Industry Sector:

Coal Mines

January 2004

Compliance Performance Report

Department of
Environment and Conservation (NSW)

This *Compliance Performance Report—Coal Mines* was prepared by the Compliance Audit Section, Department of Environment and Conservation (NSW).

For technical information on the matters discussed in this paper, contact the Compliance Audit Section on (02) 9995 5000.

Published by:
Department of Environment and Conservation (NSW)
59–61 Goulburn Street, Sydney
PO Box A290
Sydney South 1232
Phone: (02) 9995 5000 (switchboard)
Phone: 131 555 (NSW only—information & publications requests)
Fax: (02) 9995 5999
TTY: (02) 9211 4723
Email: info@epa.nsw.gov.au
Website address: www.environment.nsw.gov.au

The EPA, State of NSW and Department of Environment and Conservation (NSW) are pleased to allow this material to be reproduced in whole or in part, provided the meaning is unchanged and its source, publisher and authorship are acknowledged.

ISBN 1 74137 018 3
DEC 2004/07
January 2004
Printed on recycled paper

CONTENTS

EXECUTIVE SUMMARY

The EPA is a statutory body with specific powers under environment protection legislation. In September 2003, the EPA became part of the Department of Environment and Conservation (DEC).

As part of its industry sector-based Compliance Audit Program, the Environment Protection Authority (EPA) conducted compliance audits at 16 licensed coal mines in NSW. The audit objectives were to:

- assess the compliance of each enterprise with the statutory instruments issued to it and with legislation empowering the EPA to act
- outline a program of follow-up actions needed to address non-compliances and improve environmental performance.

This report is a collation of these audit findings. It provides an insight into the industry sector's overall compliance and a summary of other issues of environmental concern identified through 'further observations' during audits.

The procedures and protocols for conducting each audit are described in the *EPA Compliance Audit Handbook* (EPA 1997). Compliance at each premises was assessed by a detailed site inspection and a review of records and documentation relating to the premises. Officers of the EPA carried out the audits between October 2001 and July 2002.

Sixteen licensed coal mines out of 64 issued with environment protection licences under the *Protection of the Environment Operations Act 1997* (POEO Act) were audited in NSW. As the licences issued to the audited premises comprised 25% of environment protection licences issued to coal mines, it is considered likely that issues identified in this report are generally typical of issues in the whole industry sector.

Based on the audits, the principal areas where the industry could improve its compliance and environmental performance are:

- **air pollution—by implementing measures to minimise air pollution**
  Air pollution issues identified by audits mainly related to dust emissions:
  – from coal stockpiles
  – associated with coal haulage
  – generated by rehabilitation operations.

  There were also instances where the disposal of carbonaceous or combustible materials had the potential to cause air pollution.

  There were issues relating to air pollution at 11 of the 16 audited premises.

- **noise and blasting—by implementing measures to suppress operational noise and adopting practices that minimise blasting impacts**
  General operational noise issues included:
  – noise from premises exceeding limits specified by an environment protection licence
  – acoustic barriers not being constructed in accordance with a licence specification
  – blasting being undertaken outside the time limits specified by a licence
  – blasting overpressure exceeding the limit prescribed by a licence.

  There were issues relating to noise or blasting at 4 of the 16 audited premises.

- **water pollution—by effective management of rainfall run-off, containment of pollutants from point sources, effective treatment of sewage, and reduction of land impacts on water quality**
  The audits found that pollution of surface water had occurred when levels of total suspended solids, or electrical conductivity (measure of salt concentration) exceeded levels specified by an environment protection licence, or pH was outside limits specified by the licence. There were also instances of

groundwater pollution, and where the volume of liquid discharged from a premises exceeded the volume limit prescribed by a licence.

The management of rainfall run-off was an issue where:
- there were inadequate measures for separating 'clean water' (water from undisturbed areas) and 'dirty water' (water from disturbed areas and operations associated with the mine) systems
- there was inadequate infrastructure for collecting, carrying and holding 'dirty water'
- procedures for operating infrastructure were not sufficiently detailed, or were based on inadequate modelling.

Containment of point source pollutants was an issue where measures were inadequate to contain potential flows of pollutants from mine maintenance areas, wash areas and the mine coal handling plant. Inadequate measures included:
- collection pits not being provided where necessary, or existing pits not being adequately maintained
- tanks and fittings being located on pervious surfaces or being without effective bunding
- oil separation equipment not being provided where necessary, or not being appropriately installed.

The audits found sewage treatment to be an issue where there was inadequate treatment, the utilisation area was inadequate, or the quality of sewage effluent was not monitored.

Land management impacts were an issue where there was a potential for soil erosion or generation of high levels of suspended material as a result of inadequate vegetation on rehabilitated areas, or where vegetation had been inappropriately cleared.

Issues relating to water pollution were identified at 13 of the 16 audited premises.

- **waste management—by ensuring that waste generated is stored and disposed of in an environmentally acceptable manner**
  Waste management issues existed where:
  - waste exceeded volume limits set by an environment protection licence
  - large amounts of waste were not adequately segregated or suitably contained.

  Issues in relation to waste management were found at 2 of the 16 audited premises.

- **monitoring—by implementing effective procedures for monitoring dust, noise and water pollution**
  The audits found instances where:
  - the dust monitoring gauge network was not operated in accordance with the relevant Australian standard
  - blast monitoring was not undertaken at the specified location
  - all pollutants specified by a licence were not monitored
  - sampling was not undertaken at locations or frequencies specified
  - methods used for sampling and analysis were not in accordance with approved methods.

  Issues in relation to monitoring were identified at 11 of the 16 audited premises.

- **accountability—by ensuring monitoring records contain all the required information**
  There were accountability issues in relation to environmental monitoring and the monitoring of pollution complaints.

  Accountability issues were found at 8 of the 16 audited premises.

Notable practices observed during EPA audit inspections that contributed to competent environmental performance are detailed in the report.

Having completed the compliance audits and provided individual audited licensees with compliance audit reports, the EPA is carrying out a systematic and rigorous process of follow-up action programs to ensure that the licensees of audited sites address all reported non-compliances. The EPA will also ensure that the issues identified are being addressed at premises that were not audited as part of the sector audit program.

