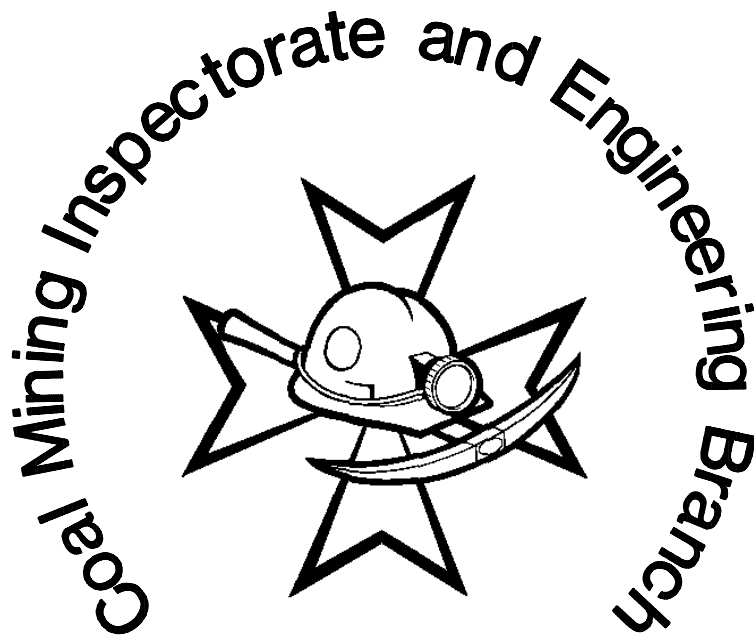




Department of Mineral Resources
New South Wales



Outburst Mining Guideline

MDG No: 1004

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OUTBURST MINING GUIDELINE

MDG 1004

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1. Overview

The intent of this guide is to provide assistance to mines in the development and implementation of management systems to control risk arising from outbursts. The status of this document is as guidance material to the coal industry to assist operating mines in developing effective systems with the primary aim of preserving the life of those who work in conditions which may be prone to outbursts.

In order to achieve this aim the guide provides a set of management elements which **must** be addressed in order to manage outburst risks in a disciplined and controlled manner. With this in mind the importance of management approaches in addition to technical measures is recognised.

The general nature of the outburst risk is such that it may be continuously variable, not only between mines but also within an individual colliery's workings. A single, unchanging approach to the management of the risk is, therefore, inappropriate. A degree of discipline is also warranted as a means to detect, and effectively act upon, the often subtle changes in a mine's operating environment which may be associated with the potential for outbursts.

It is not the intention of this document to detail how any particular aspect of the management of the outburst risk is to be attempted, but rather to give an outline of what elements **must** be considered in the development of a managed approach to that risk. That managed approach is based on the development, implementation and maintenance of an Outburst Management Plan (OMP) for an affected mine.

In this context the OMP is the collection of measures to be undertaken to assess, detect and control outburst risks at a particular mine and it is intended that working OMP's are tailored to suit the situation at any individual mine.

The extensive experience of the Coal Mining Inspectorate in the investigation of outburst events has shown that a degree of certainty is often lacking in knowing that procedures intended to be undertaken are, in fact, undertaken. In other words, it has become apparent that the management of outburst risk is at least as much a managerial and control issue as it is a technical issue. The best technology available has often been found wanting in the absence of effective systems to control its application.

The preparation of this document has drawn significantly from the model of managerial control represented by the AS3900 (ISO9000) series of quality assurance standards. This underlying model has been modified and supplemented by technically-based processes such as risk management and standards identified as desirable by various working groups formed as a result of fatalities and other outburst events in the Southern District of New South Wales.

Nothing in these guidelines shall be construed so as to contravene any provision of the Occupational Health and Safety Act 1983, Coal Mines Regulation Act 1982, or regulations, rules and schemes made thereunder.

