 INSURANCE OF ENVIRONMENTAL RISK
- 2.8 PUBLIC IMAGE

3. TYPES OF ENVIRONMENTAL AUDITS

- 3.1 DIFFERENT TYPES OF AUDITS
- 3.2 ENVIRONMENTAL MANAGEMENT AUDITS
- 3.3 COMPLIANCE AUDITS
- 3.4 TECHNICAL OR PROCESS AUDITS
- 3.5 AUDITS FOR MERGERS, ACQUISITIONS AND DIVESTMENTS
- 3.6 ENVIRONMENTAL IMPAIRMENT LIABILITY AUDITS
- 3.7 ENVIRONMENTAL MARKETING AUDITS
- 3.8 ENVIRONMENTAL IMPACT AUDITS
- 3.9 ENVIRONMENTAL PERFORMANCE AUDIT
- 3.10 PHASE ONE AUDIT
- 3.11 STATUTORY ENVIRONMENTAL AUDITS FOR MINING OPERATIONS

4. HOW TO CONDUCT AN ENVIRONMENTAL AUDIT

- 4.1 SELECTING THE AUDITORS
- 4.2 ENVIRONMENTAL MANAGEMENT AUDITS
- 4.3 THE AUDIT PROTOCOL
- 4.4 PRE-AUDIT PLANNING
- 4.5 SINGLE AND MULTIPLE SITE/FACILITY AUDITS
- 4.6 LEGAL INFORMATION
- 4.7 CONDUCTING THE AUDIT INTERVIEW
- 4.8 CONDUCTING THE SITE INSPECTION
- 4.9 COLLECTING AUDIT DATA
- 4.10 CASE STUDIES

5. IMPLEMENTING AUDIT RECOMMENDATIONS

6. OUTCOMES OF AN ENVIRONMENTAL AUDIT

CONCLUSION

REFERENCES AND FURTHER READING

APPENDIX A

General checklist for an environmental audit

APPENDIX B

Checklist to determine if an environmental audit should be carried out on a mine, processing plant, refinery or other facility

1. WHAT IS AN ENVIRONMENTAL AUDIT?

1.1 INTRODUCTION

For today's mining industry, regulations, financial reporting requirements, market competition and community expectations require environmental performance to be assessed and reported. This has led both industry and government to adopt the environmental audit process.

The word audit is generally associated with financial reviews, carried out by accounting professionals under strict rules that establish the responsibilities and liabilities of the auditors. There are no such rules for environmental auditing.

With increased awareness of the need for environment protection, the mining industry will need to rely increasingly on environmental audits. The need to carry out an environmental audit will vary depending upon the type of organisation and the objectives of the audit. The principal aims of an environmental audit are to identify and evaluate potential liabilities, risks and hazards. This in turn will assist in assessing the viability of operations after including the cost of reducing environmental risks and liability to acceptable levels.

There is no single environmental audit procedure applicable to all situations. An audit can take different forms to achieve different objectives. The reason for undertaking an audit and the agreed outcomes are the deciding factors.

1.2 DEFINING AN ENVIRONMENTAL AUDIT

Simply, an environmental audit assesses the environmental impact of an existing mining operation. A number of bodies such as the International Chamber of Commerce and the International Organisation for Standardisation (ISO) have developed detailed definitions for environmental auditing.

For its purposes the International Chamber of Commerce defines an environmental audit as —

a management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organisation, management and equipment are performing with the aim of helping to safeguard the environment by:

1. facilitating management control of environmental practices;
2. assessing compliance with company policies, which includes meeting regulatory requirements.

The International Organisation for Standardisation (ISO) defines environmental audit as a systematic, documented verification process of objectively obtaining and evaluating audit evidence (verifiable information, records or statements of fact) to determine whether specified environmental activities, events, conditions, management systems, or information about these matters conform with audit criteria (policies, practices, procedures or requirements against which the auditor compares collected audit evidence about the subject matter), and communicating the results of this process to the client (organisation commissioning the audit).

1.3 ESSENTIAL TERMS

Information on environmental audits commonly includes terms such as:

- management tool;
- systematic assessment;
- verification;
- periodic;
- documentation;
- objectivity;
- environmental risk; and
- compliance.

It is useful to examine what each of these terms means in the context of environmental audits.

MANAGEMENT TOOL

An environmental audit is a management tool for recognising and assessing environmental risk. It can lead to strategies that minimise risk and improve environmental performance. The audit is not an end in itself. Unless the recommendations of the environmental audit are carried out, the audit will neither be effective in minimising risk to the environment nor in protection from breaking the law.

SYSTEMATIC ASSESSMENT

Environmental audits are systematic and structured, using an established protocol. All relevant aspects of the operation need to be identified and included at the agreed level of detail in the audit.

VERIFICATION

All environmental audit evidence must be verified by supporting documents. If the evidence is not verified, the process is a review, survey or assessment — not an audit.

PERIODIC

It is important that the environmental audit is periodic, not just a one-off exercise. Audit periods typically range from six month to five year intervals, depending on the culture of the organisation and the level of environmental risk being assessed. Measuring progress in environmental management over time helps to demonstrate due diligence (or general environmental duty, duty of care or similar terminology) to the public, the regulating authority or, if necessary, in a court of law in the event of a prosecution carried out under environmental legislation. Periodic assessment is essential to establish continuous improvement in environmental management.



Photo: Graham A Brown & Assoc.

Clarence Colliery, Lithgow, New South Wales. Disposal of treated mine water from coal mining operations into protected waters requires particular attention in environmental audits. Compliance with discharge conditions must be measured against monitoring data by the company.



Photo: Graham A Brown & Assoc.

Disposal of tailings into disused underground workings can pose legal and environmental risks. These are addressed during environmental audits.

DOCUMENTATION

Documentation is a most important aspect of environmental auditing. Any environment protection activity required by legislation must be documented in sufficient detail for an audit to verify that it has been undertaken properly. Also, a completed environmental audit must be finalised with a written report of the assessment. A verbal presentation is not acceptable. An undocumented audit is merely a visit.

OBJECTIVITY

Above all, an environmental audit must be objective. Many companies use self auditing in a number of situations, but the outcomes cannot be accepted as a verified audit. Independence of auditors from the organisation or facility being audited is required for an objective environmental audit.

ENVIRONMENTAL RISK

A basic objective of an environmental audit is to measure the level of environmental risk of the mining operation and to devise strategies to minimise that risk. A fundamental part of the audit recommendations is to prioritise actions to minimise those environmental risks.

COMPLIANCE

While a compliance audit solely addresses compliance with environmental legislation and corporate requirements, every environmental audit includes regulatory compliance assessment as a basic objective. The detail with which strict legal compliance is assessed depends on the agreed scope of the audit.

1.4 HISTORY OF ENVIRONMENTAL AUDITING

Environmental auditing developed in the 1970s and was adopted widely by industry only in the late 1980s. Originally, it was developed as a tool by large, multi-national organisations to ensure compliance with local and national environmental laws and regulations and with corporate policies at multiple facilities. It developed in the petroleum, chemicals and petro-chemicals, mining, mineral processing and large manufacturing industries in response to increasingly stringent environmental legislation in North America and, to a lesser extent, in the UK and Europe.

Since the late 1980s, environmental auditing has become a common management tool in developed countries and is being applied increasingly in developing countries by both foreign and locally owned industries. It is being applied across the whole range of industrial and commercial activity, from the smallest workshops to the largest industrial plants (mines, refineries, chemical plants) and government service organisations, such as transport and defence.

Environmental auditing is now common practice in the larger mining and extractive industry operations in Australia. Although the level of its application varies widely, it is accepted as essential to best practice environmental management in mining for both small and large operations.



Photo: Graham A Brown & Assoc.

Baal Bone Colliery, near Lithgow, New South Wales. Sampling of treated mine process water flowing into the process water pond. Regular sampling and monitoring results form an important part of the information inspected during an environmental audit.

1.5 COMPARISON WITH FINANCIAL AUDITING

Financial auditing is historical, examining documented records of the review period. It is governed by strict legal requirements and standards.

Environmental auditing, as a process, is not as developed as financial auditing; it is a far less structured 'snapshot' of ongoing events and has little or no legal backing. Nevertheless, there is evidence that environmental auditing, undertaken by either internal or external auditors, has led to significant management changes. Established

practice encompasses a range of reporting styles from: a filled-in checklist; a few pages detailing non-compliance or exceptions (with or without recommendations); a detailed narrative report; to formal rating of environmental management programs on a numbered scale.

1.6 COMPARISON WITH ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Environmental Impact Assessment (EIA) is carried out prior to developing a new project or expanding existing facilities to predict the impact on the environment of a future action.



Photo: Graham A Brown & Assoc.

Western Main Colliery, Wallerawang, New South Wales. Correct location and marking of licensed discharge and monitoring points is verified during environmental audits.

Environmental auditing is carried out on existing facilities and operations to assess the environmental impact of current activities by looking at current operations and their immediate past history.

EIA and environmental auditing, therefore, should (but rarely do) form a continuum of environmental assessment. In fact, a special category of environmental audit assesses the predictions in an EIA, measures whether those predictions are accurate and, if not, makes recommendations to ensure that the environment is protected. Case Study 2 describes how this is done by government in Western Australia under environmental legislation.

EIA is a formal process required under law and is a prerequisite to gaining development approval, mining leases and other permits (see Environmental Impact Assessment booklet in this series). The Environmental Impact Statement is subject to public review and is assessed by a variety of experts from government agencies and other interested parties. A development application that is the basis for EIA may be subject to public hearings through a Commission of Inquiry, Planning Tribunal, Mining Wardens Court or other forum. The decision may be appealed through the courts, for example, the Land and Environment Court of NSW, and may, in many cases, be taken to a higher court for further review.

In contrast, environmental audit at present is usually informal and voluntary. Consequently, the findings are not usually available for public scrutiny (except in rare cases involving statutory or mandatory audits or audits of government agencies) and the results are not reviewed by any government authority. The environmental audit has no force in law, and is admissible in court only as evidence of 'all due diligence' or for other reasons, on the basis of voluntary disclosure by the defendant.

Voluntary environmental audit reports in the past have been regarded as highly confidential documents and have not usually been made available for public scrutiny. While this attitude is changing, it is sometimes difficult to choose between external environmental auditors because examples of their work are unavailable owing to confidentiality provisions.

2. WHY CONDUCT AN ENVIRONMENTAL AUDIT?

2.1 INTRODUCTION

With increased awareness of the need for environment protection, the mining industry will need to rely increasingly on environmental audits. The need to carry out an environmental audit will vary depending upon the type of organisation and the objectives of the audit (*see Chapter 5*). The principal aims are to identify and evaluate potential liabilities, risks and hazards. This, in turn, will assist in assessing the viability of operations after including the cost of reducing environmental risks and liability to acceptable levels.

2.2 MINING COMPANIES

A mining company may conduct an environmental audit to satisfy itself that it is complying with current and expected future legislation. Or, it may do so to protect its directors and managers from possible fines imposed for breach of environmental legislation. Increasingly, mining companies must demonstrate to customers for their coal, iron ore, refined metals etc. that their environmental performance is sufficient to meet the customer's environmental expectations. This applies particularly to sales to Europe and North America, and, increasingly, to Asia.



Photo: Niugini Mining Ltd

Red Dome Gold Mine, Chillagoe, Far North Queensland. A newly completed waste oil water separation plant — a necessary addition to workshop activities, proudly demonstrated by an employee at mine mechanical workshops.

2.3 MULTINATIONAL COMPANIES

An overseas-owned mining company operating in Australia may be directed by its parent to carry out and report back the results of environmental audits as part of an international requirement. These audits may be required annually, or less frequently,

depending on the type of audit undertaken and the company's internal environmental policies.

