# DONALDSON COAL PTY LIMITED

# ABEL MINE

## Subsidence Management Plan

## Public Safety Management Plan
## Area 2

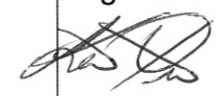
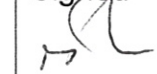
**May 2011**

# Document Control

## Description

| | |
|---|---|
| **Document No.** | Abel SMP Area 2 |
| **Title** | Public Safety Management Plan |
| **General Description** | To manage public safety in any surface areas that may be affected by subsidence from mining in Area 2 at Abel Mine |
| **Key Support Documents** | Abel Mine SMP Area 2 |

## Approvals

| | | | | |
|---|---|---|---|---|
| **ORIGINATOR** | Kevin Price | Brunskill Pty Limited | Signed  | Date 03/05/2011 |
| **REVIEWED** | Tony Sutherland | Position<br>Technical Services Manager – Donaldson Underground Operations | Signed  | Date 24/5/11 |
| **APPROVED** | Matt Blackham | Position<br>Manager of Mining Engineering – Abel Mine | Signed  | Date 25.5.11 |
| **APPROVED** | Name<br>Rob Regan | Position<br>Director Mine Safety Operations<br>Industry & Investment NSW<br>Minerals and Energy | Signed | Date |

## Revisions

| Version # | Date | Description | By | Checked | Approved Name | Approved Signed |
|---|---|---|---|---|---|---|
| 1 | May 2011 | | | | | |
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| The nominated Coordinator for this document is | Manager of Mining Engineering |

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### LIST OF TABLES

## 1 PURPOSE AND SCOPE

This Management Plan describes the processes developed, including identification of key risks and proposed management strategies, to manage Public Safety in any surface areas that may be affected by subsidence arising from mining (pillar extraction) by Abel Mine in the Subsidence Management Plan Area 2.

## 2 RESPONSIBILITIES AND RESOURCES

The Donaldson Technical Services Manager is responsible for monitoring the implementation of this plan.

The Abel Manager of Mining Engineering is responsible for ensuring that sufficient resources are available to implement the requirements of this Plan.

Each of the management strategies developed to manage subsidence allocates responsibilities in relation to their implementation. Relevant personnel will be provided with a copy of appropriate documents. Training will be provided.

## 3 SUBMISSION

This plan is submitted to the Director Mine Safety Operations for approval.

## 4 BACKGROUND

The SMP application consists of pillar extraction panels Panel 14 to Panel 26 inclusive, plus main headings development panels (South East Mains, East Install Headings and Tailgate Headings) to be extracted on retreat as shown on the attached SMP plans. The SMP application has been prepared in accordance with the NSW Department of Mineral Resources *New Approval Process for the Management of Coal Mining Subsidence* and SMP Guideline 2003.

Abel commenced coal production in May 2008 and will progressively increase production to 4.5mtpa. The SMP application area contains 211 ha, approximately 8% of the current lease area of 2755 ha.

Mining will take place in the application area under a combination of land owned by Black Hill Land Pty Limited, the Catholic Diocese of Maitland and Newcastle, a narrow strip traversing the area owned by Hunter Water Corporation and ten privately owned rural residential landholdings. The current application seeks approval to mine coal by the pillar extraction method from the Upper Donaldson Seam at depths of cover ranging generally from 100 to 150 metres.

The layout of the panels has been designed to provide management outcomes of subsidence impacts in line with the Statement of Commitments and Project Approval and to conduct the mining operations in a responsible manner, considering the existing and future environment and the community, while optimising resource recovery in the area in accordance with the principles of ecologically sustainable development. It is proposed to conduct mining in the proposed extraction panels that are generally bounded by the previously approved SMP Area 1 to the north, the lease boundary / F3 Newcastle to Sydney Freeway / resource thickness / quality to the east, Black Hill

Road for part and resource thickness / quality to the south and existing and proposed main underground development workings to the south.

Maximum subsidence predicted for the pillar extraction panels in the application area ranges between 760 mm and 1,450 mm, maximum predicted strains from 5 to 24 mm/m and tilts from 14 to 36 mm/m excluding areas nominated to be protected.

The SMP application area surface is a combination of native bushland, cleared grazing land (some previously used for poultry farms) and rural residential. Management measures are proposed to address any predicted environmental impacts, due to subsidence, for the surface above the application area.

Natural features are generally limited to Viney Creek, a Schedule 2 stream, associated tributaries and some groundwater. The only Threatened or Endangered Ecological Communities (EEC) within the SMP application area is the Lower Hunter Spotted Gum-Ironbark Forest. No adverse impacts are predicted for this EEC nor flora and fauna.