2. Scope

This document is intended to apply to underground coal mining operations which are the subject of outburst risks. It should be noted that mines may be the subject of legislative or administrative specification as to whether they are subject to such risks and therefore, that the guide **must** be applied.

3. Approach

This document approaches the development of OMPs at a number of levels. Firstly, an OMP is considered to be comprised of: general requirements; plan elements; and processes.

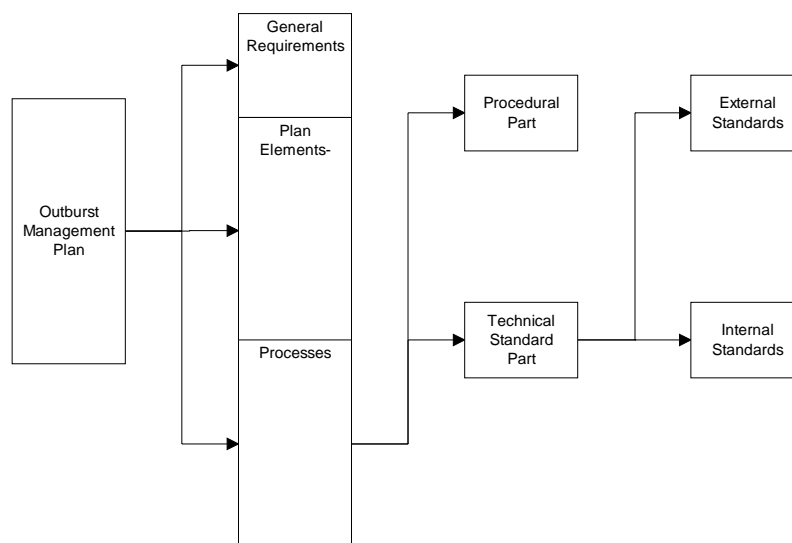
- 3.1.1. General requirements - provide a basis for the development and implementation of OMPs;
- 3.1.2. Plan Elements - provide the broad management framework. They are analogous to system elements and procedures of the AS 3900 (ISO 9000) series standards.
- 3.1.3. Processes - are those activities and equipment that form the day to day operation of an OMP and which are to be performed under controlled conditions.

Processes are further divided into two aspects:

- 3.1.4. Procedural Part - that part of a process involving people-based procedures or defined activities; and
- 3.1.5. Technical Standard Part - defined standards and levels of equipment required for a process.

Finally, technical standards may be divided two ways:

- 3.1.6. External Standards - are standards that are global and are applied to all mines, commonly through such means as compliance to relevant Australian Standards or through regulatory approval means.
- 3.1.7. Internal Standards - are standards that are local and are developed at individual minesites to suit local conditions.



4. Definition

Outburst - the sudden release of gas and material from the working place that can vary in magnitude and intensity.

Outburst Management Plan - The plan developed at the mine to manage the risks of outbursts.

Outburst-Prone Structure - any discontinuity in the worked coal seam which has associated levels of seam gas and or in-situ stress which may give rise to an outburst when mined.

Outburst-Prone Area - any area in which the measured gas content level is above the outburst mining threshold.

Total Gas Content - That gas content measured from a coal sample in accordance with AS 3980 or an approved method. For the purpose of this document all reference to gas content **must** be interpreted as a reference to total gas content.

Gas Threshold Level - Measurement of seam gas content and composition used for determining the method of mining. For the purposes of this document all gas threshold levels **must** be based on total gas content measurement.

Remote Mining Threshold - that gas threshold level above which mining may only proceed by remote means which do not expose personnel to risk arising from an outburst.

Outburst Mining Threshold - that gas threshold level above which only outburst or remote mining may be permitted to proceed.

must - denotes a mandatory condition which **must** be addressed to the extent indicated in order for conformity to this guide to be achieved.

may, should - denote discretionary conditions which, however, **must** still be considered and documented prior to any decision not to address them

Normal mining - mining below the outburst mining threshold.

