

# Muswellbrook Coal Company Limited



Established 1907

## No.1 Open Cut Extension

**FINAL**

# **SPONTANEOUS COMBUSTION MANAGEMENT PLAN (SCMP)**

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Version 1

Originally Prepared (*March 2005*) by:  
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## 1 INTRODUCTION

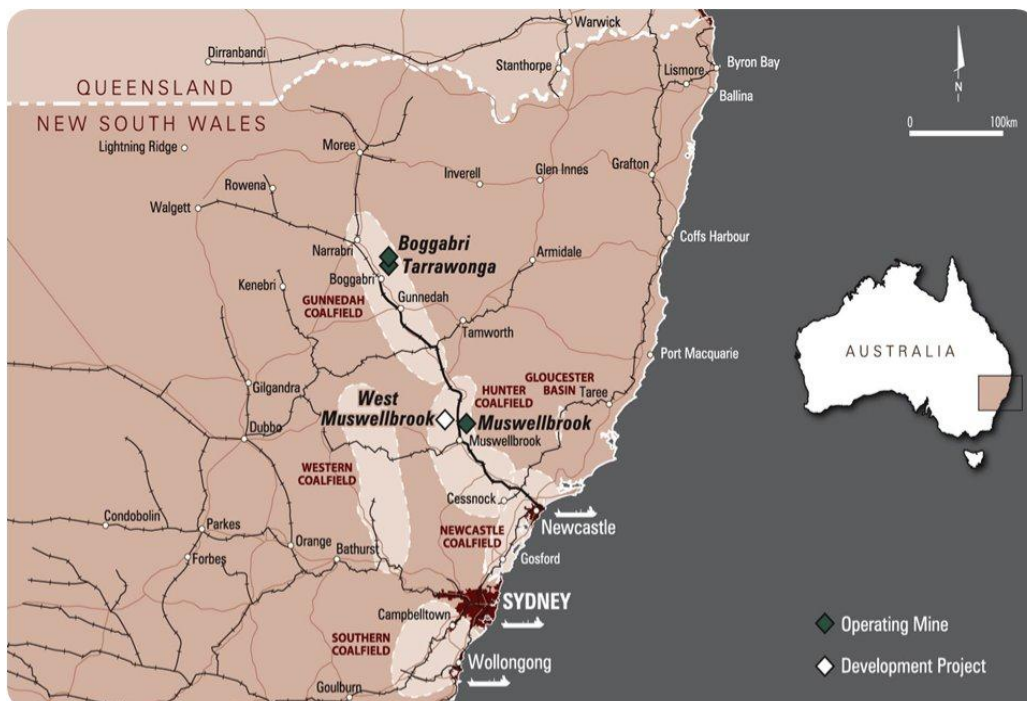
Muswellbrook Coal Company (MCC) is a wholly owned subsidiary of the Idemitsu Kosan Company Ltd. Group. Idemitsu Kosan Company Ltd. is a Japanese energy company with commercial interests in various parts of the world.

MCC has a long association with coal mining at Muswellbrook, with underground coal mining commencing in 1907 and open cut operations in 1944. The mine is located on Coal Road, approximately 3 kilometres to the north-east of Muswellbrook (**Figure 1**).

On the 1<sup>st</sup> of September 2003, Development Consent for DA 205/2002 was granted by Muswellbrook Shire Council (MSC) to extend the former MCC No.1 Open Cut. The No.1 Open Cut Extension commenced operations in March 2005 and has a capacity to produce up to 2,000,000 tonnes coal per annum for domestic and export markets. The No.1 Open Cut Extension has approval to operate until 1 September 2015.

The Development Consent requires the preparation, approval and implementation of an Environmental Management Strategy (EMS) and subordinate Environmental Management Plans (EMP). One of these EMPs is the Spontaneous Combustion Management Plan (SCMP). This plan was originally approved in March 2005 and has now been reviewed and updated to meet the requirements stated in Section 3.2(f) of the Consent (DA 205/2002):

*“The management plans are to be reviewed and updated every 5 years or at other times as directed by MSC, in consultation with the relevant government agencies”.*



**Figure 1 - Location Plan**

Notes:

1. The Department of Mineral Resources (DMR) was incorporated into the Department of Primary Industries (DPI) and was a Division of Mineral Resources. DPI is now known as Investment and Industry NSW (DII). The abbreviation DMR, will continue to be used in this plan to relate to this government agency.
2. The Environment Protection Authority (EPA) was previously incorporated into the Department of Environment and Conservation, then the Department of Environment and Climate Change (DECC) and is now known at the Department of Environment, Climate Change and Water (DECCW). The abbreviation EPA will continue to be used in this plan to relate to this government agency.

