



# **DONALDSON COAL PTY LIMITED**

## **ABEL MINE**

### **SMP Area 1 Pillar Extraction Upper Donaldson Seam**

### **Subsidence Management Plan**

**December 2009**

**Approved  
Mathew Blackham  
Manager of Mining Engineering  
Abel Mine  
Date: 9 December 2009**

## Document Control

### Description

<b>Document No.</b>	Abel SMP Area 1
<b>Title</b>	Subsidence Management Plan
<b>General Description</b>	Details the proposed monitoring, management principles and actions that will be implemented to manage any potential impacts associated with the pillar extraction mining of Abel SMP Area 1.
<b>Key Support Documents</b>	Abel Mine Area 1 SMP Written Report

### Approvals

<b>ORIGINATOR</b>	Kevin Price	Brunskill Pty Limited		
<b>REVIEWED</b>	Tony Sutherland	Position Technical Services Manager Donaldson - Underground Operations	Signed 	Date 9.12.09
<b>APPROVED</b>	Matthew Blackham	Position Manager of Mining Engineering Abel Mine	Signed 	Date 9.12.09
<b>APPROVED</b>	Name Elise Newberry	Position Director Environmental Sustainability Industry & Investment NSW Minerals and Energy	Signed	Date

### Revisions

Version #	Date	Description	By	Checked	Approved	
					Name	Signed
1	December 2009					

The nominated Coordinator for this document is	Manager of Mining Engineering
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## 1 PURPOSE

This document forms a component of the SMP Application for pillar extraction of SMP Area 1 in the Upper Donaldson Seam at Abel Mine. Refer to **Figure 1** for locality map.

The purpose of this management plan is to act as a framework document to demonstrate how the impacts of subsidence are proposed to be managed as a result of pillar extraction mining in Abel SMP Area 1 in the Upper Donaldson seam. The document aims to demonstrate the structured approach adopted by Abel in environmental management, particularly related to subsidence.

The Management Plan also fulfils the requirements of mining lease conditions in relation to establishing a Subsidence Management Plan.

## 2 SCOPE

This document relates to the management of subsidence as a result of pillar extraction mining in Abel SMP Area 1 in the Upper Donaldson Seam. The proposed layout of the mine workings is shown on **Figure 2**.

## 3 RESPONSIBILITIES AND RESOURCES

Abel's Environmental Manager is responsible for monitoring the implementation of this plan.

Abel's 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 relevant documents. Training will be provided where deemed appropriate.