The EPA will also use the findings in this report to review how best its resources may be channelled to guide industry overall. This review will include considering the use of regulatory tools such as licence conditions and enforcement, and additional tools such as policy documents, education, consultation and negotiation.

It is expected that the report will benefit the coal mining industry in understanding and managing the environmental risks involved in operating coal mines.

INTRODUCTION

The EPA is a statutory body with specific powers under environment protection legislation. In September 2003, the EPA became part of the Department of Environment and Conservation (DEC).

Purpose of this report

This report presents the key findings of compliance audits carried out on a representative sample of premises in the coal mining sector. The audits were undertaken through the Industry Sector Compliance Audit Program on coal mines across NSW that are regulated through statutory instruments issued under environmental legislation empowering the Environment Protection Authority (EPA) to act.

The EPA expects that the coal mining sector will use this report to:
- identify areas in which it can improve its overall level of compliance and environmental performance
- improve the environmental performance of individual premises.

To assist with these actions, the EPA will:
- present the findings of the industry sector Compliance Audit Program to relevant peak industry groups
- consider the issues identified by the audits that were prevalent across the industry, with input from relevant stakeholders.

This report has been prepared for the purpose described and no responsibility is accepted for its use in any other context or for any other purpose.

Selection of industry sector

The industry sector Compliance Audit Program targets industry sectors after assessing community and environmental concerns and our corporate objectives and strategies.

Individual premises in the industry sector are selected for audit in consultation with our regional offices, to obtain a representative sample.

Sixteen of the 64 or 25% of the coal mines issued with environment protection licences under the *Protection of the Environment Operations Act 1997* (POEO Act) in NSW were audited. A description of the audited premises is provided on page 3.

Audit methodology

EPA compliance audits were performed on selected premises in the coal mining sector between October 2001 and July 2002. Each audit was carried out in accordance with the procedures and protocols in the *EPA Compliance Audit Handbook* (EPA 1997) (copies of the Handbook are available from the Department of Environment and Conservation's Pollution Line: phone 131 555).

The audits' objectives were to determine:
- whether each enterprise had the appropriate statutory instruments required under the POEO Act
- if the enterprise was complying with all the Act's licensing requirements.

The scope of audits was limited to an examination of activities undertaken at the audited premises.

Audit findings were based on evidence obtained during discussions with site personnel, examination of documentation provided by the licensee and contained on EPA files, and observations made during the audit inspection.

The findings of each audit were presented to the enterprise as an individual compliance audit report. The reports included a plan of action to resolve 'non-compliances', with a target date for completion of each action. 'Non-compliances' are reported where there is clear evidence of a breach of licence conditions.

The EPA is carrying out a systematic and rigorous process of follow-up actions to ensure that licensees of audited sites address all reported 'non-compliances'. Follow-up actions for audited sites can be found in the individual audit reports.

The audit report also included 'further observations' which were made where an issue of environmental concern was observed that did not strictly relate to the scope of the audit or assessment of compliance. 'Further observations' are indicators of potential non-compliances or areas where environmental performance can be improved.

The findings in this report are a collation of the findings presented in the individual compliance audit reports. Individual compliance audit reports are publicly available in the Department of Environment and Conservation's library on Level 15, 59–61 Goulburn Street, Sydney.

Description of industry sector

The Department of Mineral Resources reported that at June 2000 there were 57 operating coal mines in NSW—35 underground and 24 open cut, which produced 133 million tonnes of coal in 1999–2000. About 60% of this production came from open cut mines and the remaining 40% from underground mines.

Both thermal and coking coal were produced, with approximately 69% of total production being exported. Thermal coal from NSW mines provided the energy source for about 91% of NSW power generation and was also exported for overseas power generation. Coking coal was used mainly in iron and steel production, in Australia and overseas.

The coal mining industry directly employed over 9000 people and impacted on regional economies in the Hunter Valley, Lithgow and Illawarra areas.

Environmental issues associated with coal mining include:

- **contamination of surface and underground water**, either as a result of rain-generated run-off from the premises, or as a consequence of contaminated discharge arising from the mine's activities
- **air pollution** as a result of dust emissions arising from the mine's activities, or smoke due to spontaneous coal combustion or combustion of other materials
- **noise** (general operational noise and noise from blasting).

The NSW coal industry has adopted comprehensive environmental procedures for the establishment, operation and rehabilitation of coal mines. These control measures are integrated into mine management through mine management plans required by the Department of Mineral Resources.

Some mine owners or operators have integrated environmental management into corporate operating systems by adopting environmental management systems. In some cases, these systems have been accredited in accordance with the joint Australian/New Zealand Standards relating to environmental management systems. Where this level of environmental management is in place, mining companies have appointed officers to coordinate mine activities, with the aim of minimising environmental impacts.

The issue of land subsidence as a consequence of underground mining (and the associated environmental impacts on waterways) has not been covered by compliance audits. This issue is addressed by the NSW Department of Mineral Resources, which requires a subsidence management plan to be prepared for all

coal mines. In the case of new mines, subsidence issues are also considered as part of the development consent process.

Scheduled activity

Coal mining premises that undertake an activity listed in Schedule 1 of the POEO Act, and conduct this activity above the identified thresholds, must hold an environment protection licence. In Schedule 1, coal mines are referred to as:

Coal mines that mine, process or handle coal and are:

(1) underground mines, or

(2) open cut mines that:

(a) have an intended production or processing capacity of more than 500 tonnes per day of coal or carbonaceous material, or

(b) have disturbed, are disturbing or will disturb a total surface area of more than 4 hectares of land by:

(i) clearing or excavating, or

(ii) constructing dams, ponds, drains, roads, railways or conveyors, or

(iii) storing or depositing overburden, coal or carbonaceous material or tailings.

Statutory instruments issued to the enterprises

All the 16 audited premises held environment protection licences issued under the POEO Act for the scheduled activity of 'coal mines'.