Man – made features include:

- Principal residences, Other Surface Structures and outbuildings;
- Disused, unoccupied residences;
- Transgrid 330kV power line;
- Energy Australia (EA) 132kV power line;
- Energy Australia rural 11kV and 415V domestic power lines;
- Optus fibre optic cable;
- Active and redundant Telstra copper communication cables;
- Hunter Water Corporation water pipeline;
- Permanent survey control marks;
- Buried stock and domestic water supply lines;
- Public roads and culverts (Black Hill and Taylors Road);
- Access roads and tracks;
- Cattle stockyards, holding areas and water troughs;
- Various fences, gates and cattle grids;
- Several buried and clay liner capped contaminated material areas; and
- Several small (<1ML capacity) stock watering dams.

This Management Plan for Area 2 includes the regular inspection of surface areas, subsidence monitoring and outlines procedures and actions to be implemented to manage the safety of the general public in the surface areas of the SMP application area that may be affected by subsidence resulting from mining (pillar extraction) by Abel Mine.

## 5 APPROACH TO PUBLIC SAFETY MANAGEMENT

The Mine's overall strategy to ensure Public Safety relating to the surface areas that may be affected by subsidence arising from pillar extraction is:

1. **Measure baseline information** – Established background data for the surface above the mining area by inspection and in certain areas also subsidence survey.

2. **Regular Monitoring of the effects of mining** - Continue monitoring and inspection of identified key positions relating to the extraction position

3. **Regularly assess and interpret monitoring and inspections** – Monitoring and inspection data is analysed to identify any variations from predictions, unexpected anomalies, visual impact or items presenting potential impact on Public Safety.

4. **Implement Immediate Responses –** If potential impact on Public Safety is observed or reported implement an immediate response including notification to the landowner.

5. **Re-assess any impacts** – where variations and/or impacts are greater than predictions made in the SMP, as nominated in the Trigger, Action and Management Response Plan, additional assessment/investigation of impacts will be undertaken. This will be carried out by specialist consultants, Abel personnel and appropriate stakeholders where required.

6. **Identify and implement remedial actions** – if impacts require mitigation and /or remedial action, these actions will be implemented in conjunction with the landholder and appropriate relevant stakeholder.

## 6 IDENTIFICATION OF RISKS

The surface to be undermined is described in **Section 4.**

As part of the application process a Risk Assessment was conducted to examine the potential impact created by subsidence on the surface above the mining area. No public safety risks in the high risk category were identified. All risks identified had either existing controls or additional controls / further actions which have been implemented or are available to identify, control or remediate these risks. The possible Public Safety risks are listed below with a summary of the Risk Assessment results relating to surface features attached as **Appendix A.**

- Damage (cracking) to roads / trails;
- Damage (cracking) to general surface; and
- Tree falls due to subsidence

Controls, monitoring and remedial actions identified as core items have been addressed in this Management Plan including,

- Regular monitoring of areas posing potential safety risks – monitoring introduced though no high risk areas identified.
- Erection of warning signs along access roads and walkways – to include mine contact numbers to report damage and be installed prior to commencement of pillar extraction.
- Entry restrictions – identified as part of management actions and remedial measures if Public Safety Risk identified.
- Backfilling of dangerous surface cracks – noted as remedial measure if identified.
- Provision of timely notification of mining progress to the landholder, community and any other stakeholders where management of Public Safety is required – noted as part of management actions.

# 7 NOTIFICATION, MONITORING AND INSPECTION SCHEDULE

The subsidence from mining, in this SMP Area 2, is not expected to have a major impact on the surface. Management of Public Safety is largely controlled by programmed and targeted inspection as well as reviewing predicted subsidence against actual subsidence.

## 7.1 Notification

Notifications to any landholders, the general public, relevant stakeholders and appropriate authorities either have or will be provided. These include.

- Newspaper advertisements relating to the SMP Application.
- Signposting of mining area.

## 7.2 Subsidence Monitoring

A description of the surface, relevant features and improvements above the proposed extraction area is contained in **Section 4** with locations of these items shown on **Plan 2** of the SMP Application.

Monitoring is conducted as per the various Management Plans and Programs submitted, consisting of a combination of subsidence surveys, surface and underground monitoring and inspections and monitoring of ecological conditions.

These Plans and Programs generally focus on intensive monitoring in the initial stages of pillar extraction and the long term monitoring of subsidence effects that may develop over time.

## 7.3 Subsidence Inspections

Inspections are to be conducted as per the various Management Plans and Programs submitted, consisting of a combination of visual and photographic inspections as detailed in the Management Plans and Programs and referenced in **Table 1**.

## 7.4 Scope and Frequency of Inspections

Regular inspections, at frequencies detailed in the Management Plans and Programs are to be initially concentrated on the current mining area, mining location and subsidence area (based on 26.5 degrees angle of draw). Inspections are concentrated on items identified in the initial pre-mining survey.

Inspections are carried out by experienced persons and follow an inspection checklist to include the items noted above.