Due to the large number of environmental audits undertaken each year, large companies often limit the report to address only non-compliance issues.



Photo: Oakbridge Pty Limited

Oakbridge Pty Ltd, Lithgow, New South Wales. Underground mining equipment and operations often cause environmental problems that must be taken into consideration in an environmental audit. As hydraulic rams wear on this roof chock used on a longwall in a coal mine, soluble oil may be released into the mine water system. This may find its way onto the surface through mine dewatering.

2.4 RISK MANAGEMENT

An environmental audit may also be commissioned as part of a risk management procedure. The determination and measurement of environmental risk is becoming a very important part of risk management in the mining industry. It is only since the introduction of very heavy penalties of \$1 million or more under Australian environmental legislation that organisations now realise their financial exposure to many different types of environmental risk. These risks may range from non-compliance with environmental legislation or conditions of pollution control licences to uninsurable types of risk such as pollution developing over a considerable period of time, or through accidental discharges. The environmental audit can be designed to recognise these risks and to develop mechanisms to minimise them.

2.5 GOVERNMENT ORGANISATIONS

Government and semi-government organisations and agencies are also exposed to risk under environmental legislation. In the past, some government agencies have caused substantial pollution, or created the risk of pollution, to the environment. These organisations now carry the same liability under environmental legislation as private industry. It is, therefore, increasingly common for government organisations to use environmental auditing to recognise, and thus minimise, the environmental effects of their operations.

In addition, environmental agencies with regulatory powers over the mining industry are undertaking environmental audits and other forms of assessment for their own purposes. Case Studies 1, 2 and 3 provide examples of this type from the Queensland Department of Minerals and Energy, the Western Australian Department of Environmental Protection and the Commonwealth Office of the Supervising Scientist (part of the EPA) respectively.

2.6 FINANCIAL INSTITUTIONS

Financial institutions will commonly require an environmental audit as part of their 'due diligence' procedures for financing acquisitions and mergers of corporations, in purchasing land or facilities or in refinancing existing loans. Financial institutions must ensure that, if they become mortgagees in possession through the non-performance of a loan, they are not exposed (as the occupier of a site or the manager of a non-performing corporation) to a high degree of environmental liability. It is not uncommon to find that the clean-up costs of contaminated sites may exceed the site value.

2.7 INSURANCE OF ENVIRONMENTAL RISK

Two further reasons for carrying out an environmental audit are to minimise the cost of insurance by providing the insurer with as much accurate information as possible on the environmental risks and to acquire environmental impairment liability insurance. The latter is often very difficult to obtain and very few policies have been written. However, it is probable that this type of insurance cover will become more common in the future and that more policies will be written to cover third party exposure through environmental accidents and incidents.

2.8 PUBLIC IMAGE

Finally, it is often the case that a mining company wishes to promote an image to the public of being an environmentally responsible organisation. An environmental audit may be commissioned in order to ensure that the policies, management procedures and operational practices of the organisation are, in fact, environmentally responsible. It is also possible that a mining company may wish to market its products as being produced in an environmentally responsible manner. In this case it is important that the company have an environmental audit carried out to ensure that its total operation is environmentally responsible.



Photo: Graham A Brown & Assoc.

Wallerawang Colliery, New South Wales. Environmental risk assessment is essential to the environmental auditing program. Here an audit team meets mine and contractor personnel to discuss low pH drainage from pond fines, caused at a disused coal mine when a new haul road was constructed.

Public disclosure of environmental audit results can substantially improve community relations. Government and industry policies and environmental management systems, such as the European Communities Eco-management and Audit Scheme (EMAS), increasingly require public disclosure of environmental affairs.

Public disclosure of environmental audit results, promoted as best practice in the mining industry, may also have some marketing advantages by demonstrating to purchasers of mining products the producer's responsible attitude to environment protection.



Photo: Graham A Brown & Assoc.

Consolidated Rutile Ltd, Stradbroke Island, Queensland. Make-up water entering the dredge pond during heavy mineral beach sand mining. All major operational components such as this should be included in environmental audit inspections.

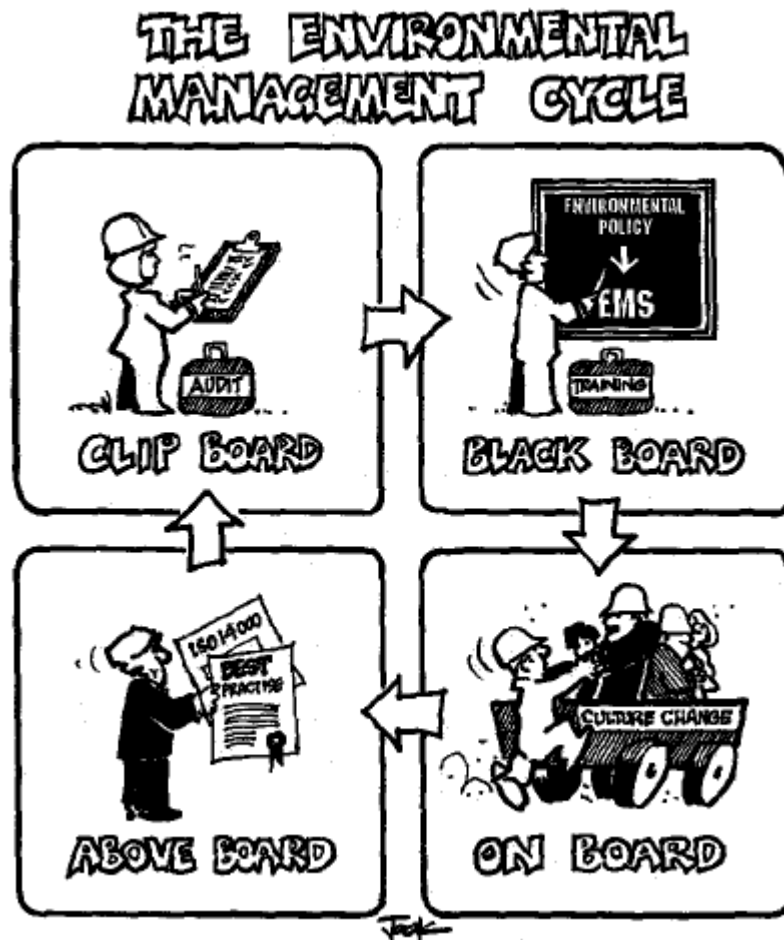




Photo: Graham A Brown & Assoc.

Kurnel Peninsula, New South Wales. Environmental audits review public information programs. A group from an environmental conference discusses a proposal to extract construction sand from the seabed off Sydney by Metromix Pty Ltd.

3. TYPES OF ENVIRONMENTAL AUDITS

3.1 DIFFERENT TYPES OF AUDITS

There are many different types of environmental audit that may be carried out on an individual facility, operation or site. It is very important when commissioning an environmental audit of a mining operation or site to ensure that the objectives of that audit are clearly defined (*see Chapter 6*). This clear definition of objectives will determine the protocol to be used by the auditors, the qualifications needed by the auditor, or the audit team, and whether or not legal input should be included in the environmental auditing process. The appendix includes a checklist to help determine whether an environmental audit should be initiated for an individual mine, operation or site.

3.2 ENVIRONMENTAL MANAGEMENT AUDITS

ENVIRONMENTAL MANAGEMENT PROGRAM AUDITS

For those companies that have not introduced a formalised environmental management system, an environmental management program audit is conducted. These are perhaps the most common type of environmental audit carried out today. It is significant that the International Chamber of Commerce, in all of its publications on environmental auditing, recognises only the environmental management audit. Accordingly, its definition refers to the environmental audit as a management tool. An environmental management audit covers the entire management procedure for environmental operations of an organisation or of a particular site or mine.

ENVIRONMENTAL MANAGEMENT SYSTEMS AUDITS

There are three levels of Environmental Management Systems (EMS) audits for those companies with a formalised Environmental Management System in place

FIRST PARTY AUDIT

A first party audit is an audit by an organisation on itself: that is, an internal audit of the EMS.

SECOND PARTY AUDIT

A second party audit is an audit by one organisation, working on its own behalf, on another. This is usually an audit on a supplier by a customer.

THIRD PARTY AUDIT

A third party audit is an audit by an independent organisation (the third party) of the EMS against the appropriate standard. The most common application of third party assessment in Australia is for the purpose of certification to the standard (for example, ISO 14001 or BS7750 or EMS) by an accredited certification body.

These standards also require internal environmental audits to be undertaken periodically according to a timetable developed by management of the organisation certified to the standard.

Best practice in the mining industry is rapidly moving to an acceptance of certified EMS and will lead to an increasing number of environmental audits being undertaken for this purpose.

ENVIRONMENTAL MANAGEMENT SYSTEMS

BS7750

The British Standard for Environmental Management Systems, issued in 1992, was revised in 1994. It has been adopted by some Australian mining companies as a standard 'in principle', ie, one that may be followed but need not be taken to full certification.

European Communities Environmental Management and Audit Scheme (EMAS)

Published as the Environmental Management and Audit Regulation (1993), this voluntary system establishes a standard of environmental performance that is independently verified by a registered 'auditor'.

ISO14000 SERIES

The International Standard for Environmental Management is planned for release in mid-1996. It consists of a number of sections:

ISO14001 — EMS: Specification with Guidance for use

ISO14004 — EMS: General Guidelines

ISO14010 — Environmental Auditing: General Principles

ISO14011 — Environmental Auditing: Auditing of EMS

ISO14012 — Environmental Auditing: Auditor's Qualifications

ISO14014 — 14015 — Environmental Auditing: Related Investigations

ISO14020 — 14024 — Environmental Labelling

ISO14031 — Environmental Performance Evaluation

ISO14041 — 14044 — Life Cycle Analysis

ISO14060 — Environmental Aspects of Products Standards

3.3 COMPLIANCE AUDITS

Environmental compliance audits examine the compliance of an organisation, a facility or mining operation with environmental legislation, regulations, licences, approvals and other documentation, including corporate environmental policies. While compliance is always a significant part of a management environmental audit, a compliance audit may go into far more detail in determining the compliance requirements and whether or not they are being met.

A strict compliance audit will normally require the services on the audit team of a lawyer experienced in environmental legislation and administrative arrangements. The audit team may include environmental, technical or industry experts who can assist in determining whether the technical aspects of compliance are being achieved. The environmental audits carried out by multinational groups over the past ten to fifteen years, that cover their world-wide facilities, have generally been for compliance purposes rather than for verifying the status of their environmental management systems. A compliance audit usually results in a 'report by exception', that is, a report that documents only the regulatory non-compliance events.



Photo: Graham A Brown & Assoc.

Consolidated Rutile Ltd, Stradbroke Island, Queensland. Environmental audits measure environmental risks of large scale heavy mineral sand mining operations. Black topsoil is being replaced immediately following mining and recontouring of tailings.

3.4 TECHNICAL OR PROCESS AUDITS

Technical or process audits may be undertaken by industry or government agencies to assess whether a particular operation or process is having a detrimental effect on the environment, or to assess the environmental impact of a specific part of an operation or process (eg, a coal preparation plant or a minerals concentrator). Technical or process audits fall into a category of statutory environmental audits required to be undertaken by the Victorian Environment Protection Authority. Results of statutory environmental audits are made public.

3.5 AUDITS FOR MERGERS, ACQUISITIONS AND DIVESTMENTS

DUE DILIGENCE REQUIREMENT

Environmental audits for financial purposes are becoming a regular part of the 'due diligence' process in mergers, acquisitions and divestments. These audits are undertaken by banks and other financial lending institutions prior to the commitment of loan funds for such purposes or by the organisation considering the merger, acquisition or divestment. They are often referred to as Phase One Audits, a term originating in North America and discussed in more detail in section 3.10.