In addition to the licensed activity of 'coal mines', four of the premises audited were also licensed to undertake the scheduled activity of 'coal works' (i.e. *works that store or handle coal or carbonaceous material (including any coke works, coal loader, conveyor, washery or reject dump) at an existing coal mine or separate coal industry site*).

The licences of four premises also authorised the scheduled activity of 'waste activities' or the activity of 'waste activities—coal wash landfill'. One premises was licensed to undertake the additional activity of 'sewage treatment systems'.

Description of the audited premises

The EPA currently licenses 64 premises in New South Wales as coal mines under the POEO Act. Sixteen of these premises (25%) were selected for auditing as a representative sample of the industry sector. Details of the premises audited are listed in Appendix A.

Six of the premises extracted coal by the open cut method, nine premises used the underground method and both methods were used on one premises. In the underground mines, the longwall method (see 'Process description and environmental issues' below) was predominantly used.

Annual coal production on the mines audited varied from 220,000 tonnes to 5,100,000 tonnes.

The scales of operation, in terms of the tonnage of coal production authorised by environment protection licences held by each premises audited, are listed in Table 1 overleaf.

Table 1: Scales of operation of premises audited

Scale of facility	No. of premises audited
0–500,000 T	1
>500,000 T–2,000,000 T	9
>2,000,000–3,500,000 T	5
>3,500,000–5,000,000 T	Nil
>5,000,000 T	1

EPA regions are shown in Figure 1. Details of the number of coal mine facilities licensed in each EPA region as at December 2002, and the number of audits carried out in each region, are shown in Table 2.

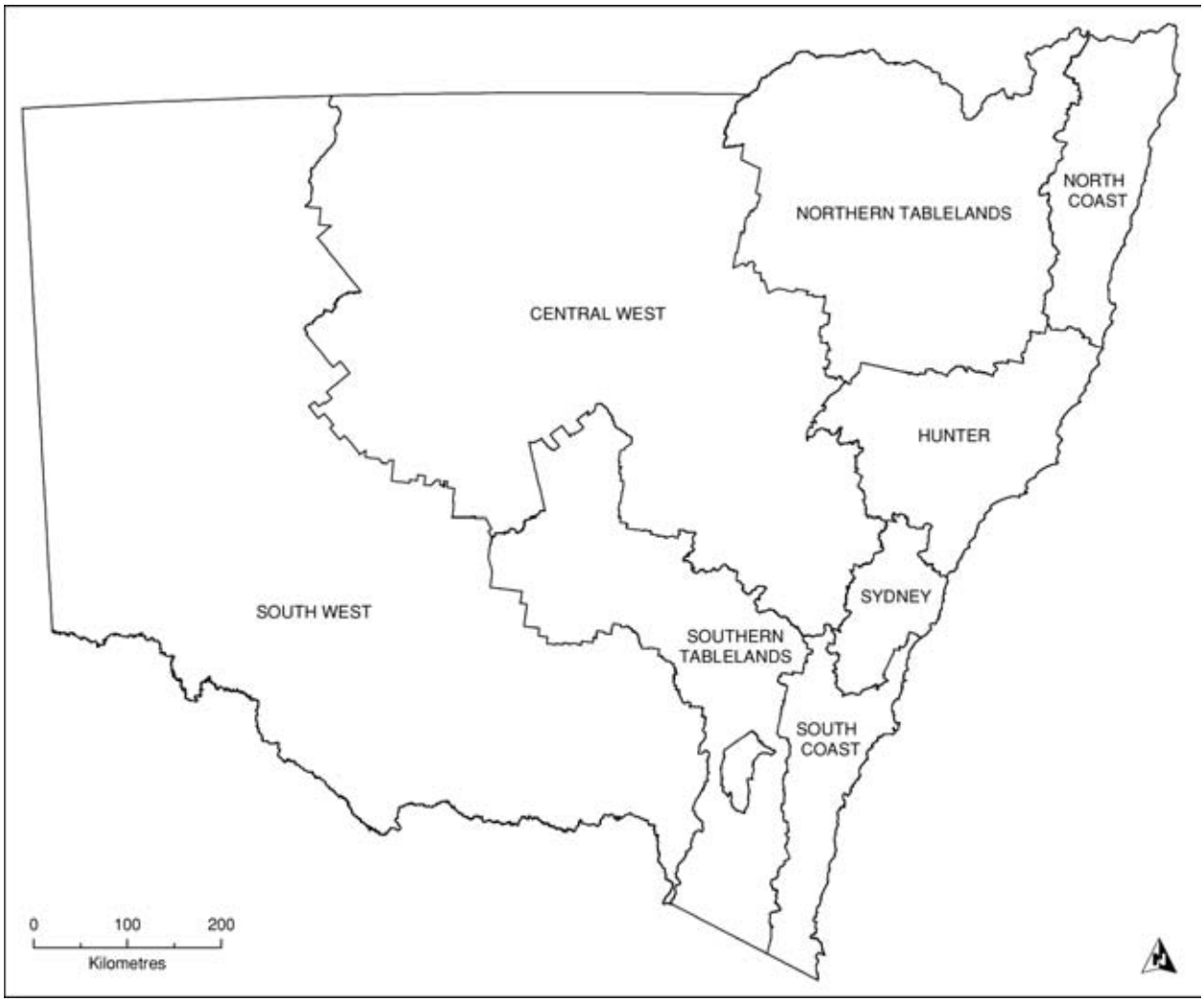

Figure 1—EPA regions

Table 2: Numbers of premises licensed as coal mines and premises audited in each EPA region as at December 2002

EPA region	No. of premises licensed	No. of premises audited
Central West	12	5
Hunter	40	8
Northern Tablelands	2	Nil
South Coast	5	1
Sydney	5	2
Total	**64**	**16**

Process description and environmental issues

Underground and open cut mining processes

Underground mining in NSW is generally based on the bord and pillar method or the longwall mining method. These methods involve the following procedures:

- **bord and pillar**: underground lanes ('bords') are cut into the coal seam with pillars of coal being left to support the roof. Extracting coal while leaving the pillars is known as 'first workings' and will result in minimal surface subsidence. Removing pillars is termed 'second workings' and will result in the collapse of the roof and surface subsidence.
- **longwall mining**: coal is extracted in a series of panels that may be up to 200 metres wide and two kilometres long. As no coal is left to support the roof at the mining face, hydraulic roof supports must be used to hold it up and the roof is allowed to fall once the coal has been extracted. This method of coal mining causes surface subsidence.