Generally, the SCMP takes into account the principles, guidelines, recommendations and requirements contained in:

- MDG1006 – Spontaneous Combustion Management Code (DMR 1996)
- ACARP – Final Report - Rehabilitation of Spontaneous Combustion – Prone Spoil Piles
- ACARP – Final Report – Infra Red Thermography
- Department of Primary Industries Lease Conditions
- Environmental Protection Act Licence Conditions

The SCMP was originally reviewed and approved by the Department of Primary Industries – Mineral Resources and approval will be sought for this revision before final issue.

Muswellbrook Coal confirms that the SCMP has been designed to meet the requirements of Coal Mines (General) Regulation 1999, Division 4 – Fire Control and Emergency Systems, Clause 21 – Fire Control and Emergency Systems.

### 1.1 Objectives

The main objective of the SCMP is to minimise the occurrence and manage the effect from spontaneous combustion in:

- existing open cut and underground workings;
- drilling and blasting;
- mining of overburden;
- mining of coal;
- emplacement of overburden;
- emplacement of washery reject; and
- coal stockpiles.

This is to be achieved by identification, control, removal, mitigation and prevention.

MCC will ensure that final rehabilitation landforms are free from spontaneous combustion.

## **EXISTING ENVIRONMENT**

The coal seams to be mined at the No.1 Open Cut Extension are those associated with the Greta Coal Measures. These Measures have a history of spontaneous combustion. Spontaneous combustion has been a long-term issue at MCC since the first operation (an underground mine) opened in 1907.

Incidences of spontaneous combustion have taken place over a number of years, particularly in the spoil piles on the western side of the No.1 Open Cut. During the 1980's, this was successfully dealt with by sealing both the burning area and the material liable to spontaneous combustion with approximately 10 metres of inert overburden.

Spontaneous combustion has previously occurred within parts of No.2 Underground roadway, particularly near the old tunnel mouth and in the vicinity workings where broken coal was found.

Mining of these areas in a manner which removes the spontaneous combustion is one of the main reasons for the mining of No.1 Open Cut Extension.

## **2 IDENTIFICATION OF CAUSES**

In order to develop effective prevention and control measures for spontaneous combustion, it has been necessary to engage in extensive monitoring and research to better understand the mechanisms which cause spontaneous combustion to commence and spread. MCC has participated in an industry sponsored research program in spontaneous combustion in open cut mines.

### **2.1 ACARP PROJECT 1609 (1993 – 1994)**

This project utilised resources from ACIRL and CSIRO to investigate the factors likely to contribute to the occurrence and spread of spontaneous combustion in spoil emplacement areas. Findings from the project suggest the primary contributing factors were:

- 1 coal/carbonaceous shale oxidation – the oxidation of coal and carbonaceous shale within the spoil heaps. A direct relationship was found between the percentage of carbonaceous waste and the propensity for spontaneous combustion to occur and to be sustained;
- 2 heat and wetting – when water interacts with solid coal, heat is liberated. This phenomenon can generate sufficient heat to cause oxidation in both solid and broken coal and carbonaceous material;
- 3 heat and water condensation and evaporation – the transfer of heat throughout an overburden spoil emplacement area by condensation and evaporation of water contributes to the spread of spontaneous combustion; and
- 4 oxidation of pyrite – the oxidation of pyrite, whilst not essential, can further increase the likelihood of spontaneous combustion of spoil material if sufficiently carbonaceous.

Extensive mathematical modelling of spoil heaps of different sizes and configurations and with varying distributions of carbonaceous material was carried out. The characterisation of various materials according to propensity to spontaneous combustion was also determined. Drilling into hot spoil heaps and monitoring the heat and oxygen distribution with the spoil emplacements verified this modelling work.