It may seem somewhat of a contradiction for an organisation to carry out an environmental audit at a time when it is divesting itself of a particular facility or mining or processing operation. As financial institutions and purchasers of property

become more aware of the potential for acquiring environmental liabilities, it is becoming common for them to require undertakings that the vendor of the property will retain all, or a proportion of, or specified environmental liability in the event that the acquisition proceeds. Therefore, to provide this type of undertaking, it is now common for vendors of mining properties to determine the level of their ongoing liability before providing such warranties.



Photo: Graham A Brown & Assoc.

Oakbridge Pty Ltd, Wallsend, New South Wales. This water flow through a park at Wallsend, is from de-watering of the nearby Gretley Colliery. Impacts on social amenity are relevant issues for environmental audit.

LIABILITY OF OWNERS AND OCCUPIERS

With the increase in environmental liability attaching to owners and occupiers of property, it is standard practice for environmental audits to be carried out to determine the level of liability or risk that may attach to the property or asset. These audits may be commissioned by a prospective purchaser, or by a lessor or lessee to define the limits of environmental liability arising from land contamination or other pollution.

FINANCIER LIABILITY

Financial institutions are taking a more cautious approach regarding loans to industrial organisations (including mining companies) because of the risk attaching to the loan in the event that the lending institution becomes a mortgagee in possession, an owner, or is required to participate directly in the management of an organisation. The directors and managers of that financial institution may expose themselves to personal liability under current environmental legislation or face financial exposure through the potential impact of fines or other costs on the ability of borrowers to service their debts. As well as the impact of environmental liabilities on the value of securities (for example, through contaminated land or on shares in the company) financiers also face a potential direct liability for environmental costs, which may mean that an asset or security may have a negative value.

An environmental audit to assess potential liability from environmental risks is now almost mandatory before financial institutions will accept a security. Best practice in the mining industry indicates that such audits are becoming a standard procedure.

3.6 ENVIRONMENTAL IMPAIRMENT LIABILITY AUDITS

Acquiring insurance for environmental exposures can be a complex and difficult process. There is a range of insurance cover available for different types of exposure; however, most organisations examining their current insurance policies will find that pollution is specifically excluded. This is generally the case both for property risks and for directors' and officers' liability insurance.

Most of the public liability policies issued by the major general insurers exclude liability 'arising from, or in connection with, contamination or pollution by any substances discharged into or upon land, the atmosphere or any water, unless such discharge, dispersal, release or escape is caused by a sudden, unexpected and unintended happening'. There is no insurance protection for incidents that arise from seepage or other forms of gradual pollution, or intentional release of pollutants from a mine, even if this is authorised under a pollution discharge licence.

As a result of insurers' decisions to confine their insurance cover to 'sudden, unintended and unexpected happenings', there has been a move to obtain specific policies that will insure against the effects of gradual or seeping pollution. This Environmental Impairment Liability (EIL) Insurance will normally cover both sudden and accidental pollution as well as gradual pollution. An environmental audit is a prerequisite to obtaining this type of insurance.

3.7 ENVIRONMENTAL MARKETING AUDITS

There is an increasing amount of legislation, guidelines, codes of practice and other requirements relating to consumer products. These include: eco-labelling schemes; trade practices legislation relating to environmental claims; the use of logos and other devices indicating so called 'environmentally friendly' products; labelling provisions; and other elements relating to the marketing of products. In addition to this, there is increasing awareness among consumers, largely encouraged by the environmental movement, of the need for environmentally responsible products and packaging.

An environmental marketing audit is a mechanism to assess the environmental standing of a product or a range of products. It often entails a form of cradle-to-grave assessment of a company's products, as well as verifying that the company's operations accord with legislative requirements and community expectations.

Coal mining companies are now being asked to demonstrate to their customers in Europe, North America and Asia that their coal is produced in an environmentally responsible manner — an example of how environmental marketing audits can help the mining industry.

3.8 ENVIRONMENTAL IMPACT AUDITS

An environmental impact audit is a specific type of environmental audit carried out on an operation that has been the subject of an Environmental Impact Statement (EIS). It is designed to assess the extent to which the predictions or commitments contained in the EIS prior to commencing the operation are reflected in monitoring during the operational phase of the project.

Case Study 2 describes how the Western Australian EPA undertakes this type of environmental audit.

3.9 ENVIRONMENTAL PERFORMANCE AUDIT

Environmental performance auditing is carried out at Energy Resources of Australia Ranger Mine in the Northern Territory of Australia. It is regarded as an on-going management activity designed to examine and assess practices and procedures which, in the event of failure, would cause some environmental impact.

The technology used at Ranger has evolved over the years from internal audits conducted by mine personnel to a combination of:

- BS7750 audit conducted by a team of environmental staff from other business units within the North Group of resource based companies;
- environmental risk assessments conducted by independent consultants; and
- the parallel process of environmental performance review by regulatory agencies.

The environmental performance review process managed by the Environment Protection Agency's Office of the Supervising Scientist is described in Case Study 3.

COMMON ENVIRONMENTAL AUDITS — A SUMMARY

Environmental Management Audits

Environmental Management Program Audits for companies with no formalised Environment Management System.

Environmental Management Systems Audits for those companies with a formalised Environmental Management System.

Three levels:

First Party Audit - internal

Second Party Audit - usually by a customer on a supplier

Third Party Audit - independently against the appropriate standard

Compliance Audits - usually against environmental legislation, regulations, licences, approvals and internal policies.

Technical or Process Audits - assess the environmental impact of a specific part of an operation or a process.

Audits for Mergers, Acquisitions and Divestments - usually by banks and other financial lending institutions or by vendors and purchasers to assess environmental liability.

Environmental Impairment Liability Audits - a prerequisite to Environmental Impairment Liability (EIL) insurance.

Environmental Marketing Audits - usually a cradle-to-grave analysis of a company's products and operations to assess the environmental standing.

Environmental Impact Audits - to assess monitoring of Environmental Impact Statement commitments or concerns during operations.

Environmental Performance Audit - assesses environmental performance of ongoing activity.

Phase One Audit - assesses environmental liability related to acquisition or divestment of an asset.

3.10 PHASE ONE AUDIT

The term *phase one audit* (or *assessment*) comes from terminology generally used in assessing site contamination in the United States, and has been adopted world wide.

Phase one audits have frequently been required of the foreign subsidiaries of US- or UK-owned companies (including mines) in Australia for acquisition or divestment purposes. The objective of the phase one audit is to assess, the level of environmental liability that may be acquired due to an acquisition (purchase, takeover, merger etc.), or that may be retained through the warranties provided in an agreement with a purchaser on divestment. It is conducted through a review of available data and

documentation combined with a site inspection and interviews with site management. Samples of on-site materials, soil, surface water or groundwater are not usually taken during a phase one audit, which is described as a non-intrusive audit. However, it may be necessary to verify some key areas of concern, by sampling, for example, the status of asbestos on site, or to test for legionella bacteria to verify that air conditioning systems are not infected. A prepared questionnaire may be used for the interviews and observations.

Presently there are three phases of assessment for site contamination in the audit process. *Phase one* is non-intrusive and determines whether contamination potential exists. If *phase one* reveals that contamination potential exists, a *phase two* (intrusive) *assessment* is carried out to confirm the nature and extent of contamination. This assessment usually consists of sampling around suspected sources of contamination. A *phase two assessment* is not necessarily designed to collect sufficient information to remediate the site, but is used to decide whether to complete the property transaction.

A *phase three assessment* is conducted to determine the extent of contamination and to gather information about remediation. It may result in the development of the site remediation program, including timetables and costs.

3.11 STATUTORY ENVIRONMENTAL AUDITS FOR MINING OPERATIONS

There are several types of statutory environmental audits required for mining operations in Australia and others may be applicable from time-to-time. As environmental regulations are strengthened in the future, further statutory (or mandatory) environmental audits for the mining industry may be required.

Statutory environmental audits are required in Queensland under mining legislation for the certification of an EMOS (Environmental Management Overview Strategy). These are carried out by or on behalf of the miner, and are described in Case Study 1.

Compliance audits following environmental impact assessment are undertaken by the Environmental Audit Branch of the Department of Environmental Protection under environmental legislation in Western Australia. These are described in Case Study 2.

The Department of Mineral Resources in NSW also undertakes statutory environmental audits under mining legislation.

Other statutory environmental audits may be required, for example, on relinquishment of a mining lease in Victoria when a contaminated site audit may be necessary prior to changing the land use.



Photo: Graham A Brown & Assoc.

Oakbridge Pty Ltd, Bulga Mine, New South Wales. Regular water quality monitoring and recording of results is essential for compliance and effective environment management.

4. HOW TO CONDUCT AN ENVIRONMENTAL AUDIT

4.1 SELECTING THE AUDITORS

CHOICE OF AUDITORS

It is often difficult for Australian mining companies, especially if they are carrying out their first environmental audit, to choose suitable environmental auditors. Most mining organisations in Australia seek external consultants to carry out their environmental audits.

It is less common for organisations to train internal auditors or put together an internal auditing team. Sometimes internal auditors are supported by external auditors, either for verification or for additional expertise. These various possibilities are discussed in the following sections.

FINDING COMPETENT CONSULTANTS

There are three methods of choosing external environmental auditors:

- advertising to seek expressions of interest and choosing usually three or four organisations that appear suitable to respond to a request for proposals;
- choosing one or more environmental auditing firms from lists derived from:
- publications listing environmental consultants;
- consultants who have given papers at environmental conferences and seminars;
- membership lists of organisations such as the Australian Institute of Mining and Metallurgy, the Environment Institute of Australia or the Environmental Management Industry Association of Australia;

- seeking advice from organisations such as the Quality Society of Australia on its Register of Certified Auditors, the Institute of Consulting Engineers of Australia, the Mining Industry Consultants Association or the Environmental Management Industry Association of Australia;
- choosing environmental or engineering consultants already known to the company or those recommended by colleagues and associates.

QUALIFICATIONS AND EXPERIENCE

Audit findings could have serious legal implications for the company, its directors and managers. Therefore, the auditors should be appropriately qualified and capable of providing the service and the quality of report required.

AUDITOR ACCREDITATION

An Australian scheme for environmental auditor certification is expected to be operating by the time the ISO 14001 environmental management systems standard is released in 1996.

Some auditors working in Australia have already been accredited through the British Environmental Auditors Registration Association. Registration under both systems is available for Associate Environmental Auditor, Environmental Auditor and Principal Environmental Auditor (Senior Environmental Auditor in Australia).

Mining companies seeking to achieve best practice may wish to have their own internal environmental auditors appropriately certified, or use appropriately certified external environmental auditing consultants.

CLIENT CONFIDENTIALITY

As environmental audit reports are confidential documents, even the fact that an environmental audit has been commissioned is often held in confidence by the organisation that has been audited. The company should consider the potential benefits of public release, in terms of improved credibility and relationships with community groups.

INTERNAL ENVIRONMENTAL AUDITORS

For a decade or more, large companies have carried out environmental audit programs using teams of one or more competent staff members. Audit teams may comprise from one to ten members (generally three to five), selected because of their technical knowledge, their ability, their auditing experience and their independence from the facility being audited.



Photo: Graham A Brown & Assoc.

Correct bunding of fuel and other liquid storage tanks on mines and mineral processing facilities is essential to minimise Environmental risk.