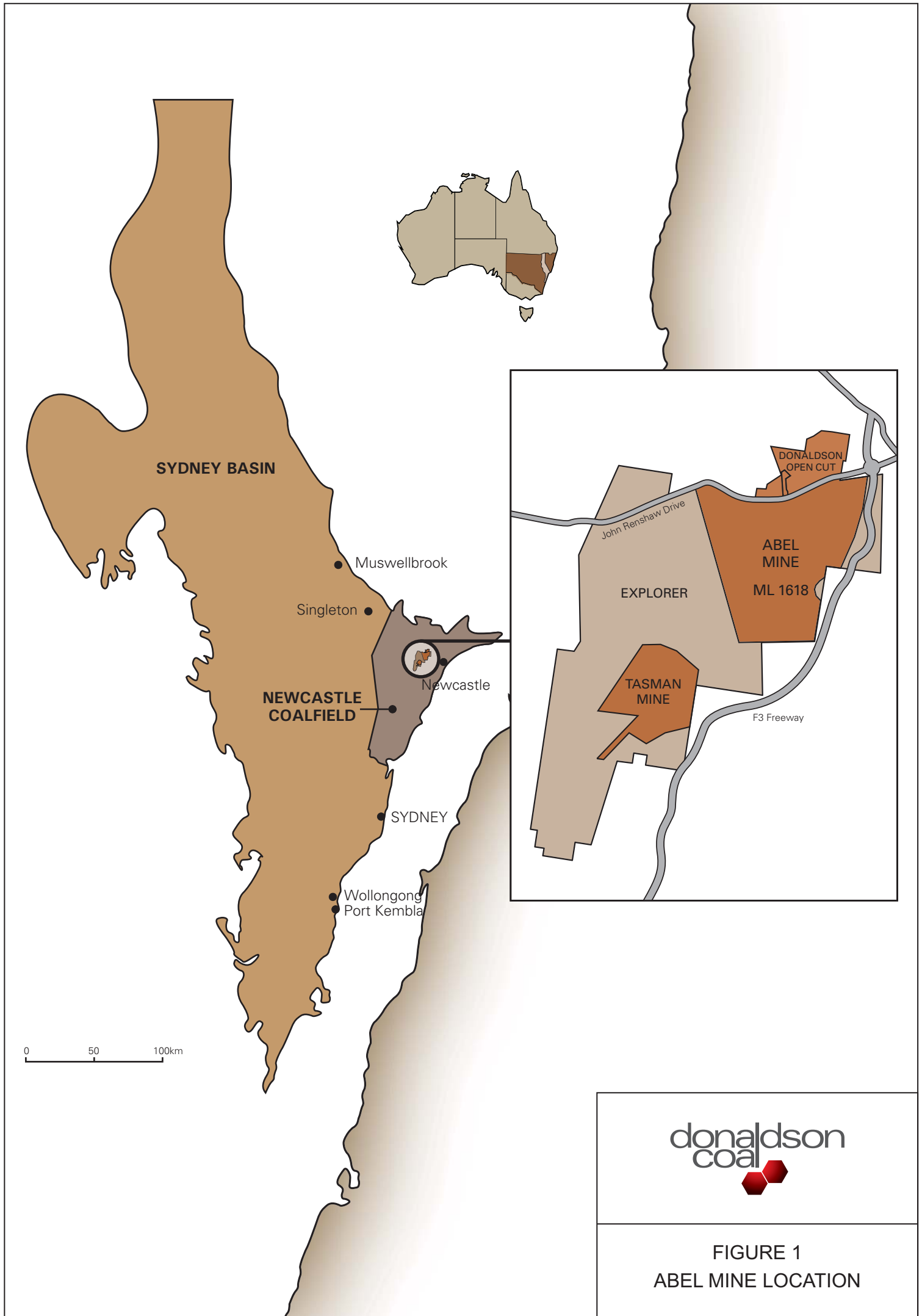
## 4 CONSULTATION AND SUBMISSION

Relevant stakeholders including the landowner(s), Abel Community Consultative Committee, various government agencies, infrastructure owners and operators, specialist consultants and the results of the Abel Mine Subsidence Risk Assessment (HMS 837) have provided valuable input into the development of the SMP and proposed management strategies.

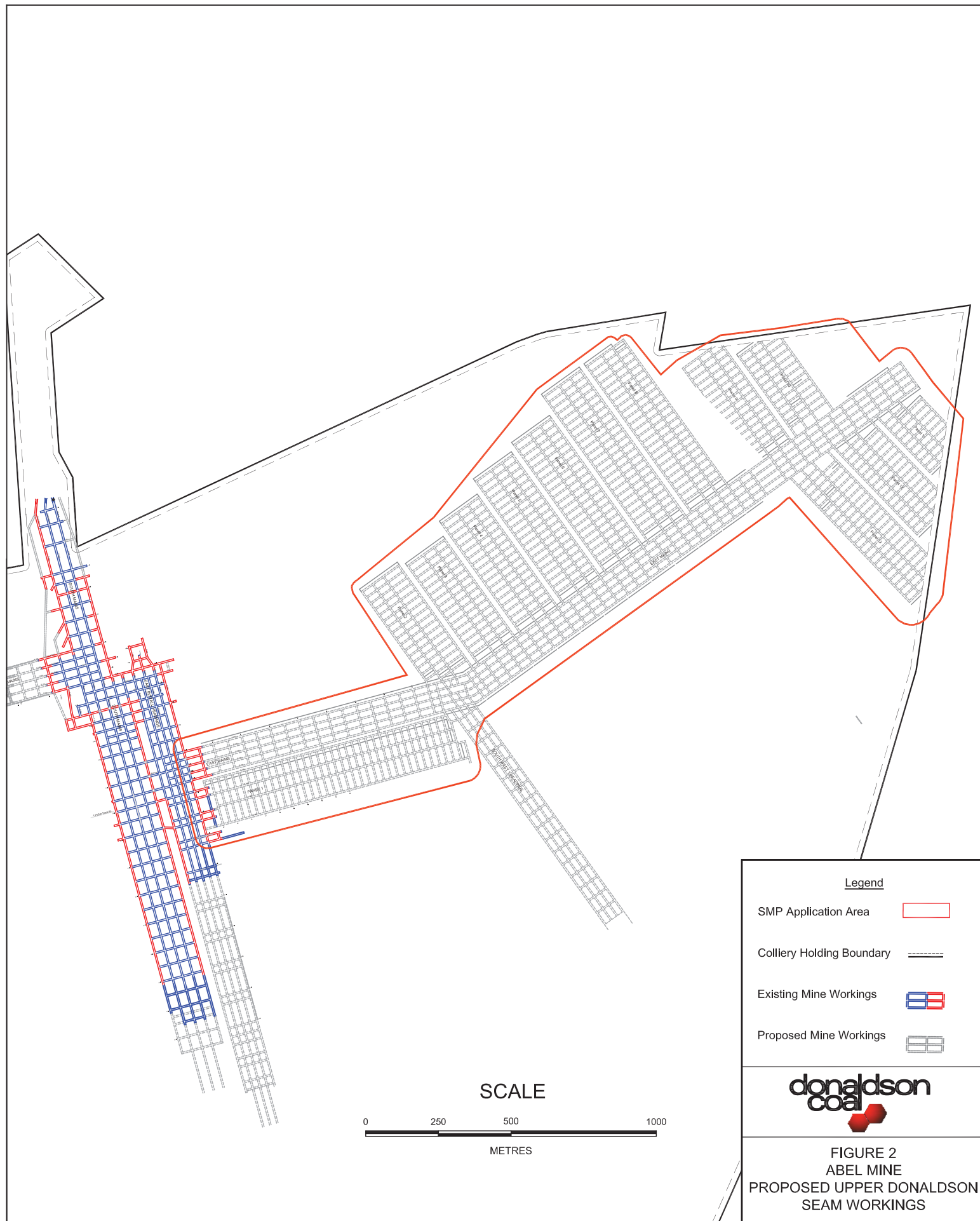
Further input is expected as part of the application review process and will be incorporated, where applicable, in any review of these strategies.

