

# Subsidence Management Plan Approval

I, the Director, Resource Assessments within the Department of Planning, Industry & Environment, under the provisions of the development consent referred to in Schedule 1, approve the development set out in Schedule 2, subject to the conditions set out in Schedules 3 and 4.



**Stephen O'Donoghue**  
**Director**  
**Resource Assessments**  
as nominee of the Secretary

Sydney

8 December 2020

---

## SCHEDULE 1

Condition 7 of Schedule 3 of the development consent granted by the Minister for Urban Affairs and Planning on 20 November 2001 for the development of the Dendrobium Coal Mine and the construction and operation of associated surface facilities (DA 60-03-2001).

---

## SCHEDULE 2

Underground mining operations, and associated monitoring, management and remediation, in Area 3B of the Dendrobium Coal Mine.

---

## SCHEDULE 3 – GENERAL CONDITIONS

### Definitions

1. BCD Biodiversity Conservation Division within the Department (now Biodiversity, Conservation and Science)  
Department of Planning, Industry and Environment  
DRG Division of Resources and Geoscience within the Department (now Minerals, Energy and Geoscience Division of the Department of Regional NSW)  
DSC Dams Safety Committee (now Dams Safety NSW)  
Independent Expert Panel Independent Expert Panel for Mining in the Catchment  
Mining Panel Independent Advisory Panel for Underground Mining  
Minor Not very large, important or serious  
Mitigation Activities associated with reducing the impacts of mining operations prior to or during those impacts occurring  
Negligible Small and unimportant, such as to be not worth considering  
NSWET NSW Environmental Trust  
Previous Subsidence Management Plans Subsidence Management Plan (2012), Subsidence Management Plan (2016); Subsidence Management Plan (2017) and Subsidence Management Plan (2019)  
Remediation Activities associated with partially or fully repairing or rehabilitating the impacts of mining operations or controlling the environmental consequences of these impacts  
Resources Regulator NSW Resources Regulator  
Secretary Planning Secretary of the Department, or nominee  
Subsidence Management Plan (2012) Subsidence Management Plan prepared by BHP Billiton Illawarra Coal Holdings Pty Limited, Review B; including the attached Watercourse Management Plan, Swamp Management Plan, Groundwater Management Plan and SCA Asset Management Plan; as amended until 1 December 2012.  
Subsidence Management Plan (2016) Subsidence Management Plan prepared by Illawarra Coal South32 dated 4 March 2016, including Attachments A-U and the Response to Submissions dated 25 August 2016, as amended by the letter and attachments dated 9 November 2016, including the plans DEN-01-6151 Rev 6 and DEN-01-6153 Rev 5.  
Subsidence Management Plan (2017) Subsidence Management Plan prepared by Illawarra Coal South32 dated October 2017, including Attachments A-D, the Response to Submissions dated 13 April 2018 and plans DEN-01-6151 Rev 6 and DEN-01-6153 Rev 11.  
Subsidence Management Plan (2019) Subsidence Management Plan prepared by Illawarra Coal South32 dated March 2019, including supporting documents, the Response to Submissions dated 31 May 2019, including Attachments 1-22.  
Subsidence Management Plan (2020) Subsidence Management Plan prepared by Illawarra Metallurgical Coal South32 dated November 2020, including supporting documents, the Response to Submissions dated 29 September 2020.  
WaterNSW WaterNSW (replaced Sydney Catchment Authority and State Water Corporation in 2015)
2. Subject to the definitions above, the definitions in the development consent DA 60-03-2001 apply to this approval.

### Previous Subsidence Management Plan approvals

3. All approvals of previous Subsidence Management Plans issued in respect of the development set out in Schedule 2 under the provisions of the development consent set out in Schedule 1 cease to have effect from the date of this approval.

### Terms of Approval

4. The Applicant must carry out the development generally in accordance with the:
  - (a) conditions of consent (DA 60-03-2001);
  - (b) conditions of this approval;
  - (c) Subsidence Management Plan (2020); and
  - (d) the Mining Layout Plan.