The recommended management measures from this research included:

- 1 reduce the overall fuel(carbon) content;
- 2 selective placement and rapid burial of material high in carbonaceous content;
- 3 build spoil piles with lower dump layers (5 – 15 metres) to increase the stability and reduce voidage; and
- 4 cover exposed batters with inert material and compact wherever possible.

### **2.2 GENERAL GUIDELINES**

Mining, including drilling and blasting, will take place in areas currently or previously affected by spontaneous combustion. The effects of spontaneous combustion may include:

- elevated temperature – MCC has hot hole blasting procedures in place in addition to hot material handling procedures;
- gases – safe work procedures, including the use of monitoring equipment on machinery, have been developed; and
- dust – this can occur during blasting and overburden removal, including both loading and dumping.

As part of preparation for mining of areas affected by spontaneous combustion, higher risk areas will have been identified by:

- examination of previous information records, accumulated over the last ten years, for occurrences of spontaneous combustion;
- examination of the surface for any physical affects of spontaneous combustion such as brown or dying vegetation and increased surface temperature;
- where appropriate use of infra-red photography to show areas of increased temperature;
- measuring borehole temperatures for temperature increases; and
- measuring surface temperatures.

This predictive information will be summarised in a plan (to a 1:4000 scale or similar) and referenced by operating personnel prior to work commencement.

All new occurrences will be shown on an operational plan.

MCC has successful experiences in managing and controlling areas prone to spontaneous combustion. Methods used to manage mining in areas prone to spontaneous combustion include:

- cooling the heated area with water before mining (water infusion);
- removal of the fuel by mining the coal;
- minimisation of areas of coal exposed to the air prior to mining;
- retention of 5 metres of overburden above workings to exclude oxygen from areas not immediately required for mining operations;
- limiting exposure of only small areas of coal at any time; and
- sealing of remaining unmined underground workings with clay or inert material to prevent the ingress of oxygen.

Where spontaneous combustion has been identified as having a significant adverse effect on an area, either currently active or not, an assessment of magnitude of this effect will be made by the Open Cut Examiner (OCE) in conjunction with the Technical Services staff. This assessment will be based upon:

- previous heating;

- current temperature both on the surface and in blast holes; and
- nature of drill cuttings.

Where applicable, water infusion will be used to reduce heat and/or dust. Water infusion will be undertaken in accordance with the relevant safe work procedure. Other measures include placement of select material to exclude oxygen.



### **3 DRILLING AND BLASTING**

#### **3.1 MONITORING PROGRAM**

Prior to work commencing in an area, the necessary information will be checked by the Technical Services staff before providing the information to the OCE.

The OCE will, as part of the inspection prior to drilling commencing, assess appropriate equipment and a safe work procedure checklist for any surface signs of heating.

Areas identified as being affected by spontaneous combustion will be worked in accordance with existing safe work procedures such as hot hole loading.

#### **3.2 PREVENTATIVE MEASURES**

Preventative measures to reduce the incidence of spontaneous combustion within blast holes include the following:

- have blast holes not drill through major coal seams;
- stand off coal seams whenever feasible;
- have holes drilled and loaded in the minimum time period;
- no sleeping shots wherever possible; and
- prevent the ingress of air to spontaneous combustion areas.

#### **3.3 CONTROL MEASURES**

##### **3.3.1 Spontaneous Combustion Control**

The identification and remediation of outbreaks of spontaneous combustion will be the responsibility of production staff. Incidences of spontaneous combustion that are of high severity will require the guidance and input of technical service staff to develop appropriate control measures tailored to each individual outbreak.

##### **3.3.2 Identification**

The OCE will inspect the open cut each shift to identify areas of spontaneous combustion.

Technical Services staff will inspect the open cut on a regular basis, placing emphasis on those areas of spontaneous combustion identified by the OCE.

Technical Services staff and/or the OCE will outline areas requiring control works. Suitable sources of inert material will be identified to control any outbreaks of spontaneous combustion.

##### **3.3.3 Priorities**

Each of the areas requiring control works will be prioritized by the General Manager to indicate to production staff the order in which control works will be carried out. These areas will be noted in the minutes of the daily production meeting.