This plan is submitted to the Director Environmental Sustainability for approval as part of the SMP application.

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## 5 BACKGROUND

Abel commenced coal production in May 2008 and will progressively increase production to 4.5mtpa. The SMP application area contains 200 ha, less than 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 and a narrow strip traversing the area owned by Hunter Water Corporation. 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 50 to 135 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 bounded by the lease boundary / John Renshaw Drive and cover restrictions to the north, the lease boundary / F3 Newcastle to Sydney Freeway to the east and existing and proposed main underground development workings to the south and west.

Maximum subsidence predicted for the pillar extraction panels in the application area ranges between 870 mm and 1,760 mm. Maximum predicted strains from 4 to 33 mm/m and tilts from 15 to 76 mm/m excluding areas nominated to be protected.

No substantial adverse environmental effects due to subsidence are predicted for the surface above the application area. The SMP application area surface is a combination of native bushland, cleared grazing land previously used for poultry farms and a small section of industrial land in the north east corner of the application area.

Natural features are generally limited to Viney Creek, a Schedule 2 stream, associated tributaries and some groundwater. A large portion of the SMP area is covered by a Lower Hunter Spotted Gum – Ironbark Forest, an Endangered Ecological Community. No adverse impacts are predicted for this EEC nor flora and fauna.

Man – made features include:

- Boral Asphalt Plant;
- Transgrid 330kV power line;
- Energy Australia (EA) 132kV power line;
- EA rural 11kV power lines;
- Optus fibre optic cable;
- Redundant Telstra copper communication cables;
- Hunter Water Corporation water pipeline;
- Scattered aboriginal artefacts;

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- Disused, unoccupied residences proposed for demolition;
- Stock water supply line;
- Access roads and tracks;
- Various fences; and
- One small disused dam.

This Subsidence Management Plan is based around monitoring of:

- Subsidence,
- Surface watercourse flows,
- Groundwater and effects of mining on aquifers,
- Flora,
- Fauna,
- Private properties and structures, and
- Infrastructure.

by a combination of survey and measurement, monitoring (including photographic monitoring) and physical inspection.

Also addressed is the establishment of management strategies (TARPs) in response to unexpected monitoring results and mitigation remediation measures for any impacts, as part of the associated management plans.

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## 6 OVERALL APPROACH TO SUBSIDENCE MANAGEMENT

The Mine's overall strategy for subsidence management is:

1. **Design to reduce surface impacts** - Mine design is such that predicted subsidence is not expected to result in negative surface impacts (that is, manageable levels of subsidence, tilts, strains, and cracking).
2. **Identify environmental risks** – A risk assessment is undertaken to determine environmental risks.
3. **Measure baseline information** – Establish background data for the surface above the proposed mining area, including subsidence monitoring points and the monitoring of watercourse flows, groundwater, flora, fauna, water make and weather.
4. **Monitor the effects of mining** - Continue monitoring of subsidence, watercourse flows, flora and fauna, groundwater, water make and weather patterns.
5. **Regularly assess and interpret monitoring** – Monitoring data is analysed to identify any variances
6. **Re-assess impacts** – where variances are identified that are greater than predictions (i.e. trigger points are reached), additional assessment of impacts is undertaken.
7. **Identify and implement remedial actions** – if additional assessment indicates greater impacts then remedial action may be required. Stakeholder consultation will be undertaken in determining and implementing remedial actions.
8. In the event that any surface impacts due to subsidence are noted, implement agreed appropriate remediation and / or mitigation measures in consultation with the landholder and any appropriate stakeholders.
9. Provide regular progress reports to relevant parties and hold periodic consultation meetings. Such reports and consultation to include updates on all monitoring results, including any impacts and management actions.