It is common for multinational organisations to bring in team members from the UK, Europe and North America to audit a facility in Australia. This is especially true with large oil, mining and chemical companies (see Case Study 5).

4.2 ENVIRONMENTAL MANAGEMENT AUDITS

At the moment, most environmental audits carried out on mining operations are environmental management audits. The following description will, therefore, cover the steps that would be followed in conducting an environmental management audit. Figure 1 is a graphical representation of the activities during an audit of a large mining operation, and Figure 2 is a simplified procedure for small mines.

4.3 THE AUDIT PROTOCOL

Environmental auditors may use a number of devices and it has become common practice for the term audit protocol to be used regardless of the nature or type of the documentation supporting the audit program.

The audit protocol presents a plan for the auditor to follow in order to gain evidence about an organisation's environmental practices. This plan may be a standard procedure or it may be a guideline specific to the organisation or facility being audited. A detailed protocol will also provide a format for assigning specific tasks to individual members of an audit team, for comparing what was accomplished during the audit with the original audit plan and for summarising and recording the work in progress and work completed.

A major advantage of using a comprehensive audit protocol is to ensure consistency in the audit process and reporting procedures. This is particularly important where audit team membership is rotated. An audit protocol can also be used to help train inexperienced auditors and to reduce the amount of supervision required by the leader of the team.

It should be understood that not every audit will follow every step outlined below. Modification of the procedure will be necessary to suit each case.

Figures 1 and 2 outline audit activities for large and small mining operations.

An indicative checklist of those items that need to be considered in formulating an audit protocol for a mining operation is given in Appendix A.

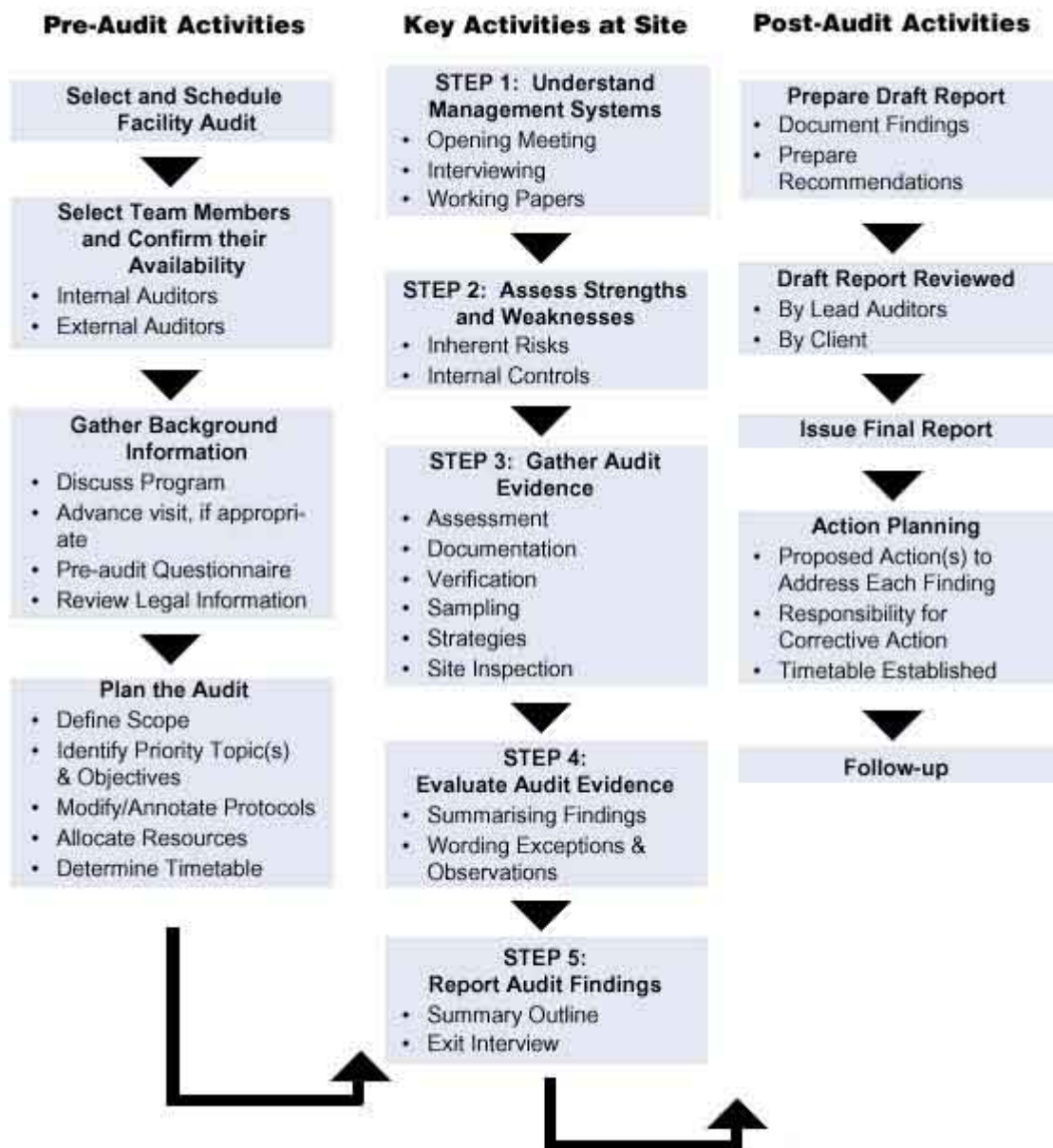


Figure 1: Review of Environmental Audit Activities for a large operation

4.4 PRE-AUDIT PLANNING

As in all management tasks, planning is an essential phase of the environmental audit procedure. The more detail the planning stage contains, the more successful the outcome of the audit is likely to be. Careful pre-audit planning will therefore ensure success of both an initial audit and follow-up audits. It is likely that an organisation will find that its pre-audit planning will improve over time as the requirements of the audit procedure become better known and established within the organisation and as auditing staff improve the environmental auditing programs. Continuous improvement is an essential component of best practice and this extends to the audit process as well.

The pre-audit planning phase is often quite time-consuming, entailing lengthy reviews of relevant information on facilities being audited. Pre-audit requirements will also vary depending on whether it is a single or multiple site/facility and whether audits are to be conducted across legal boundaries, that is, whether all of the audited areas are in one State or country.



Figure 2: Overview of Environment Audit Activities for a small mining operation

4.5 SINGLE AND MULTIPLE SITE/FACILITY AUDITS

In pre-audit planning for single and multiple facilities (eg a mine site, processing plant, refinery or several of these considered under the same audit), it is important to gather as much information relating to the facilities as possible, including a knowledge of the activities carried out, the management structure, the history of the site, the legal status and the legal framework within which the facilities operate. Pre-

audit planning also includes selecting the audit protocol, the audit team and sourcing funds for the audit program.

Pre-audit planning is essential to establish clear objectives and to define the scope of the audit as precisely as possible. This includes defining the audit boundaries in terms of organisational, geographical, locational, functional or compliance perspectives.

In addition, pre-audit planning for multiple sites/facilities also includes a range of choices that must be made about individual audit sites as well as the total audit program. To make these choices the following questions must be considered:

- Are all facilities operated by the organisation to be included, or only selected facilities? What are the implications for environmental risk management in leaving out the facilities not selected? Priority should be given to facilities with poor environmental practices or a history of non-compliance with regulatory requirements.
- Will the same auditors conduct all of the audits at every facility? Factors to be considered are: the cost of training for additional auditors; the cost of travel and accommodation for a single audit team to visit each facility; whether consistency can be maintained using a variety of auditors; and whether using different auditors over a number of facilities will increase the knowledge base of the organisation.
- Should a common protocol be used for each facility, or should specific protocols be developed for different facility types?
- Should the cost of the environmental audit be carried by each facility being audited or should the funds be provided by the corporation?
- Is the objective of the environmental audit the same for each facility or do different facilities warrant different objectives? For example, should the audit objective for an underground mine, an open-cut mine, a processing plant, a refinery, a warehouse, a transport workshop and the head office of a single organisation all be the same?

4.6 LEGAL INFORMATION

The audit must identify and document the environmental regulatory framework under which the organisation or facility must operate. The situation will vary depending upon whether an organisation or an individual site/facility is the subject of the environmental audit. In the case of an organisation, numerous local, State and national environmental laws may operate. The legal information required for an environmental audit will depend on the type and complexity of the operation and the range of approvals, leases and licences that control its operation.

4.7 CONDUCTING THE AUDIT INTERVIEW

Environmental auditors begin by interviewing relevant staff. These interviews should be pre-arranged with the facility management. Depending on the type of protocol being followed, interviews may take several hours for a small minesite or several days for a large operation and may consist of numerous separate discussions with individuals or groups.

In addition to the environmental manager, the mine or facility manager, operational managers, maintenance managers, transport managers, processing plant managers and process control engineers, any others who may be involved in the production or removal of wastes should be present at the audit interview. Depending on the scope of the audit, marketing personnel, a legal representative (either in-house or external), plant chemists and quality control managers may also be interviewed.

4.8 CONDUCTING THE SITE INSPECTION

Although a general site inspection may be appropriate before or during the course of the audit interview, it is preferable for a detailed site inspection to follow immediately after the interview. The inspection time may vary, depending on the size and complexity of a mine or operating facility.

A walk-through site inspection can often be undertaken in an hour or two to give auditors a general overview of a facility. If outside auditors are commissioned to undertake an environmental audit, they will often have undertaken a walk-through prior to providing a quote.

4.9 COLLECTING AUDIT DATA

WORKING PAPERS

A considerable amount of data and information is gathered during the environmental audit procedure. It consists of the audit protocol, documentation supplied by the facility, the auditor's own notes and observations, results of sampling and monitoring, if appropriate, and photographs, plans, maps, diagrams and other illustrative material.

The ICC Guide to Effective Environmental Auditing suggests that for each topic assigned to each audit team member, the working papers should include notes of people contacted, discussions held, records reviewed, tests performed and conclusions reached. These working papers form an important part of the documentation of an environmental audit and must be carefully assembled.

Each document or item should be numbered and preferably retained in a folder or large ring binder in numerical sequence, so that it can be easily reviewed and retrieved or, if it is removed from the binder, it can be replaced easily in the correct location. In the event of any dispute regarding the audit findings or procedures, these working papers will be important. However, their prime purpose is to support the audit findings.

DOCUMENTATION

Not all of the many documents reviewed during an environmental audit need to be retained by the auditors.

Only copies of such documentary evidence necessary to support or verify the audit evidence and findings should be retained. Normally, original documents are not retained.

RECORDING OBSERVATIONS

The role of an environmental auditor is to observe, record, verify and report. It is therefore essential that the auditor has highly developed powers of observation and is trained and experienced in recording those observations. Nothing should be committed to memory. A complex environmental audit of a large mine or processing facility covers so much technology and operational information that it is impossible to recall all of the facts and figures that are presented during the course of the environmental audit unless they are properly recorded.

SAMPLING AND ANALYSIS

Generally, it is not the auditor's role to carry out sampling or monitoring. Monitoring of the operation should be carried out by the facility management over a period of time and in accordance with the requirements of the licences, permits, approvals and other documentation relating to the site. If these monitoring results are not available, it is the auditor's role to record that fact, not to carry out sampling in order to correct the deficiency. A single sample at a point in time may not be scientifically valid.

By contrast, in the case of a site contamination audit (or assessment), sampling and analysis is a vital part of the procedure and may continue for many months before the nature and extent of contamination can be assessed (see also Chapter 3.10).

Sampling in terms of a management environmental audit generally means sampling by the auditor of a statistically representative number of documented results, such as monitoring data, incident reports, inspection records etc. or physical inspection by the auditor, eg, the integrity of bunding, the storage of drums etc.