In underground mining, coal is transported from the underground mining face by conveyor to the mine coal handling plant. Water, which is often polluted, may be disposed of from underground mine workings with adverse environmental impacts.

Open cut mining involves the large-scale excavation of material. Overburden (unwanted material) is removed to expose the coal, which is then removed by dragline or shovel and hauled by trucks to the mine coal handling plant. Drilling and blasting are usually required so overburden and coal can be excavated. Associated with these operations are environmental issues of noise (both general operational noise and noise due to blasting), air pollution and water pollution.

Coal handling plant operations may include the crushing, grading, washing (often facilitated by chemicals), stockpiling and reclaiming of coal. In addition, a loading facility loads coal onto transport, which may be by rail, road or conveyor (e.g. to an adjacent power station). Environmental issues of dust generation, operational noise and water pollution are associated with coal handling.

Most coal mines have large-scale facilities for servicing and maintaining plant items. These facilities may be the source of water-borne pollutants such as oil, hydraulic fluid and other chemicals, so control measures generally need to be in place to contain these.

Air pollution

Air pollution at a coal mine will most frequently be due to dust emissions. However, air pollution due to smoke, typically arising from spontaneous coal combustion, can be a source of pollution in some regions. Dust control may require the adoption of any (or all) of the following measures:

- overhead sprinkler systems in and around coal stockpile areas
- water carts on haul roads and open areas
- a minimal area of land left exposed without vegetative cover
- dust suppression equipment on drilling rigs
- blasting arrangements that minimise dust emissions.

Smoke arising from spontaneous combustion occurs when coal from some coal seams is exposed to air. The problem arises when reject coal that is likely to spontaneously combust is dumped with overburden. These fires are usually difficult to control, but can be avoided by selectively removing and treating material that is prone to self-heating.

Noise and blasting

Environmental noise may arise from drilling and blasting, operating excavation equipment, on-site haulage of coal and overburden, handling and loading coal, and transporting coal from the premises. To minimise

noise from general operations and reduce its impact on the neighbouring community, the following measures are generally adopted:

- effectively maintaining the plant and equipment (e.g. equipment exhaust systems)
- restricting certain operations when meteorological conditions are not favourable
- using noise abatement measures, such as construction of mounds or walls
- limiting the hours in which various mining operations may take place, and setting limits for general operational noise.

When blasting is undertaken, airblast overpressure (air disturbance) and ground vibration occur. Environment protection licences set limits for both air blast noise and ground vibration. These limits are based on Australian & New Zealand Environment and Conservation Council (ANZECC) guidelines and can be met by licensees combining good blasting practices with responsible operation, and by monitoring every blast. Good blasting practices are based on the use of appropriate explosive material and detonation sequencing, while responsible operation means ensuring blasts are not undertaken during unfavourable meteorological conditions.

Water pollution

Run-off from a coal mine needs to be considered as two separate systems: 'clean water' (water from undisturbed areas) and 'dirty water' (water from disturbed areas and operations associated with the mine). Good management practice generally requires 'dirty water' to be retained on the premises except in the case of extreme rainfall events or treated to an extent that the quality of water discharged from a mine is suitable for discharge. Basic concepts in water management for a coal mine include the provision of:

- cut off banks/drains around areas to be disturbed, to divert 'clean water' around 'dirty' areas such as mining excavations, coal handling areas, haulage roads, and maintenance and service areas
- a system of drains that allows water from all 'dirty' areas to flow to treatment or containment facilities
- appropriately located storages of sufficient capacity for containment of 'dirty water' for treatment or use in mining operations.

Operations in either underground or open cut mines can cause aquifers to merge with poor quality groundwater, resulting in the generation of polluted water. This water may be highly saline, contain pollutants that individually have adverse environmental impacts (e.g. iron) or have a pH that is outside the range desirable for discharge to the receiving waters. The water may be:

- treated (e.g. to remove iron)
- retained on the premises and used for various operations (e.g. dust control)
- released into waters through regulatory schemes designed to minimise the impact of poor quality water releases (e.g. the Hunter River Salinity Trading Scheme).

Run-off from in and around mine maintenance and servicing areas, and also mine coal handling areas, may need additional treatment before entering the 'dirty water' system. For instance, dedicated settlement ponds may be constructed to treat water from coal handling plants, particularly if coal washing is involved. Water and chemicals used for activities such as plant or floor washing in workshop areas may be retained by collector pits, often in conjunction with the use of oil separators. Fuel or chemical storages are generally installed on impervious surfaces and are surrounded by impervious bunding.

Rehabilitation of mine sites

Rehabilitation of mined areas is a key phase of open cut mining and involves the use of overburden to re-fill mined areas, reshaping these areas, replacing top soil, and finally sowing and nurturing vegetation.

Inadequate vegetation on rehabilitated areas may result in dust generation, and also water pollution due to soil erosion and the discharge of suspended solids from the premises. Selection of vegetation species will depend on intended land use. Biodiversity of species, if local native flora and fauna are to be a feature of the rehabilitated site, will require vegetation to be based on seeds collected from appropriate local species.

SUMMARY OF FINDINGS OF COMPLIANCE AUDITS

Individual compliance audit reports on premises listed in Appendix A describe the compliance of each premises with the conditions attached to the statutory instruments held and with environmental legislation empowering the EPA to act. This report summarises issues of concern identified through the 'non-compliances' and 'further observations' reported in these individual reports. See page 2 for information on how 'non-compliances' and 'further observations' are determined.

In this report, the following symbols represent findings that have been reported in the individual audit reports as 'non-compliances' and those reported as 'further observations':

- non-compliances
- ❑ further observations.

Numbers in brackets at the end of each finding indicate the number of premises (of the 16 premises audited) where an issue was identified as a 'non-compliance' or 'further observation'. The issues of concern identified during the audits are summarised in Table 3.

This section of the report also highlights practices that were observed during the EPA audit inspections that contributed to the competent environmental management of various issues.

Table 3: Issues contributing to non-compliances and further observations identified in the audits

Category	Issue contributing to non-compliances and further observations	No. of premises at which the issue was identified (out of the 16 premises audited)
Preventing air pollution		
	Dust control	11
	Other air pollution issues	2
Noise management		
	Suppressing general operational noise	2
	Limiting blasting impacts	2
Preventing water pollution		
	Pollution of waters	6
	Volume limits for discharge	2
	Managing run-off	8
	Containing point source pollutants	12
	Treatment and utilisation of sewage	2
	Land management impacts	2
Waste management		
	Waste management	2
Monitoring		
	Monitoring air pollution	2
	Monitoring noise/blasting	1
	Monitoring water pollution	11
	Other environmental monitoring	2
Accountability		
	Recording monitoring	4
	Monitoring pollution complaints	7

Preventing air pollution

Issues relating to air pollution as a result of mining activities were identified at 11 of the 16 premises audited. On these premises, the generation of dust was the primary air pollution issue identified. Issues other than dust control were of concern on premises where the disposal of carbonaceous or combustible materials had the potential to cause air pollution.

All operators need to identify activities, plant and equipment that have the potential to cause air pollution, and develop operational procedures and process controls that minimise air emissions from the site. The effectiveness of the procedures and controls need to be monitored on an ongoing basis.

Dust control

Licensees need to be aware of the environmental impact that can occur should dust be generated on the premises and migrate off the site into the environment. Dust control may be an issue as a result of dust accumulation, resulting in excessive dust emissions from a premises when strong winds cause the dust to become airborne. There may also be short-term incidents as a result of operations such as vehicle movement, overburden removal, blasting or rehabilitation activities.

An indication of the level of dust generation is obtained through dust generation gauges. Generally the expected maximum level for dust deposition is $4g/m^2$ per month as an annual mean for total solids; however a lower limit may be expected where coal mines are located adjacent to sensitive areas. Coal mine management need to identify areas of the premises, or processes on the premises, where dust may be generated and put appropriate controls in place to suppress dust. Dust generation needs to be considered in the planning process for coal mines, so mine operating procedures need to detail practices to minimise dust generation.

Practices observed during EPA audit inspections that contributed to competent dust control
Some premises had comprehensive dust control systems where sprinkler systems to suppress dust on coal stockpiles were controlled by a computer link to a weather station. In addition, to remove all potential for adverse environmental impacts, some arrangements were augmented by contingency plans for dust suppression if the automatic controls failed.

Issues in relation to dust control were identified at 11 of the 16 premises audited:

- sprinklers installed to contain dust on coal stockpiles were inadequate or required maintenance, resulting in dust being generated (1 premises)
- automatic sprinklers at coal stockpiles were not operating as required due to equipment components not being installed to enable automatic operation when necessary; as a consequence there was potential for generation of dust when strong winds occurred, if the site was unattended and sprinklers failed to operate automatically (2 premises)
- external surfaces of vehicles were not washed before leaving the premises, as required by a licence condition (1 premises)
- part of an enclosure for a conveyor used to transport coal on the premises was missing; as a result, dust could be emitted from coal carried by the conveyor (1 premises)
- there was a build-up of fine material at various locations on the premises, e.g. along haul roads; near mining areas, stockpiles and the coal handing plant; at maintenance areas and under conveyors; as a result, there was potential for this material to be the source of dust emissions when strong winds blew (4 premises)
- the loading of coal or overburden into trucks, and haulage trucks dumping coal into receival bins, was generating excessive dust (2 premises)
- haulage trucks were generating excessive dust when operating on internal haulage roads, either as a result of inadequate road maintenance, or trucks being driven at excessive speed (3 premises)
- dust deposition gauges indicated high levels of dust adjacent to the premises (2 premises)
- there were significant dust deposits on access roads to the premises, or potential for dust to be carried onto roads (in one case due to a blocked wheel grid being unable to perform its function); the dust deposits were a potential source of dust emissions when strong winds blew (3 premises)

- significant dust was being generated by rehabilitation operations, including emissions from biosolid/fertiliser stockpiles and during placement of topsoil for revegetation (2 premises)
- a drilling rig in the active mining area was emitting excess levels of dust; this indicated that the rig's dust suppression system may not have been working properly and that dust could be emitted from the premises, especially during unfavourable wind conditions (1 premises).

Other air pollution issues

Issues that related to air pollution other than dust control were identified at 2 of the 16 premises audited:

- carbonaceous material that is prone to self-heating, and which was not extracted as coal, was not selectively removed and disposed of in a manner that prevented the development of spontaneous combustion at the disposal site (1 premises)
- large windrows of combustible materials (cleared timber) on the premises could constitute a fire hazard (1 premises).

Noise management

There were issues relating to noise management identified at 4 of the 16 audited premises. These issues are dealt with in the categories of 'suppression of general operational noise' and 'limiting blasting impacts'.

Suppression of general operational noise

Environment protection licences for coal mines commonly require compliance with specified noise level limits for specified locations; these noise level limits may vary for different times of the day. A licence may also prescribe action that must be taken by the licensee to mitigate noise levels (e.g. construction of acoustic barriers between the source of the noise and affected receivers). There was an issue in relation to operational noise at 2 of the 16 premises audited:

- noise from the premises had exceeded limits prescribed by an environment protection licence twice in the 12 months before the audit inspection (1 premises)
- acoustic barriers were not as high as specified by an environment protection licence and were not continuous as specified (1 premises).

Limiting blasting impacts

Environment protection licences prescribe limits for airblast overpressure, ground vibration resulting from a blast and the hours within which blasting may take place.

Practices observed during EPA audit inspections that contributed to the competent management of blasting impacts

Most of the audited premises had operational procedures in place to minimise the impacts of each blast. These procedures included:

- *not undertaking blasts when there were unfavourable weather conditions, e.g. when winds were excessive, a temperature inversion was suspected, or there was a low cloud ceiling*
- *notifying nearby private residents of scheduled blasts*
- *designing blasts so the volumes of explosive loaded in shot holes and the sequence of shots minimised the impacts of each blast*
- *monitoring the impacts of each blast, with the aim of modifying future blast arrangements if appropriate.*

There was an issue in relation to blasting identified at 2 of the 16 premises audited:

- blasts were undertaken outside the time limits specified by an environment protection licence on one occasion in the 12 months prior to the audit inspection (1 premises)
- blasting overpressure or vibration exceeded the limit prescribed by an environment protection licence on one occasion in the 12 months prior to the audit inspection (1 premises).

Preventing water pollution

Areas of concern relating to water pollution that were identified in audit reports, are categorised as follows:

- pollution of waters
- compliance with volume limits for discharge
- management of rainfall run-off
- containment of point source pollutants
- treatment and utilisation of sewage
- land management impacts.

Issues relating to water pollution as a consequence of mining activities were identified at 13 of the 16 premises audited.

Pollution of waters

Environment protection licences state that the licensee must not pollute waters, except as expressly permitted by the licence. Permission to pollute waters through a licence may be by allowing discharges at designated discharge points and by specifying the concentration of pollutants that may not be exceeded at these points. A licence may also specify a range of pH values that discharges must fall within at a particular discharge point.

Audit evidence that pollution had occurred was obtained:

- by reviewing the records of the licensee's water quality monitoring (as required by an environment protection licence)
- through observations made by the EPA during the audit inspection
- by the EPA taking water samples on-site during the audit inspection.

There were issues relating to pollution of waters at 8 of the 16 premises audited. At six of these premises, pollution of water occurred as a consequence of pollution exceeding limits specified by an environment protection licence, or pH falling outside the range specified by the licence. At one premises there was evidence that pollution of groundwater was occurring. At two premises, there were situations that had the potential to result in pollution of waters. Details of these issues are as follows:

- the concentration of total suspended solids in samples taken at designated EPA monitoring/discharge points exceeded the concentration specified by an environment protection licence at the time of, or in the 12 months prior to, the audit inspection (5 premises)
- the pH for samples taken at designated EPA monitoring/discharge points was outside the range specified by an environment protection licence at the time of, or in the 12 months prior to, the audit inspection (4 premises)
- discharges of effluent caused the electrical conductivity (measure of salt concentration) of the receiving waters to rise above the limit specified by a condition of an environment protection licence (1 premises)
- water containing pollutants (oil and grease) was being discharged into underground mine workings, resulting in groundwater pollution (1 premises)
- there was evidence of an unlicensed discharge to waters through a discharge pipe installation and consequent potential pollution of waters (1 premises)
- mine seepage water was not contained on the premises and not handled in accordance with the licence condition relating to saline mine water (i.e. Hunter River Salinity Trading Scheme), which requires saline water to be contained on the premises until formally transferred (1 premises).

Compliance with volume limits for discharge

To restrict the volume of potential pollutants, environment protection licences may authorise a specified maximum volume or mass of discharge from a premises to occur at a specified point. The following was an issue at 2 of the 16 premises audited:

- the volume of liquid discharged to waters at a monitoring/discharge point exceeded the volume limit prescribed by an environment protection licence.

Management of rainfall run-off

Issues in relation to the management of rainfall generated run-off in the following categories:

- separating 'clean water' and 'dirty water' run-off systems
- infrastructure for collecting, carrying and holding 'dirty water'
- the basis for operational decisions regarding run-off management.

Practices observed during EPA audit inspections that contributed to the competent management of rainfall run-off

Some of the premises audited retained all run-off through a series of interconnected dams. The dams, and associated piping networks, were designed to deliver water for mine requirements (e.g. for dust suppression) and ensured that dams could retain run-off from high intensity storms.

In some cases water management systems had been designed, and were operated, using computer modelling. These systems were designed to ensure that there was sufficient storage capacity in dams, adequate pipeline capacity to transfer water between dams, and dams were sufficiently empty to retain run-off from a specified rainfall event.

There were issues relating to the management of run-off from coal mines at 8 of the 16 premises audited:

- stormwater collection drains (and associated structures) were not maintained to prevent erosion and would result in flows that discharged suspended solids from the premises (3 premises)
- run-off from 'dirty' areas of the premises (e.g. extraction areas, haul roads, coal handling areas, workshop areas) was not contained on the premises and could flow to waters without treatment (3 premises)
- silt removed from a dam had been deposited on a floodplain, with potential to be carried away by flood waters and pollute waters (1 premises)
- the spillway for a dam holding 'dirty water' was damaged and had the potential to allow discharge of suspended solids when high flows occurred (1 premises)
- the storage capacity of dams holding 'dirty water' was reduced due to build-up of solids; as a result, the capacity of the dams to collect run-off was reduced and there was increased potential for pollution of waters (1 premises)
- operational procedures for containing 'dirty water' on the premises with 'nil discharge' requirements were not sufficiently specific, and were not based on modelling predicting the dynamics of the mine water management system (3 premises)
- some 'clean water' areas of a premises were not separated from 'dirty water' areas, resulting in increased run-off being directed to dams provided for removal of suspended solids; this could result in ineffective treatment of water and pollution of waters (1 premises)
- earthen embankments for dams used to collect or treat run-off appeared to be unstable
- failure of such an embankment had the potential to pollute waters (1 premises).

Containment of point source pollutants

Pollutants such as fuel, oil, grease and other chemicals need to be contained, so different streams of 'dirty water' are separated to ensure each treatment system is not compromised.

Strategies such as bunding, collector pits and oil separators contain potential flows of pollutants from mine maintenance areas, wash areas and the mine coal handling plant. Where activities generate large volumes

of heavily polluted water (e.g. coal wash water), this is generally treated in dedicated holding ponds, where oil and grease are removed and flocculants added to accelerate settling of suspended particles.

Practices observed during EPA audit inspections that contributed to the competent management of point source pollutants

At some of the premises audited, concrete collection pits collected discharges from activities likely to generate pollutants. Some pits were equipped with automatically controlled pumps that pumped the pit contents to a treatment facility. Where automatic arrangements were not in place, collector pits were generally emptied frequently, so they would not become a source of pollutants when a large volume of rain generated run-off.

Issues relating to containment of pollutants were identified at 12 of the 16 premises audited:

- discharge collection pits serving coal handling or maintenance areas were not maintained properly, resulting in the pits not performing their intended function, and water containing oil and grease entering the remainder of the 'dirty water' system (6 premises)
- tanks or their fittings (e.g. valves, couplings) for bulk storage of fuel or other chemicals were located on pervious surfaces or not located within effective bunding, resulting in the potential to contaminate soil or pollute waters (5 premises)
- drums of chemicals (e.g. new and waste oil, pickle liquor), used batteries and drums containing residue were stored or handled in a manner that spillage, overflow or leakage could cause soil contamination and pollution of waters (8 premises)
- discharge from a workshop area could bypass an oil separator, or the oil separator was not operating effectively, resulting in oil entering waters directly or contaminating treatment ponds (3 premises)
- ❑ discharge collection pits were not provided to contain oil and diesel spillages in the workshop and refuelling areas; as a consequence, there was potential for oil to reduce the effectiveness of the collection/treatment system and pollute waters (1 premises)
- ❑ oil and sediment contamination on workshop complex hardstand areas had the potential to block drains, impede the flow of contaminated stormwater to oil separator equipment, and pollute waters (1 premises)
- ❑ the disused plant was stored near a watercourse so there was potential for pollutants (e.g. draining hydraulic fluid) to contaminate soil and pollute waters (1 premises)
- ❑ contaminated water collected in fuel storage bunds was used for dust suppression; this had the potential to result in oily contaminants entering the water treatment system, which was not designed to remove oil (1 premises)
- ❑ underground fuel storages were not monitored to determine if there was any leakage to groundwater, with resulting potential for pollution of groundwater (1 premises)
- ❑ used drums containing oil residues were disposed of in underground mine workings, so leakage from the drums had the potential to pollute groundwater (1 premises)
- ❑ effluent discharged from the mine workings of an underground mine had a high iron content (1 premises)
- ❑ a waste emplacement area had no arrangements in place for collecting and treating run-off (1 premises).

Treatment and utilisation of sewage

Coal mines generally have a large workforce working several shifts, and require large ablution blocks. Wastewater, including sewage generated at these facilities, may have a significant impact if released into waters.

Practices observed during EPA audit inspections that contributed to the competent treatment and utilisation of sewage

Many of the premises audited recognised that treated sewage was a resource for utilisation. These premises used adequately-treated sewage for mine operational purposes, in particular, irrigation of vegetation on rehabilitated areas.

Issues relating to the treatment and disposal of sewage were identified at 2 of the 16 premises audited:

- sewage effluent did not appear to have been adequately treated, and the utilisation area did not appear to have the ability to assimilate and effectively utilise applied effluent; the resulting run-off or leachate had the potential to pollute waters (2 premises)
- the quality of sewage effluent discharged to waters was not monitored through sampling and analysis (1 premises).

Land management impacts

Appropriate land management (outside the actual mining operation) is an important factor in minimising pollution of waters. Rehabilitation areas must be managed so there is adequate vegetation to minimise soil erosion and run-off. Issues relating to land management were identified at 2 of the 16 premises audited:

- vegetation on rehabilitated areas was sparse and growth had not advanced to the extent normally expected after the elapsed time since sowing; consequently, there was potential for soil erosion, the generation of high levels of suspended material and pollution of waters (1 premises)
- vegetation had been cleared (e.g. below powerlines) resulting in the potential for soil erosion, the generation of high levels of suspended material and pollution of waters (1 premises).

Waste management

Waste management was an issue at 2 of the 16 premises audited:

- the volume of waste oil stored on a premises exceeded the volume limit for the storage of Group A waste specified by an environment protection licence (1 premises)
- large amounts of stored mixed waste materials consisting of paper, drums, metal and plastic were not segregated and suitably contained as recyclable and non-recyclable materials (1 premises).

Monitoring

Monitoring of environmental issues such as air emissions, dust deposition, noise and effluent quality allows the operator to determine the nature and extent of any pollution caused by activities at the premises, and provides the basis for any action needed to address the issue identified.

Effective monitoring requires the results of measurements to be analysed and assessed on an ongoing basis against previous results and relevant criteria, so trends may be identified. To properly monitor any actual or potential environmental issues, samples or measurements must be taken at sufficient frequency and with appropriate rigour to provide a reliable basis for such an analysis or assessment.

Monitoring must reflect the true nature and environmental impact of any environmental issue. Accordingly, monitoring that satisfies the requirements of an environment protection licence must be based on sampling and analysis undertaken in accordance with the approved methods manuals—*Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (*EPA 2001) or *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales* (EPA 1998). If methods are not specified in the manuals, monitoring should be undertaken in accordance with any methodology which a licence condition requires, or if there is no such requirement, any methodology approved by the EPA in writing.

Issues in relation to monitoring were identified at 11 of the 16 premises audited.

Monitoring air pollution

Dust levels were monitored at coal mine premises using dust deposition gauges and high volume dust samplers. Issues in relation to dust monitoring were identified at 2 of the 16 premises audited:

- the dust monitoring gauge network was not operated in accordance with the relevant Australian standard (2 premises).

Monitoring noise/blasting

There were not any issues relating to the monitoring of operational noise, although blast monitoring was an issue at 1 of the 16 premises audited:

- blast monitoring was not carried out at the nearest affected residence or sensitive noise location, as required by a licence condition (1 premises).

Monitoring water pollution

Practices observed during EPA audit inspections that contributed to the competent monitoring of water pollution

The licensees of many coal mines audited recognised the importance of monitoring water pollution as a basis for effective water management, and consequently had water quality monitoring arrangements that exceeded the requirements of POEO licences. This information was used by coal mine operators to manage water storage systems so water was effectively treated before reuse or discharge.