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## 7 MINE DESIGN

The first step in subsidence management is to design the mine to minimise any surface impacts whilst providing safe and efficient resource recovery. For SMP Area 1 the mine design results in the following:

- Design of the pillar extraction panel layout to provide protection against adverse subsidence impacts for the SMP area while optimising resource recovery. The proposed pillar extraction panels are bounded to the north by John Renshaw Drive, east by the F3 freeway and to the south and west by existing and proposed main underground headings developments.
- Maximum vertical subsidence is predicted in the range of 870 to 1,760 mm
- Protection from subsidence impact is provided to items noted as Principal Residences (in SMP Area 1 the Boral Asphalt Plant) and the Schedule 2 Viney Creek, by limiting mining to first workings only or the development of a Subsidence Control Zone (SCZ) to restrict subsidence in the area.
- Some surface cracking, up to 260mm wide, is predicted.

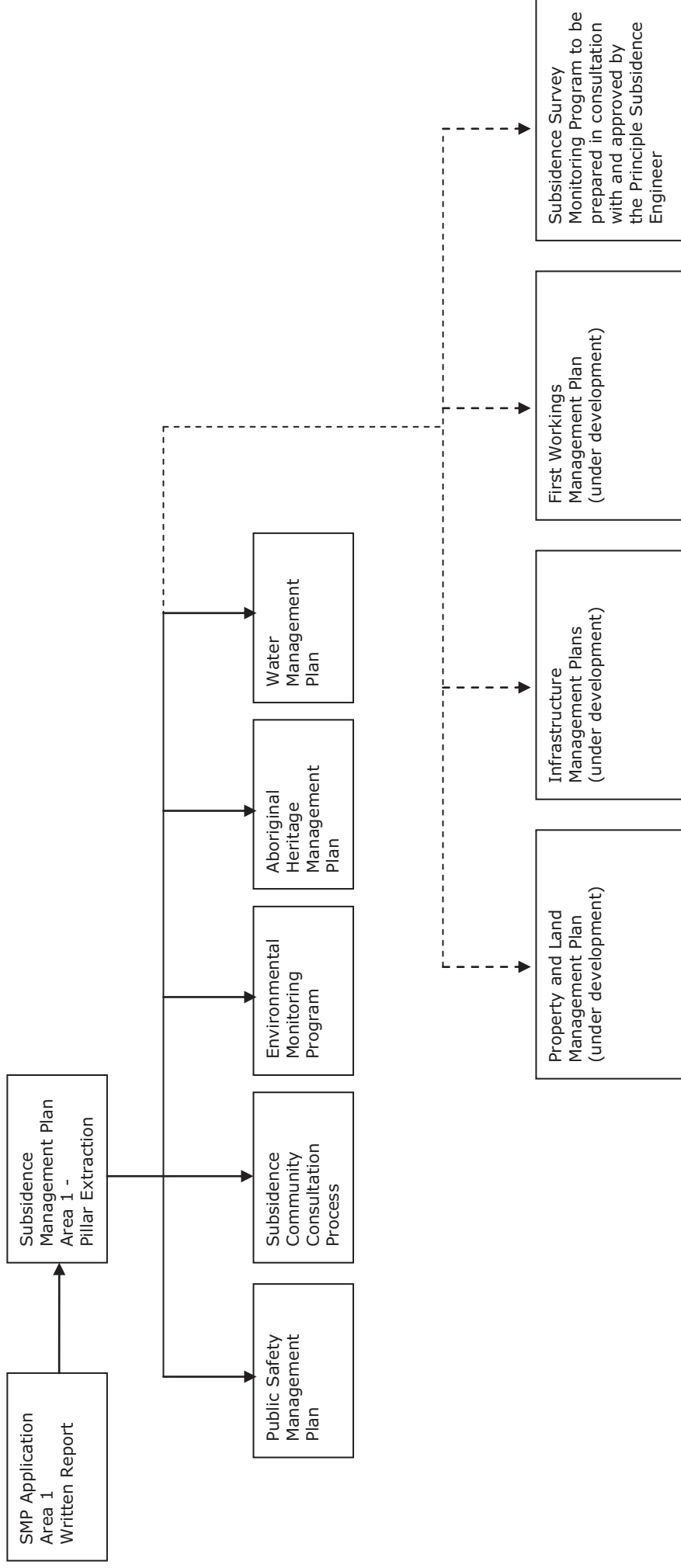
## 8 MONITORING AND MANAGEMENT

A number of monitoring programs and management strategies are already in place and others have been specifically developed to identify and manage issues identified as requiring management as a result of subsidence in Abel SMP Area 1.

The following **Table 1** shows an outline of the SMP process including these management plans and programs. Additional management plans and programs to be prepared prior to the commencement of the pillar extraction mining are also included.

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**TABLE 1- SUBSIDENCE MANAGEMENT PLAN FLOWSHEET**



Note: Specific Management Plans and progress are listed. Remainder are incorporated within this document.

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Descriptions of these management plans and programs are listed below.

## 8.1 Public Safety Management Plan

A Public Safety Management Plan (attachment A) has been developed for Abel SMP Area 1 and though predicted subsidence impacts should not create a situation where the public will be endangered some surface cracking is anticipated and a combination of signposting and inspections is proposed. Additionally, the application area is contained within land owned by The Catholic Diocese which has procedures in place relating to both public access and public safety.

## 8.2 Subsidence Community Consultation Process

A Subsidence Community Consultation Process (attachment B) has been developed for the Abel SMP Area 1 as an extension of Abel's existing process.

## 8.3 Environmental Monitoring Program

An Integrated Environmental Monitoring Program (attachment C) has previously been developed and approved as part of the Project Approval conditions incorporating monitoring of surface watercourses, groundwater, flora, fauna, surface features, underground water make and roads / trails.

## 8.4 Aboriginal Places and Archaeological Management

Abel has an Aboriginal Heritage Management Plan (attachment D) in place, developed and approved as part of the Project Approval conditions.

## 8.5 Surface and Groundwater Management

Abel has a Water Management Plan (attachment E) in place developed and approved as part of the Project Approval conditions. This Plan includes both Surface and Groundwater Monitoring Plans and also a Surface and Groundwater Response Strategy. The type and extent of remedial measures implemented will depend largely on the nature and location of any impact. Such measures may range from continued monitoring and evaluation to physical measures such as earthworks to repair any cracking in watercourses.

There are several other areas that require a management response plan, as detailed below, and these are currently being developed.

## 8.6 Property and Land Management Plan

Individual Property and Land Management Plan's are currently being prepared in consultation with both major landholders within the SMP application area and will address any impacts relating to surface cracking, soil erosion, soil slumping and land degradation, disruptions to water supply or reticulation and fencing associated with subsidence due to pillar extraction mining or subsidence monitoring. This plan will be completed prior to the commencement of pillar extraction.

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## 8.7 Infrastructure Management Plans

Consultation is continuing with all infrastructure owners / operators to develop appropriate management plans in relation to their assets. This may involve mine design modifications to extraction, mitigation and/or remediation measures or possibly rerouting or replacing the infrastructure. These Management Plans will be completed and agreed with the infrastructure owners prior to the commencement of pillar extraction. The Plans are :

- Transgrid Management Plan;
- Energy Australia Management Plan;
- Hunter Water Management Plan; and
- Optus Management Plan.

## 8.8 First Workings Management Plan

As a condition of the Project Approval a First Workings Management Plan will be required to be developed prior to first workings under both the Boral Asphalt Plant and/or Viney Creek.

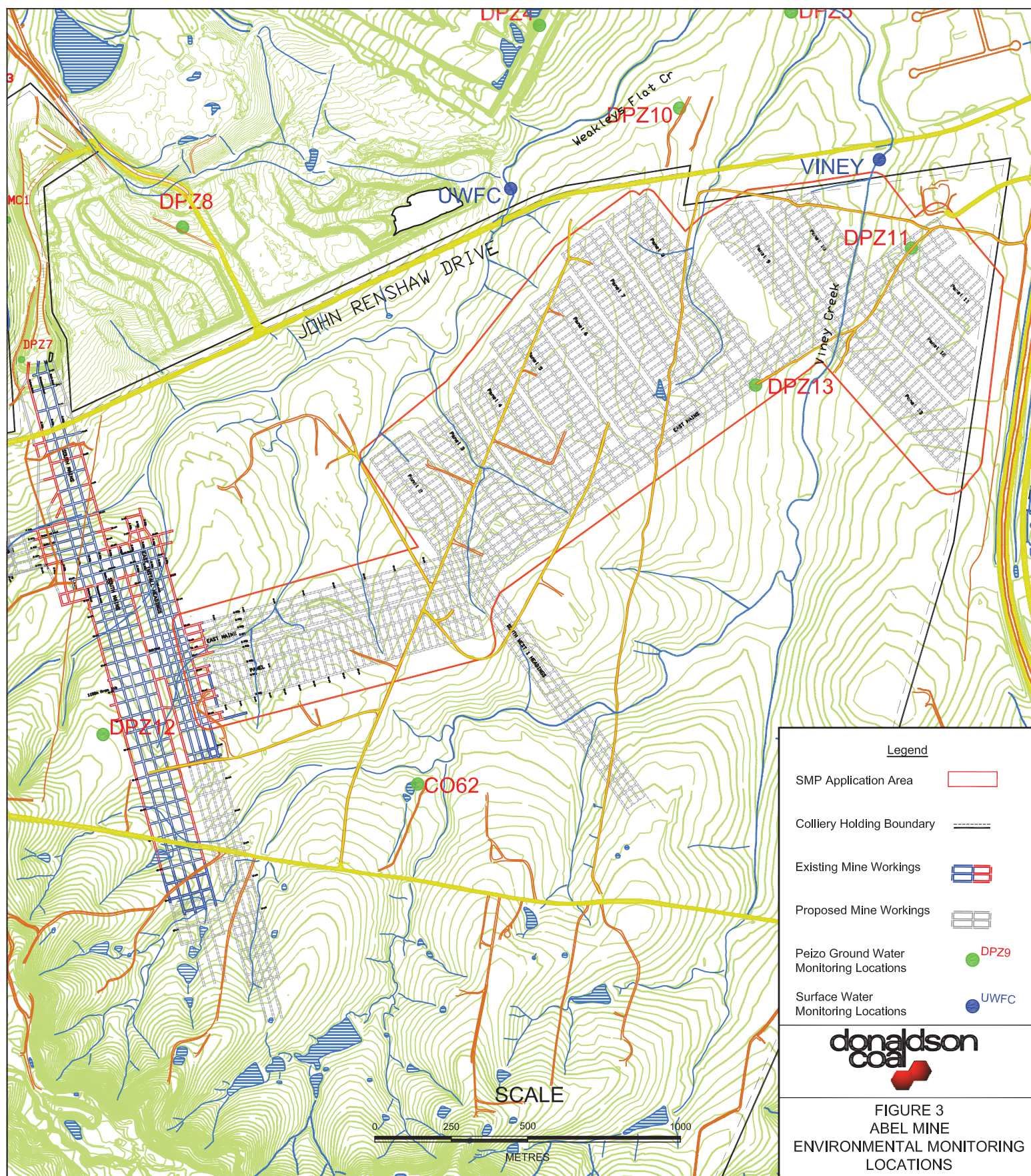
## 8.9 Principal Residence Management Plan

As a condition of the Project Approval a Principal Residence Management Plan is required to be developed prior to any first workings under any principle residence.

The only principle residence with the SMP application area is the Boral Asphalt Plant, which has been included in a Subsidence Control Zone (SCZ) and no first workings are planned in this area, negating the need for a Principal Residence Management Plan at this time.

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## 8.10 Monitoring

Detail of environmental monitoring is provided in the attached Integrated Environmental Monitoring Program.

### 8.10.1 Subsidence

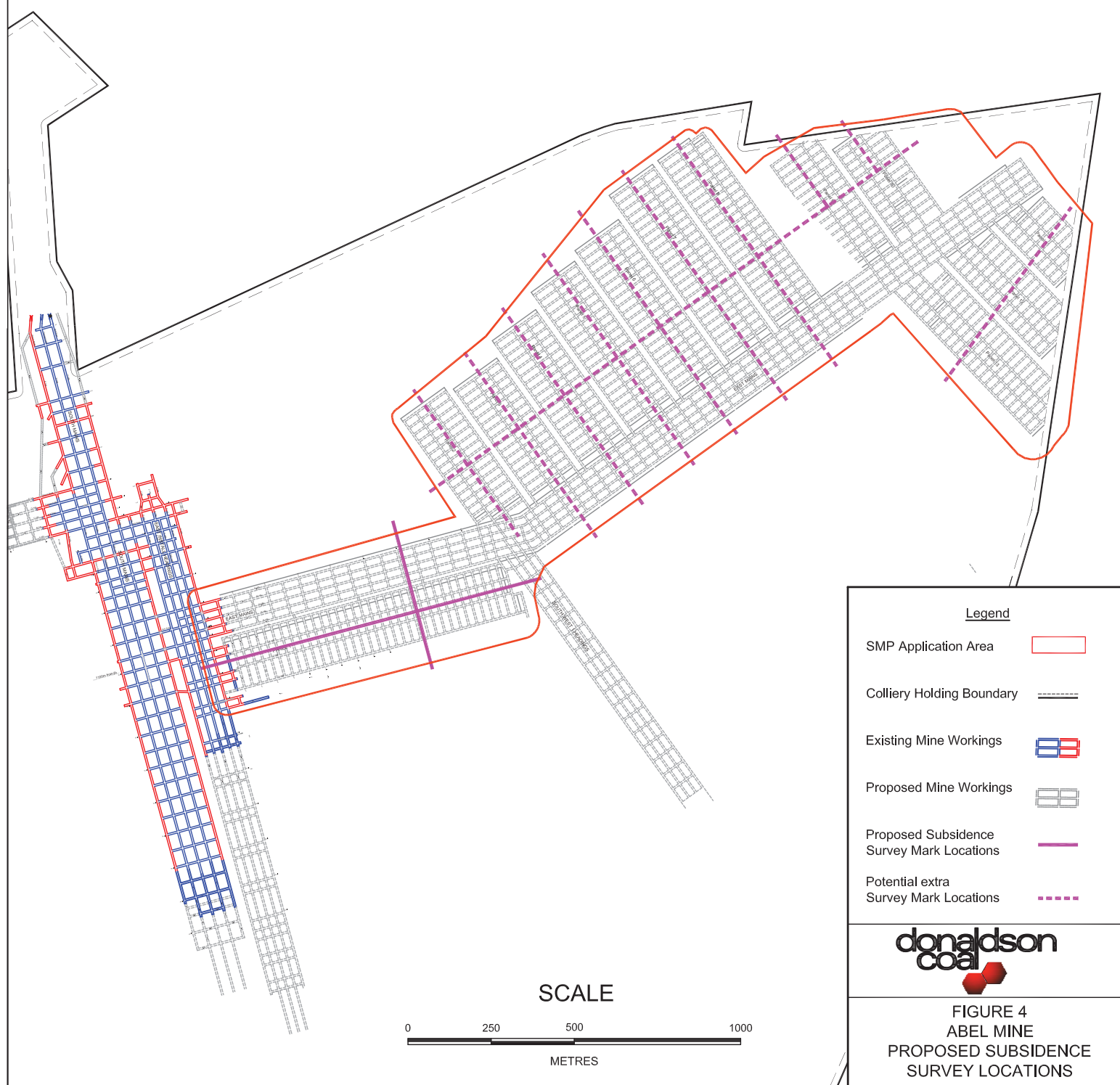
**Proposed** – The Subsidence Survey Monitoring Program for SMP Area 1 will be prepared in consultation with and agreed by the Principal Subsidence Engineer – Minerals and Energy following a detailed surface inspection as part of the SMP application assessment process. To include as a minimum:

1. One transverse subsidence line across the pillar extraction panels. The lines will be installed to at least the middle of the next adjacent panel before undermining occurs.
2. A longitudinal line extending in-bye and out-bye from each panels starting and finishing points, for a minimum distance equal to the cover depth (i.e. to an AoD of 45°).
3. A survey line along and across the banks of Viney Creek.
4. A minimum of 4 pegs spaced 10 m apart adjacent to or around any feature of interest (i.e. transgrid tower, archaeological sites) to measure subsidence, tilt and strain.

The survey pegs should be spaced at a minimum of 10 m apart. A minimum of two baseline surveys of subsidence and strain will be carried out before mine subsidence occurs to establish survey accuracy.

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Legend







- SMP Application Area 
- Colliery Holding Boundary 
- Existing Mine Workings 
- Proposed Mine Workings 
- Proposed Subsidence Survey Mark Locations 
- Potential extra Survey Mark Locations 



FIGURE 4  
ABEL MINE  
PROPOSED SUBSIDENCE  
SURVEY LOCATIONS

### 8.10.2 Surface Water

This Surface Water Monitoring Plan covers the monitoring of surface waters within and adjacent to the Abel Underground Mine Area. This includes the following drainage systems:

- Blue Gum Creek, Long Gully and the Pambalong Nature Reserve,
- Viney Creek and Weakley's Flat Creek,
- Buttai Creek, and
- Four Mile Creek.

As well as the portal, surface facilities and surface water management facilities associated with the Abel Underground Mine site.

### 8.10.3 Groundwater

The groundwater monitoring program which has been operating on the Abel project site since September 2005 will be integrated with the surface water monitoring program. The groundwater monitoring program includes:

- Monthly measurement of water levels in a representative network of piezometers.
- Quarterly sampling of all standpipe piezometers, for laboratory analysis of electrical conductivity (EC), total dissolved solids (TDS) and pH.
- Annual collection of water samples from all standpipe piezometers for laboratory analysis of a broader suite of parameters
- Weekly measurement of the volume of mine water pumped from the underground workings.
- Weekly measurement on site of the EC, TDS and pH of the mine water pumped from the underground workings.

### 8.10.4 Flora

Initial investigations and monitoring of Flora above the Abel Mine area was targeted at classifying the various ecosystems extant across the area based on the vegetation, floristic content and structure. The detail of these investigations is shown in the attached Environmental monitoring program. (attachment C)

### 8.10.5 Fauna

The details of the investigations into Fauna above the proposed mining area is shown in the attached Environmental monitoring program. (attachment C)

A summary of current monitoring, proposed additional monitoring, and trigger / response references is included in **Table 2**.

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**TABLE 2- SUBSIDENCE MONITORING AND MANAGEMENT RESPONSE**

Item	Monitoring Program and Frequency	Actions Required	Person Responsible	Target Date	Trigger / Response
<b>Subsidence</b>	To be confirmed with DII – Mineral Resources	1. Consult with DPI – MR for development of Subsidence Monitoring Program	Technical Services Manager	April 2010	See Table 2 – Public Safety Management Plan.
		2. Establish monitoring lines and baseline monitoring in accordance with DPI-MR requirements over future mining area	Mine Surveyor or contract surveyor	Prior to commencement of pillar extraction	Also to be included in Subsidence Monitoring Program
		3. Monitor at agreed intervals	Mine Surveyor or contract surveyor	Agreed intervals from commencement of pillar extraction	

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Item	Monitoring Program and Frequency	Actions Required	Person Responsible	Target Date	Trigger / Response
<b>Surface watercourses / drainage lines</b>	Ephemeral watercourses / drainage lines to be visually inspected for flow on a regular basis while mining in vicinity. Monthly surface water sampling.	Inspect as noted for flow and any subsidence impact during mining.	Environment Manager	Monitoring ongoing	See Section 4.4 and Table 4 Integrated Environmental Monitoring Program
<b>Groundwater</b>	Four groundwater monitoring bores and piezometers established. Continuous monitoring with data collection at monthly intervals.	Photographic Monitoring at bore sites undertaken at four monthly intervals	Environment Manager	Baseline survey to be completed by September 2007.	See Section 4.5 and Table 5 Integrated Environmental Monitoring Program
<b>Flora</b>	Monitoring quadrat established. Baseline monitoring completed and ongoing program established (one survey per year)	Continue existing established monitoring program	Environment Manager	Ongoing (one survey per year)	Figure 10 Integrated Environmental Monitoring Program

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Item	Monitoring Program and Frequency	Actions Required	Person Responsible	Target Date	Trigger / Response
<b>Fauna</b>	Monitoring locations established. Baseline monitoring completed and ongoing program established (annual survey)	Continue existing established monitoring program	Environment Manager	Ongoing	Table 7 Environmental Monitoring Program
<b>General surface</b>	Proposed : Visual inspections at weekly intervals during mining.  Photographic monitoring at start and end of each panel or if changes noted on inspection.	Baseline inspection and photographic monitoring to be completed prior to extraction of each panel.	Environment Manager or nomination.	Baseline inspection and photographic monitoring for first panel to be completed prior to March 2010.	
<b>Fences / Roads</b>	Proposed : Visual inspections at monthly intervals during Photographic monitoring at start and end of panel or if changes noted on inspection.	Baseline inspection and photographic monitoring to be completed prior to extraction of each panel.	Environment Manager or nomination.	Baseline inspection and photographic monitoring for first panel to be completed prior to March 2010.	

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## 9 JUSTIFICATION OF THE MINE PLAN, MINING METHOD AND MINING SEQUENCE APPROPRIATE TO IDENTIFIED MANAGEMENT PRIORITIES

In the initial planning of the area, a number of alternative mine plans were considered and the current plan and layout was developed having regard to the lease boundaries, exploration geological data and initial environmental assessment details.

The layout of the pillar extraction panels has been designed to provide protection against subsidence impacts for most of the natural features in the area while optimising resource recovery.

Section 5.2.1 in the Written Report provides justification for the mine layout and mining sequence. Many of the justifications presented follow through to demonstrate the proposed mine plan and proposed mining schedule adequately address the key issues requiring management.

The management strategies outlined are relevant to the level of risk involved as defined in the SMP Risk Assessment. The strategies identify actions and a timeframe and resources for them to be carried out.

Abel has demonstrated a professional and proactive role in managing the potential impacts of mine subsidence. Examples of best practice subsidence management are highlighted with a number of examples, including:

- The extensive baseline and proposed monitoring being undertaken to assess any impacts of underground mining on fauna, flora, and groundwater in the mine lease area.

Management strategies involve mechanisms to manage situations where the actual impacts are greater than those predicted to occur. The monitoring systems proposed will identify variations at a stage early enough to enable the impacts to be mitigated.

## 10 ONGOING STAKEHOLDER CONSULTATION

Abel has an established Community Consultative Committee in relation to the mine operations. Ongoing consultation will be carried out with a number of stakeholders not just on subsidence related matters but on the progress of the mine and overall environmental performance.

Detail is provided in the attached Subsidence Community Consultation Process (**attachment B**)

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## 11 REPORTING

Results of subsidence surveys, monitoring, inspections and effectiveness of management strategies are to be reported in the four monthly Subsidence Management Status reports, part of the Subsidence Community Consultation Process, and also the Annual Environmental Management Report.

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

## 12 REVIEW

This plan will be reviewed as necessary including:

- In the event that landholders and/or government agencies raise issues that necessitate a review, or
- Monitoring demonstrates that impacts are such that a review is warranted.

Any review will be conducted in consultation with the Industry & Investment NSW – Minerals and Energy. In the event of the management plan being changed a copy will be sent to the relevant agencies.

## 13 REFERENCES

**NSW Department of Mineral Resources (2003)** – *Guideline for Applications for Subsidence Management Approvals*

## 14 ATTACHMENTS

- A PUBLIC SAFETY MANAGEMENT PLAN**
- B SUBSIDENCE COMMUNITY CONSULTATION PROCESS**
- C INTEGRATED ENVIRONMENTAL MONITORING PROGRAM**
- D ABEL ABORIGINAL HERITAGE MANAGEMENT PLAN**
- E ABEL WATER MANAGEMENT PLAN** including
  - Surface Water Monitoring Plan;
  - Groundwater Monitoring Plan; and
  - Surface and Groundwater Response Plan

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