Photo: Graham A Brown & Assoc.

*Oceanic Coal Australia Ltd (formerly FAI Mining), Newcastle, New South Wales.
Rehabilitation is a major part of any mining activity. This trial plot is on a coal mine.*

PHOTOGRAPHY

Photography is a vital part of gathering audit evidence. It is very rare that photography is not allowed during an environmental audit, but permission should always be sought at the planning stage.

It is said that a photograph is worth a thousand words and this is certainly the case in environmental auditing. The value of the photograph is two-fold. Firstly, it is of immense value to the auditor, as it can be examined in detail after the site inspection and can be referred to in ensuring all relevant details are included in the audit report.

Secondly, photographs are valuable additions to an environmental audit report. It will often be the case that the person or senior management receiving the environmental audit report rarely visit the mine or facility being audited and, even if they do, have probably not observed many of the locations visited by the environmental auditor. This is especially the case if the audit report is being received by a corporate counsel, managing director or other board member.

VERIFICATION OF AUDIT EVIDENCE

An environmental audit differs from a survey in that evidence obtained during the process is verified. In verifying documentation, the auditor must ensure that the documents produced are genuine, current and valid. The audit protocol should establish the level of verification required; alternatively, this should be established during auditor training or be included in an audit manual.

EVALUATING AUDIT FINDINGS

The findings of the audit should be carefully evaluated against the objectives established in the agreed protocol. Auditor findings may be restricted to the recognition of exceptions or non-compliance events. This is the case in a strict compliance audit, and is a mechanism favoured by large multinational organisations that operate multiple facilities and have a long-established auditing program as part of a recognised environmental management structure.

More commonly, the findings of a management environmental audit will be used in improving environmental management systems. Audit findings may be evaluated numerically to measure compliance with criteria established in the audit protocol, or to measure deviation from required performance levels. Where numerical results are not established, the audit findings will be evaluated empirically. Basically, audit findings will be evaluated on three criteria:

- does the parameter being evaluated comply with required standards;
- has the finding been verified; and
- is there any existing, residual, inherent, contingent or potential environmental risk revealed by this finding?

AUDIT RECOMMENDATIONS

The audit recommendations are aimed at minimising environmental risk, ensuring compliance with environmental legislation and improving environmental management procedures. An audit of a major mine or facility may contain fifty or more recommendations. Several times that number of recommendations may be made in a consolidated audit report covering many facilities. Implementing these recommendations as soon as practicable, to the satisfaction of the next audit, demonstrates best practice environmental management in the mining industry.

4.10 CASE STUDIES

Case studies of environmental audits of Arco's Gordonstone Coal Mine in Queensland, six coal mines for Oakbridge Pty Limited in NSW, and of Red Dome gold mine in Queensland, are provided in Case Study 7, 8 and 9 respectively.

5. IMPLEMENTING AUDIT RECOMMENDATIONS

Implementing the recommendations of the environmental audit requires an environmental action plan to be set up complete with:

- goals;
- strategies;
- performance indicators;
- responsibilities;
- a timetable for achievement; and
- cost estimates.

An environmental audit is an effective management tool only if the auditor's recommendations are acted on as soon as possible. An environmental audit is not an end in itself; it is only a means of assessing the environmental status of an organisation or facility at the time of the audit. It provides a basis for recommending actions to correct any deficiencies and to address any areas of environmental risk recorded as part of the audit findings. Matters arising in an audit which are not addressed in an appropriate time frame should be highlighted in subsequent audits, and an assessment made of the reasons for the lack of (or delay in) remedial action.

The recommendations of an environmental audit may be incorporated effectively into a structured Environmental Management System (EMS) (see *Environmental Management Systems* module in this series).

Effectively implemented, audit recommendations reduce environmental risk and assist companies to demonstrate 'due diligence' in a court of law. Conversely, it could be argued that if companies follow the best practice in environmental management they are unlikely to be in a court of law.



Photo: Graham A Brown & Assoc.

Recommendations coming from an environmental audit include actions to achieve best practice such as preventing leakage from oil drums.

6. OUTCOMES OF AN ENVIRONMENTAL AUDIT

The following benefits can be derived from the environmental auditing process *providing the findings and recommendations* are acted upon. The headings below may also be used as a guide to the objectives of an environmental audit (see also Chapter 3).

IDENTIFICATION OF ENVIRONMENTAL RISK

- causing environmental harm
- non-compliance with statutory requirements
- poor operating procedures
- site contamination
- improper disposal of wastes

DEVELOPMENT OF ENVIRONMENTAL POLICY

- is there an environmental policy?
- does it need updating?
- are operational guidelines documented?
- management structure
- environmental budgets
- reporting procedures

AVOIDANCE OF FINANCIAL LOSS

- plant closures
- operating restrictions
- site clean-up
- bad publicity
- third party damage
- compensation claims

AVOIDANCE OF LEGAL SANCTIONS

- corporate fines
- fines or jail for directors, managers, staff
- ensure compliance with environmental laws
- avoid civil liability

INCREASE IN STAFF AWARENESS

- policies and guidelines
- training programs
- staff feedback
- extension to suppliers and distributors

IDENTIFY POTENTIAL COST SAVINGS

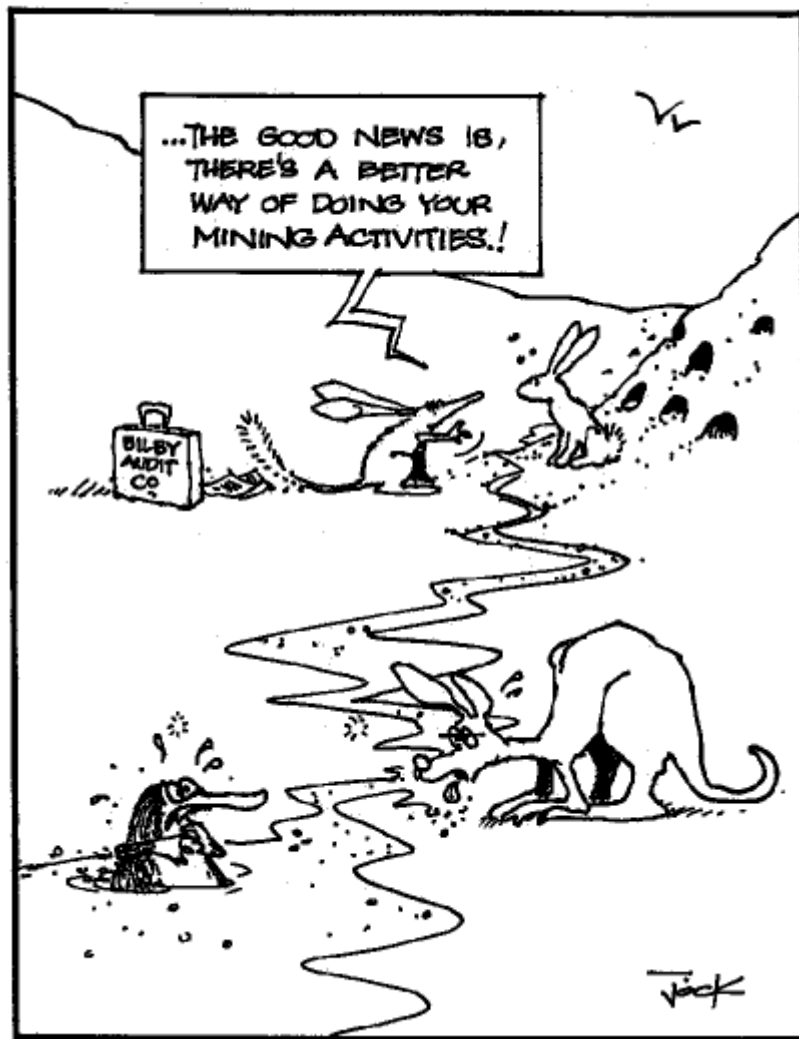
- waste minimisation
- reuse of materials in-house
- recycling in-house and externally
- energy conservation

IMPROVE DEALINGS WITH ...

- employees
- unions
- environmental groups
- regulatory agencies
- media representatives
- community groups
- insurance companies
- financial institutions
- shareholders

ESTABLISH A HISTORY OF ENVIRONMENTALLY RESPONSIBLE OPERATIONS THROUGH ...

- environmental incident reports
- environmental monitoring and recording
- reporting to committees



CONCLUSION

Environmental auditing has become an essential management tool for any mining or processing operation. It is not an end in itself, but the basis on which an environmental action plan can be developed to improve environmental performance. Also, in the event of a prosecution, it is important to have an environmental auditing program in place to demonstrate due diligence in a court of law.

Environmental audits should be part of an ongoing environmental management and improvement program, that is, not a one-off event but a periodic reassessment of the environmental management system. They can be undertaken by internal or external auditors (or a combination of both), but to maintain credibility the auditors must be independent of the facility being audited.

Governments in Australia support voluntary environmental auditing, especially in the mining industry. As audit reports do not have legal privilege exempting liability (except in South Australia and Tasmania) the confidentiality of environmental audit reports must, therefore, be preserved by the auditors. However, the company may wish to release audit reports as part of best practice.

Environmental auditing is an emerging and evolving technique. It has been common in Australia's mining industry only since the 1980s. International standards for auditing environmental management systems are a useful basis for developing the technique. Audit remains the most effective tool for assessing environmental risk and for measuring environmental impacts of an operating mining facility.

REFERENCES AND FURTHER READING

Australian Chamber of Manufactures 1992, *The Environment Management Handbook for Small Industry*, Sydney.

Australian Institute of Petroleum Ltd 1991, *Environmental Auditing and the Oil Industry*, Melbourne.

Australian Manufacturing Council 1991, *The Environmental Challenge, Best Practice Environmental Management*, Melbourne.

British Standards Institute 1992, *BS7750: Specification for Environmental Management Systems*, London.

Brown, G.A. 1993, *Environmental Audit Guidebook*, Centre for Professional Development, Melbourne.

Brown, G.A. 1994, *Environmental Awareness and Obligations: an Australian Management Perspective*, Centre for Professional Development, Melbourne.

Brown, G.A., Bragg, R., Lenton, R. & McMahon, B. 1995, *Development of an Environmental Management System for Oakbridge Limited Coal Mines Technical Proceeding*, AusIMM Annual Conference, Newcastle, NSW.

Buckley, R. 1989, *Precision in Environmental Impact Prediction: First National Environmental Audit*, Australia, CRES/ANU Press, Canberra.

Business Council of Australia 1992, *Principles of Environmental Management*, Melbourne.

European Commission EEC Council Regulation No. 1836/93: Community Eco-Management and Audit Scheme June 29 1993, *Official Journal of the European Communities No L 168/1*.

Global Environmental Management Initiative 1991, *Corporate Quality/Environmental Management*, Washington.

Harrison, L.L. (ed) 1984, *The McGraw-Hill Environmental Auditing Handbook*, McGraw-Hill, New York.

International Chamber of Commerce 1986, *ICC Position Paper on Environmental Auditing*, Paris.

Institution of Engineers, Australia, 1992, *Environmental Principles for Engineers*, Barton, ACT.

International Federation of Accountants 1995, *The Audit Profession and the Environment*, New York and Melbourne.

Kelly, William G. 1984, 'Undertaking an environmental audit, Case Study 4: Atlantic Richfield', in *The McGraw-Hill Environmental Auditing Handbook*, ed L. Lee Harrison, McGraw-Hill Book Company, New York.

Lukatelich, R.J. 1991, 'Refining Perspective', in *Environmental Auditing in the Oil Industry*, Australian Institute of Petroleum Seminar Papers, Melbourne, November 21, 1991.