At the completion of mining in each panel a full surface inspection will be conducted and results included in the following Subsidence Management Status Report.

Listed below is a schedule of inspections and subsidence survey frequencies of areas of potential Public Safety risk (**Table 1**).

**Table 1: Inspection and Survey Schedule**

| Infrastructure Item | Visual Inspection Frequency | Visual Inspection by | Photographic Monitoring Frequency | Photographic Monitoring by | Subsidence Survey Frequency | Subsidence Survey by | Comments |
|---|---|---|---|---|---|---|---|
| • General surface over SMP area | Pre and post mining | Abel Environmental Manager or nomination | Pre and post mining plus if changes noted on visual inspections | Abel survey staff or external survey contractor | Pre and post mining as detailed in Subsidence Monitoring Program to be approved by Principal Subsidence Engineer | Abel survey staff or external survey contractor | |
| • Specific surface features over current extraction area | Pre and post mining plus weekly during mining | As above | Pre and post mining plus if changes noted on visual inspections | Abel survey staff or external survey contractor | Pre and post mining as detailed in Subsidence Monitoring Program to be approved by Principal Subsidence Engineer | Abel survey staff or external survey contractor | |
| • Roads / trails | Pre and post mining plus weekly during undermining. | As above | Pre and post mining plus if changes noted on visual inspections. | As above | Pre and post mining as detailed in approved Subsidence Monitoring Program | As above | |

Results of each subsidence survey will be forwarded promptly following completion to the Principal Subsidence Engineer.

# 8 ACTIONS AND REMEDIAL MEASURES

Abel will install appropriate warning signage, positioned along public and property access roads and property boundaries, prior to the commencement of pillar extraction, advising of the potential for subsidence impacts. The objective of the signage is to ensure users of the public and access roads and surrounding area are aware of potential hazards resulting from subsidence. Mine contact details shall be included to enable any damage to be reported.

Visual inspections will identify impacts on access roads or natural features.

## 8.1 Public Safety Issues Identified During Inspections or Monitoring

If these inspections reveal any Public Safety issue (see **Table 2**) that requires remedial works to ensure Public Safety the person conducting the inspection shall :

- Immediately notify the Manager of Mining Engineering and/or Environmental Manager of the findings.

- Erect “NO ROAD” or barrier tape and warning signs if immediate remediation is not possible

- The Manager of Mining Engineering shall immediately notify the District Inspector of Coal Mines, landholder and any infrastructure owner.

## 8.2 Remediation of Public Safety Issues

Following completion of the above the Manager of Mining Engineering or his nominee shall:

- Arrange inspections of area at regular intervals including installation of appropriate barriers if required, until remediation works are carried out.

- Arrange for remediation works as detailed in **Table 2**. This will require consultation with the landholder, possibly infrastructure owner and NSW Department of Industry & Investment – Minerals and Energy, specialist consultants and appropriate stakeholder, as noted in current Management Plans and Programs, to prepare appropriate remediation plan relating to the particular item. Notification to the general public may form a part of the remediation plan.

## Table 2: Triggers, Actions and Management Responses – Public Safety

| Monitoring / Surface Element | Trigger / Response | Results within predicted / acceptable range | Irregular result | Increased irregular result |
|---|---|---|---|---|
| **Subsidence Monitoring** | Trigger | Subsidence results are not greater than 10% above predictions | Subsidence results are greater than 10% but less than 15% above predictions or visible surface impacts above predictions. | Subsidence results are greater than 15% above predictions |
| | Notification | N/A | Notify NSW I & I – Minerals and Energy Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval. | Notify NSW I & I – Minerals and Energy Principal Subsidence Engineer (PSE), Mine Safety operations, landholder and appropriate parties under the SMP Approval. |
| | Action / Response | Continue to monitor at specified frequency | Conduct field inspections.<br>Review predictions.<br>Obtain opinion from appropriate consultant, review program and consult with PSE | Review predictions.<br>Review program and obtain opinion from appropriate consultant.<br>Consult with PSE |
| | Mitigation / Remediation | N/A | Review mine plan in consultation with appropriate consultant and PSE | Review mine plan in relation to surface features in consultation with PSE |