#### **3.3.4 Resourcing**

The OCE will be responsible for allocating and coordinating appropriate levels of manning and machinery to undertake control works for outbreaks of spontaneous combustion that have been identified.

#### **3.3.5 Corrective Actions**

Any blast hole which shows signs of spontaneous combustion or is allowing air into areas of spontaneous combustion is to be bagged off or backfilled.

#### **3.3.6 Review**

During each inspection of mining areas subject to spontaneous combustion, senior management will review the remediation strategies and incorporate incomplete works into the next shift or week's schedule of priority works.

#### **3.3.7 Audit**

The General Manager and Environmental Officer will review the short-term control process every three months to determine whether the control measures that have been implemented are successful or whether they require modification.

## **4 OVERBURDEN AND COAL SPONTANEOUS COMBUSTION**

### **4.1 MONITORING PROGRAM**

The OCE will investigate areas of spontaneous combustion as they occur and are brought to the attention of production team members. The OCE will assess the severity of the outbreak and implement the required mitigation measures. In addition, a bi-monthly audit will be carried out by the Environmental Officer to determine the location of hot spots that require ongoing maintenance and areas that are of high risk for spontaneous combustion. These areas are discussed internally with senior management and mine production staff to ensure that possible spontaneous combustion areas are monitored regularly.

### **4.2 PREVENTATIVE MEASURES**

Preventative measures to reduce the incidences of spontaneous combustion within overburden spoil emplacement areas include the following.

- The mining of thin splits down to 0.25 metres thickness wherever practicable to reduce the overall carbon content in overburden spoil emplacement areas.

The mine planning engineer and geologists are responsible for scheduling the recovery of thin seams where possible. The OCE is responsible for ensuring that the efficient mining of thin seams is carried out.

- Limiting overburden spoil emplacement lifts under normal conditions to height of 10 – 15 metres to increase stability and compaction. This will reduce the flow of oxygen and heat through the spoil.

The mine planning engineer is responsible for ensuring that overburden spoil emplacement lifts are normally kept to a height range of between 10 – 15 metres.

- The selective placement of high carbonaceous material. This material will be deeply buried to prevent oxidation.
- Rapid burial of carbonaceous material to prevent the time that it is exposed to the oxygen and heat.
- Cooling the area affected by spontaneous combustion with water infusion before mining.
- Removal of coal affected by spontaneous combustion before the heating can spread.
- Minimising the areas of exposed coal which is likely to be affected by spontaneous combustion.

### **4.3 CONTROL MEASURES**

#### **4.3.1 Spontaneous Combustion Control**

The identification and remediation of outbreaks of spontaneous combustion will be the responsibility of production staff. Incidences of spontaneous combustion that are of high severity will require the guidance and input of technical service

staff to develop appropriate control measures tailored to each individual outbreak.

#### **4.3.2 Identification**

The OCE will inspect the open cut each shift to identify areas of spontaneous combustion.

Technical Services staff will inspect the open cut on a regular basis, placing emphasis on those areas identified in the OCE's inspections, to identify areas of spontaneous combustion. Technical Services staff and/or production staff will outline areas requiring control works. Suitable sources of inert material will be identified to control any outbreaks of spontaneous combustion.

Outbreaks of spontaneous combustion that are reported by the community or other employees will be referred to the OCE for immediate inspection and corrective action.

#### **4.3.3 Priorities**

Each of the areas requiring control works will be prioritised by the General Manager to indicate to production staff the order in which control works will be carried out. These areas will be noted in the minutes of the daily production meeting.

#### **4.3.4 Resourcing**

The OCE will be responsible for allocating and co-ordinating appropriate levels of manning and machinery to undertake control works for outbreaks of spontaneous combustion that have been identified.

#### **4.3.5 Corrective Actions**

Use water infusion or water sprays in accordance with the relevant safe work procedure.

Remove coal subject to active spontaneous combustion to prevent spreading. This coal will then be spread out and cooled.

Backfill with clay against underground headings to prevent ingress of air.

Loose heaps of material that are subject to spontaneous combustion will be spread out and compacted with a dozer. These areas will be saturated with water from the water cart and/or sealed with inert material, if necessary, to prevent oxidation.