Mclean, R. & Knapp, P., *The Environmental Management Audit*, Strategic Direction Publishers Ltd, Zurich (undated).

Terrens, Greg 1991, 'Refining Perspective', Esso Australia's Approach to Environmental Assessment', in *Environmental Auditing in the Oil Industry*, Australian Institute of Petroleum seminar papers, Melbourne, November 21, 1991.

The Institute of Internal Auditors Research Foundation 1993, *The Role of Internal Auditors in Environmental Issues*, Atlanta.

APPENDIX A

GENERAL CHECKLIST FOR AN ENVIRONMENTAL AUDIT

1. SITE

- 1.1 Position relative to environmental features and public scrutiny
- 1.2 Location relative to usage of surrounding areas
- 1.3 Site history
- 1.4 Chance of prior contamination
- 1.5 Security of site
- 1.6 Accessibility in emergency situations
- 1.7 Layout with respect to operations
- 1.8 Housekeeping/landscaping
- 1.9 Presence of asbestos and asbestos cement sheeting
- 1.10 Loading bays—containment of spills

2. MANAGEMENT

- 2.1 Environmental policy & guidelines
- 2.2 Environmental personnel
- 2.3 Environmental laws and procedures
- 2.4 Environmental budget
- 2.5 Environmental training
- 2.6 Third party environmental involvement
- 2.7 Data collection and storage
- 2.8 Public relations on environmental matters
- 2.9 Staff suggestion schemes

3. RAW MATERIALS

- 3.1 Pollution potential
- 3.2 Toxicity potential
- 3.3 Quality testing
- 3.4 Dangerous goods legislation compliance
- 3.5 Containment of spills/leaks
- 3.6 Storage
- 3.7 Documentation
- 3.8 Transportation on-site and between sites
- 3.9 Raw material sources

4. PROCESSES

- 4.1 Process monitoring

- 4.2 Plant maintenance
- 4.3 Process transfers
- 4.4 Quality control and testing
- 5. LIQUID WASTES**
- 5.1 Stormwater
 - 5.1.1 Stormwater drain protection
 - 5.1.2 Vehicle and plant washdown
- 5.2 Sewer
 - 5.2.1 Treatment systems prior to discharge
 - 5.2.2 Pollution potential of untreated discharge
 - 5.2.3 Discharge monitoring and recording
 - 5.2.4 Permits
 - 5.2.5 Visual check of sewer discharge
- 5.3 Tanker
 - 5.3.1 Presence of proper contract
 - 5.3.2 Contractor licence check
 - 5.3.3 Pollution/toxicity potential
 - 5.3.4 Knowledge of quality
 - 5.3.5 Knowledge of destination
 - 5.3.6 Knowledge of quantities, contractor & disposal
 - 5.3.7 Recycling/resale programs
- 6. SOLID WASTES**
- 6.1 Presence of proper contract
- 6.2 Pollution potential
- 6.3 Segregation programs
- 6.4 Recycling/resale programs & potentials
- 6.5 Knowledge of destinations
- 7. AIR EMISSIONS**
- 7.1 Visual check on air emissions
- 7.2 Pollution potential
- 7.3 CFCs, halons and use of alternatives
- 7.4 Cooling tower cleaning and testing
- 7.5 Complaints
- 8. NOISE**
- 8.1 Noise level at external boundaries
- 8.2 Noise monitoring, protection and abatement programs

9. PRODUCTS

9.1 Transportation

9.2 Labelling

9.3 Packaging

10. EMERGENCY RESPONSE PROCEDURE

10.1 Documentation of procedures

10.2 Scope and detail of procedures

10.3 Liaison with external authorities

10.4 Testing of procedures

10.5 Demographic studies

10.6 Natural disaster planning

10.7 Staff training and knowledge

11. PRIOR CONVICTIONS AND COMPLAINTS

11.1 Prior convictions by statutory authorities

11.2 Any actions by environmental/community groups

11.3 Customer complaints about environmental issues

11.4 Recording of complaints & responses

11.5 Management structure for dealing with external bodies

12. TRANSPORT

12.1 Servicing of vehicles

12.2 Recycled oil use

12.3 Unleaded fuel use

12.4 Air conditioning CFC charging

12.5 Refrigerant issues

12.6 Disposal of worn tyres

12.7 Cleaning chemicals and waste water

12.8 Catalytic exhaust on vehicles

12.9 Transport labelling on vehicles

12.10 Emergency response procedures

APPENDIX B

CHECKLIST TO DETERMINE IF AN ENVIRONMENTAL AUDIT SHOULD BE CARRIED OUT ON A MINE, PROCESSING PLANT, REFINERY OR OTHER FACILITY.

This is a simple checklist to determine if the minimum requirements for an environmental management program are in place.

If you answer [NO] to any of these questions, an environmental audit is indicated, because there is an obvious gap in the minimum standards for environmental management.

If there are several [NO] answers it means that there may be serious deficiencies and an audit is urgent.

If all (or almost all) of the questions scored [NO], an environmental audit is imperative to measure the level of environmental risk posed by the operation and to determine a program to minimise that risk (which includes directors' and managers' liability under environmental legislation).

Has an environmental audit been carried out at this mine previously?	[YES]	[NO]
Does this mine operate without the use of chemicals (including fuels)?	[YES]	[NO]
Has a comprehensive environmental management plan been prepared for this mine?	[YES]	[NO]
Does the organisation have a comprehensive written environmental policy that covers this mine?	[YES]	[NO]
Has an environmental manager/coordinator been appointed in writing for this mine?	[YES]	[NO]
Is there a specific budget for environmental management and improvement?	[YES]	[NO]
Are managers at this mine fully informed of their obligations and liabilities under environmental legislation?	[YES]	[NO]
Is environmental training provided for all employees at this facility?	[YES]	[NO]
Has the mine operated without prosecution under environmental legislation for at least the past two years?	[YES]	[NO]
Are all underground storage tanks known to be sound, including associated pipework?	[YES]	[NO]
Is the history of this site known to the present management?	[YES]	[NO]
Do you know that you hold all the required environmental licences and permits to operate this mine and that they are current?	[YES]	[NO]
Do you know that this mine has not been contaminated by past or present activities on it?	[YES]	[NO]
Have you answered all of the above questions?	[YES]	[NO]

CASE STUDY 1

QUEENSLAND DEPARTMENT OF MINERALS AND ENERGY— ENVIRONMENTAL AUDIT PLAN OF OPERATIONS

Since 1993, the Department of Mines and Energy has applied a system of environmental management to large and small scale mines in Queensland. This four step system, which leads to an environmental audit report, encourages industry self-regulation in improving environmental protection and management. Information is collected on standard forms from small scale mining operations such as alluvial gold, metalliferous mines, opal etc.

Large scale mines (including coal) use the general format to produce a comprehensive environmental audit report. The Department conducts check audits and if an auditor has supplied false information, that auditor's reports are no longer accepted. Small scale mine owners can do their own audits. Large scale operations use external independent auditors, or an internal auditor or audit team.

The four steps in the development of an environmental audit report are:

Step One — Mine Planning

The miner is required to address four questions:

- What can the land be used for after mining?
- How do I plan and operate my project to ensure that the land can be used for these purposes?
- How will my plan affect the local environment during the operation?
- How will I be able to show that I am keeping to the commitments I made in my Environmental Management Overview Strategy (see Step Two) and Plan of Operations?

Step Two — Environmental Management Overview Strategy (EMOS)

An EMOS contains commitments by a miner to manage the project, to protect the environment and to rehabilitate the mine site to the satisfaction of the Minister and other stakeholders. The requirements for an EMOS are:

- a description of the project;
- a statement of acceptable environmental impacts; and
- a schedule of impact control strategies for the life of the project, including landform management, water management, and conservation programs. Noise, air quality, cultural heritage, and environmental monitoring control strategies should also be included.

Step Three — Plan of Operations

The Plan of Operations will:

- describe the project;
- state the term of the Plan of Operations (up to 5 years);
- describe how the commitments made in the EMOS, in particular the programs and strategies, will be met during the term of the Plan;

- provide a schedule of the type and area of land disturbance within the mining lease boundary, the progressive rehabilitation program and estimated costs for the progressive or final rehabilitation of the various disturbed land types;
- propose a performance category and security deposit for the operation. Six performance categories relate to the degree of achievement of the EMOS commitments. A better performance category means less security deposit to be lodged by the company with the Department.

Step Four — Environmental Audit

The environmental audit report certifies that the Plan of Operations complies with the accepted EMOS. The auditor examines and reports on the schedule of rehabilitation for the total disturbed area for the period of the Plan of Operations, confirms the Performance Category and checks the security deposit calculation. The Department has prepared guidelines for the content of an environmental audit report.

The security deposit provided by a holder of a mining lease is to reduce the risk to the Government that may be incurred by failure of the holder to meet their environmental responsibilities. As described in Step Three, a reduction in the security deposit required is available when the prescribed environmental performance criteria are achieved. The security deposit can be progressively reduced over successive Plans of Operations by demonstrating improved environmental management.

Mining companies operating in Queensland have found the following benefits of producing an environmental audit report:

- check of performance category is undertaken ensuring the correct security deposit is lodged;
- company management is made aware of environmental management issues such as rehabilitation and these are incorporated into daily operations;
- financial benefits from improved levels of environmental performance are more secure; and
- the company's commitment to improving environmental management and performance is demonstrated to both government and the community.

A company demonstrating high environmental performance can nominate for The Premier's Awards for Environmental Excellence in the Queensland Mining Sector. These annual awards publicly acknowledge and encourage environmental excellence in the Queensland Mining Industry. In 1995 awards were presented to:

- Mt Leyshon Gold Mines Limited for excellence in planning, design and implementation of waste rock dump construction at their Mt Leyshon gold mine; and
- to CSR Limited-PGH Cooroy (Qld) for excellence in the planning, environmental management and rehabilitation of clay pits at Cooroy.

CASE STUDY 2

WESTERN AUSTRALIA DEPARTMENT OF ENVIRONMENTAL PROTECTION — COMPLIANCE AUDIT FOLLOWING ENVIRONMENTAL IMPACT ASSESSMENT OF PROPOSED MINING PROJECTS

In Western Australia, following Environmental Impact Assessment (EIA), the Minister for the Environment may issue an approval subject to legally binding environmental management conditions. Under his approval, commitments made by the proponent also become legally binding.

Compliance with these conditions and commitments is monitored, on the Minister's behalf, by the Environmental Audit Branch of the Department of Environmental Protection. To ensure that they meet their statutory responsibilities, proponents need to audit their compliance. The Government's compliance auditing process is designed to assist and complement the proponent's own audit program.

To facilitate compliance reporting the Government prepares an audit table spelling out the required actions, the timing, standards, reporting etc. This table is used as the reference point for reporting.

Commitments in an approval might be expressed imprecisely — failing to specify some of the details that are essential for auditing, such as the time by which the action is to be completed or the standard that is to be met. The Government's audit table includes prompts for these missing items and the proponent's agreement to the audit table is sought.

Conditions and commitments in an approval often contain more than one action. The audit table identifies each individual auditable element to simplify the reporting and auditing process.

The responsibility for reporting compliance with conditions rests with the proponent. A schedule of compliance reports is drawn up, often related to the phases of implementation of the project.

For each element where reporting is due the proponent is required to report on the action taken and how compliance may be verified. This may be conducted by a Department of Environmental Protection site visit or by the report including copies of correspondence from other relevant government agencies (eg, Department of Minerals and Energy) certifying satisfactory compliance.

Where the proponent is required to report to other agencies every effort is made to coordinate reporting requirements so that one report meets the requirements of all agencies.