| Monitoring Element / Method | Trigger / Response | Results within predicted / acceptable range | Irregular result / Minor impact | Increased irregular result / Major impact |
|---|---|---|---|---|
| **Surface cracking / erosion on <u>roads & access tracks</u> (by visual inspection)** | Triggers | Surface cracking up to 100mm<br>No noticeable increase in erosion. | Surface cracking 100-380mm.<br>Noticeable increase in level of recent rill erosion along track and/or table drains. | Surface cracking > 380mm.<br>Perceived imminent threat to public safety from anomalous situation (ie. adjacent mass movement,). |
| | Notification | N/A | Landholder, NSW I & I – Minerals and Energy PSE and appropriate parties under the SMP Approval ( including Director Environmental Sustainability and DECCW) if cracking over 190mm | Landholder, Interagency Committee and PSE. Other appropriate parties under the SMP Approval ( including Director Environmental Sustainability and DECCW) |
| | Action / Response | Maintain warning signs.<br>Inspect and isolate by temporary fencing if required<br>Continue to review and monitor cracks periodically to ensure they do not expand or create a public safety hazard. | Note GPS location and orientation of crack or erosion and photograph.<br>Review public safety aspect.<br>Maintain warning signs and erect additional signs and/or temporary fencing in immediate area.<br>Increase monitoring frequency to twice weekly until area has been satisfactorily remediated.<br>Discuss / confirm appropriate level of action / remediation with landholders, and any other relevant Government Department.<br>Review subsidence predictions with expert consultant, review monitoring program and/or consult with PSE if required. | Note GPS location and orientation of crack or erosion and photograph.<br>Review public safety aspect.<br>Maintain warning signs and erect additional signs and/or temporary fencing in immediate area including barricades and NO ROAD signs.<br>Increase monitoring frequency to daily until area has been satisfactorily remediated and/or made safe.<br>Site inspection with specialist soil conservationist, landholder and other relevant Government Departments to discuss / confirm appropriate level of action / remediation.<br>Undertake detailed review of subsidence predictions with expert consultant, review monitoring program and consult with PSE. |

| Monitoring Element / Method | Trigger / Response | Results within predicted / acceptable range | Irregular result / Minor impact | Increased irregular result / Major impact |
|---|---|---|---|---|
| **Continued…<br>Surface cracking / erosion on roads & access tracks** | Mitigation / Remediation | Repair by grading, excavation and fill, or by concrete grout if required for erosion control. | Repair cracks by excavation, fill and/or grading, concrete or grout, and install drainage structures if required, in program agreed by landholder and appropriate authorities.<br>Review mine plan in consultation with appropriate consultant and PSE. | Repair cracks by excavation, fill, and/or grading, concrete or grout, and install drainage structures if required, following consultation with landholder, appropriate authorities and specialist consultants.<br>Review mine plan in consultation with appropriate consultant and PSE. |

| Monitoring Element / Method | Trigger / Response | Results within predicted / acceptable range | Irregular result / Minor impact | Increased irregular result / Major impact |
|---|---|---|---|---|
| **Surface cracking, mining induced erosion in other <u>general surface areas</u> (by visual inspection)** | Triggers | Surface cracking < 100mm.<br>No evidence of mass movement or slumping.<br>No evidence of accelerated rill or gully erosion. | Surface cracking 100-380mm.<br>Some minor areas of mass movement or slumping can be observed (<100$m^{2.}$).<br>Surface rilling to a depth < 300mm. | Surface cracking > 380mm.<br>Large areas of mass movement or slumping identified (>100$m^{2.}$).<br>Surface rilling and/or gullying to a depth > 300mm. |
| | Notification | N/A | Landholder, NSW I & I – Minerals and Energy PSE and appropriate parties under the SMP Approval ( including Director Environmental Sustainability and DECCW) if cracking over 190mm | Landholder, Interagency Committee and PSE. Other appropriate parties under the SMP Approval ( including Director Environmental Sustainability and DECCW) |
| | Action / Response | Maintain warning signs.<br>Inspect and isolate by temporary fencing if required<br>Continue to review and monitor cracks periodically to ensure they do not expand or create a public safety hazard. | Note GPS location and orientation of anomaly and photograph.<br>Review public safety aspect.<br>Maintain warning signs and erect additional signs and/or barrier tape or temporary fencing in immediate area.<br>Increase monitoring frequency to twice weekly until area has been satisfactorily remediated and/or made safe.<br>Discuss / confirm appropriate level of action / remediation with landholder and other relevant Government Departments<br>Review subsidence predictions with expert consultant, review monitoring program and/or consult with PSE if required. | Note GPS location and orientation of anomaly and photograph.<br>Review public safety aspect.<br>Maintain warning signs and erect additional signs in immediate area including barricade and NO ROAD signs.<br>Increase monitoring to daily until area has been satisfactorily remediated and/or made safe.<br>Site inspection with specialist soil conservationist, landholder and other relevant Government Departments to discuss / confirm appropriate level of action / remediation.<br>Undertake detailed review of subsidence predictions with expert consultant, review monitoring program and consult with PSE. |
| | | | | |