Outburst mining - mining during which a mine's outburst mining process is put into effect.

Outburst mining procedures - the total of measures, including, but not limited to, such things as machine operator protection, mining and coal loading sequence, and personnel movement constraints, put in place for the purpose of reducing the effect of any outburst on personnel.

Outburst conditions - those conditions (gas level, presence or likelihood of structures, other outburst potential signs) under which mining **must** only proceed as per the Outburst Management Plan.

5. Guideline Requirements

This section describes mandatory and desirable requirements considered appropriate to be in place for effectively operating OMP's.

5.1 General Requirements

Every mine subject to the application of this guide (the mine) **must** have systems for control of outburst related risks to be known collectively as the Outburst Management Plan (OMP) for the mine and which **must** be put in effect at the mine. The mine **must** only work in accordance with any OMP in effect at the mine.

The following general requirements for the OMP **must** be met:

5.1.1. The OMP **must** be based on an assessment of the outburst risk to be managed at the particular minesite.

Due regard **must** be paid to the different level and type of risk presented by predominantly carbon dioxide as opposed to methane seam gas environments.

5.1.2. The OMP **must** be fully and effectively documented to ensure that processes and standards at the mine for management of the outburst risk proceed in accordance with the plan.

- 5.1.3. The OMP **must** contain a policy statement, which **must** be signed by the most senior officer (CEO) of the business. The policy statement should contain an expression of the broad objectives of the plan and the corporation's commitment to the attainment of those objectives.
- 5.1.4. The OMP **must** address all requirements of this guide and records **must** be maintained to indicate that this has been done.
- 5.1.5. The OMP **must** be in a form which allows effective transfer of information and responsibilities and which is able to be effectively updated.
- 5.1.6. The OMP **must** be adequately resourced in respect of plan development, implementation and ongoing maintenance.
- 5.1.7. All employees at the mine **must** have appropriate representation in respect of plan development, implementation and ongoing maintenance.

5.2 **Mandatory OMP Elements**

The mine **must** develop and implement the following elements in the operation of the OMP. These elements **must** be considered mandatory although the mode and degree of implementation of any element may be tailored to the assessed needs of the mine and the risk to be managed.

5.2.1 **Organisation**

The responsibilities and authorities of all persons who fall into the following categories **must** be defined. In particular,

- Persons who manage activities.
- Persons who perform work.
- Persons who make strategic decisions.
- Persons who initiate or participate in processes for change to the OMP.

In fulfilling these requirements such devices as organisation charts, job or position descriptions in relation to the OMP, or statements of duties with respect to the OMP may be employed.

5.2.2 **Review**

A timely and effective review of the content and operation of the OMP **must** be undertaken with the aim of assessing the plan's continued suitability and effectiveness in managing outburst related risks present.

In order to achieve this the mine **must** prepare a review protocol conforming to the following requirements:

- 5.2.2.1. Reviews **must** be based on a re-assessment of the overall outburst risk to be catered for in the OMP;
- 5.2.2.2. The protocol **must** define who initiates and who is to participate in reviews;
- 5.2.2.3. Reviews **must** cover all aspects of the OMP including general elements, required processes and technical standards;
- 5.2.2.4. The protocol **must** define review triggers (conditions to cause a review to be conducted);
- 5.2.2.5. There **must** be two types of review triggers defined: time based and event based;
- 5.2.2.6. Time based review triggers **must** include, as a minimum requirement, the conduct of a review at least annually;
- 5.2.2.7. Event based review triggers **must** include as minimum requirement, the triggering of a review on significant change in mining systems or conditions and may include such factors as change of equipment, change of management, unexpected or abnormal outbursts.
- 5.2.2.8. The protocol **must** indicate who **must** decide if significant change has occurred, and to what criteria.

