



# **EDG17 GUIDELINE FOR APPLICATIONS FOR SUBSIDENCE MANAGEMENT APPROVALS**

**December 2003**

From 1 July 2014, the Division of Resources & Energy's former Subsidence Management Plan process was replaced by a consolidated Extraction Plan process. The consolidated process requires a Single Extraction Plan that is jointly managed by the Department of Planning & Environment and Division of Resources & Energy.

These guidelines are made available for transitional purposes only.

Read more about the [consolidated Subsidence Management Plan Process](#)

NSW Department of Mineral Resources

**GUIDELINE FOR  
APPLICATIONS FOR  
SUBSIDENCE MANAGEMENT  
APPROVALS**

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## 1. INTRODUCTION

As a result of the NSW Government's revised subsidence management approval process, all potential mining-induced subsidence impacts will be dealt with via an approval required by the conditions of the mining lease. A new condition to this effect has been added to all underground coal mining leases under powers available through Section 239(2) of the *Mining Act 1992*. The revised approval process requires the preparation of a Subsidence Management Plan (SMP) and its approval by the Director-General of the Department of Mineral Resources.

A Section 138 CMRA approval will not be granted until an SMP approval is in place.

The SMP approval process has been updated from the current Section 138 CMRA approval process mainly in the following areas:

- (1) Improved environmental management consistent with community and government expectations for responsible mining, optimal resource recovery and effective land use and environmental management, and
- (2) Improved community consultation as a necessary and integral element of subsidence management.

The main areas to be addressed by an SMP application include:

- (1) The proposed mining system(s) and resource recovery;
- (2) Community consultation;
- (3) Statutory requirements that apply to the Application Area;
- (4) Expected subsidence and its potential impacts on public safety, the environment, community, land use, surface improvements and infrastructure, and
- (5) The proposed Subsidence Management Plan for the expected subsidence impacts.

This Guideline is to be used by prospective applicants in preparing applications for subsidence management approvals.

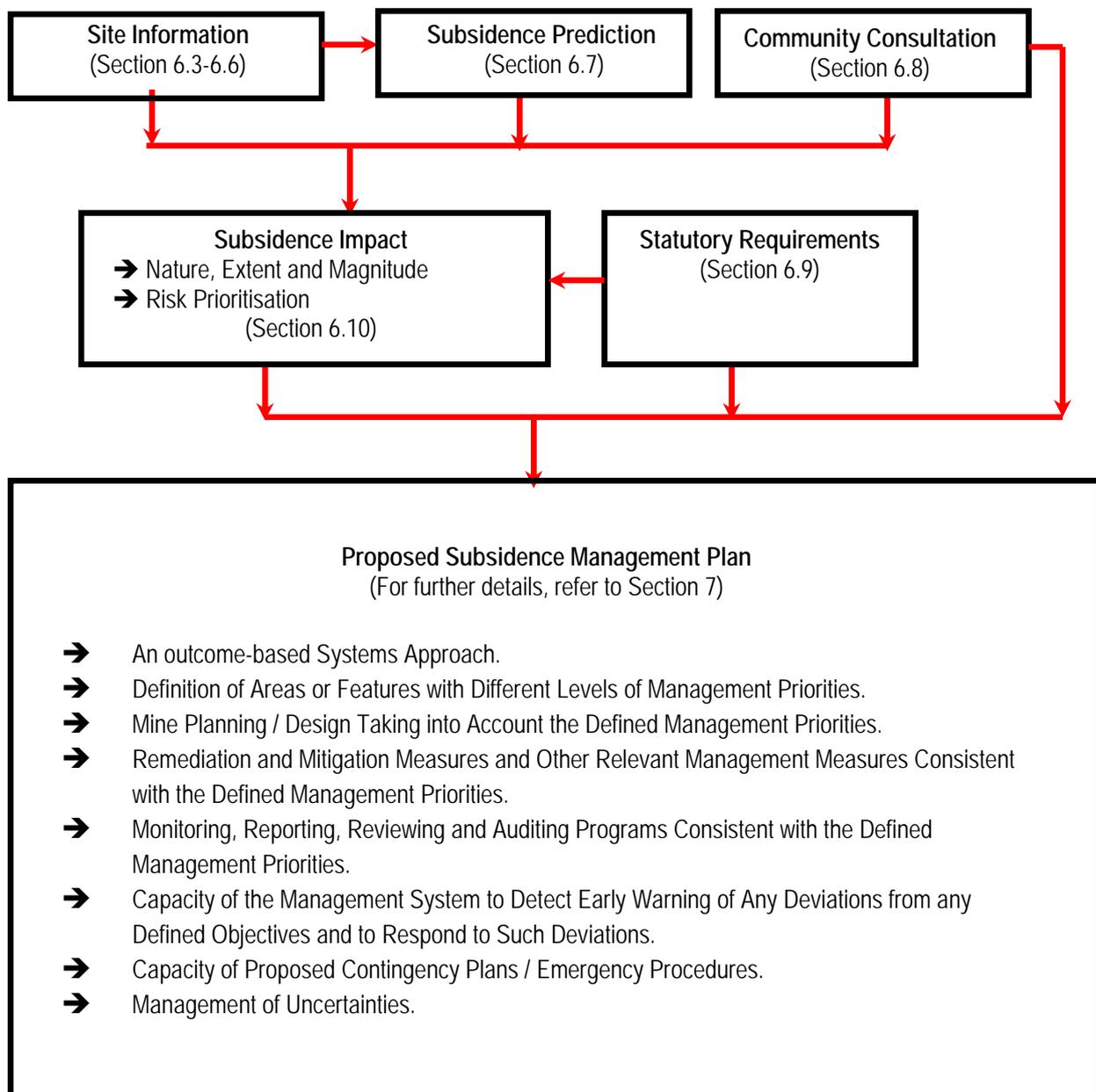
Applicants should note that the level of detail and depth of analysis required for all aspects of an SMP application should be commensurate with the scale and significance of the anticipated subsidence impacts. The SMP application should be appropriate to the nature and scale of the potential subsidence impacts, with the level of investigation and detail of reporting related to the scale of impact and the sensitivity of the features affected.

The SMP approval requires an outcome-based systems approach. The proposed Subsidence Management Plan must be capable of managing potential subsidence impacts to produce outcomes that are consistent with government policies and which take into account community expectations. The emphasis of the approach is on the quality and effectiveness of the proposed management solutions (ie. the Subsidence Management Plan or SMP) and their outcomes. To assist with the preparation of an SMP application, Figure 1 provides an overview showing a suggested structure between the different system elements within a required SMP application. Figure 1 also shows the Section Number(s) within this document where detailed guidance notes can be found for each of the system elements.

Due to the changing surface land use and environmental management needs over NSW coal mining lease areas, an SMP approval is restricted to a maximum period of seven years.

An SMP application will be assessed by a Departmental SMP Review Committee comprising the Director Environment (Chair), Assistant Director Environment, Chief Inspector of Coal Mines, Principal Subsidence Engineer, Manager Policy and Legislative Review and Chief Geologist Coal and Petroleum.