| Monitoring Element / Method | Trigger / Response | Results within predicted / acceptable range | Irregular result / Minor impact | Increased irregular result / Major impact |
|---|---|---|---|---|
| **Continued…<br>Surface cracking, mining induced erosion in other general surface areas** | Mitigation / Remediation | Repair by grading, excavation and fill, or by concrete grout if required for erosion control. | Repair cracks by excavation, fill and/or grading, concrete or grout, and install drainage structures if required, in program agreed by landholder and appropriate authorities.<br>Review mine plan in consultation with appropriate consultant and PSE. | Repair cracks by excavation, fill, and/or grading, concrete or grout, and install drainage structures if required, following consultation with landholder, appropriate authorities and specialist consultants.<br>Review mine plan in consultation with appropriate consultant and PSE. |

| Visual Inspection / Photographic Monitoring | Trigger / Response | Results within predicted / acceptable range | Irregular result - Director Mine Safety Operations and District Inspector of Coal Mines to be notified | Irregular result - Director Mine Safety Operations and District Inspector of Coal Mines to be notified |
|---|---|---|---|---|
| **Steep slopes damage or instability** | Trigger | Visual inspection or monitoring reveals minor cracking (<100mm) | Surface cracking 100 – 380mm or visible instability | Surface cracking >380mm / Visible instability. |
| | Notification | N/A | Notify NSW I & I – Minerals and Energy Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval. | Notify NSW I & I – Minerals and Energy Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval. |
| | Action / Response | Field Inspections to assess requirements for additional / increased frequency monitoring | Erect warning signs and barrier tape in immediate area.<br><br>Review predictions<br><br>Suitably qualified external consultant to inspect and advise on further action including possible remedial / stabilisation works in consultation with PSE and landholder. | Erect warning signs and barrier tape in immediate area.<br><br>Arrange inspection with landholder.<br><br>Suitably qualified external consultant to inspect and advise on further action including possible remedial / stabilisation works. |
| | Mitigation / Remediation | | Repair any cracks promptly with a sand/cement/bottom ash grout or equivalent and installation of erosion controls and surface / sub-surface slope drainage systems.<br><br>Review mine plan in consultation with appropriate consultant and PSE | Repair any cracks promptly with a sand/cement/bottom ash grout or equivalent and installation of erosion controls and surface / sub-surface slope drainage systems.<br><br>Review mine plan in consultation with appropriate consultant and PSE |

## 9 REPORTING

Results of subsidence surveys, visual inspections and photographic monitoring are to be reported at each survey to the Principal Subsidence Engineer (for subsidence surveys) and landholder, also in the four monthly Subsidence Management Status Reports and the Annual Environmental Management Report.

Additionally, notification will be provided to relevant Authorities of any incident or occurrence as detailed in the Triggers Actions and Management Responses.

## 10 REVIEW

This plan will be reviewed as necessary including:

- Within one year of the approval date or in the event that the Director Mine Safety Operations raises issues that necessitate a review;
- In the event that any of the landholders raise issues that necessitate a review;
- Inspections or ongoing monitoring demonstrate that the subsidence effects are such that a review is warranted.

Any review will be conducted in consultation with the Director Mine Safety Operations and landholder. In the event the management plan is revised a copy will be forwarded to the relevant landholder, stakeholder(s) and agencies and also placed on the Donaldson website.