While failure to comply with conditions and failure to report as required are offences, the threat of the use of those powers has been enough to ensure compliance. The emphasis is on achieving compliance through cooperation, on the basis that the environment is best protected by willing proponents.

A compliance audit:

- assists in identifying the level of statutory risk of a proponent's environmental liabilities;
- provides a measure of the success of managing the potential environmental issues;
- is an important component of the company's overall environmental audit and performance process; and
- provides information which assures the public and government agencies that the proponent is meeting its statutory responsibilities in protecting the environment.

These are matters that can have significant implications for the company's operations and, therefore, should be managed to demonstrate due diligence and minimise potential liabilities.

Examples of how the compliance audit process has worked following an environmental impact assessment of a proposed mining project are as follows:

A compliance audit of a gold mining operation near Coolgardie identified that there was environmental damage to vegetation due to excessive leakage from a tailings dam. The company installed interceptor trenches and pumps as a temporary measure and commenced a rehabilitation program. The EIA prediction of the leakage rate was reviewed and the tailings management system was modified to minimise the leakage. The remedial regime saved the company the cost of installing and operating a permanent borefield.

A compliance audit of a natural gas processing facility revealed that its construction was not consistent with the environmental approval. As a result there were numerous unbunded sites of potential leakage or spillage. The bunding has now been installed and if spillages occur they are collected and sold off site to an oil recycler.

CASE STUDY 3

COMMONWEALTH OFFICE OF THE SUPERVISING SCIENTIST — EXTERNAL ENVIRONMENTAL PERFORMANCE REVIEWS OF THE NABARLEK AND RANGER URANIUM MINES, NORTHERN TERRITORY

The Commonwealth Government has particular interests relating to the uranium mines of the Alligator Rivers Region of the NT. These include:

- ownership of uranium in the NT which is vested in the Commonwealth;
- protection of the Kakadu National Park environment, which lies within the Alligator Rivers Region and much of which is downstream of the Ranger mine;
- management and protection of the Kakadu World Heritage Area;
- uranium mining is a sensitive social issue in the Australian electorate, particularly in this case, where the mines are on Aboriginal land and are surrounded by or adjacent to a national park.

The Commonwealth Government has no mining legislation through which it may directly regulate the uranium mines. It has, however, set up a small organisation to conduct research into the environmental impacts of uranium mining and to oversee the adequacy of environmental management by the mining companies and environmental regulation by the NT Government.

This overseeing role is performed by the Office of the Supervising Scientist. The audit mechanism used is termed Environmental Performance Review (EPR).

EPRs are conducted twice yearly and the NT regulating authorities are invited to participate jointly in the process. The objective is focused on environmental outcomes rather than with compliance — there are other mechanisms operated by the NT Government for that. The process is an open one; the mine operators are advised beforehand of the main lines of questioning in the next EPR and the process is designed to encourage the companies to improve their environmental performance continuously. Where issues are identified that reflect poor performance, the emphasis is on working together to identify solutions to the problems. Representatives of community and other stakeholder groups are consulted on the issues to be emphasised in future EPRs.

The EPR process involves:

- an extensive questionnaire sent to the company at least two weeks before the review;
- an interview session addressing the questionnaire;
- a site visit to inspect areas of concern and a general overview of the site;
- verification of documentary evidence cited during the interview session;
- an evaluation of performance, with the response to each question being rated as either acceptable, requiring further work, or not acceptable; and
- preparation of a short (two-page) summary report.

The evaluation document and the summary report are presented to a meeting of stakeholder group representatives held the day after completion of the EPR. This group includes representatives of Aboriginal, environmental, local government and union organisations as well as the mining companies and Territory and Commonwealth Government Departments for Resources, Environment and Health. The companies are encouraged to table copies of their environmental reports at the meeting and to make presentations on topical issues and development plans. The NT regulators also table environmental monitoring reports for the minesites.

Within two weeks of each EPR, 'matters arising' — that is, issues that need to be attended to — are circulated to the mining companies and to members of the stakeholder group committee. In this way, there is no uncertainty about the expectations of all the interested parties and what needs to be done to attain continuous improvement in environmental management at the mine sites.

The EPR process has resulted in much improved, collaborative action by industry and the Territory and Federal Governments to demonstrate the standard of environmental protection being achieved and the commitment to continue improving the quality of environmental protection.

Internal environmental performance audits conducted at the Ranger uranium mine are described in Case Study 4.

CASE STUDY 4

RANGER URANIUM MINE — INTERNAL ENVIRONMENTAL PERFORMANCE AUDITS

Energy Resources of Australia's Ranger mine is about 250km east of Darwin in the Northern Territory. It is surrounded by the Kakadu National Park. ERA is a member of the North Group of resource based companies.

Internal Environmental Performance Auditing was used as a management tool by mine personnel at the Ranger mine in the late 1980s and early 1990s. It was regarded as an ongoing management activity designed to examine and assess practices and procedures which, in the event of failure, would cause some environmental impact. The following procedure was used:

1. Each work group supplied information on report sheets which recorded perceptions of possible environmental impacts at each work area.
2. Each of the 250 items included on the report sheets was grouped according to the degree of risk and priority for action. Four groupings were used:
 - I Infringement imminent/immediate action
 - II Simple resolution/immediate action
 - III Variable risk/prioritised action
 - IV Low risk and high cost/no action
4. The priority for action was calculated by taking into account:
 - o cost;
 - o potential environmental impact;
 - o potential for legislative infringement;
 - o potential for adverse affect on the company; and
 - o probability of occurrence.
5. Remedial action was monitored on an ongoing basis.
6. This process was regarded as having the greatest potential for minimising environmental impact on one hand and managing the project in the most cost effective manner on the other. The procedure included as many employees as possible who, through their involvement in the auditing process, became more familiar with operating environmental protection objectives. The more serious potential impacts were targeted for immediate remedial action.

In 1994/95 the system evolved into a hazard reporting system accessible from all computer terminals throughout the site.

Major advantages have been the definition of individual responsibility of all employees to report environmental and safety hazards site-wide and a mechanism for regular (weekly) review and update to ensure that reported hazards were being acted upon.

BS7750 Environmental Audit

The North Group has moved to standardise business units to one common platform of audit.

This allows for consistency of performance measurement across the range of business units in the Group for the Board, shareholders and broader community. It also allows for environmental staff from anywhere within the Group to conduct audits on other sites.

Environmental Risk Assessment

An Environmental Risk Assessment conducted by an independent consultant provided the opportunity to focus on environmental risks of the plant. An independent expert in risk analysis and chemical processing assessed any hazards and recommended actions to reduce the risk.

This assessment, carried out in 1995, assessed the site as well managed and recommended work to further reduce risk in the area of hydrocarbon management including storages, pipe integrity and bund construction and management.

General

The use of environmental auditing in its various forms has been a high priority for ERA. The sensitivity of mining uranium adjacent to a World Heritage area owned by Aboriginal landowners requires the company's environment performance to be at an extremely high level.

The information provides assurances to the company and its staff, to the other stakeholders in the region and to statutory authorities. This is further complemented by the six-monthly Environmental Performance Review conducted by the Office of the Supervising Scientist and the Northern Territory Department of Mines and Energy (Case Study 3).

ERA completed mining of the first orebody at Ranger in 1994. To ensure that approvals are gained to mine additional orebodies and that support from the Aboriginal landowners continues, it is vital that the company is able to demonstrate a very high standard of environmental management. Internal and external audits, assessments and reviews all play a part in this process.

CASE STUDY 5

ALCOA OF AUSTRALIA LTD

Alcoa of Australia Limited is a major, integrated aluminium producer in Australia. In Western Australia it operates three bauxite mines at Jarrahdale, Huntley and Willowdale, in the Darling Range south of Perth, and a gold mine at Boddington. Three alumina refineries are located on the coastal plains south of Perth at Kwinana, Pinjarra and Wagerup with shipping terminals at Kwinana and Bunbury.

Auditing is considered by Alcoa to be an important tool in the continuous improvement of environmental management performance. Alcoa has three tiers of environmental auditing. Corporate level audits are conducted by international teams, each led by a full-time audit team leader who is supported by environmental professionals from Business Units other than the one being audited. The teams generally include at least one consultant. The protocols used are broad (water/wastewater, air, facility environmental management etc.) and are designed to be implemented by environmental professionals. The results are presented in the form of a numerical score and a written report which highlights the situations requiring attention. These corporate audits are conducted on a three-yearly basis. Location managers are required to respond to the audit team's findings with an action plan and to certify biannually that the action plan is being implemented on schedule.

In Western Australia, additional audits of the operating locations are conducted midway between the corporate audits. The main purpose of these secondary audits is to assess progress against the action plans developed in response to the previous corporate audit. They also identify any other significant issues requiring attention. The protocols used in these audits are the same as those used in the corporate audits. The audit teams are made up of operations and environmental personnel from locations in Western Australia other than the one being audited. Actions taken in response to the results of these audits are determined solely by location management.

The final level of auditing is in an early stage of development and implementation. These audits are intended to be undertaken by operating centre personnel, most of whom have had only job-specific and general environmental awareness training. Consequently, the protocols used are fairly prescriptive. They specify what management procedures should be in place to achieve a performance ranking of poor through excellent. The corrective actions are handled in the same system as the quality system audit corrective actions. Alcoa believes this 'on the job' auditing holds great promise for improving environmental management performance and achieving best practice objectives.

One of the primary benefits of environmental auditing is its effectiveness as a tool for continuous improvement. In addition to identifying areas requiring improvement, the corporate audits have facilitated transfer of best environmental practice. At this stage, best practice is being transferred by means of personal contact between the auditors from external Business Units and personnel at the location being audited. This transfer can be in either direction. A register of best environmental practice within the corporation worldwide, based on corporate audit findings, is at an advanced stage of development.

Multidisciplinary Audit Team Membership

Environmental audits may be for compliance purposes only or they may examine the whole environmental management structure or system. The auditors comprising the environmental audit team will generally have been trained on the job or have undertaken an environmental auditor training program. However, it is becoming common for companies to have multi-disciplinary internal audit teams. This includes internal financial and operations auditors and trained Occupational Health and Safety and quality systems auditors. Best practice demands that environmentally competent people are included in the audit team.

Large organisations, including governments and larger industrial organisations, which operate multiple manufacturing plants, mines and refineries often have in-house technical staff competent to undertake their own audit. According to international consultants Arthur D. Little, most established environmental audit teams include individuals with technical expertise, knowledge of environmental regulations, plant experience and a strong knowledge of auditing procedures and techniques. Knowledge of environmental management systems and an understanding of the hazard control programs of similar companies are also important staffing criteria. Audit teams usually include environmental specialists and may also include a plant manager, process engineer, lawyer, analytical chemist, internal auditor, toxicologist or outside consultant.

Some companies have a full-time audit program manager; others staff their audit program part-time as they do not conduct sufficient audits to justify full time staff. Other companies rotate the membership of the audit team to involve a wider range of staff; others vary their team membership to get the specific expertise desired for a particular audit. Case Study 6 provides information on internal audit teams from the petroleum industry.

Using the same auditors for every audit (as opposed to rotating the membership of the audit team) provides greater continuity from audit to audit and generally greater confidence that the goals and objectives of the program are being met.