The mine **must** conduct OMP reviews in accordance with the review protocol and **must** maintain records of such reviews

Where the conduct of any review indicates that the OMP is no longer suitable and effective in managing outburst related risks present then management **must** implement corrective action to amend the plan to make it suitable and effective for this purpose.

External facilitation and/or expertise may be desirable as an aid to the effective conduct of OMP reviews.

5.2.3 Audit

The effective audit of OMPs **must** be ensured; in particular:

- 5.2.3.1. A schedule of both internal and external audits **must** be prepared and adhered to.

5.2.3.2. Internal audits **must** be carried out by persons independent of those with direct responsibility for the aspect of OMP which is the audit subject.

5.2.3.3. External audits **must** be carried out by those with independence from the mine's operations. It should be noted that a statutory authority may impose an external audit regime separate from, or involved with, the mine's external audit schedule.

External audits may be conducted by those external to a mine but still within the corporate entity owning or operating the mine, provided that persons are sufficiently removed from the client to guarantee objectivity.

5.2.3.4. Audits **must** be designed to effectively determine compliance with, and adequacy of, the OMP.

5.2.3.5. Suitably trained persons **must** be nominated for conducting audits.

5.2.3.6. The mine **must** maintain records of all internal and external audits.

5.2.3.7. Causes of non-conformities to the plan **must** be investigated and corrective actions developed, implemented and recorded.

It should be noted that effective, and timely, audits are a valuable means to give management, and others, assurance that requirements of the OMP are being adhered to in practice.

5.2.4 Information Control

Up to date information **must** be communicated to those needing such information for effective OMP operation and means **must** be implemented to maintain objective evidence of those information transfers. In particular, current issues of information **must** be available at all locations where operations dependent on that information are conducted, and obsolete information **must** be promptly removed from all points of issue or use.

5.2.5 Goods/Services Acquisition Control

The mine must implement means to ensure that:

- equipment acquisition is effectively reviewed with the aim of ensuring that such equipment is compatible with the OMP and meets any relevant statutory requirement; and

- providers of services (by contract arrangement) are reviewed with the aim of ensuring that they are consistent with the OMP and that work is to be conducted to standards consistent with the aims of the plan (see also training requirements for contractors). eg. drilling, geophysical, geological and core testing services

5.2.6 Permits to Mine

Mining shall only proceed:

- after evaluation of all information required by the OMP.
- after some documentary form of authorisation to verify the evaluation is issued.
- when the type of mining system for the area is stated.
- where authorisation documentation is signed off by the Manager or person specified in the OMP. (Control may take the form of a working plan certified by the Mine Manager.)
- that only those personnel with adequate competency are to be allowed to proceed in outburst crews, drilling crews or as contractors performing work which is under the control of the OMP.

5.2.7 Plan Monitoring

All persons involved in the operation of the OMP shall have a role in monitoring the performance of the plan with respect to:

- the plan being followed at all times; and
- physical and other circumstances continuing to be adequately catered for by the plan.

As part of plan monitoring means **must** be established and maintained to enable all personnel involved in the operation of the plan to report:

- instances where the OMP is not followed; and
- instances where physical, or other, circumstances are not adequately catered for in the plan;

to persons with sufficient authority to initiate action with respect to the plan. Such instances **must** be considered non-conformities to the plan.

5.2.8 Corrective Action

The mine **must** ensure that causes of non-conformities to the plan are investigated and that corrective actions are developed, implemented and recorded.

5.2.9 Training

The mine **must** ensure that a training plan is developed and implemented so that persons having a role in relation to the OMP are trained sufficiently to safely and effectively perform that role.

5.2.10 Process Reliability

The mine **must** maintain records as to the reliability of all processes intended for the mining of outburst prone areas. These may include, but not be limited to:

- the reliability of gas content measurement processes;
- the reliability of gas drainage processes; and
- the reliability of drilling as an outburst structure predictor.
- the reliability of any other means of outburst structure prediction in use at the mine.