*Note: The Mining Layout Plan is shown in Appendix 1.*

5. If there is any inconsistency between documents listed in condition 4, then the conditions of this approval and the development consent (DA 60-03-2001) prevail to the extent of the inconsistency.

#### **Limits on Approval**

6. The Applicant must obtain the approval of the Secretary prior to the commencement of gateroad development for each of Longwalls 14 to 19. The Secretary's approval will take into account the:
- documents required to be reviewed or prepared and other measures required to be developed or implemented under the conditions of this approval; and
  - the Applicant's performance under previous Subsidence Management Plans and the conditions of this approval and development consent (DA 60-03-2001).

The Secretary's approval under this condition may be subject to conditions.

7. For Longwalls 14 to 18, the Applicant must not extract the coal seam to a height of greater than 3.9 metres, subject to approval from the Resources Regulator to extract a greater height for identified mine safety reasons.
8. For Longwalls 14 to 18, the Applicant must obtain the endorsement of DSC prior to commencing the extraction of each longwall.

*Note: DSC may require that the commencement of extraction is set back further from Avon Reservoir.*

#### **Biodiversity Offset Strategy**

9. The Applicant must prepare a Biodiversity Offset Strategy to the satisfaction of the Secretary. The Strategy must compensate for the impacts of any longwalls in Area 3B on upland swamps and must:
- be prepared in consultation with BCD and WaterNSW;
  - be submitted by 31 October 2013 to the Secretary for approval;
  - provide a suitable offset for all predicted impacts of the project on upland swamps;
  - give priority to like-for-like physical environmental offsets, but also consider:
    - measures that result in beneficial effect on water quality, water quantity, aquatic ecosystems and/or the ecological integrity of WaterNSW's special areas or water catchments;
    - other potential physical environmental offsets; and
    - potential financial environmental offset contributions payable to a relevant public trust or authority (e.g. the NSWET, BCD or WaterNSW), where physical offsets or other measures are unavailable or insufficient to provide a suitable offset;
  - propose a process whereby the actual impacts of the development on upland swamps are regularly reviewed (at least every 2 years) against predicted impacts and reported on to all affected agencies, including detailed consideration of the:
    - predictions in the Subsidence Management Plans;
    - performance measures in Table 1;
    - monitoring results;
    - application, success and predicted success of measures to mitigate or remediate subsidence impacts and/or associated environmental consequences;
    - predicted and actual long-term impacts; and
    - views of BCD and WaterNSW; and
  - propose a process whereby a suitable residual environmental offset is provided where the actual impacts on upland swamps exceed those predicted in the Subsidence Management Plans.

Following approval, the Applicant must implement the strategy.

#### **Security of Offsets**

10. Prior to the extraction of Longwall 14, the Applicant must provide long-term security for any approved offset, to the satisfaction of the Secretary.
11. The Applicant shall pay all reasonable costs incurred by the Department to engage suitably qualified and experienced experts to review adequacy of any component of the Biodiversity Offset Strategy.

#### **Strategic Biodiversity Offset**

12. The requirements under 9(c), (d) and (f) above can be met through the provision of a Strategic Biodiversity Offset pursuant to condition 15 of Schedule 2 of consent DA 60-03-2001.

Note: The Applicant has transferred the 'Maddens Plains' site into the National Parks estate as a Strategic Biodiversity Offset for both the Dendrobium Mine and Bulli Seam Operations Project. Following consultation with BCD and WaterNSW, the Department has certified the conservation values of the land in the Maddens Plains site.