Overburden spoil emplacement area faces showing signs of spontaneous combustion will be battered off and covered with inert material. Treatment of overburden will be in accordance with the guidelines (modified where applicable) used in the mine closure works for No.2 Open Cut.

#### **4.3.6 Review**

During each inspection of mining areas subject to spontaneous combustion, senior management will review the remediation strategies and incorporate incomplete works into the next shift or week's schedule of priority works.

### **WASTE DUMP SPONTANEOUS COMBUSTION**

#### **4.4 MONITORING PROGRAM**

The OCE will investigate areas of spontaneous combustion as they occur and are brought to the attention of production team members. The OCE will assess the severity of the outbreak and implement the required mitigation measures. In addition, a bi-monthly audit will be carried out by the Environmental Officer to determine the location of hot spots that require ongoing maintenance and areas that are of high risk for spontaneous combustion. These areas are discussed internally with senior management and mine production staff to ensure that possible spontaneous combustion areas are monitored regularly.

#### **4.5 PREVENTATIVE MEASURES**

Preventative measures to reduce the incidences of spontaneous combustion within overburden spoil emplacement areas include the following.

- Use of the washery to increase the recovery of carbon material from the geological resource.
- The selective placement of waste materials with high carbonaceous content. This material will be placed progressively in the lower portions of the spoil emplacement areas to ensure deep burial and minimisation of oxidation.
- Rapid burial of carbonaceous material to minimise the time that it is exposed to oxygen and heat.
- Limiting overburden spoil emplacement lifts, under normal conditions, to a height of 10 – 15 metres to increase stability and compaction. This will reduce the flow of oxygen and heat through the spoil.

The Mine Planning Engineer is responsible for ensuring that overburden spoil emplacement lifts are normally kept to a height range of between 10 - 15 metres.

#### **4.6 CONTROL MEASURES**

##### **4.6.1 Spontaneous Combustion Control**

The identification and remediation of outbreaks of spontaneous combustion will be the responsibility of production staff. Incidences of spontaneous combustion that are of high severity will require the guidance and input of technical service staff to develop appropriate control measures tailored to each individual outbreak.

##### **4.6.2 Identification**

The OCE will inspect the open cut each shift to identify areas of spontaneous combustion.

Technical Services staff will inspect the open cut on a weekly basis, placing emphasis on those areas identified in OCE inspections, to identify areas of spontaneous combustion.

Technical Services staff and/or production staff will outline areas requiring control works. Suitable sources of inert material will be identified to control any outbreaks of spontaneous combustion.

Outbreaks of spontaneous combustion that are reported by the community or other employees will be referred to the OCE for immediate inspection and corrective action.

#### **4.6.3 Priorities**

Each of the areas requiring control works will be prioritized by the General Manager to indicate to production staff the order in which control works will be carried out. These areas will be noted in the minutes of the daily production meeting.

#### **4.6.4 Resourcing**

The OCE will be responsible for allocating and co-ordinating appropriate levels of manning and machinery to undertake control works for outbreaks of spontaneous combustion that have been identified.

#### **4.6.5 Corrective Actions**

Overburden spoil emplacement faces showing signs of spontaneous combustion will be battered off and covered with inert material. Treatment of spoil emplacement dumps will be in accordance with the guidelines (modified where applicable) used in the mine closure works for No 2 Open Cut.

#### **4.6.6 Review**

During each inspection of spoil emplacement areas subject to spontaneous combustion, senior management will review the remediation strategies and incorporate incomplete works into the next shift or week's schedule of priority works.

## 5 PRODUCT COAL SPONTANEOUS COMBUSTION

Potential for spontaneous combustion can also occur within product coal stockpiles. However, historically, product coal stockpiles have not been prone to the effects of spontaneous combustion given the expeditious turnover in coal.

### 5.1 PRODUCTION

Coal production is scheduled to ensure that, wherever possible, coal of particular product types are produced and shipped within their known shelf life. Shelf life refers to the time in which spontaneous combustion may occur. Shelf life can be influenced by the following factors:

- stockpiling – geometry/height/location;
- weather conditions; and
- coal types.

### 5.2 MONITORING PROGRAM

#### 5.2.1 Surface Conditions

Visual inspections of all areas of product stockpiles are carried out daily by the OCE to identify:

- status and effectiveness of spontaneous combustion control works in progress on product coal stockpiles;
- areas where active spontaneous combustion is occurring; and
- areas where spontaneous combustion has occurred within the previous week.