## APPENDIX A – RISK ASSESSMENT RESULTS TABLE – NATURAL FEATURES AND SURFACE IMPROVEMENTS

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Public Utilities | Electricity transmission lines (overhead / underground) and associated plants | 2.04.01 | Damage and / or loss of clearance to 330kV Transgrid Power line | 1. Subsidence<br>2. Tilt<br>3. Strains | 1. Cruciform footings<br>2. Conductor strings | A | 2 | C | 8 | S | 1. Transgrid to review structural integrity and design of cruciform's<br>2. Continual dialogue with Transgrid re Supplied draft management plan<br>3. Investigate need for installation of pulleys on earth wires<br>4. Check conductor clearance<br>5. Pre-mining surveys<br>6. Subsidence data from Panels 1-4 will be available prior to mining under Transgrid 330kV power lines<br>7. Review mine plan if required | |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Public Utilities | Roads (all types) | 2.01.01 | Serviceability of public roads | 1. Cracking<br>2. Steps (Scarps)<br>3. Change in road profile<br>4. Reduction in sight distance on road<br>5. Change in drainage<br>6. Tree falling | 1. Develop road management plan with Cessnock City Council<br>2. Develop Public Safety Management Plan<br>3. Ongoing consultation<br>4. Develop road management plan for 4wd tracks for fire fighting access | P | 2 | D | 12 | S | | |
| Natural Features | Tributaries | 1.02.02 | Hydraulic connection from surface to underground | 1. Connective cracking from stream bed to seam<br>2. Shallow cover depth<br>3. Mining height | 1. Cover depth is greater than 100m<br>2. Mining height is less than 3.2m at this location | A | 3 | C | 13 | S | 1. Mining height can be varied<br>2. Extraction ratio can be varied | Yes |
| Natural Features | Tributaries | 1.02.06 | Long term impact on aquatic ecosystem | 1. Change in flow regime<br>2. Change in water quality | 1. EMP TARPs includes remediation and mine plan review<br>2. Property Management Plans to be developed<br>3. No known acid sulphate soils<br>4. No upward gradient of groundwater | E | 3 | C | 13 | S | 1. Assess remediation works of contaminated areas<br>2. Update CAD data with contaminated areas<br>3. Review contaminated areas studies (Douglas Partners) | Yes |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Features | Aquifers, known groundwater resources | 1.03.04 | Contamination of groundwater through leachate from waste areas | 1. Connective cracking | | E | 3 | C | 13 | S | 1. Assess remediation works of contaminated areas<br>2. Update CAD data with contaminated areas<br>3. Review contaminated areas studies (Douglas Partners) | |
| Public Utilities | Electricity transmission lines (overhead / underground) and associated plants | 2.04.02 | Damage and / or loss of clearance to 132kV Energy Australia Power line | 1. Subsidence<br>2. Tilt<br>3. Strains | 1. Timber poles more resilient to subsidence impacts | A | 3 | C | 13 | S | 1. Check conductor clearance<br>2. Survey pole locations<br>3. Continual dialogue with Energy Australia to update management plan<br>4. Pre-mining surveys<br>5. Investigate need for installation of pulleys on earth wires | |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Public Utilities | Electricity transmission lines (overhead / underground) and associated plants | 2.04.03 | Damage and / or loss of clearance to 11kV Energy Australia Power line | 1. Subsidence<br>2. Tilt<br>3. Strains | 1. Timber poles more resilient to subsidence impacts<br>2. Power line Management Plan | A | 3 | C | 13 | S | 1. Check conductor clearance<br>2. Continual dialogue with Energy Australia to review existing management plan<br>3. Pre-mining surveys<br>4. Investigate need for installation of pulleys on earth wires<br>5. Energy Australia to review requirement for power line | |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Residential | Principal dwellings and proposed buildings within Catholic Diocese principal residence area | 4.01.01 | Damage to principal dwellings | 1. Subsidence impacts | 1. Mine design and layout<br>2. Subsidence control zones (SCZ) to the 20mm subsidence contour (assumed 26.5 degrees for design purposes)<br>3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM)<br>4. Monitoring arrangements (Subsidence)<br>5. Mine Subsidence Board inspections to determine tolerable levels<br>6. Incorporate assessment of vibration into Property Management Plan<br>7. Mine schedule provides for substantial amount of subsidence data prior to first workings underneath principal dwellings<br>8. Recalibration of subsidence model after each panel | A | 3 | C | 13 | S | 1. Review monitoring results regarding angle of draw<br>2. Test monitoring of disused houses | |
| Natural Features | Tributaries | 1.02.03 | Ponding or reversal of flow | 1. Tilting<br>2. Subsidence | 1. EMP TARPs includes remediation and mine plan review<br>2. Property Management Plans (PMP) to be developed | E | 4 | B | 14 | S | 1. Mining height can be varied<br>2. Extraction ratio can be varied | Yes |
| Natural Features | Tributaries | 1.02.04 | Destabilisation of bank and / or bed | 1. Tilting<br>2. Subsidence<br>3. Gradient change | 1. EMP TARPs includes remediation and mine plan review<br>2. Property Management Plans to be developed | E | 4 | B | 14 | S | 1. Include tributary management in PMP | Yes |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Features | Schedule 2 Creeks | 1.01.02 | Hydraulic connection from surface to underground | 1. Connective cracking from stream bed to seam<br>2. Pillar extraction within SCZ | 1. Mine design and layout<br>2. Subsidence control zones (SCZ) 40m + to the 20mm subsidence contour (assumed 26.5 degrees for design purposes)<br>3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM)<br>4. Monitoring arrangements (Subsidence, surface and groundwater)<br>5. Environmental Monitoring Program (EMP)<br>6. Site water balance review<br>7. TARP | A | 2 | E | 16 | M | 1. Include visual inspection of stream flow and pool depth in checklist | Yes |
| Natural Features | Schedule 2 Creeks | 1.01.01 | Loss of overland flow | 1. Surface cracking of stream bed<br>2. Pillar extraction within SCZ | 1. Mine design and layout<br>2. Subsidence control zones (SCZ) 40m + to the 20mm subsidence contour (assumed 26.5 degrees for design purposes)<br>3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM)<br>4. Monitoring arrangements (Subsidence, surface and groundwater) | R | 3 | D | 17 | M | 1. Include visual inspection of stream flow and pool depth in checklist | Yes |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Features | Schedule 2 Creeks | 1.01.06 | Long term impact on aquatic ecosystem | 1. Change in flow regime<br>2. Change in water quality<br>3. Pillar extraction within SCZ | 1. Mine design and layout<br>2. Subsidence control zones (SCZ) 40m + to the 20mm subsidence contour (assumed 26.5 degrees for design purposes)<br>3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM)<br>4. Monitoring arrangements (Subsidence, surface and groundwater) | E | 3 | D | 17 | M | | Yes |
| Natural Features | Tributaries | 1.02.05 | Long term effects of change in stream water quality | 1. Tilting<br>2. Subsidence<br>3. Gradient change<br>4. Contaminants from waste disposal areas | 1. EMP TARPs includes remediation and mine plan review<br>2. Property Management Plans to be developed | E | 3 | D | 17 | M | 1. Update CAD data with contaminated areas<br>2. Review contaminated areas studies (Douglas Partners) | Yes |