CASE STUDY 6

ENVIRONMENTAL AUDITING IN THE PETROLEUM INDUSTRY — SOME EXAMPLES

Esso Australia

Esso Australia maintains a number of environmental scientists within the organisation and, in addition, has numerous engineers, chemists and geologists with experience in environmental management. While responsibility for environmental compliance lies with the operating units, an environmental auditing team is selected in accordance with the size of the facility to be audited and knowledge of the facility operation. An Environmental Coordinator (one of the environmental scientists) and a facility representative are always on the team. A specialist consultant may also be included. Esso Australia has only upstream petroleum operations to audit, that is, exploration, production and transport of crude oil and gas. (Source: Terrens, 1991)

BP Oil Australia

BP Oil operates refineries and undertakes distribution and retailing of petroleum products in Australia. BP is moving towards combined Health, Safety and Environmental (HSE) audits at its refineries and other facilities, based on the Five-Star International Safety Rating System. The membership of the audit team depends on the exact nature of the audit. BP Oil has, for several years, assembled teams of qualified professionals to visit facilities and review and audit HSE performance from both management and technical perspectives. An audit team visiting an Australian refinery would typically have five members, consisting of two corporate environmental professionals (one UK, one USA) and three refinery environmental managers (one European, one UK, one Australian). (Source: Lukatelich, 1991)

Atlantic Richfield Company (ARCO)

A further example from the oil and chemicals industry is provided by ARCO. A team of internal auditors is selected from a nominated panel of about 125 personnel representing engineering, operations and environmental expertise. Each team member serves on the panel for two years. An environmental audit team will typically consist of a team leader and two or three additional team members from the panel, a corporate environmental adviser and a corporate legal adviser. (Source: Kelly, 1984)

CASE STUDY 7

GORDONSTONE MINE, ARCO COAL AUSTRALIA INC.

The Gordonstone mine is located about 45 km northeast of Emerald in the Bowen Basin Coalfields in Central Queensland. Emerald is about 300 km east of Rockhampton. The mine is one of Australia's largest underground coal operations. It produces 4.3 million tonnes annually using longwall mining technology.

As part of the company's Environmental Management System, it conducts regular external and internal Environment, Health and Safety audits using its staff for internal audits and staff from sister operations and the corporate office for external audits.

External Audits

The highest level of external audit is the Corporate Environment Health and Safety Audit Program which is modelled by ARCO's Safety, Health and Environment Policy. It focuses primarily on mine compliance with legislation, with company and corporate environmental policies, with Codes of Practice, Australian Standards and any other relevant guidelines and practices. Since 1991, three external audits have been conducted by a team of six auditors. The team remains on site for two weeks and investigates all aspects of environment, health and safety management issues.

To formalise the audit, a protocol was drawn up with well over 1000 separate items selected to indicate the level of compliance with legislation, policies, standards and site procedures. The checklist has a simple yes/no column with a space for auditor's comments.

To optimise the audit process, the audit team and site personnel discuss observations and findings with relevant personnel each day. When the audit is completed, the audit team reports to site management about the findings. This meeting discusses the issues of compliance and identifies areas for improvement.

The audit report is then used to draw up an action plan to address deficiencies identified in the audit. Every 90 days the mine is required to report on progress achieved with the action plan.

Recently, the audit program has been expanded to include an assessment of environmental and health and safety management systems. Compliance audits have been very successful in dealing with the physical elements of water, waste, land and air monitoring. The company believes that systems audits will raise the level of environment performance of the mine through reviewing procedures for training, planning and communication etc.

Internal Audits

A program of internal auditing has been adopted to allow site environmental professionals to assess their own management systems and report formally to the company executives. Schedules, strategies and responsibilities are included in the internal audit report to ensure that all environmental systems are continuously monitored, maintained and improved.

Systems auditing has become a focal point of the internal audit. This process should not be seen as being conducted every twelve months but is a continual process that all company personnel apply to their everyday tasks.

The internal audit is conducted by the environment, health and safety professional staff who review the environmental and the health and safety management systems. They comment on the systems' effectiveness in achieving the objectives and targets set for the following year. The system approach or 'stocktake' has been a useful tool in gauging the success and effectiveness of the company's environmental programs and management systems.

The systems evaluated by the internal audit process include:

- Surface water management
- Waste minimisation
- Subsidence
- Training
- Geographic information systems
- Groundwater
- Reject management
- Landholder relations
- Regulatory authorities
- Quality assurance
- Hazardous materials management
- Air quality
- Dust and noise monitoring
- Wildlife habitat enhancement program

Overall Benefits of Audits

The benefits of the audits are financial savings to the company and the value in providing assurance that the environmental impact of a large-scale coal mine are well managed and minimal.

During 1995, the waste minimisation program, by reducing, reusing and recycling waste items saved over one million dollars in materials. In so doing, the Gordonstone team effort was recognised by achieving a Corporate Award for Waste Minimisation. The waste minimisation program was tracked and measured through the internal audit system.

Even more significant to the company, is the level of assurance provided through the audit system that performance in the field matches corporate expectations. The delivery of environmental protection programs in the field is measured against corporate policies and against regulatory requirements so that shortfalls can be rectified and exemplary performance recognised.

CASE STUDY 8

OAKBRIDGE PTY LIMITED, NSW — ENVIRONMENTAL AUDITING PROGRAM

Oakbridge Pty Ltd is an amalgamation of three coal companies operating seven coal mines in the Hunter Valley and around Lithgow, New South Wales. Some of the mines originated in the 1850s. The mines in the group developed in isolation from each other, which led to differences in their Environmental Management Plans and, consequently, different levels of environmental performance.

An audit of the group's mines was undertaken in 1992. The purpose of the audit was twofold:

- the audit would form an important part of the company's due diligence program; and
- the audit would allow the company to benchmark its individual operations against each other.

The audit followed the International Environmental Protection Rating System. The audit was the initial review used to develop a revised Oakbridge Environmental Management System based on BS7750.

Prior to this audit, each of the mining operations had its own Environmental Management System in place as part of its individual Environmental Management Plan. At the time, these EMSs tended to deal with issues imposed by legislation, licences and leases. This resulted in the 1992 audit findings which showed higher levels of environmental performance for water, air and land management. Areas requiring attention were environmental policy and leadership, environmental training, and assessing the effectiveness of the environmental management plans.

Following the 1992 audit, the company developed and implemented what was essentially a new Environmental Management System for the whole of its operations, based on BS7750. The Board developed an Environmental Policy and introduced it to all employees from the Board to the miners at the coal face. At the same time an action plan was set up to address those areas that were noted as requiring attention in the audit.

The action plan required:

- a formal environmental management structure comprising Board, Corporate and Operations level Environment Committees;
- environmental responsibility at all management levels;
- an environmental awareness training scheme for employees covering correct environment management procedures for all parts of the mining operation;
- environmental principles included in standard operating procedures including;
- standard procedures for notification and handling of environmental matters; and
- computer-based tracking of legislative requirements, licences and leases applying to various parts of the mining operations.

These changes were made at all sites, with overall coordination by an Environmental Managers Group (EMG) made up of the Site Environmental Managers, the Group Environmental Training and Development Manager and an external consultant. The introduction of any EMS is a large task and cannot be completed overnight. The EMG worked closely with management and site personnel to complete these tasks. The 63 tasks requiring action in the 1992 audit had been reduced to 5 by the end of 1996.

By following up the audit with an action plan, Oakbridge has reinforced its commitment to enhancing environmental performance. It has communicated this commitment to its stakeholders through public consultation and close interaction with government.

The improvements following the 1992 audit were so evident that the Board has since decided to conduct external audits every second year and internal reviews every other year to stimulate continued environmental and operational improvements.



Photo: Graham A Brown & Assoc.

Oakbridge Pty Ltd, Bulga Mine, New South Wales. An environmental auditor observes the measurement of water quality in a coal mine retention pond as part of the verification procedure.

CASE STUDY 9

RED DOME GOLD MINE, QUEENSLAND — ENVIRONMENTAL AUDITING PROGRAM

Since 1989 the Red Dome Mine, near Chillagoe, 135 km west of Cairns in far north Queensland, has been continually improving its environmental management. Its complex operation, in one of the steepest and deepest open pits in the country, includes heap leach, column flotation and carbon-in-leach processing. The mine is adjacent to a National Park.

Consultants have conducted annual environmental audit inspections of the mine since 1990 and, in 1996, the operators decided to benchmark the operation to increase their understanding of its environmental impact.

Past Audit Inspection Process

Initially, predominantly visual site inspections were carried out by a consultant using a standardised audit inspection form to examine designated areas. These were based on environmental management units defined in the life of the mine decommissioning document and called domains. The consultant also inspected facility structures or services and the general condition of the area in which they were found, assessing them subjectively for condition and risk. Based on this assessment, critical action(s) were identified and performed by relevant staff.

This process was unsatisfactory because:

- it was too field oriented , relying heavily on the Plan of Operations Audit (The Plan of Operations Audit which described what was happening on the site over a set period was also limited in meeting documentation and compliance control issues.);
- the consultants may have been too closely associated with the mine for the results to be truly impartial and objective;
- subjective assessment by different consultants reduced consistency;
- it focused on problems rather than overall performance, often creating barriers between the environmental team and other mining personnel; and
- it was done only once a year.

New Audit Approach

The new approach uses an external, independent auditor, certified under the British Environmental Auditor's Registration Association. The auditor also had no prior close association with the mine.

The auditor developed a broad, yet focused, ten element environmental audit protocol comprising 97 questions to be answered by a range of mining staff including the General Manager Operations. It provided an excellent snapshot of how the site measured up from an internationally accredited viewpoint and what would be useful to improve the company's environmental performance.

Audits now include occupational health and safety issues, incorporating joint weekly site reviews by environmental personnel and the site safety officer. The result has been improved environmental and safety performance of the mine. Urgent 'Must Do's' require a corrective action request form to be signed by both the General Manager and the relevant department manager when the action is completed.

Compliance audits are also required at the Red Dome under Queensland mineral resources legislation. They measure performance against Environmental Management Overview Strategy commitments and Performance Category ratings.

Outcomes of Audit

Results of the first benchmark audit were deemed by the auditor as well above the average. Two significant shortcomings, subsequently rectified, were:

- not having a signed copy by the Chairman of the Board and General Manager Operations of the environment policy for the mine; and
- noise and air quality, which had not previously been recognised as an issue at the mine.

Also, some Standard Operating and Emergency Procedures needed revising. The audit outcome was significant in enabling the company to formulate and implement an environmental management system that complied with the Queensland Environmental Protection Act 1994.

The best way to implement the audit findings is to develop a site specific environmental management system.

At the Red Dome the activities of all employees and contractors have been reviewed. The list of core activities for each mine site employee relates on site actions to potential environmental and safety impacts. It also identifies key people and their level of responsibility, relating these to specific actions in each area, thus defining the chain of command in an emergency. An audit, in conjunction with some degree of environmental risk analysis, allows the company to identify present weaknesses in its operating system and to prioritise appropriate remedial measures.



Photo: Niugini Mining Ltd

Red Dome Gold Mine, Chillagoe, Far North Queensland. Tailings emplacement. The tailings line is so placed that if it breaks any spillage will flow into the dam. The environmental audit recognised this as applying best practice.

Benefits

As well as benchmarking the company's environmental credentials, an independent audit provides important environmental performance feedback to the board of directors. This allows appropriate allocation of resources to rectify weaknesses in the current operating system.

Additionally, audits give mining companies added confidence when dealing with regulatory agencies and the general community. At the Red Dome regular site visits by local conservation and community groups exhibit day-to-day environmental performance. The intangible assets, credibility and public trust, built by such transparency of operation, are further boosted by the mine Environmental Manager's being an active participant in, and Chairman of, the local Water Catchment Management Committee.



Photo: Niugini Mining Ltd

Exploration Camp, Mungana, Red Dome Gold Mining area, west of Cairns, Queensland. The oil rack has a drip tray made with railway sleepers and plastic sheet filled with sand.