Visual inspections should check for steam or smoke emissions, a heat haze or spontaneous combustion odour.

The outcome of this inspection will be documented in the daily OCE shift report.

Temperature	Action
< 50° C	Observe and measure weekly.
≥ 50° C	Observe and measure daily, expect a rapid increase.
> 70° C	Spontaneous combustion is occurring. Take remedial action and continue daily observation and measurement.

Areas requiring spontaneous combustion control works will be referred to the General Manager and Environmental Officer. The General Manager will direct employees to carry out the best course of action in relation to the area.

#### 5.2.2 Incidental Monitoring

Mining personnel who observe spontaneous combustion within product coal stockpiles will notify the General Manager and OCE, who will then co-ordinate the appropriate corrective action.

### **5.3 CORRECTIVE ACTION**

In the event of ignition within the product stockpile area, the affected area is to be spread out on the pad area and thoroughly saturated with water to extinguish the fire and cool down the coal before it is re-shaped.

The General Manager will liaise with the OCE and Environmental Officer to prioritise the timely allocation of resources to carry out the above task.

### **5.4 PREVENTATIVE MEASURES**

Stockpiles are to be turned before ignition occurs either by relocation within the product coal stockpile pad or by being scheduled for dispatchment.

### **5.5 CONTROL MEASURES**

#### **5.5.1 Spontaneous Combustion Control**

The identification and remediation of outbreaks of spontaneous combustion will be the responsibility of production staff. Incidences of spontaneous combustion that are of high severity will require the guidance and input of technical service staff to develop appropriate control measures tailored to each individual outbreak.

#### **5.5.2 Identification**

The OCE will inspect the product stockpiles each shift to identify areas of spontaneous combustion.

Technical Services staff will inspect the product stockpiles on a weekly basis, placing emphasis on those areas identified in the OCE's report, to identify areas of spontaneous combustion.

Technical Services staff and/or production staff will outline areas requiring control works.

Outbreaks of spontaneous combustion that are reported by the community or other employees will be referred to the OCE for immediate inspection and corrective action.

#### **5.5.3 Priorities**

Each of the areas requiring control works will be prioritised by the General Manager to indicate to production staff the order in which control works will be carried out. These areas will be noted in the minutes of the daily production meeting.

#### **5.5.4 Resourcing**

The OCE will be responsible for allocating and coordinating appropriate levels of manning and machinery to undertake control works for outbreaks of spontaneous combustion that have been identified.



### **5.5.5 Corrective Actions**

Loose heaps of coal that are subject to spontaneous combustion will be spread out and compacted with a dozer. These areas will be saturated with water from the water cart to prevent oxidation.

### **5.5.6 Review**

During each inspection of mining areas subject to spontaneous combustion, senior management will review the remediation strategies and incorporate incomplete works into the next shift or week's schedule of priority works.

## **6 REPORTING**

MCC will report on the environmental performance of the mine each year in an Annual Environmental Management Report (AEMR).

The following bodies and government departments are provided with AEMR reports:

- Muswellbrook Shire Council (MSC)
- Department of Mineral Resources (DMR) – currently known as the NSW Department of Industry and Investment (NSW DII)
- Department of Environment and Conservation (DEC) – currently known as the Department of Environment, Climate Change and Water (DECCW)
- Department of Infrastructure, Planning and Natural Resources (DIPNR) – currently known as the Department of Planning (DoP)
- National Parks and Wildlife Service (NPWS)
- Muswellbrook Coal Company Community Consultative Committee (MCCCCC)

Quarterly reporting will be provided to the NSW DII in accordance with AEMR inspection requirements (2003/4) and to the DECCW as required by the Muswellbrook Coal Environment Protection Licence (No. 656).

## **7 REVIEW**

This SCMP shall be reviewed and updated every five (5) years or as directed by Muswellbrook Shire Council, in consultation with the relevant government agencies, in accordance with the Consent Conditions 3.2 (f). The Environmental Officer, in consultation with MCC operational staff and DPI, will undertake the review.

This review is the first 5-year review of this document as advised to MSC in January 2010.