| Public Utilities | Telecommunication lines (overhead / underground) and associated plants | 2.05.01 | Damage to Optus Optical Fibre Cables | 1. Subsidence | 1. Optus have own internal management plan<br>2. Location of cable confirmed<br>3. Pre-mining audit has been carried out<br>4. Relocate fibre optic cable if required | A | 3 | D | 17 | M | 1. Assess Optus MP<br>2. Investigate durability of Optus cable<br>3. Subsidence data from Panels 1-4 will be available prior to mining under Optus Optical Fibre cable<br>4. Continual dialogue with Optus to confirm appropriate management plan | |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Public Utilities | State Survey marks | 2.07.01 | Use of disturbed State Survey Marks | 1. Disturbance of State Survey Marks due to subsidence | 1. Location of marks known<br>2. Notify Department of Lands | A | 3 | D | 17 | M | | |
| Residential | "Other surface structures" | 4.02.02 | Exposure to asbestos substances in the disused dwellings | 1. Subsidence impacts | 1. Property Management Plan<br>2. Further inspections will be conducted prior to mining underneath | P | 3 | D | 17 | M | 1. Consider independent assessment of asbestos risk | |
| Natural Features | Tributaries | 1.02.01 | Cumulative loss of overland flow from tributaries | 1. Surface cracking of stream bed | 1. EMP TARPs includes remediation and mine plan review | E | 4 | C | 18 | M | 1. Include visual inspection of stream flow and pool depth in checklist | Yes |
| Public Utilities | Culverts associated with Black Hill Road | 2.02.01 | Serviceability of culverts | 1. Cracking<br>2. Steps (Scarps)<br>3. Change in road profile<br>4. Change in drainage | 1. Develop road management plan with Cessnock City Council<br>2. Develop Public Safety Management Plan<br>3. Ongoing consultation<br>4. Preliminary inspections of culverts have been undertaken | A | 4 | C | 18 | M | 1. Add inspection of culverts during mining to checklists | |
| Public Utilities | Water pipeline | 2.03.01 | Damage to HWC 200mm PVC pipe resulting in interruption to water supply | 1. Strains | 1. HWC Waterline Management Plan<br>2. Monitoring of pipeline<br>3. Pipeline was constructed in anticipation of future subsidence | R | 4 | C | 18 | M | 1. Request HWC to install additional gate valve to minimise impact | |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Farm Land and Facilities | Agricultural utilisation or agricultural suitability of farm land | 3.01.01 | Temporary loss of access to grazing areas | 1. Surface cracking | 1. Property Management Plans<br>2. Ongoing consultation with property owners | A | 4 | C | 18 | M | | |
| Farm Land and Facilities | Internal Access tracks | 3.02.01 | Damage to internal property access tracks | 1. Cracking<br>2. Steps (Scarps)<br>3. Change in road profile<br>4. Reduction in sight distance on road<br>5. Change in drainage<br>6. Tree falling | 1. Develop Public Safety Management Plan<br>2. Ongoing consultation<br>3. Property Management Plans | A | 4 | C | 18 | M | 1. Ground truthing of surface features | |
| Farm Land and Facilities | Fences, gates and cattle grids | 3.03.01 | Damage to fences and / or gates including resulting loss of livestock | 1. Strain<br>2. Subsidence<br>3. Falling tree | 1. Property Management Plans<br>2. Ongoing consultation with property owners<br>3. Monitoring arrangements | A | 4 | C | 18 | M | | |
| Farm Land and Facilities | Farm dams | 3.04.01 | Damage to dams resulting in loss of serviceability and integrity of dam wall | 1. Cracking<br>2. Tilting | 1. Dam monitoring and management strategy (DMMS) will be developed for all dams prior to mining impact<br>2. Statement of commitments to provide water in the event of interruption of supply of water from dam | A | 4 | C | 18 | M | | |
| Farm Land and Facilities | Water Reticulation systems | 3.07.01 | Damage to water reticulation system resulting in loss of service | 1. Subsidence impacts | 1. Property Management Plan<br>2. Monitoring arrangements<br>3. Statement of commitments to provide water in the event of interruption of supply of water from reticulation system | A | 4 | C | 18 | M | 1. Complete identification of water reticulation systems within SMP Area 2 | |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Farm Land and Facilities | Capping of remediated areas | 3.08.01 | Loss of integrity of capping | 1. Subsidence impacts | 1. See above | A | 4 | C | 18 | M | | |
| Residential | "Other surface structures" | 4.02.01 | Damage to other structures | 1. Subsidence impacts | 1. Mine design and layout<br>2. Monitoring arrangements (Subsidence)<br>3. Mine Subsidence Board inspections in conjunction with property owner and Abel to determine potential impacts, tolerable levels,<br>4. Management plan to be developed, incorporating responsibilities<br>5. Incorporate assessment of vibration into Property Management Plan<br>6. Mine schedule provides for substantial amount of subsidence data prior to workings underneath structures<br>7. Recalibration of subsidence model after each panel | A | 4 | C | 18 | M | 1. Review monitoring results regarding angle of draw<br>2. Test monitoring of disused houses | |
| Natural Features | Schedule 2 Creeks | 1.01.03 | Ponding or reversal of flow | 1. Tilting<br>2. Subsidence<br>3. Pillar extraction within SCZ | 1. Mine design and layout<br>2. Subsidence control zones (SCZ) 40m + to the 20mm subsidence contour (assumed 26.5 degrees for design purposes)<br>3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM)<br>4. Monitoring arrangements (Subsidence, surface and groundwater) | E | 4 | D | 21 | L | | Yes |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Features | Schedule 2 Creeks | 1.01.04 | Destabilisation of bank and / or bed | 1. Tilting<br>2. Subsidence<br>3. Gradient change<br>4. Pillar extraction within SCZ | 1. Mine design and layout<br>2. Subsidence control zones (SCZ) 40m + to the 20mm subsidence contour (assumed 26.5 degrees for design purposes)<br>3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM)<br>4. Monitoring arrangements (Subsidence, surface and groundwater) | A | 4 | D | 21 | L | | Yes |
| Natural Features | Schedule 2 Creeks | 1.01.05 | Change in stream water quality | 1. Tilting<br>2. Subsidence<br>3. Gradient change<br>4. Pillar extraction within SCZ | 1. Mine design and layout<br>2. Subsidence control zones (SCZ) 40m + to the 20mm subsidence contour (assumed 26.5 degrees for design purposes)<br>3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM)<br>4. Monitoring arrangements (Subsidence, surface and groundwater) | E | 4 | D | 21 | L | | Yes |
| Natural Features | Aquifers, known groundwater resources | 1.03.02 | Additional flow to underground workings | 1. Connective cracking | 1. Water Management Plan<br>2. Pumping capacity is approximately 3 times current flows<br>3. Underground water storage area available | A | 4 | D | 21 | L | | |
| Natural Features | Aquifers, known groundwater resources | 1.03.03 | Quality change of groundwater inflows through mine workings | 1. Aquifer depressurisation | 1. Water Management Plan | A | 4 | D | 21 | L | | |

| Process | Sub-process | H# | Risk Issue | Causes | Existing Controls and planned Management Plans | Loss Type | Consequence | Likelihood | Risk Rank | Risk Level | Further Actions | ALARP (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Features | Natural Vegetation | 1.08.01 | Change in habitat / fauna | 1. Falling tree<br>2. Dieback | 1. Mine design<br>2. Monitoring arrangements<br>3. Visual inspections<br>4. TARPs - remediation works | E | 4 | D | 21 | L | | |
| Natural Features | Natural Vegetation | 1.08.02 | Visual impact | 1. Falling tree<br>2. Dieback | 1. Mine design<br>2. Monitoring arrangements<br>3. Visual inspections<br>4. TARPs - remediation works<br>5. Ongoing Consultation | R | 4 | D | 21 | L | | |
| Areas of Archaeological and/or Cultural Significance | Areas of Archaeological and / or Heritage Significance | 5.01.01 | Disturbance of archaeological significant area contained within Area 2 | 1. Subsidence impacts | 1. Located within Viney Creek SCZ<br>2. ATM<br>3. PEMP | A | 4 | D | 21 | L | 1. Confirm details on sites and location | |
| Natural Features | Aquifers, known groundwater resources | 1.03.01 | Reduction in bore yield and adverse effects on groundwater dependent ecosystems | 1. Connective cracking | 1. No groundwater dependent ecosystems in area<br>2. No bores in area | E | 5 | C | 22 | L | | |
| Public Utilities | Telecommunication lines (overhead / underground) and associated plants | 2.05.02 | Damage to Telstra Local Copper Cables | 1. Subsidence | 1. Location of cable confirmed | R | 5 | C | 22 | L | 1. Confirm extent of current service<br>2. Continual dialogue with Telstra to develop management plan | |