Adequate account **must** be taken of the reliability of structure prediction or outburst severity reduction measures in the operation of the mine.

5.2.11 Outburst Data Collection

The mine **must** collect and record relevant information related to outbursts at the mine in a form which will assist review of the effectiveness of the OMP in managing the outburst risk at the mine.

A minimum industry standard for outburst data collection **must** be applied for the characterisation of outbursts at the mine. (Appendix 2)

5.3 Process Requirements

The mine **must** have in place the following processes which the mine **must** ensure are carried out under controlled conditions. Controlled conditions **must** include the following: documented instructions defining the manner in which processes **must** proceed; the use of suitable equipment; compliance with relevant standards; criteria by which to judge the success of processes; and means for the approval of processes by responsible persons (as defined in the OMP) prior to initial implementation or subsequent change.

A general process model for Management Systems (Appendix 1) is attached.

5.3.1 Information Gathering - Prediction:

The mine **must** have in place processes for the timely collection of appropriate information related to outburst risk, to reliably predict the likelihood and severity of outbursts.

In particular the mine **must** have processes in place for:

- determining the total seam gas content and composition of coal to be mined at all times.
- evaluating the outburst related history of both the mine and any adjacent or prior operations;
- evaluating and recording the geological and geotechnical environment of the mine with regard to: structures, gas content & composition.
- evaluating all available external information.

5.3.2 Change Detection

The mine **must** have in place processes for the detection of changes in the environment during mining which may indicate an increased risk of outburst.

If substantial change is detected mining **must** stop, a review (consistent with 5.3.3.) **must** take place and a permit to mine **must** be reissued.

Sufficient training, (consistent with 5.4.2.6.) **must** be provided to ensure the identification of outburst signs that represent substantial change.

5.3.3 Evaluation / Decision

The mine **must** have processes in place for the timely evaluation of information gathered from all sources and for decisions to be made based on that information regarding operation of the OMP.

An example flowsheet for decision making during authorisation to mine (Appendix 3) is attached.

In particular, the mine **must** have documented evaluation/decision processes for the following:

- Structure location;
- Gas environment;
- Delineation of outburst prone areas;
- Mining process to be undertaken - outburst, normal or remote mining;
- The need for and adequacy of gas drainage; and
- Response to detected change which may indicate outburst proneness.

Those documented evaluation/decision processes **must** identify who **must** be involved in the process, who has authority for the decision(s) and the criteria to which the decisions are to be made.

Flowcharts or other means of effectively documenting decision processes may be desirable.

5.3.4 Prevention/Modification

The mine **must** have in place processes to prevent the occurrence of outbursts or, in the event of an outburst, to modify (reduce) the harmful effects. These **must** include the following:

5.3.4.1 Normal Mining

The normal mining process may also include other operational controls intended to reduce the effect of any outburst which may be encountered unexpectedly.

5.3.4.2 Outburst Mining

Prior to mining in any outburst prone area, the mine **must** develop and implement an outburst mining process. Mining in any outburst prone area **must** only proceed in accordance with the mine's outburst mining process.

The principle intent of this process is to ensure that mining in outburst-prone areas proceeds with maximum practicable protection for personnel at all times. In developing an outburst mining process the mine **must** take account of the following procedural matters:

- procedures for coal cutting;
- face area strata support activity;
- shuttle car deployment and coal loading;
- personnel deployment during (and for a defined period after) coal cutting;
- control of access to return airways;
- control of all other operations which may be taking place in the panel (for example drilling operations); and
- control of entry by persons to the panel.

5.3.4.3 Shotfiring

The mine may develop alternative mining processes such as shotfiring for the purpose of the alleviation of the likelihood and severity of outbursts. Where such a process is developed it **must** consist of procedural and technical standard components and **must** become part of the OMP for the mine.