### Performance Measures for Area 3B

13. The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 1, to the satisfaction of the Secretary.

Table 1: Subsidence Impact Performance Measures

<b>Swamps</b>	
Swamps 1a, 1b, 5, 8, 11, 14 and 23	Minor environmental consequences including: <ul style="list-style-type: none"> <li>• <i>negligible</i> erosion of the surface of the swamps;</li> <li>• <i>minor</i> changes in the size of the swamps;</li> <li>• <i>minor</i> changes in the ecosystem functionality of the swamp;</li> <li>• <i>no significant</i> change to the composition or distribution of species within the swamp; and</li> <li>• <i>maintenance or restoration</i> of the structural integrity of the bedrock base of any significant permanent pool or controlling rockbar within the swamp.</li> </ul>
Swamps 3, 4, 10, 13, 35a and 35b	No significant environmental consequences beyond predictions in the Subsidence Management Plan (2012).
<b>Watercourses</b>	
Waterfall WC-WF54	Negligible environmental consequences including: <ul style="list-style-type: none"> <li>• <i>no</i> rock fall occurs at the waterfall or from its overhang;</li> <li>• <i>no</i> impacts on the structural integrity of the waterfall, its overhang and its pool;</li> <li>• <i>negligible</i> cracking in Wongawilli Creek within 30 m of the waterfall; and</li> <li>• <i>negligible</i> diversion of water from the lip of the waterfall.</li> </ul>
Wongawilli Creek Donalds Castle Creek	Minor environmental consequences including: <ul style="list-style-type: none"> <li>• <i>minor</i> fracturing, gas release and iron staining; and</li> <li>• <i>minor</i> impacts on water flows, water levels and water quality.</li> </ul>
<b>Water storages</b>	
Avon Reservoir	Negligible environmental consequences including: <ul style="list-style-type: none"> <li>• <i>negligible</i> reduction in the quality or quantity of surface water inflows to the reservoir;</li> <li>• <i>negligible</i> reduction in the quality or quantity of groundwater inflows to the reservoir; and</li> <li>• <i>negligible</i> leakage from the reservoir to underground mine workings.</li> </ul>

Notes: These performance measures apply to Longwalls 9 to 18. The Applicant may meet the requirements of this condition either by avoidance, mitigation or remediation. Most swamps and watercourse features are shown on the site and key natural features plan (see Appendix 1).

### Rehabilitation

14. If the Applicant does not meet the performance measures in Table 1, then following consultation with BCD, DSC, WaterNSW and the Resources Regulator, the Secretary may issue the Applicant with a direction in writing to undertake actions or measures to mitigate or remediate subsidence impacts and/or associated environmental consequences. The Applicant must implement the direction in accordance with its terms and requirements, in consultation with the Secretary and relevant agencies.
15. The Applicant must undertake remediation programs for WC21 and Donalds Castle Creek, to the satisfaction of the Secretary.

Note: Following consultation with BCD, WaterNSW and Resources Regulator, the Department has approved a Remediation Program for WC21. The Department has also requested that the Applicant prepare a remediation program for Donalds Castle Creek in consultation with these agencies.

### Watercourse Impact Monitoring, Management and Contingency Plan

16. The Applicant must implement the most recently approved Watercourse Impact Monitoring, Management and Contingency Plan for Area 3B prepared under condition 4 of Schedule 3 of the development consent (DA 60-

03-2001) to provide for achievement of the performance measures listed in Table 1 in consultation with WaterNSW and to the satisfaction of the Secretary.

*Note: Additional specific requirements for inclusion in the Watercourse Impact Monitoring, Management and Contingency Plan are included in Schedule 4.*

### **Swamp Impact Monitoring, Management and Contingency Plan**

17. The Applicant must implement the most recently approved Swamp Impact Monitoring, Management and Contingency Plan for Area 3B prepared under condition 6 of Schedule 3 of the development consent (DA 60-03-2001) to provide for achievement of the performance measures listed in Table 1 in consultation with WaterNSW and to the satisfaction of the Secretary.

*Note: Additional specific requirements for inclusion in the Swamp Impact Monitoring, Management and Contingency Plan are included in Schedule 4.*

### **Groundwater Model**

18. The Applicant must regularly review and update the Area 3B Groundwater Model to the satisfaction of the Secretary. The model must:
- include detailed consideration of surficial aquifers, swamps and watercourses;
  - include all available data on groundwater levels;
  - model baseflow contributions for all sub-catchments from baseline (i.e. prior to the extraction of Longwall 9) until 30 years post-mining, using 5-yearly increments;
  - provide adequate water table contour plots, drawdown plots and pore pressure vertical section plots for predicted and observed conditions;
  - take into consideration the findings of any independent report on groundwater commissioned by the Department, any advice from the Independent Expert Panel and the Mining Panel, and the report required under condition 19(c) of this approval; and
  - be peer reviewed by a suitably qualified, experienced and independent expert, who is approved by the Secretary.