Issues relating to monitoring of surface water and groundwater were identified at 9 of the 16 premises audited:

- monitoring, by sampling and obtaining results by analysis, was not undertaken at all the points specified by an environment protection licence (1 premises)
- some pollutants specified by an environment protection licence for monitoring at a designated EPA monitoring/discharge point were not sampled or analysed (1 premises)
- monitoring to analyse the concentration of some pollutants discharged to waters at a designated EPA monitoring/discharge point (i.e. by water sampling and analysing samples), was not undertaken in accordance with the frequency specified by an environment protection licence (2 premises)
- monitoring to analyse the concentration of some pollutants discharged to waters (i.e. by water sampling and analysing samples) was not carried out in accordance with the approved methods manual, and another method had not been approved by the EPA in writing before the tests were conducted (5 premises)
- the sampling method used for monitoring of pollutants was not the sampling method specified by an environment protection licence (1 premises)
- volumes of discharges at designated EPA monitoring/discharge points were not determined as specified by an environment protection licence; this was a result of failure to measure discharges, measuring equipment not working, or measuring methods not being as specified in the licence (4 premises)
- ❑ prescribed locations where water monitoring needed to be undertaken could not be located by the licensee's representative (1 premises)
- ❑ monitoring results obtained by the licensee may have been inaccurate due to sample contamination or deterioration from incorrect sampling procedures (1 premises)
- ❑ discharge from a premises was not monitored by sampling and analysis to ensure that the quality of effluent discharged to waters complied with requirements for discharge to classified waters (see POEO Act, Schedule 5, Part 3) (2 premises)
- ❑ monitoring of discharge point volumes were determined from inputs (e.g. mine pump running time, rainfall) rather than discharge being directly measured by flow meter (1 premises).

Other environmental monitoring

An issue relating to the accuracy of data collected from a weather station was identified at 1 of the 16 premises audited:

- ❑ a weather station was not installed in accordance with the relevant Australian standard, so there was potential for inaccurate meteorological monitoring (1 premises).

Accountability

Issues in relation to the accountability requirements of licences were identified at 8 of the 16 premises audited.

Recording of monitoring

Issues relating to records of monitoring undertaken were identified at 5 of the 16 premises audited:

- records of monitoring did not include some details of samples taken, as required by an environment protection licence; the details omitted included the name of the person who collected the sample and the time at which samples were taken (4 premises)
- the EPA was not provided with receival reports for waste transported from a premises (1 premises).

Monitoring pollution complaints

Complaints received can be valuable tools for monitoring the environmental impact of an enterprise on the local community. By keeping the required information on pollution complaints, operators can clearly demonstrate that complaints are being satisfactorily resolved.

Issues relating to pollution complaint records or telephone complaints lines were identified at 7 of the 16 premises audited:

- the licensee did not notify the community of the existence of a telephone complaints line (2 premises)
- the record of complaints kept by a licensee did not include all the information required by an environment protection licence (e.g. the method by which complaints were made, or the time when complaints were made) (6 premises).

WHERE TO FROM HERE?

Issues identified in the representative sample of 16 licensed coal mines are likely to be generally typical of the whole sector. Issues of concern were identified relating to air pollution, noise management, water pollution, monitoring and accountability. An issue of concern was identified at 15 of the 16 audited premises.

Based on the audits, the principal areas where the industry could improve its compliance and environmental performance are:

- air pollution—by implementing measures to minimise dust and other factors that contribute to air pollution
- noise and blasting—by implementing measures to suppress operational noise and adopting practices that minimise blasting impacts
- water pollution—by effectively managing rainfall run-off, containing pollutants from point sources, effectively treating sewage and reducing land impacts on water quality
- waste management—by ensuring that waste generated is stored and disposed of in an environmentally acceptable manner
- monitoring—by implementing procedures for monitoring dust, noise and water pollution in accordance with specified standards
- accountability—by ensuring records for monitoring and complaints contain all the required information.

While the EPA, through a systematic and rigorous process of follow-up actions, ensures that these particular issues are being addressed at the audited sites, they are likely to be of concern at any coal mine premises and warrant an ongoing focus by all site managers. The EPA will ensure that the issues are being addressed at premises that were not audited as part of the sector audit program.

Reporting on the state of the coal mine industry sector's environmental performance is a valuable management tool for operators of coal mines. The EPA will circulate information in this report to relevant stakeholders and seek cooperative opportunities to work with the industry to improve its environmental performance.

The EPA will:

- use the findings of this sector report to review how best it can channel its resources to guide industry in dealing with the identified issues
- consider using a suite of tools in addition to regulatory instruments to address environmental issues that are prevalent across the sector
- use the findings of this report in the licence reviews undertaken under the POEO Act.

APPENDIX A: LIST OF PREMISES AUDITED

The findings of this report are based on the results of compliance audits on the following premises:

- Clarence Colliery Pty Ltd— Clarence Colliery, Newnes Junction
- Drayton Coal Pty Ltd— Drayton Coal Mine, Muswellbrook
- Lithgow Coal Company Pty Limited— Cullen Valley Mine, Cullen Bullen
- Endeavour Coal Pty Limited—Westcliff And Northcliff Collieries, Appin
- Ivanhoe Coal Pty Limited—Ivanhoe No 2 Colliery, Portland
- Tahmoor Coal Pty Ltd—Tahmoor Colliery, Tahmoor
- The Wallerawang Collieries Limited—Baal Bone Colliery, Lithgow
- Camberwell Coal Pty Ltd—Camberwell Coal Mine, Singleton
- Powercoal Pty Ltd—Myuna Colliery, Wangi Wangi
- Hunter Valley Earth Moving Co Pty Ltd—Westside Mine, Killingworth
- Oceanic Coal Australia Limited—Lake Macquarie Properties, Teralba
- Charbon Coal Pty Limited, Charbon
- Endeavour Coal Pry Limited—Eloura Colliery, Wongawilli
- Bloomfield Collieries Pty Ltd—Bloomfield Colliery, Ashtonfield
- Powercoal Pty Ltd—Newstan Colliery, Fassifern
- Stratford Coal Pty Ltd—Stratford Coal Mine, Stratford.

REFERENCES

Environment Protection Authority 1997, *EPA Compliance Audit Handbook*
Environment Protection Authority 1998, *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales*.
Environment Protection Authority 2001, *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. EPA 2001/55