5.3.4.4 Escape / First Response Rescue

The mine **must** develop and implement processes to ensure the safety of all personnel in areas affected by an outburst. These are to cover both escape (self rescue) and assisted, first response rescue of affected persons and **must** include, but may not be limited to the following:

- initial response and donning of personal protective equipment;
- assembly;
- control of personnel movement;
- notifications and communications;
- egress from affected area;
- control of rescue attempts; and
- standards for equipment.

5.4 Technical Standards

Technical standards to be of two kinds: defined (external) standards applicable to all mines; and, mine developed (internal) standards intended to suit local conditions.

5.4.1 External Standards

External standards **must** be acceptable to the Coal Mines Inspectorate and the District Check Inspector.

5.4.1.1 Continuous Miner Operator Protection

Continuous miner operator protection **must** be to a standard not less than that specified in any notice issued pursuant to Clause 42 of the Coal Mines Regulation (Mechanical-Underground Mines) Regulation 1984.

5.4.1.2 Seam Gas Content & Composition

Means of seam gas content and composition determination shall be to AS 3980 or an equivalent approved method.

5.4.1.3 Seam gas thresholds

Appropriate seam gas thresholds for outburst and remote mining **must** be specified in each OMP and may be the subject of statutory or administrative requirements.

5.4.1.4 Standard for Recording Outburst Data

For each outburst event, data **must** be recorded at least to the standard identified in Appendix 1.

5.4.2 Internal Standards

The mine **must** develop, document and implement standards which define the following:

5.4.2.1 Seam Gas Content and Composition - Sampling Strategy

Standard for seam sampling to determine gas content and composition. To include, but not limited to:

- statement of overall strategy (eg. worst case sampling);
- location of samples with respect to roadway / panel development;
- frequency of samples or minimum distance between samples;
- requirements for survey of sample drill holes;

5.4.2.2 Drilling Standards

Drilling standards to be developed in support of the mine's outburst structure detection/gas drainage processes. To include, but not limited to:

- equipment standards for drilling and gas containment;
- drilling patterns;
- maximum hole spacing;
- hole survey;
- hole logging including gas flow;
- standard drill log sheets.

5.4.2.3 Gas Drainage Standards

Definition of mine standards for gas drainage as a means to prevent/ameliorate outbursts, and to include but not limited to:

- hole integrity;
- gas capture;
- gas removal;
- flow monitoring;
- seam gas pressure monitoring.

5.4.2.4 Outburst Mining Standards

Standards, to support the mine's outburst mining process, and to include, but not limited to:

- tolerances to be applied around outburst prone areas or structures;
- standards for equipment operator protection may include but not be limited to: physical protection from flying coal/debris; and respiratory protection sufficient to protect from outburst generated gas/dust.
- standards of personal protective equipment (PPE) to be available, and utilised, as part of the outburst mining process;
- ventilation standards to be maintained as part of the outburst mining process including, but not limited to: ventilation quantities, ventilation appliances (including fans, ducting, stoppings and doors) and layouts;
- standards of stone dusting to be maintained as part of the outburst mining process;
-
- standards for equipment and procedures for cable handling;
- standards and procedures for signage restricting return or panel entry or for other purposes in support of the outburst mining process.

5.4.2.5 First Response Rescue/Escape

Standards and procedures to support the mine's first response rescue/escape process, are to include, but not be limited to: (Refer to 5.3.4.5.)

- Emergency Base equipment standards
- Emergency Base location requirements
- Emergency Base manning standards

5.4.2.6 Training

The mine **must** develop and implement training sufficient to meet the requirements of Section 5.2.9.

In particular, the mine **must** have standards for the training process which define:

- who or which entities are to conduct training and the requisite level of certification or other qualification required by trainers;
- the persons at the mine who are to receive training;

- the competencies to be imparted to those classes of persons;
- means of assessing competencies;
- frequencies for reassessment and refresher training;

The minimum content of training at the mine **must** cover, but not be limited to:

- roles and responsibilities of persons in relation to the operation of the OMP.
- means for the identification of outburst signs during drilling or mining; (Refer to 5.2.11.)
- the appropriate use of personal protective equipment;
- the use of self rescue equipment;
- first response rescue equipment and procedures.