### **Groundwater Monitoring and Height of Cracking**

19. The Applicant must undertake a comprehensive program of groundwater monitoring and assessment, including:
- undertaking detailed geotechnical and hydrological investigations of the height of connective cracking in Longwalls 6 to 12, prior to the extraction of Longwall 14;
  - installing a combination of extensometers, time domain reflectometry and/or multi-level piezometers directly above Longwalls 14, 15, 16 and 17 in consultation with WaterNSW and BCD, prior to the extraction of each longwall;
  - engaging a suitably qualified, experienced and independent expert, who is approved by the Secretary, to update and submit a report to the Department prior to the extraction of each of Longwalls 14 to 18, unless otherwise agreed by the Secretary, which includes:
    - a model describing the measured height of connective cracking;
    - detailed predictions of the height of cracking for Longwalls 14 to 18, and associated impacts on sensitive surface features, including watercourses, swamps and Avon Reservoir;
    - an analysis of the extent of surface cracking and potential connections with horizontal partings; and
    - consideration of the findings and recommendations of any independent report on groundwater commissioned by the Department and any advice from the Independent Expert Panel and the Mining Panel; and
  - undertaking an assessment of the height of connective fracturing and the extent of surface cracking before and after the extraction of Longwalls 14, 15, 16, 17 and 18;
- to the satisfaction of the Secretary.

### **Swamp Rehabilitation Research Program**

20. The Applicant must prepare and implement a Swamp Rehabilitation Research Program to the satisfaction of the Secretary. This program must:
- be prepared in consultation with BCD, WaterNSW and DRE;
  - be submitted by 31 October 2013 to the Secretary for approval;
  - investigate methods to rehabilitate swamps subject to subsidence impacts and environmental consequences within Areas 3A and 3B, with the aim of restoring groundwater levels and groundwater recharge response behaviour to pre-mining levels;
  - establish a staged field trial (for a 5-year duration or longer) for rehabilitation techniques at swamps that have been impacted by subsidence, commencing with Swamp 1b, including:

- drilling a series of piezometers adjacent to targeted swamps to characterise groundwater levels and the bedrock fracture network;
  - undertaking electrical resistivity tomography surveys; and
  - undertaking a detailed evaluation of the success of the first stage of the trial, prior to the commencement of further stages;
- (e) include the engagement of a suitably qualified, experienced and independent expert, who is approved by the Secretary in consultation with BCD, to prepare and submit a report to the Department and BCD on the local and regional impacts of mining at the mine on the Giant Dragonfly and the Littlejohns Tree Frog;
- (f) include a trial of electrical resistivity tomography before and after the extraction of Longwalls 14 and 15 to detect changes in groundwater near the surface (including Swamps 13 and 14) and at deeper levels, with calibration against piezometer data over time;
- (g) provide for the expenditure of at least \$3.5 million over this period; and
- (h) include a schedule for subsequent trials, development of work plans and ongoing reporting.

*Note: Previous requirements to implement a trial of directional drilling and grouting underneath targeted swamps have been removed from paragraph (d) of this condition.*

21. By 31 December 2021, the Applicant must review its Swamp Rehabilitation Research Program and submit a report of the Program to the Secretary which includes a:
- (a) full reconciliation of funds invested;
  - (b) discussion of field trials and other activities undertaken;
  - (c) review of lessons learnt and summary of key findings; and
  - (d) consideration and discussion of any ongoing or additional research opportunities and commitments.

### **Area 3C Mine Layout and Monitoring Program**

22. By 30 June 2018, and prior to the commencement of any longwall gateroad development in Area 3C, the Applicant must submit the:
- (a) proposed mine layout and mining geometry for Area 3C; and
  - (b) proposed baseline monitoring program for Area 3C, for approval by the Secretary.

### **Regular Reporting**

23. By 30 September 2018, and every 4 months thereafter, the Applicant must submit a summary report to the Secretary which provides a:
- (a) consolidated summary of the monitoring results gathered during each 4-month period;
  - (b) tracks compliance with the water performance measures listed in Table 1 of this approval;
  - (c) details any actions undertaken in the period to investigate any exceedances of predictions in the previous Subsidence Management Plans and the Subsidence Management Plan (2020) and any reported Level 2 or Level 3 Triggers in the Trigger Action Response Plans; and
  - (d) accurately records the mining seam height during the period;

### **Independent Environmental Audit**

24. The Applicant must ensure that the audit team for the Independent Environmental Audit, required under condition 6 of Schedule 8 of the development consent (DA 60-03-2001), includes suitable experts in the fields of mine subsidence impacts and remediation, upland swamps, and stream hydrology and water quality; and carries out an extensive audit of the impacts of mining in Area 3B, and the efficacy of the Biodiversity Offset Strategy.

## SCHEDULE 4 – CONDITIONS GOVERNING INDIVIDUAL LONGWALLS

### LONGWALL 12

#### Groundwater Monitoring

1. Prior to the extraction of Longwall 12, the Applicant must:
  - (a) undertake detailed geotechnical and hydrological investigations of the height of cracking in Longwalls 6 to 10; and
  - (b) submit a report to the Department, including:
    - a model describing the measured height of cracking across Longwalls 6 to 10; and
    - detailed predictions of the height of cracking for Longwalls 11 to 19;to the satisfaction of the Secretary.

### LONGWALLS 14-15

#### Groundwater Model

2. By 31 October 2013, the Applicant must review the Area 3B Groundwater Model to the satisfaction of the Secretary. The revised model must:
  - (a) include detailed consideration of surficial aquifers, swamps and watercourses;
  - (b) include all available data on groundwater levels; and
  - (c) model baseflow contributions for all sub-catchments from baseline (i.e. prior to the extraction of Longwall 9) until 30 years post-mining, using 5-yearly increments.
3. Prior to the extraction of Longwall 14, unless otherwise agreed by the Secretary, the Applicant must review and update the groundwater model to the satisfaction of the Secretary. The updated model must:
  - (a) provide adequate water table contour plots, drawdown plots and pore pressure vertical section plots for predicted and observed conditions;
  - (b) take into consideration the findings of any independent report on groundwater commissioned by the Department, and the report required under condition 19(c) of this approval; and
  - (c) be peer reviewed by a suitably qualified, experienced and independent expert, who is approved by the Secretary.

#### Revision of Environmental Management Strategy

4. Prior to the extraction of each of Longwalls 14 and 15, the Applicant must review and revise the Environmental Management Strategy required under condition 1 of Schedule 8 of the development consent (DA 60-03-2001).

### LONGWALL 16

#### Watercourse Impact Monitoring, Management and Contingency Plan

5. Prior to the extraction of Longwall 16, the Applicant must review the Watercourse Impact Monitoring, Management and Contingency Plan for Area 3B prepared under condition 4 of Schedule 3 of the development consent (DA 60-03-2001) to provide for achievement of the performance measures listed in Table 1 in consultation with WaterNSW, to the satisfaction of the Secretary. The revised plan must include:
  - (a) a program of long-term groundwater monitoring, to be developed in consultation with WaterNSW, to monitor groundwater levels at specific locations and depths until post-mining groundwater levels have stabilised;
  - (b) flow gauges with sufficient low flow accuracy in watercourses LA2, LA3 and WC12; and
  - (c) a monitoring and management strategy for waterfall WCWF54, which considers adaptive management of mining to avoid impacts to the waterfall.

#### Swamp Impact Monitoring, Management and Contingency Plan

6. Prior to the extraction of Longwall 16, the Applicant must review the Swamp Impact Monitoring, Management and Contingency Plan for Area 3B prepared under condition 6 of Schedule 3 of the development consent (DA 60-03-2001) to provide for achievement of the performance measures listed in Table 1 in consultation with WaterNSW, to the satisfaction of the Secretary. The revised plan must include suitable revisions to the Trigger Action Response Plan, which take into consideration the revised groundwater model predictions and advice from the Independent Expert Panel.

## **Groundwater Model**

7. Prior to the extraction of Longwall 16, unless otherwise agreed by the Secretary, the Applicant must review and update the Area 3B Groundwater Model to the satisfaction of the Secretary. The updated model must:
  - (a) provide adequate water table contour plots, drawdown plots and pore pressure vertical section plots for predicted and observed conditions;
  - (b) take into consideration the findings of any independent report on groundwater commissioned by the Department, or advice from the Independent Expert Panel, and the report required under condition 19(c) of Schedule 3; and
  - (c) be peer reviewed by a suitably qualified, experienced and independent expert, who is approved by the Secretary.

## **LONGWALL 17**

### **Limits on Approval**

8. The Applicant must set back the installation gateroad of Longwall 17 a minimum distance of 300 metres from the Full Supply Level of the Lake Avon reservoir.
9. The Applicant must set back Longwall 17 at least 600 metres from the centreline of Wongawilli Creek, subject to condition 10 below.
10. The Applicant may extend Longwall 17 (ie continue extraction), but not closer than 400 metres from the centreline of Wongawilli Creek, providing it can demonstrate:
  - (a) the relevant watercourse performance measure for Wongawilli Creek (ie minor environmental consequences, see Table 1) has not been exceeded by longwall extraction and would not be exceeded by extraction of Longwall 17; and
  - (b) detailed Trigger Action Response Plans that can accurately provide early warning of potential exceedances of this performance measure are approved and in place, to the satisfaction of the Secretary.

### **Offsets**

11. The Applicant must offset the mining-induced reduction of surface water reporting to WaterNSW storages as a result of the extraction of Longwall 17, in consultation with WaterNSW and to the satisfaction of the Secretary.

Calculation of any such reduction must take into account the results of monitoring under condition 19 of Schedule 3, monitoring under condition 5 of this Schedule and modelling under condition 7 of this Schedule.
12. The Applicant must revise the Trigger Action Response Plan within the Watercourse Impact Monitoring, Management and Contingency Plan by 31 December 2019, following consultation with WaterNSW and to the satisfaction of the Secretary. The revised Trigger Action Response Plan must contain:
  - (a) clear, agreed and quantitative triggers which are directly linked to the relevant performance measures in Table 1; and
  - (b) suitable revisions to the Trigger Action Response Plan, which take into consideration loss of baseflow to Wongawilli Creek, the revised groundwater model predictions and reports produced by or other advice from the Independent Expert Panel.

### **Additional Investigations**

13. Prior to the extraction of Longwall 17, the Applicant must undertake additional investigations into:
  - (a) geological structures near bore S2436 to clarify the nature, extent and significance of monitoring data reported from that bore;
  - (b) the location and nature of the Elouera Fault, including additional surface drilling and subsequent geotechnical, geophysical and hydrogeological testing; and
  - (c) report the results of these investigations to the Secretary, WaterNSW and the DSC, to the satisfaction of the Secretary.

## **LONGWALL 18**

### **Limits on Approval**

14. The Applicant must set back the installation gateroad of Longwall 18 a minimum distance of 300 metres from the Full Supply Level of the Lake Avon reservoir.



## **Offsets**

15. The Applicant must offset the mining-induced reduction of surface water reporting to WaterNSW storages as a result of the extraction of Longwall 18, in consultation with WaterNSW and to the satisfaction of the Secretary.

Calculation of any such reduction must take into account the results of monitoring under condition 19 of Schedule 3, monitoring under condition 5 of this Schedule and modelling under condition 7 of this Schedule.

## **Mining Panel Recommendations**

16. The Applicant must prepare a plan, in consultation with WaterNSW and to the satisfaction of the Secretary, for the effective implementation of all recommendations contained in the Mining Panel's advice dated November 2020 in respect of the Subsidence Management Plan (2020).

The Applicant must not commence extraction of Longwall 18 until this plan is approved by the Planning Secretary.

The Applicant must implement this plan as approved by the Planning Secretary.

# APPENDIX 1: Mining Layout Plan