The approach taken in assessing SMP applications is one of openness and consultation with all parties affected by the proposal. The Department encourages and promotes communication between parties in an attempt to find a solution which optimises benefit to the community. A consensus solution is always sought. However, where consensus is not possible, the Director-General (or delegate) will make a decision on the basis of all the available information.



*Figure 1 – Structure between the Different Elements of an SMP Application*

## **2. SUBMISSION OF SMP APPLICATION**

Six hard copies of the SMP application, including the SMP Approved Plan, should be submitted to the Director Environment. Additional electronic copies of the application may also be included in the submission. If approval is granted, a copy of the submitted SMP Approved Plan will be returned to the Colliery Manager with the endorsement of the Director-General (or delegate).

The SMP application submitted to the Director Environment must be accompanied by a leaseholder's notification to the Director Environment and a distribution list to indicate that copies of the SMP application have been provided to all relevant government agencies.

An SMP application containing draft and/or unsigned documents by the applicant's consultants or any other third parties will not be accepted by the Department.

Applications should be lodged at least six (6) months prior to the commencement date(s) desired by the applicant. Applications need to be thorough otherwise processing times will be more protracted whilst shortcomings are rectified by the applicant. This could result in the approval being given later than the time first sought or desired by the applicant.

## **3. APPLICATION FOR SUBSIDENCE MANAGEMENT APPROVAL**

### **3.1 Application for SMP Approval**

Underground mining operations that require SMP approval by the Director-General (or delegate) are:

- (1) All types of secondary extraction, such as pillar extraction or quartering, longwall or miniwall mining;
- (2) First workings that directly support any proposed secondary extraction by longwall or miniwall mining (eg. gateroads, installation roadways or bleeder headings and the associated main headings, etc.), and
- (3) Any other case where the proposed underground coal mining will potentially lead to subsidence (refer to Appendix A for the definition of subsidence).

Under lease conditions, the leaseholder must not commence driveage of first workings that directly support any proposed secondary extraction by longwall or miniwall mining methods, unless the SMP for such proposed secondary extraction and associated first workings has been approved by the Director-General (or delegate).

If the leaseholder is unsure whether first workings that are not included in Section 3.1 (2) above will potentially lead to subsidence, the leaseholder should seek advice from the Principal Subsidence Engineer. An SMP application will be required if the Director-General (or delegate) determines that the proposed first workings have a potential to cause subsidence.

Applicants are encouraged to submit applications for SMP approval in respect of complete longwall or pillar extraction domains. Better subsidence management and mine planning decisions will be able to be made where domains are subject to a single application and assessment, rather than repeated small-scale applications, which, in any case, may be impracticable in the case of small-scale, highly flexible systems of work for pillar extraction.

Where a mine does not have a valid, current development consent, the Director-General will determine the SMP application in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979*. It is anticipated that, in most circumstances, the information supplied with the SMP application will be sufficient to make this determination. However, where there is likely to be a significant effect on the environment, Part 5 EPAA requires that an Environmental Impact Statement (EIS) must be prepared and considered prior to determination of the SMP application.

### **3.2 Other Subsidence Management Approvals**

Approval to conduct first workings in barriers and protective pillars may be required under Section 139 *Coal Mines Regulation Act 1982*. Approval may also be required under the *Dams Safety Act 1978*. For such first workings, the applicant should prepare necessary applications in accordance with the appropriate clauses within this Guideline and/or any other appropriate statutory requirements, for approval by the Minister (or delegate). These include, but are not limited to, the following:

- (1) Proposed first workings within Mining Control Zones;
- (2) Proposed first workings within High Water Level Subsidence Control Zones;
- (3) Proposed first workings in any barriers or protective pillars pursuant to Section 139 CMRA or as required in mining leases, and
- (4) Proposed first workings under prescribed dams referred to under the *Dams Safety Act 1978*.

## **4. FORMAT OF AN SMP APPLICATION**

An SMP application should contain the following:

- (1) A letter of application (refer to Section 5);
- (2) A written report (refer to Section 6);
- (3) A proposed Subsidence Management Plan (refer to Section 7), and
- (4) The "SMP Approved Plan" and other related plans (refer to Sections 9 and 10).

## **5. LETTER OF APPLICATION**

The letter should be addressed to the Director-General briefly setting out the following:

- (1) The name of the mine;
- (2) The relevant mining lease(s) and the conditions under which approval is sought;
- (3) The locality of the area and type of mining operation proposed;
- (4) Any special considerations or issues addressed by the application;
- (5) An indication of planned commencement date for proposed mining;
- (6) Reference to relevant previous correspondences concerning the application, and
- (7) A reference list of all attachments.

## **6. WRITTEN REPORT**

### **6.1 Introduction**

The main areas to be addressed in the written report include:

- (1) The proposed mining system(s) and resource recovery;
- (2) Community consultation;
- (3) Statutory requirements that apply to the Application Area, and
- (4) Expected subsidence and its potential impacts on public safety, the environment, community, land use, surface improvements and infrastructure.

The Department does not expect work supporting an SMP application to be repeated if such work has already been undertaken during the relevant EIS processes. However, relevant information derived from such work should be provided in the SMP application.

It is recommended that the applicant apply risk principles such as those documented in the *Risk Management Handbook for the Mining Industry* (MDG1010, DMR) when preparing the Subsidence Management Plan.

## 6.2 The Application Area

The Application Area delineates the minimum areal extent of the assessment required for an SMP application.

The Application Area is defined as the surface area that is likely to be affected by the proposed underground coal mining. It should not be smaller than:

- (1) A surface area defined by the cover depths, Angle of Draw of 35° and the limit of the proposed extraction area in mining leases of the Southern Coalfield, and
- (2) A surface area defined by the cover depths, Angle of Draw of 26.5° and the limit of the proposed extraction area in mining leases of all other NSW Coalfields.

However, adjustments to the areal extent of assessment as defined above may be necessary where there are other affecting factors such as overlying or underlying mine workings or where far-field subsidence may develop and affect surface features that are sensitive to such far-field subsidence effects.

## 6.3 Mining System and Resource Recovery

The objective of this section is to demonstrate that the proposed mining is efficient in terms of resource recovery and that any resources contained within the seams above and /or below the seam proposed to be mined are not sterilised.

The following information should be included in this section:

- (1) Proposed mining method(s) and mine layout(s) and the main reasons for selecting the particular method(s) and layout(s);
- (2) Name of the seam to be mined, seam thickness and proposed extraction thickness;
- (3) A schedule of proposed mining within the Application Area for the period to be covered by the SMP;
- (4) The impact on resource recovery of the remainder of the mining lease(s) and colliery holding area;
- (5) Justification if proposing to mine only a selected part of a thick seam;
- (6) Estimated recovery of the total resource contained within the proposed layout, as a percentage and in tonnes;
- (7) The possible effects of the mining proposal on seams above and/or below the seam to be mined;
- (8) Any further plans for mining other seams within the Application Area, and
- (9) Any other information which the applicant considers to be relevant.

## 6.4 Site Conditions of the Application Area

The following information about the Application Area and its immediate surrounds should be provided:

- (1) Surface topography;
- (2) Cover depths;

- (3) Overburden stratigraphy;
- (4) Location of the proposed mine workings in relation to any existing and/or planned future mine workings that may interact with the proposed workings;
- (5) The lithological and geotechnical characteristics of the overburden;
- (6) The lithological and geotechnical characteristics of the roof and floor strata;
- (7) Existence and characteristics of geological structures, and
- (8) Any other relevant information for the site.

## **6.5 Stability of Underground Workings**

The term "Underground Workings" refers to the proposed mine workings and any existing and/or planned future mine workings that may interact with the proposed workings.

Where the proposed mine workings are designed to provide support to the surface (for example, certain secondary extraction layouts under residential areas or workings in coal barriers required for surface protection or first workings that may cause instability of overlying existing workings, etc.), the application should contain the following information:

- (1) The required level(s) of surface protection and/or the maximum allowable subsidence parameters for the site where applicable;
- (2) The proposed mine workings including all dimensions;
- (3) Any existing and/or planned future mine workings, which may interact with the proposed mine workings, including all known dimensions;
- (4) Location of the proposed mine workings in relation to any existing and/or planned future mine workings that may interact with the proposed mine workings;
- (5) The thickness of seam to be mined and proposed pillar heights;
- (6) The cover depths;
- (7) Detailed lithological and geotechnical conditions of the strata within a distance, as noted below, of the seam to be mined and the existing and/or planned workings which may interact with the proposed mine workings. This distance should generally be the average width of pillars in a particular area of concern or subject to appraisal by geotechnical specialists in exceptional circumstances. Specific attention should be paid to the existence and characteristics of claystone units or other mechanically weak layers or strata within the above-specified distance.
- (8) Detailed descriptions of geological structures at the level of the seam to be mined and the seams associated with the existing and/or planned future mine workings;
- (9) Lithological and geotechnical conditions of the overburden, in particular, the locations and thickness of massive strata units, and
- (10) Any other relevant site information.

The applicant should demonstrate that the "Underground Workings" will provide long term support to the surface, or the overburden, of the relevant part of the Application Area consistent with the required or agreed level(s) of surface protection where appropriate and the objectives set out in the proposed Subsidence Management Plan (Section 7).

## **6.6 Characterisation of Surface and Sub-Surface Features within the Application Area**

### **6.6.1 Identification of Surface and Sub-Surface Features**

A list of surface and sub-surface features is included in Appendix B of this Guideline. However, it is the proponent's responsibility to ensure that all surface and sub-surface features that are likely to be affected

by the proposed mining are identified and fully characterised and assessed in the SMP application. In addition, this section should include:

- (1) A statement as to whether the area is partly or wholly within a declared Mine Subsidence District;
- (2) Identification, so far as is practicable, of all man-made structures which were built before the declaration of the Mine Subsidence District, and
- (3) Identification of any known, relevant proposed developments (eg sub-divisions or improvements), which are proposed for development within the next 7 years or during the time when the Application Area is to be affected by the proposed mining. The Mine Subsidence Board, relevant local or state government agencies and public utility authorities are possible sources for this information.

### **6.6.2 Characterisation of Surface and Sub-Surface Features**

The following information should be provided in the written report:

- (1) A general description of the surface environment of the Application Area, for example, residential, agricultural, industrial, commercial and natural environments or their combinations as well as any identified areas of potential conservation, heritage, archaeological or environmental significance;
- (2) Maximum plan dimension, type of construction, height and/or number of stories, estimated ages, pre-mining conditions and any other relevant structural information for each of the surface improvements or man-made structures in the Application Area;
- (3) Results of a minimum of one-year pre-mining base-line monitoring of relevant environmental values in areas of environmental sensitivity that may be affected by the proposed mining. Base-line data may include water quality, groundwater levels, surface water flows or quantity, water dependent ecosystems or any other relevant site-specific information that may vary with time, climate conditions or any other factors. Summary analysis of the base line data should also be presented;
- (4) The location, distribution/density, dimension/geometry in plan view and other relevant information where appropriate of each of the identified surface features should be marked on Plan 2 (Section 9.2); and
- (5) Characterisation of each of the identified surface and sub-surface features that may be affected by the proposed mining. This is one of the most important elements of the SMP application. The proponent has a responsibility to ensure the relevance and adequacy of investigations to thoroughly characterise the surface and sub-surface features. To achieve the best results from carrying out this task, including the establishment of the baseline data program, it is recommended that the proponent:
  - 1) Comply with the relevant statutory requirements (Section 6.9) that apply to the Application Area and the proposed mining operation;
  - 2) Refer to relevant Guidelines published by the NSW Government, and
  - 3) Make efforts, as early as possible, to consult with the Director Environment, or the Principal Subsidence Engineer of the Department, other local and state government agencies, the community, authorities / owners of public utilities and amenities who have an interest in the proposed mining operation.

### **6.6.3 Areas of Environmental Sensitivity**

For the purposes of the SMP approval process and this Guideline, areas of environmental sensitivity are defined as follows:

- (1) Land reserved as a State conservation area under the *National Parks and Wildlife Act 1974*;
- (2) Land declared as an Aboriginal place under the *National Parks and Wildlife Act 1974*;
- (3) Land identified as wilderness by the Director, National Parks and Wildlife under the *Wilderness Act 1987*;

- (4) Land subject to a 'conservation agreement' under the *National Parks and Wildlife Act 1974*;
- (5) Land acquired by the Minister for the Environment under Part 11 of the *National Parks and Wildlife Act 1974*;
- (6) Land within State forests mapped as Forestry Management Zone 1, 2 or 3;
- (7) Wetlands mapped under SEPP 14 - Coastal Wetlands;
- (8) Wetlands listed under the Ramsar Wetlands Convention;
- (9) Lands mapped under SEPP 26 - Coastal Rainforests;
- (10) Areas listed on the Register of National Estate;
- (11) Areas listed under the *Heritage Act 1977* for which a plan of management has been prepared;
- (12) Land declared as critical habitat under the *Threatened Species Conservation Act 1995*;
- (13) Land within a restricted area prescribed by a controlling water authority;
- (14) Land reserved or dedicated under the *Crown Lands Act 1989* for the preservation of flora, fauna, geological formations or other environmental protection purpose;
- (15) Significant surface watercourses and groundwater resources identified through consultation with relevant government agencies;
- (16) Lake foreshores and flood prone areas;
- (17) Cliffs, escarpments and other significant natural features;
- (18) Areas containing significant ecological values;
- (19) Major surface infrastructure;
- (20) Surface features of community significance (including cultural, heritage or archaeological significance), and
- (21) Any other land identified by the Department to the titleholder.

## **6.7 Subsidence Prediction**

### **6.7.1 Prediction Method and Reliability**

Subsidence predictions are one of the essential input parameters for the assessment of risk levels and the severity of consequences associated with the expected subsidence impacts. In the context of management, the importance of accurate subsidence predictions relates to the quality and effectiveness of the management solutions, namely the SMP.

The following information should be provided in the written report:

- (1) Method(s) employed to estimate subsidence resulting from the proposed underground coal mining;
- (2) A discussion of all factors that may affect the development of subsidence over the Application Area;
- (3) Relevance of all input data, including results of previous relevant subsidence monitoring, which has been utilised or considered to develop the predictions;
- (4) Identification of all assumptions used, especially those which may significantly affect the outcome of the subsidence predictions, and discussion of their relevance, and
- (5) Reliability of the subsidence predictions and the level of uncertainties involved, in particular, any potential deviations from the predictions due to factors such as topographic, geological or geotechnical conditions or variations.

### **6.7.2 Results of Subsidence Predictions**

This section provides the predicted subsidence parameters for the Application Area. The applicant should clearly demonstrate that:

- (1) The subsidence parameters included in the subsidence predictions are relevant. In most cases, vertical subsidence, strains, tilts and curvatures should be included. However, depending on the

nature of the identified surface/sub-surface features in the Application Area, other subsidence parameters such as horizontal movements, valley closure, upsidence or far field subsidence, etc, may also need to be included, and

- (2) The results of the predictions, irrespective of any differences in presentation formats, will lead to the identification and adequate assessment of maximum subsidence impacts to be experienced by each of the surface and sub-surface features, or different sections or domains of such features in the Application Area. In order to identify such maximum subsidence impacts, subsidence predictions to be provided in this section may be:
  - 1) Estimates of the maximum values of appropriate subsidence parameters over the Application Area, which may be observed at the completion of the proposed mining or at appropriate stages of the proposed mining, and/or
  - 2) Estimates of the maximum values of appropriate subsidence parameters at each individual location of the identified surface/sub-surface features or different sections or domains of such features in the Application Area, which may be observed at the completion of the proposed mining or at appropriate stages of the proposed mining, and/or
  - 3) Any other appropriate forms as long as maximum subsidence impacts on each of the identified surface/sub-surface features or different sections or domains of such features in the Application Area can be identified and adequately assessed.

## 6.8 Community Consultation

According to *Guidelines for Best Practice Community Consultation in the New South Wales Mining and Extractive Industries*, developed by the NSW Minerals Council, the "Community" is anyone who has an interest in subsidence issues related to the proposed mining project.

Community consultation is a necessary and integral element of subsidence management. The proponent has a responsibility to accommodate the needs of the community for information, consultation and participation.

Throughout the process of community consultation, the applicant is encouraged to apply the *Guidelines for Best Practice Community Consultation in the New South Wales Mining and Extractive Industries*, developed by the NSW Minerals Council.

It is recommended that the proponents undertake a stakeholder analysis early in the application process to identify relevant stakeholders who should be consulted. An early start to consultation with the community and government agencies will significantly benefit the planning and development of the SMP.

### 6.8.1 Community Consultation Undertaken during Preparation of SMP Application

- (1) The applicant should identify stakeholders who have an interest in or concern about subsidence issues related to the proposed mining project, including, where appropriate, but not limited to:
  - 1) Owners and / or users of land, agricultural, industrial, commercial and business establishments and residential buildings in the Application Area;
  - 2) State and local government agencies whose interests or responsibilities may be affected by the potential subsidence impacts arising from the proposed mining operation;
  - 3) Aboriginal communities that may be affected by the potential subsidence impacts arising from the proposed mining operation;

- 4) Authorities and/or organisations responsible for the public utilities that may be affected by subsidence due to the proposed mining operation;
  - 5) Any persons / organisations responsible for the public amenities that may be affected by subsidence due to the proposed mining operation, and
  - 6) Any other persons, organisations and community groups in either the Application Area or wider society, who have indicated an interest in or concern about subsidence issues related to the proposed mining project.
- (2) The proponent should provide in the written report:
- 1) A summary of consultation processes undertaken with the parties listed above;
  - 2) Copies of advertisements that have appeared in a local and a state newspaper of the proponent's intention to submit an application for approval to extract coal under the Application Area. The advertisements should include:
    - a) A map of the Application Area;
    - b) Information about where the proposed SMP application may be viewed, and
    - c) Information about where submissions concerning the proposed SMP application may be sent (including to the leaseholder and the Director Environment);
  - 3) Copies of written notice<sup>1</sup> sent by the proponent to any of the parties listed in Section 6.8.1 (1), advising on:
    - a) The proposed mining operation;
    - b) The anticipated subsidence impacts and proposed management strategies or information about where the SMP application may be viewed;
    - c) Rights of landholders and information about where submissions concerning the proposed SMP application may be sent (including to the leaseholder and the Director Environment), and
    - d) Any other relevant information that may be of interest to the community.

### ***6.8.2 Results of Community Consultation Undertaken during Preparation of SMP Application***

The results of community consultation undertaken by the applicant should be summarised in this section of the written report. The results should include, but not be limited to:

- (1) A summary of the views, perceptions, expectations, needs and concerns expressed by the community as relevant to the application;
- (2) Any identified subsidence issues causing significant community concerns;
- (3) Recommendations or suggestions made by the community with regard to subsidence management;
- (4) Management tasks or priorities identified through the consultation processes;
- (5) Areas or issues where subsidence management is to be undertaken jointly with relevant stakeholders (eg in the case of roads, rail and utilities). This is usually the case where the expertise and/or resources of such stakeholders form a fundamental part of the management process, and
- (6) Any other conclusions relevant to the expected subsidence impacts and the proposed management programs for such impacts, derived through the consultation process.

Written comments from local and state government agencies, including MSB and DSC, and authorities and/or owners of public utilities/major amenities, where appropriate, must be incorporated as part of the application. The proponent may be required by the Department to provide additional written comments from other relevant stakeholders.

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<sup>1</sup> For a given group of stakeholders, such as residents who live in the Application Area, only copies of generic letters, together with a distribution list, rather than individual letters, are required.

## 6.9 Statutory Requirements

- (1) The applicant should identify the statutory requirements that apply to the Application Area and the proposed mining operation, in relation to any potential subsidence impacts. Reference should be made to:
  - 1) The relevant mining lease conditions;
  - 2) The relevant development consent conditions;
  - 3) Conditions of any other existing approvals, licenses and / or permits from local and state government agencies;
  - 4) Any specific provisions of relevant legislation, regulations, policies, guidelines, codes and Australian standards, and
  - 5) Any other relevant statutory requirements, directions or notices issued pursuant to statutory powers by the Department and / or other local and state government agencies.
- (2) The following information should be provided in the written report of the SMP application:
  - 1) A reference list quoting relevant sections/parts/clauses of all existing approvals, consents, licences, permits and policies that apply to the Application Area, in relation to any potential subsidence impacts likely to arise from the proposed mining operation;
  - 2) Identification of any additional approvals, consents, licenses or permits regarding the expected subsidence impacts due to the proposed mining, which will be required conjointly with the SMP approval;
  - 3) A statement as to whether the proposed mining is under lake foreshores or land prone to flooding or inundation and if so whether the predicted subsidence effects are in conformity with any current guidelines and reasons for any variations from the guidelines;
  - 4) A statement as to whether the proposed mining is under any dams (including stored waters and reservoirs) and/or structures referred to by the *Dams Safety Act 1978* and if so whether the approval of the Dams Safety Committee has been sought;
  - 5) A statement as to whether the proposed mining is under any heritage items and if so whether an approval by the Heritage Office and/or other relevant authorities is required by the authorities;
  - 6) A statement as to whether the proposed mining is under an area of potential archaeological significance and if so whether an archaeological survey of that area has been undertaken. In addition, the applicant should make a statement as to whether an approval under Section 90 of *the National Parks and Wildlife Act 1974* is required by or has been obtained from NPWS for identified archaeological sites that may be affected by subsidence arising from the proposed mining, and
  - 7) Any other relevant information.

Any necessary approvals, consents, licenses or permits as per paragraphs 2) – 6) above must be in place prior to any impact resulting from subsidence. Copies of such approvals, consents, licenses or permits, if already granted, should be attached to the SMP application.

A clear understanding of the statutory requirements is essential as they provide guidance for site investigations, community consultation, impact assessments and the development of the required Subsidence Management Plan (Section 7) so that compliance can be ensured.

## 6.10 Subsidence Impacts

In this section, the applicant should provide information that:

- (1) Characterises the nature, extent and magnitude of the expected subsidence impacts due to the proposed mining, and
- (2) Identifies priority risks, highlighting the expected subsidence impacts with high risk levels and /or potentially severe consequences.

The above information provides critical input into the formulation of the action plans; that is, the Subsidence Management Plan (Section 7).

#### **6.10.1 Assessment of Subsidence Impacts**

The assessment of impacts of the proposed mining upon the Application Area as a whole and on each of the identified surface or sub-surface features should be made based on:

- (1) Site information provided in Sections 6.3, 6.4 and 6.5;
- (2) Characterisation of surface and sub-surface features provided in Section 6.6;
- (3) Subsidence predictions provided in Section 6.7, and
- (4) Results of community consultation provided in Section 6.8.

Attention should be paid to potential subsidence impacts on public safety as well as any potential propagation of impacts beyond the Application Area, for example, impacts of potential infrastructure failures that may affect people, services and the environment beyond the Application Area, or potential breach of dams impacting on people and the environment in the down stream areas.

The leaseholder should seek advice from the Principal Subsidence Engineer if unsure whether potential impacts of far-field subsidence may be significant, notwithstanding that the vertical downward surface movements are less than 20mm (see the definition of "subsidence" in Appendix A).

Descriptions of the nature, magnitude, distributions/densities, estimated duration and most importantly, potential consequences of the expected subsidence impacts on the Application Area as a whole and on each of the identified surface or sub-surface features should be provided in this section of the written report.

#### **6.10.2 Risk Assessment**

- (1) The assessment of risks necessitates the establishment of certain criteria against which judgement may be made to identify management priorities. In the case of subsidence, fixed criteria are either impossible or inappropriate to specify due to the high degree of variations in site conditions and community expectations between different mining leases and the complexities/variations of the site-specific assessments likely to be involved. It is the applicant's responsibility to assess the risks by referring to:
  - 1) Any relevant criteria or requirements as defined by the statutory requirements (Section 6.9), such as MSB or DSC policies, which apply to the Application Area and the proposed mining operations;
  - 2) Main findings of community consultation, including any requirements by the local and state government agencies who have responsibilities in the Application Area (Section 6.8);
  - 3) Relevant sections of operational licences for public utilities that may be affected by subsidence due to the proposed mining;

- 4) Structural tolerances or any other relevant information for surface man-made structures or improvements, such as major public utilities and amenities, provided by the owners/operators or relevant authorities;
- 5) Relevant guidelines published by the NSW Government;
- 6) Relevant previous observations or information collected from the area or other locations, if available, and
- 7) Any other relevant information.

Risk assessments may be conducted where appropriate jointly with relevant government agencies, authorities or operators/owners of public utilities/amenities or other relevant stakeholders. If necessary, the Department will require the applicant to conduct such joint risk assessments with relevant stakeholders.

- (2) Based on the findings presented in Section 6.10.1, the applicant should provide the results of a risk assessment, where appropriate, with an emphasis on identifying those subsidence impacts with high-risk levels and/or potentially severe consequences. Areas requiring attention by the applicant when conducting risk assessment include potential subsidence impacts on:
  - 1) Public safety;
  - 2) Areas of high environmental, heritage or archaeological significance;
  - 3) Wetlands, swamps and water related ecosystems;
  - 4) Catchment areas causing or exacerbating erosion and drainage pattern changes;
  - 5) Significant water courses including surface flows, water quantity and quality and ecological integrity;
  - 6) Significant groundwater resources including groundwater levels and quality;
  - 7) Threatened and protected species under the *Threatened Species Conservation Act 1995*;
  - 8) The stability of escarpments and significant clifflines, pagodas or steep slopes;
  - 9) The serviceability of major public utilities and /or amenities;
  - 10) Surface improvements causing damage beyond safety, serviceability and repairability;
  - 11) Agricultural suitability or productivity;
  - 12) Industrial, commercial and business establishments;
  - 13) Foreshores and land prone to flooding or inundation;
  - 14) Prescribed dams (including stored waters and reservoirs) and/or structures referred to by the *Dams Safety Act 1978*, and
  - 15) Any other areas or features within the Application Area causing significant concern to the community, local and state government agencies.

### **6.10.3 Impact Assessment based on Increased Subsidence Predictions**

The analysis documented in this Section aims to facilitate the development of appropriate subsidence management and/or contingency plans.

For any areas/surface features in the Application Area, which satisfy any of the following conditions, the assessments as outlined in Sections 6.10.1 and 6.10.2 should be repeated based on appropriately selected subsidence parameters, such as strains, tilts or vertical subsidence, that are appropriate multiples, such as 1.5, 2 or 2.5 times, of the subsidence predictions as provided in Section 6.7.2. If the predicted vertical subsidence is less than 150 mm, an extra analysis may need to be conducted based on subsidence parameters that are 5 times of the predictions as provided in Section 6.7.2.

- (1) Where there are significant uncertainties and / or significant potential deviations from the subsidence predictions (Section 6.7.2) and / or from the impact assessments (Sections 6.10.1 and 6.10.2), due to

factors such as topographic, geological / hydrogeological, geotechnical or any other site condition variations or uncertainties;

- (2) Where there are uncertainties in the assumptions used, which may significantly affect the outcome of subsidence predictions (Section 6.7.2) and/or impact assessments (Sections 6.10.1 and 6.10.2);
- (3) Where the consequences of the expected subsidence impacts are likely to be severe to the community and the environment, even though the probability for the expected impacts to occur may be low;
- (4) Any other circumstances where the use of increased subsidence predictions is appropriate for the development of subsidence management and/or contingency plans.

The applicant should seek early advice from the Director Environment or the Principal Subsidence Engineer of the Department if uncertain about the process documented in this section.

#### **6.10.4 Summary**

The applicant should provide a summary of the results from Sections 6.10.1 to 6.10.3. This summary should be made by defining areas or features, which may be affected by subsidence due to the proposed mining, with different levels of risks (or different levels of management priorities), highlighting the expected subsidence impacts with high risk levels and /or potentially severe consequences.

The applicant should also demonstrate an adequate understanding of the causes of the expected impacts, especially those with high-risk levels and /or potentially severe consequences. Such understanding is essential for the development of appropriate risk control measures as part of the required SMP (Section 7).

## **7. PROPOSED SUBSIDENCE MANAGEMENT PLAN**

### **7.1 Format**

There should be a title block on the Subsidence Management Plan containing:

- (1) Name of company;
- (2) Name of mine;
- (3) Plan title;
- (4) Date of last revision, and
- (5) Plan reference number.

The Mine Manager's signature and date of signing should be clearly evidenced on the Subsidence Management Plan to testify to the Manager's acceptance of the information contained in the Plan.

### **7.2 Preparation of Subsidence Management Plan**

The Subsidence Management Plan, or SMP, presents the proposed management solutions or action plans developed as a result of the subsidence impact characterisation and risk assessment undertaken in accordance with Section 6.10. The proposed SMP should be adequate and relevant to the nature, magnitude, extent and causes of the expected subsidence impacts arising from the proposed mining.

The applicant should provide in this section sufficient details to demonstrate that the proposed SMP will be capable of managing potential subsidence impacts to produce outcomes that are consistent with government policies, taking into account community expectations.

The details to be provided should include, but not be limited to:

- (1) The objectives of the SMP as defined by the applicant;
- (2) A summary of the leaseholder's subsidence management process, structure and organisation, with clearly defined responsibilities including, where appropriate, those of infrastructure owners, participating stakeholders and other third parties, and adequate training programs, resources and communication systems, etc;
- (3) The relevance and adequacy of the proposed mine layout, mining methods and sequences demonstrating that the identified management priorities (Section 6.10) have been adequately considered at the mine planning / design stage;
- (4) The relevance and adequacy of any proposed mitigation and remediation measures and/or any other management measures or procedures consistent with the identified management priorities as per Section 6.10;
- (5) The proposed program for the implementation of the above mitigation and remediation measures and/or any other management measures or procedures;
- (6) Estimated likelihood of success of the proposed mitigation and remediation measures and/or any other management measures or procedures;
- (7) The relevance and adequacy of the proposed community consultation programs, including the Subsidence Community Consultation Process (Section 7.4) if required;
- (8) The relevance and adequacy of the proposed monitoring, reporting and reviewing programs consistent with the identified management priorities as per Section 6.10. Where relevant, the principal elements of a monitoring program may include:
  - 1) Monitoring of subsidence impacts on surface and sub-surface features;
  - 2) Monitoring of the effectiveness of any mitigation and/or remedial measures, and
  - 3) Monitoring of subsidence development;
- (9) Capacity of the proposed management system to detect early warning of any deviations from any defined outcomes on an on-going basis and to correct any such deviations in a timely fashion;
- (10) The relevance and adequacy of any proposed contingency plans / emergency procedures in the event that any proposed management strategies / programs fail to control the subsidence impacts;
- (11) Any proposed options, such as compensation, land acquisition, temporary relocation and other forms of agreement with the landowners in regard to likely compensable loss, if subsidence impacts cannot be reduced satisfactorily;
- (12) Any proposed measures for quality assurance of the management system;
- (13) A calculation of any additional security deposit required to reflect potential subsidence-related impacts, and
- (14) Any other relevant information.

Where appropriate, the applicant may elect to provide estimates of the economic and social benefits associated with the proposed mining (eg. jobs, continued mine operation, regional economic development, royalties, loss of revenues, etc) to facilitate a balanced assessment for the whole or any particular section of the proposed layout on a cost-benefit basis to ensure optimal resources recovery.

Matters related to compensation arising from subsidence impacts payable under Part 13 of the *Mining Act 1992* ("compensable loss") and the *Mine Subsidence Compensation Act 1961* are not the subject of this

Guideline, and should be dealt with under the separate processes for payment of compensation. However, under paragraph (11) above, some indication should be made of the losses and damage likely to arise from subsidence, and the processes proposed by the leaseholder in regard to compensation. In addition, the requirements of this Guideline do not replace the responsibilities of the applicant regarding compensation under either the *Mining Act 1992* or the *Mine Subsidence Compensation Act 1961*, or change the responsibilities or powers of the Mine Subsidence Board.

### 7.3 Preparation of Public Safety Management Plan

A Public Safety Management Plan is required as part of the proposed SMP if the predicted subsidence has a potential to cause safety hazards to the public. This Plan should address management measures such as monitoring of areas posing safety risks, erection of warning signs, entry restrictions, backfilling of surface cracks and securing of potentially unstable structures/buildings or rockmasses, where required, and the provision of timely notification of mining progress to the community where management of public safety is required.

### 7.4 Preparation of Subsidence Community Consultation Process

The applicant may include details of any proposed continuing Subsidence Community Consultation Process (SCCP) in the SMP application. The SCCP should aim to ensure that the needs of the community for information, consultation and participation are adequately considered during the development and implementation of the SMP via a transparent and interactive process.

An SCCP will usually be required by the Director-General in environmentally sensitive areas or in areas where impacts of subsidence are of significant concern to the community. The proposed SCCP should be developed by the proponent to be relevant to the Application Area, timing and the community. The proponent may utilise the existing consultation mechanisms where these exist and should refer to these processes.

The Department may require the preparation of a satisfactory SCCP as a condition of the SMP approval, if no SCCP has been proposed by the applicant.

Depending on the characteristics of the site, an SCCP may include:

- (1) Mechanisms for the community to monitor and comment on the implementation of the SMP in relation to the progress of the proposed mining operation;
- (2) Systems, such as individual consultation with community members, committees, advisory panels, regular reporting/review, etc to ensure effective communication between the applicant and the community, in order to facilitate fair and informed discussions/decision making in relation to subsidence management. In particular, how the identified subsidence issues causing significant community concerns will be taken into account in the SMP;
- (3) Mechanisms to record and to respond to community inquiries, concerns or complaints;
- (4) Mechanisms to facilitate conflict management, and
- (5) Any other site-specific procedural protocols to ensure management outcomes that are consistent with government policies, taking into account community expectations.

## 7.5 Preparation of Specific Management Plans

Specifically developed management plans are required as part of the proposed SMP for certain potential subsidence impacts with high risk levels and /or potentially severe consequences. This is to ensure that such impacts will be systematically and effectively managed to achieve the SMP objectives as defined in the Subsidence Management Plan.

Subsidence impacts requiring specific management plans should be identified and assessed as per Section 6.10. The applicant may seek advice from the Director Environment, or the Principal Subsidence Engineer of the Department, and/or other relevant government agencies and stakeholders as early as possible regarding the need to develop such management plans.

When developing the required specific management plans, the applicant should refer to Section 7.2 of this Guideline and should apply risk management principles such as those documented in the *Risk Management Handbook for the Mining Industry* (MDG1010, DMR).

Specific management plans may be required by the Department to be jointly developed with relevant stakeholders.

Specific management plans, where required, should be submitted as part of the SMP for Director-General's approval. However, the Department recognises that the development of specific management plans for certain subsidence impacts with high risk levels and /or potentially severe consequences may require major engineering analyses, planning, mine design/scheduling, community consultation, assessment of social and economic factors as well as compliance with relevant legislation, policies, approval conditions and licences. For this reason, later submission of specific management plans may be accepted. In proposing a later submission, the following points need to be considered by the proponent:

- (1) Inadequate information about the subsidence impacts to be covered by the specific management plans and the likely success of available management measures for such impacts may result in rejection of or delays in approval of the proposed SMP, and
- (2) Surface areas or features that are to be covered by the specific management plans must not be affected by subsidence arising from the proposed mining unless the Director-General's approval of such management plans has been granted.

## 8. APPLICATION FOR SMP VARIATION

- (1) An application for an SMP variation will be required under the following circumstances:
  - 1) When the leaseholder seeks to vary the approved Subsidence Management Plan;
  - 2) When the leaseholder seeks to vary major mine layout parameters which control subsidence (such as location, dimension or thickness of longwall voids);
  - 3) Any other circumstance where the leaseholder identifies that there are likely significant additional and / or increased subsidence risks or impacts as compared with those documented in Section 6.10 of the original SMP application, due to revised subsidence predictions, results of monitoring and/or any other reason, and
  - 4) If the Director-General (or delegate) requires a submission of an SMP variation application by the leaseholder.

It is noted that there are cases where detailed changes in mine layout may also cause either increased subsidence or risk of additional impacts. For this reason, SMP approval conditions may specify additional mine layout variations that should trigger a variation application on a case-by-case basis.

- (2) The leaseholder should include in the application for an SMP variation:
- 1) An application letter as appropriate according to Section 5;
  - 2) Descriptions of the proposed or required variation(s);
  - 3) Results of an appraisal of the proposed or required variation(s) against each of the Clauses in Section 6, where appropriate. Particular attention should be paid to Sections 6.8 and 6.9, if any additional and/or increased subsidence impacts as compared with those documented in the original SMP application are identified;
  - 4) Clearly stated findings of this appraisal with regard to any identified changes in subsidence impacts as compared with those documented in the original SMP application and characteristics of the varied subsidence impacts in accordance with Section 6.10;
  - 5) An assessment of the results of the above-mentioned appraisal against the Clauses in Section 7 to identify appropriate and necessary modifications to the original SMP;
  - 6) Copies of required documentation as per Section 6.9, where appropriate, with regard to any identified additional and/or increased subsidence impacts as compared with those documented in the original SMP application. Attention should be paid to the provision of copies of notices to those affected by the proposed or required variation(s) according to Sections 6.8.1 (1) and 6.8.1 (2) 3), where appropriate.
  - 7) If the variation(s) have a potential to cause significant additional and/or increased subsidence impacts that affect the community and/or the responsibilities of government agencies and/or utility authorities, the proponent may be required by the Director-General (or delegate):
    - a) To provide copies of written comments from relevant local and state government agencies, including MSB and DSC, and authorities and/or operators of public utilities/amenities, where appropriate. The proponent may be required by the Department to provide additional written comments from other relevant stakeholders, and
    - b) To advertise the proposed variation(s).
  - 8) Amended SMP Approved Plan and other Plans, if required;
  - 9) Amended Subsidence Management Plan, if required, and
  - 10) Any other relevant information.

The applicant may seek advice from the Director Environment, or the Principal Subsidence Engineer of the Department, and other relevant government agencies and stakeholders as early as possible when planning to submit a variation application.

## 9. PLANS

The following plans are required as part of the application.

While the plans supplied under this section need not be in the exact format as suggested below, all the information required must be supplied. All plans need to be clear, uncluttered and legible. If necessary to clarify understanding, plans additional to those specified below should be included in the SMP application.

All plans should be of the same scale and size and cover the same area so that they can be compared to assess surface and underground features.

A copy of coloured aerial photography of the Application Area and its immediate surroundings with an outline of existing and proposed workings should be included, where available. An adequate scale of the aerial photography should be used to show significant surface features.

### **9.1 Plan 1**

A paper print (Scale 1:4000) displaying:

- (1) The existing and proposed workings within the seam being mined relevant to the application;
- (2) All existing workings within a distance of 500m of the voids to be created by the proposed mining;
- (3) All future workings required for the mining system with full dimensions;
- (4) The dimensions of abutment pillars adjacent to the extracted voids;
- (5) The dimensions of all voids to be created as part of the proposal;
- (6) All other areas previously approved for mining within the area of the plan, and
- (7) A co-ordinate grid (MGA).

### **9.2 Plan 2**

A paper print (Scale 1:4000) showing:

- (1) All natural and man made surface features that may be affected by subsidence resulting from the proposed mining operation;
- (2) An outline showing the extent of the Application Area;
- (3) Surface contour lines;
- (4) Boundaries and identifications of any Mine Subsidence Districts;
- (5) The proposed and existing workings as shown in Plan 1, and
- (6) A co-ordinate grid (MGA).

### **9.3 Plan 3**

A paper print (Scale 1:4000) showing:

- (1) Geological and seam data relevant to the proposed workings;
- (2) The proposed and existing workings as shown in Plan 1;
- (3) Overburden thickness isopachs;
- (4) Seam thickness isopachs;
- (5) All known geological structures, and
- (6) A co-ordinate grid (MGA).

### **9.4 Plan 4**

A transparent overlay (preferred) or paper print (Scale 1:4000) showing, where information is available:

- (1) All existing and/or planned future workings in seams above and/or below the proposed workings;
- (2) Overburden thickness isopachs relevant to the existing and/or planned future workings in the seams above and/or below the proposed workings;
- (3) Seam thickness isopachs relevant to the existing and/or planned future workings in the seams above and/or below the proposed workings;
- (4) All known geological structures relevant to the existing and/or planned future workings in the seams above and/or below the proposed workings, and
- (5) A co-ordinate grid (MGA).

## 9.5 Plan 5

A paper print (Scale 1:4000) showing:

- (1) Details of mining titles and land ownership. A schedule of leases should be included;
- (2) Areas affected by particular lease and/or consent conditions or restrictions in relation to subsidence;
- (3) The owners of all land affected by the proposal, other than for individual domestic dwellings and small commercial properties;
- (4) The proposed and existing workings as shown in Plan 1, and
- (5) A co-ordinate grid (MGA).

## 9.6 Plan 6

This plan should show:

- (1) Geological sections and/or borehole illustrations of the overburden strata representative of the area. Where there is significant variation across the area of the proposal, adequate information should be given to demonstrate the variation.
- (2) A detailed geotechnical log for strata within a minimum distance, as defined in Section 6.5 (7), of the seam being mined relevant to the application, if the proposed mine layouts are designed for supporting the surface. Additional geotechnical log(s) should be provided for strata within a minimum distance, as defined in Section 6.5 (7), of the seam(s) above and/or below the proposed mine layouts, where any existing or planned future workings may interact with the proposed workings.

## 10. SMP APPROVED PLAN

As part of the application, a plan is required to be submitted which will be endorsed by the Director-General (or delegate) at the time of granting approval. This plan, known as the "SMP Approved Plan" will become part of the permanent record of the details of the approval. This plan must be of a high standard and clearly show all of the pertinent details of the proposed mining. The plan will be returned to the Colliery Manager for amendment if it does not conform with the requirements which are set out in this section.

Approval will not be granted unless a satisfactory "SMP Approved Plan" is provided.

The following standards are required for the "SMP Approved Plan".

### 10.1 Scale

The preferred scale is 1:4000. A smaller scale (eg 1:10,000) is not acceptable.

However, where appropriate, a larger scale (eg 1:2000) will be accepted.

### 10.2 Sheet Size and Format

The preferred sheet size is AO. The plan should be contained within a border. There should be a title block on the plan containing:

- (1) Name of company;
- (2) Name of mine;
- (3) Plan title - (including the words "SMP Approved Plan");

- (4) Scale;
- (5) Date of last revision;
- (6) Plan number; and
- (7) Surveyor's signature certifying the accuracy of the plan.

### **10.3 Manager's Certificate**

The Mine Manager's signature and date of signing should be clearly evidenced on the plan to testify to the Manager's acceptance of the information shown on the plan.

### **10.4 Workings to be Shown on the Plan**

#### ***10.4.1 Actual Workings being Approved***

- (1) All workings which are necessary for the formation of the areas to be mined are to be shown;
- (2) All existing workings at the date of application are to be clearly indicated but do not require dimension;
- (3) All planned workings which are the subject of the application are to be shown with all dimensions;
- (4) The dimensions of abutment pillars adjacent to the extracted voids are to be shown, and
- (5) The dimension of all voids to be created by the mining system are to be shown.

#### ***10.4.2 Workings Adjacent to the Approval Workings***

All existing workings within a distance of at least 500m of the voids to be created by the proposed mining should be shown.

This should include goaf areas and areas not yet mined but approved for mining.

### **10.5 Identification of Areas Approved for Mining**

- (1) All areas which are subject of the application for approval should be marked as such, and
- (2) All areas to be mined as part of the approval should be coloured in a distinctive manner and clearly identified as such in the plan legend.

## Appendix A – Definition of Selected Terms

**SMP** – *Subsidence Management Plan.*

**CMRA** – *Coal Mines Regulation Act 1982.*

**Community** – *Anyone who is interested in or affected by subsidence issues associated with the proposed mining project.*

**Application Area** – *Refer to the detailed definition in Section 6.2.*

**Subsidence** – *For the purposes of the SMP approval process, subsidence is defined as mining-induced movements and deformations at the ground surface where:*

- i) the vertical downward surface movements are greater than 20mm; or*
- ii) the potential impacts on major surface infrastructure, structures or natural features may be significant, notwithstanding that the vertical downward surface movements are less than 20mm.*

**Vertical Subsidence** – *Vertical downward movements of the ground surface caused by underground coal mining.*

**Upsidence** – *Relative vertical upward movements of the ground surface associated with subsidence.*

**Far-field Subsidence** – *Mining-induced movements of the ground surface in areas where vertical subsidence is less than 20mm.*

**Angle of Draw** – *The angle between the vertical and the line joining the edge of the mining void with the limit of vertical subsidence, usually taken as 20mm.*

**Areas of Environmental Sensitivity** – *Refer to Section 6.6.3.*

**Mitigation Measures** – *Subsidence management measures which aim to reduce subsidence impacts, usually implemented prior to or during mining.*

**Remediation Measures** – *Subsidence management measures which aim to repair any adverse effects of subsidence, usually implemented after mining.*

**Risk** – *The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood (AS4360)*

**Risk Management Process** – *The systematic application of management policies, procedures and practices to the tasks of establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risk (AS 4360)*

**Cover Depth** – *The depth of coal seam from the ground surface (metres).*

**Geological Structures** – *Geological structures are faults, igneous intrusions, joints or any other significant type of discontinuity or disturbances within the rock strata.*

**Goaf** – *The mined-out area into which the immediate roof strata break.*

**The Department** – *NSW Department of Mineral Resources*

**DMR** – *NSW Department of Mineral Resources*

**DSC** – *Dams Safety Committee*

**MSB** – *Mine Subsidence Board*

**NPWS** – *NSW National Park and Wildlife Service*

**Director-General** – *Director-General of NSW Department of Mineral Resources*

**Director Environment** – *Director Environment of NSW Department of Mineral Resources*

## Appendix B – Surface and Sub-Surface Features that may be Affected by Underground Coal Mining

A list of surface and sub-surface features is given below to provide assistance with the investigations by the applicant. Note that it is not a full listing of surface or sub-surface features that may be affected by underground coal mining. The applicant should be responsible for identifying all surface or sub-surface features that may be affected by the proposed mining.

### (1) Natural Features

- 1) Catchment areas and declared Special Areas;
- 2) Rivers and creeks;
- 3) Aquifers, known groundwater resources;
- 4) Springs;
- 5) Sea/lake;
- 6) Shorelines;
- 7) Natural dams;
- 8) Cliffs / pagodas;
- 9) Steep slopes;
- 10) Escarpments;
- 11) Land prone to flooding or inundation;
- 12) Swamps, wetlands, water related ecosystems;
- 13) Threatened and protected species;
- 14) National parks;
- 15) State recreation areas;
- 16) State forests particularly areas zoned FMZ 1, 2 and 3;
- 17) Natural vegetation;
- 18) Areas of significant geological interest, and
- 19) Any other feature considered significant.

### (2) Public Utilities

- 1) Railways;
- 2) Roads (all types);
- 3) Bridges;
- 4) Tunnels;
- 5) Culverts;
- 6) Water/gas/sewerage pipelines;
- 7) Liquid fuel pipelines;
- 8) Electricity transmission lines (overhead/underground) and associated plants;
- 9) Telecommunication lines (overhead/underground) and associated plants;
- 10) Water tanks, water and sewage treatment works;
- 11) Dams, reservoirs and associated works;
- 12) Air strips, and
- 13) Any other infrastructure items.

### (3) Public Amenities

- 1) Hospitals;
- 2) Places of worship;
- 3) Schools;
- 4) Shopping centres;

- 5) Community centres;
  - 6) Office buildings;
  - 7) Swimming pools;
  - 8) Bowling greens;
  - 9) Ovals and cricket grounds;
  - 10) Race courses;
  - 11) Golf courses;
  - 12) Tennis courts, and
  - 13) Any other amenities considered significant.
- (4) Farm Land and Facilities
- 1) Agricultural utilisation or agricultural suitability of farm land;
  - 2) Farm buildings / sheds;
  - 3) Gas and / or fuel storages;
  - 4) Poultry sheds;
  - 5) Glass houses;
  - 6) Hydroponic systems;
  - 7) Irrigation systems;
  - 8) Fences;
  - 9) Farm dams;
  - 10) Wells, bores, and
  - 11) Any other feature considered significant.
- (5) Industrial, Commercial and Business Establishments
- 1) Factories;
  - 2) Workshops;
  - 3) Business or commercial establishments;
  - 4) Gas and / or fuel storages and associated plants;
  - 5) Waste storages and associated plants;
  - 6) Buildings, equipment and operations that are sensitive to surface movements;
  - 7) Surface mining (open cut) voids and rehabilitated areas;
  - 8) Mine infrastructure including tailings dams and emplacement areas, and
  - 9) Any other feature considered significant.
- (6) Areas of Archaeological and/or Heritage Significance
- (7) Items of Architectural Significance
- (8) Permanent Survey Control Marks
- (9) Residential Establishments
- 1) Houses;
  - 2) Flats / Units;
  - 3) Caravan parks;
  - 4) Retirement/aged care villages;
  - 5) Associated structures such as workshops, garages, on-site waste water systems, water or gas tanks, swimming pools and tennis courts, and
  - 6) Any other feature considered significant.
-