The mine **must** maintain records of training and the assessment of training.

6. References

Australian Standard AS3980-1991, Guide to the determination of desorbable gas content of coal seams - Direct method.

Notice pursuant to Clause 42 of the Coal Mines Regulation (Mechanical - Underground Mines) Regulation 1984

AS 3900 series standards

7. Appendices

Appendix 1 - General Process Model for Management Systems

Appendix 2 - Outburst Report

Appendix 3 - Flowsheet for Decisions Making during Authorisation to Mine

8. Source Material for the Preparation of this Document:

Risk Management System Analysis - Outburst Risk Management in the Bulli Seam, Southern Coalfields, Minerisk Management Services (16 Sep 1991).

Outburst Mining Guideline

Draft report - Technical Working Group; to the Steering Committee for the management of outbursts in the Bulli Seam (undated)

Guidelines for Outburst Risk Management Plan - Operator's Working Group (January 1992)

Workshop on detection of Outburst Prone Structures in the Bulli Seam

Minimum Standards - Internal Working Document (undated)

AS3902

Source Material provided to operators, Prepared by A Reczek.

GENERAL PROCESS MODEL

OUTBURST REPORT

1. LOCATION

Mine:..... Panel:

Roadway location: Co-ordinate: N -

E -

2. TIMING

Date: Day of Week:

Time: am. / pm. Shift:

3. HEALTH AND SAFETY

Injuries:

.....

Fatalities:

.....

4. GEOLOGY

Presence of Structure Type of Structure:

Fault: Type: normal / reverse / thrust / slipstrike /

Throw: mm Dip Dip Direction

Dyke: Thickness Hardness

Stress Direction:

Frequency & Direction of Jointing

Mylonite (Gouge Evident) Thickness:mm

Changes in Coal Properties:

Changes in Roof:

Changes in Floor:

Water:

Seam Gas Methane:% Carbon Dioxide% Contentm/tonne

Drill Log: Comments

5. **VENTILATION**

Air quantity: m³/sec. Location:

Gas Readings:

Before o/b: CH₄% CO₂%

After o/b: CH₄% CO₂%

Variations detected:

6. **MINING DETAILS**

Outburst mining method in use: Yes/No

Method of mining: Cont Miner / Road Header / Shearer /

Mine Layout: Heading / Cut-through / Pillar / Split /

Distance Driven: On Shiftm Last 24 hoursm Last 72 hoursm

Face Description: Cut out LHS Cut out RHS Undercut..... Face square.....

7. **INCIDENT DETAILS**

Nature of Discharge: Lump Coal:

Fine Coal:

Roof Stone / Coal

Location of Outburst: Face centre..... Face LHS..... Face RHS.....

Left Rib..... Right Rib.....

Quantity discharged:tonnes

Distance solids thrown:

Gas Liberated: CH₄% CO₂.....% CH₄m³ CO₂.....m³

Coning Evident: Haze: Brown / Red Colouring:.....

Effective on Machinery: Trip-outs:..... Distance dislodged.....

Comments:.....

.....

APPENDIX 2 continues

8. OBSERVED

Audible Signs: Rumble / Bumping / Knocking / Loud / Soft /.....

Visible Signs: Coal Spitting / Slabbing / Mass Ejection / Surging /.....

Sensed Signs: Air warming / Air Cooling / Smell

9. WRITTEN REPORTS (Attached)

Witnesses

Deputy

Undermanager

Inspector

Check Inspector

Others

10. PLANS

Mine Location (1: 10,000)

Panel Location (1: 2,000)

Gas Drainage (1:50)

Prepared by

Date:

Signed

Position:

Authorised /
Countersigned:

Position:

