

25 June 2015  
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Dear Paul

### **Dendrobium Area 3B SMP Condition 13 EMP**

I refer to emails 24 June 2014 and 24 June 2015 from the Manager and Principal Inspector Environment (Wollongong) seeking an updated EMP to take into account revisions to the Dendrobium Swamp and Watercourse Plans.

The Plans have been updated in accordance with discussions with the Department of Planning and you. Final Plans including all maps, figures and TARPs have been provided.

The revised EMP (attached) consists of:

- Attachment A – Revised EMP
- Attachment B – EMP Revision Checklist
- Attachment C - SMP Approval Condition 13 EMP Checklist

Illawarra Coal looks forward to receiving final approval for the EMP. The current approval for the EMP expires 30 June 2015 so your urgent attention to this is requested. If you would like further information or wish to discuss the EMP or Plans further please contact the undersigned.

Yours sincerely



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# Attachment A – Revised EMP

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## Background

Illawarra Coal (IC) operates underground coal mining operations at Dendrobium Mine, located in the Southern Coalfield of New South Wales. Longwalls from the Wongawilli Seam are currently being extracted from Area 3B.

BHPBIC was granted Development Consent by the NSW Minister for Planning for the Dendrobium Project on 20 November 2001. In 2007 BHPBIC proposed to modify its underground coal mining operations and the NSW Department of Planning advised that the application for the modified Area 3 required a modification to the original consent. The application followed the process of s75W of the Environmental Planning and Assessment Act 1979 (EP&A Act) and required the submission of a comprehensive Environmental Assessment.

On 8 December 2008, the Minister for Planning, approved a modification to DA\_60-03-2001 for Dendrobium Underground Coal Mine and associated surface facilities and infrastructure under Section 75W of the EP&A Act.

BHPBIC submitted the Dendrobium Area 3B SMP to the Director General Trade and Investment and the Director General Planning and Infrastructure 4 October 2012. Conditional approval was received from the Director General Trade and Investment 5 February 2013. Condition 13 of that approval requires the submission of an Environmental Management Plan. The Acting Director Environmental Sustainability and Landuse approved the SMP as the Environmental Management Plan 5 February 2013. This approval requires the Environmental Management Plan be revised to ensure compliance with conditions of the SMP Approval.

BHPBIC provided revised versions of the Swamp Impact Monitoring Management and Contingency Plan (SIMMCP) and Watercourse Impact Monitoring Management and Contingency Plan (WIMMCP) to the Department 5 June 2014. These documents have been revised a number of times to take into account the SMP Approval Conditions and multiple and ongoing submissions from Government Agencies.

The Department has provided a number of extensions for the EMP with the latest being til 30 June 2015. This document provides the revised Sections 16 to 21 of the EMP.

## Section 16 - Groundwater

The Area 3 Modification Conditions require the SMP to include a Groundwater Monitoring Program under Condition 13 Schedule 3. A groundwater monitoring program is currently being implemented at Dendrobium Mine and is in accordance with the Dendrobium Area 3B SMP Groundwater Management Plan and the Area 3 Modification Conditions.

The Groundwater Monitoring and Management Plan (Coffey 2012), is provided as Attachment C Volume 1 of the Area 3B SMP.

BHPBIC commissioned the development of a regional-scale numerical groundwater flow model in support of the approval process for mining of Area 3B at Dendrobium Mine.

The Area 3B SMP approval conditions stipulated further development of the numerical model by 31 October 2013. This condition required:

- Groundwater Model Condition 13 - By 31 October 2013, the Applicant shall review the Area 3B Groundwater Model to the satisfaction of the Director-General. The revised model must:
  - include detailed consideration of surficial aquifers, swamps and watercourses;
  - include all available data on groundwater levels; and
  - 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.
- The Applicant must address the following water storage performance measures for Avon Reservoir including:
  - negligible reduction in the quantity of surface water inflows to the reservoir;
  - negligible reduction in the quantity of groundwater inflows to the reservoir; and
  - negligible leakage from the reservoir to underground mine workings.
- The Applicant shall ensure the development does not result in reduction (other than negligible reduction) in the quality or quantity of surface water or groundwater inflows to Lake Cordeaux or Lake Avon or surface water inflow to the Cordeaux River at its confluence with Wongawilli Creek.

These SMP conditions were able to be addressed through enhancing the Area 3B groundwater model, as follows:

- Addition of a thin (2 m thick) superficial layer to represent the swamp deposits where they exist, and regolith otherwise;
- Inclusion of swamp and other 'shallow' groundwater level data for calibration, which were not utilised by Coffey (2012). The model was re-calibrated to these data;
- Interchange of the MODFLOW Drain boundary condition, which was previously used to simulate creeks and rivers, for the Stream Flow Routing boundary condition. This was used to calibrate modelled stream flows to gauged data. It also provided the utility for simulating potential impacts of mining Area 3B on swamps, creeks and rivers, as required by the SMP approval conditions, and helped in achieving adequate calibration to the shallow (swamp) groundwater level data.

The enhanced model was validated at all project stages against the reported model outputs of Coffey (2012), thereby ensuring as much consistency as possible between the revised model and that of Coffey (2012).

The revised model (HydroSimulations 2014) adopted a simulated height of fracture using the Ditton (2012) method. The model will be further enhanced in 2014/2015 using time-varying material properties to simulate fracturing height and the current (Longwall 9) height of fracture research at Dendrobium Mine.

Shallow groundwater monitoring has been updated for Dendrobium Area 3B. These changes have been implemented to address the Area 3B SMP approval conditions. The revised shallow

groundwater monitoring program is described in Section 2.7 of the WIMMCP and SIMMCP with detailed plans of the monitoring locations provided as Figures 2-2 to 2-24 of the SIMMCP.

Section 3.2 of the WIMMCP and SIMMCP addresses the issue of connective fracturing impacting groundwater and Section 3.3 of the Plans address the potential for fracturing beneath watercourses and swamps and the resultant impact on groundwater. Section 5 of the Plans addresses management and rehabilitation of groundwater in respect of watercourses and swamps.

The groundwater monitoring program was assessed against the requirements of the SCA Guideline “The Design of Hydrological and Hydrogeological Monitoring Programs to Assess the Impact of Longwall Mining on Water Resources”. The key objectives of the Guideline are:

- To obtain accurate and representative monitoring data to assess and understand the environmental consequences of subsidence impacts on water resources (surface water and groundwater).
- To quantify if there is any net loss of surface flow or water quality deterioration at the end of the hydrological flow system.
- To determine the extent of any groundwater level declines and whether groundwater flow paths have changed.
- To determine the extent of any impact, laterally and with depth.
- To determine whether the hydrological and hydrogeological systems will return to baseline (pre- mining) conditions and the rate of that recovery.
- To evaluate the immediate and long-term effectiveness of remediation techniques.

These objectives are met with the proposed groundwater program as described in the SMP Section 16, SIMMCP Sections 2 and 5 and the WIMMCP Sections 2 and 5.

A search of the Murray Darling Basin Authority’s website could not locate the “Groundwater Quality Guideline” or “Groundwater Sampling and Analysis Field Guideline”. The groundwater quality monitoring program as described in SMP Section 16, SIMMCP Section 2 and WIMMCP Section 2 was developed by experts in this field and is conducted by appropriately trained and competent persons as described in Section 7 of the WIMMCP and SIMMCP.

The “Groundwater Sampling and Analysis – A Field Guide” published by Geosciences Australia was reviewed and the Groundwater Monitoring Program is generally in accordance with the requirements of this guideline.

The “Australian Groundwater Modelling Guidelines” published by the National Water Commission was reviewed and the Groundwater Model for Dendrobium is generally in accordance with the requirements of this guideline.

## **Section 17 – Surface Water**

Surface water monitoring and management programs have been implemented for Dendrobium Areas 1, 2 and 3 for the management of any mining induced subsidence. The Water Monitoring and Management Plan for Area 3B is included as part of Attachment B Volume 1 of the Area 3B SMP.

Pool water level and flow monitoring sites have been established in Dendrobium Area 3B for monitoring before, during and after mining and the program is described in Section 2.6 of the WIMMCP (Figure 2-25 to Figure 2-36). Water level/flow gauges and data loggers are installed at key stream flow monitoring sites which are shown in Figure 2-35 of the WIMMCP.

Data from the monitoring is used to compare differences in pool water level within swamps and streams before and after mining. Sites that will not be mined under are also monitored to provide a comparison of mined and not mined under sites during different climatic conditions.

Flow monitoring sites are installed downstream of the mining area to assess any changes in surface flow from a catchment resulting from the mining. Due to the general requirement to not install V notch weirs or other large artificial flow controls within the catchment areas, the sites are predominately installed using natural flow control features such as rockbars. For this reason, the monitoring program focuses largely on recession, baseflow and small storm periods where the flow data is of sufficient quality i.e. lies below the upper limit of validity of the rating curve.

Hydrologic modelling and assessments in the area have used the Free University of Amsterdam non-linear hydrologic model RUNOFF2005. The model is similar to other popular lumped-parameter models e.g. the Australian SIMHYD. This model has been successfully used for Native Dog, Sandy, Wongawilli and Donalds Castle Creeks and a large number of their sub-catchments as shown in Figure 2-36 of the WIMMCP. Hydrologic assessment will continue to be based on application of the RUNOFF2005 model or similar as circumstances require.

The Area 3B SMP Approval Conditions and in particular the performance measures for surface water are addressed in Sections 3.6 and 3.7 of the WIMMCP.

The surface water monitoring program was assessed against the requirements of the SCA Guideline “The Design of Hydrological and Hydrogeological Monitoring Programs to Assess the Impact of Longwall Mining on Water Resources”. The objectives of this Guideline are generally met with the proposed surface water program as described in the SMP Section 17, SIMMCP Sections 2 and 5 and the WIMMCP Sections 2 and 5.

## **Section 18 – Landscape**

Landscape features within Area 3B are being monitored and managed as outlined in the SMP, SIMMCP and WIMMCP.

The monitoring and management for Dendrobium Area 3B is based on the monitoring and management implemented for Areas 1, 2 and 3A and address the requirements of the Area 3B SMP Approval Conditions. The monitoring includes pre-mining baseline monitoring of Area 3B sites, monitoring of sites above the panel currently being mined and previously mined under sites.

The aim of the monitoring is to record any cracking, rock falls, erosion and/or sedimentation impacts resulting from subsidence. Baseline surveys are undertaken to establish the existing condition of the monitoring sites prior to mining. This data is then used as a reference when measuring impacts during and after mining.

The monitoring program will be implemented throughout the period of mining, and for a two year period after mining, or other agreed period. The monitoring measures subsidence impacts so that corrective management actions (CMAs) can be implemented as required.

Slopes within Area 3B have been mapped according to their gradients and are identified on Drawing 9 in MSEC (2012) as Attachment A of the Area 3B SMP. Valley infill swamps such as Swamps 1a, 5, 8, 10, 14, 23, 35a and 35b, are located along the valley floors of streams and are characterised by steeper gradients than headwater swamps which occur on low sloped areas of weathered Hawkesbury Sandstone where hillslope aquifers exist. Monitoring of landscape features such as slopes and swamps is undertaken in Area 3B as identified in Figure 2-37 of the WIMMCP and SIMMCP.

The monitoring undertaken includes the following sites:

- Sites based on an assessment of risk of impact;
- Areas of steep slopes;
- Rock outcrops;
- Any other sites where impacts have been previously observed that warrant follow-up inspection (i.e. rockfalls and soil cracking); and
- The general areas above the current mining location.

The monitoring sites include comprehensive investigation as described below, and the wider area around the monitoring site is subject to inspection during monitoring events.

Observations on landform and land surface at the monitoring sites are recorded generally in accordance with the Australian Soil and Land Survey, Field Handbook (2<sup>nd</sup> Edition), to take into account the nature of subsidence impacts.

For each watercourse monitoring site (including those associated with swamps), a range of measurements and observations of the watercourse characteristics are recorded along with established photo points. Measurements and observations incorporate the relevant parts of the Field Handbook, and relevant parts of the Riparian-Channel-Environmental Assessment (RCE) methodology.

Most of the surface of Area 3B has been identified as highly weathered Hawkesbury Sandstone outcrops and sandstone derived-soils. This soil landscape has been identified to have high to extreme erosion susceptibilities to concentrated flows. This results in potential flow-on effects to slope stability and erosion from any cracking resulting from subsidence (Ecoengineers 2012).

Studies undertaken by Earth Tech (2005) identified that if shear stress thresholds are not exceeded then swamps are most likely to remain intact. Swamps at risk of erosion include those that have vegetation of poor condition or those that lie on higher order streams. Tomkins and Humphrey (2006) concluded that the occurrence of wildfires can also lead to erosion of swamps. Landscape monitoring of slopes and swamps is undertaken in Area 3B to identify any erosion of the surface (SIMMCP and WIMMCP Figure 2-37).

The Subsidence Monitoring Program for Dendrobium Area 3B has been approved by the Principal Subsidence Engineer. An extensive survey network has been implemented with some emphasis

given to swamps and Wongawilli and Donalds Castle Creeks. Swamps are monitored for relative and absolute horizontal and vertical movements.

Inspections of the mining area will be undertaken at regular intervals, during active subsidence. In addition to erodibility, these observations aim to identify any surface cracking, surface water loss, soil moisture changes, vegetation condition changes, and slope and gradient changes. The observational monitoring program will also include specific attention to the condition of controlling rockbars and will incorporate both impacts sites (Figure 2-2 to Figure 2-11 of the SIMMCP and Figure 2-2 to Figure 2-11 and Figure 2-25 to Figure 2-32 of the WIMMCP) and reference sites (Figure 2-12 to Figure 2-24 of the SIMMCP and Figure 2-12 to Figure 2-24 and Figure 2-33 to Figure 2-35 of the WIMMCP).

The Area 3B SMP Approval Performance Measures relating to erosion of the landscape is addressed in Section 3.4 of the WIMMCP and SIMMCP.

## **Section 19 – Aquatic Ecology**

The aquatic ecological values within Dendrobium Area 3 are detailed in the SIS (Biosis 2007). Cardno Ecology Lab (CEL) has undertaken a revised assessment and recommended management measures for aquatic ecology for Area 3B and this is provided as Attachment E Volume 1 of the Area 3B SMP.

Aquatic ecology monitoring includes direct measures of aquatic flora and fauna as well as biophysical measures. Aquatic ecology monitoring sites for Area 3B are shown in Figure 2-57 of the WIMMCP. These sites are located in watercourses that contain “significant” or “moderate” aquatic habitat and are suitable for AUSRIVAS assessment (i.e. are at least 100 m long).

During the baseline study the condition of the aquatic habitat at each site was assessed using a modified version of RCE methodology.

At each site where instream aquatic macrophytes are present, their species composition and total area of coverage is recorded. Features such as the presence of algae or flocculent on the surface of macrophytes are also noted.

Two methods are used to sample aquatic macroinvertebrates: the AUSRIVAS protocol for NSW streams (Turak et al. 2004) and artificial aquatic macroinvertebrate collectors, a quantitative method developed by CEL for freshwater environmental impact assessment.

In consideration of the possible but unlikely presence of two threatened macroinvertebrate species (Adams Emerald Dragonfly and Sydney Hawk Dragonfly) within the SMP Area, all dragonfly larvae collected in invertebrate sampling are identified to the taxonomic level of family. Any individuals of the genus Austrocorduliidae or Gomphomacromiidae are identified to genus and species level if possible, and if there is any confusion, specimens are referred to a specialist taxonomist. The confirmed presence of a threatened species triggers further investigation into this species and its habitats in relation to potential subsidence impacts.

Fish are sampled using a back-pack electrofisher and baited traps. At each site, eight baited traps are deployed in a variety of habitats such as amongst aquatic plants and snags, in deep holes and

over bare substratum. The back-pack electrofisher is operated around the edge of pools and riffles. At each site, four, two minute shots are performed.

The potential for impacts to aquatic ecology within Dendrobium Area 3B is discussed in Section 3.5 of the WIMMCP. Where there are changes to watercourse hydrology that are large and persistent there is likely to be an aquatic ecology response. Aquatic species which do not have life-cycles adapted to temporary loss of aquatic habitat are likely to be relatively susceptible to changes in pool water level. In comparison, riparian vegetation is likely to be relatively resilient to short term changes in groundwater level and soil moisture, demonstrated by the persistence of these vegetation communities during extended periods of drought.

Rehabilitation methods to reinstate significant pool water habitat is described in Section 5 of the WIMMCP.

## Section 20 – Terrestrial Ecology

The terrestrial ecological values within Area 3 of Dendrobium Mine have been assessed in the Environmental Assessment and Species Impact Statement (Biosis, 2007a). A revised assessment of the Area 3B ecological values and recommendations for management was undertaken by Niche (2012) and is provided as Attachment D Volume 1 of the Area 3B SMP.

A monitoring program designed to detect potential impacts to ecology and ecosystem function from subsidence has been implemented for Area 3B. The monitoring program is based on a Before After Impact Control (BAIC) design with sampling undertaken at impact and control locations prior to the commencement of extraction, during extraction and after extraction.

Over two years of baseline data is available for Area 3B and this data indicates that the habitat in this area is relatively undisturbed. There is sufficient baseline data to enable the detection of changes to ecology associated with mining related impacts.

The study is described in Section 2.11 of the WIMMCP and SIMMCP and focuses on flora, fauna and ecosystem function of swamps and watercourses and is measured via the following attributes:

- The size of the swamps and the groundwater dependent communities contributing to the swamps;
- The composition and distribution of species within the swamps;
- Presence of threatened species (including Macquarie perch, Littlejohn's tree frog, Giant burrowing frog, Adams emerald dragonfly and Sydney hawk dragonfly).

Detailed mapping of the boundaries of the swamps and vegetation sub-communities has been undertaken for Swamps 1a, 1b, 5, 8, 11, 13, 14 and 23 (Figure 2-42 to Figure 2-50 of the SIMMCP). Three reference swamps were selected for mapping, including Swamp DC10 (Swamp 85), Swamp 15a(1) and 33 (Figure 2-51 to Figure 2-53 of the SIMMCP). These swamps were selected based on size, similar vegetation sub-communities, geographic proximity and a lack of previous mining near them.

Mapping will be replicated following mining and on an ongoing basis as required based on the results of observational monitoring. This will allow direct comparison of changes in the size of



upland swamps as well as the distribution of vegetation sub-communities within upland swamps. It is envisaged that this monitoring will be ongoing for up to ten years or as required.

Any change in the total area of a swamp will be compared to its pre-mining area and any change in area of reference swamps.

Quantitative flora monitoring within Area 3B is described in Section 2.11.3 of the SIMMCP, including Swamps 1a (Figure 2-54), 1b (Figure 2-55) and 5 (Figure 2-56) along with continued monitoring of Swamp 11 (Figure 2-57), which has a long-term monitoring record. Control sites have been established at Gallahers Creek Swamp (Swamp 88 - Figure 2-58), Fire Trail 15e Swamp (Swamp 87 - Figure 2-59), Fire Trail 6x Swamp (Swamp 86 - Figure 2-60), Swamp 15A(1) (Figure 2-61), Swamp 22 (Figure 2-62) and Swamp 33 (Figure 2-63). An initial round of monitoring was completed in summer 2012. The second round of monitoring was undertaken in autumn 2013.

Transects consisting of thirty 0.5m X 0.5m quadrats have been established in upland swamps. The monitoring will record:

- Presence of all species within each quadrat;
- Percentage foliage cover and vegetation height;
- Observations of dieback or changes in community structure; and
- Photo point monitoring at each transect.

Data will be analysed according to the BACI design. Statistical analyses of species richness and species diversity between control and impact sites is used to determine whether there are statistically significant differences between these sites. This analysis will be compared with baseline data collected prior to mining to assist in determining if these differences could be a result of mining or natural variation in vegetation communities.

Standardised transects in potential breeding habitat for the threatened frog species Littlejohn's tree frog and Giant burrowing frog have been established in Dendrobium Area 3B. These repeatable surveys enable direct comparison of the numbers of individuals recorded at each site from one year to the next.

The frog monitoring program is described in the WIMMCP for Creeks DC13 (Figure 2-42), DC(1) (Figure 2-43) and WC21 (Figure 2-44), LA4A (Figure 2-45), ND1 (Figure 2-46) and WC15 (Figure 2-47). Monitoring is also undertaken away from mining to act as control sites for the mining versus non-mining comparative assessment (Figure 2-48 to Figure 2-56).

Baseline surveys commenced in winter 2013 and included counts of frogs along each transect, an assessment of pools being used for breeding and counts of tadpoles and egg masses in each pool. This will enable a quantitative as well as qualitative assessment of breeding habitat for these species prior to, during and after mining.

Observation data will also be collected as part of the monitoring program. Locations where significant changes have been observed (e.g. drainage of pools) will be mapped, documented and reported.

The potential for impacts to terrestrial ecology within Area 3B is described in Section 3.5 of the SIMMCP. Where impacts are observed rehabilitation measures are described in Section 5 of the SIMMCP.

## **Section 21 – Cultural Heritage**

The Subsidence Archaeological Monitoring and Management Programs for Dendrobium Areas 1, 2, 3A and 3B were developed in consultation with Registered Aboriginal groups. The cultural heritage monitoring and management requirements for Areas 1, 2, 3A and 3B are provided in Attachment F Volume 1 of the Area 3B SMP.

There are 23 sites in Area 3B that require management in accordance with the Dendrobium Consent. All of these sites are either sandstone shelters with art or sandstone shelters with deposit. The sites are monitored before, during and after longwall mining. Refer to Figure 21-1 of the Area 3B SMP for the location of these sites.

The management plans and monitoring methodology have been reviewed and no revisions are required. No new sites have been identified since the Area 3B SMP was lodged and the Area 3B SMP Approval Conditions have not changed performance measures or management requirements for the sites.

# Attachment B – EMP Revision Checklist

SMP/EMP Section	Revised to address	Reference
Section 16 Groundwater	Area 3B SMP Approval Condition 9: Performance measures for water storages: “Negligible environmental consequences: negligible reduction in the quality or quantity of groundwater inflows to the reservoir”	<ul style="list-style-type: none"> <li>• Revised EMP Section 16 Groundwater</li> <li>• Revision of the Dendrobium Numerical Groundwater Model</li> <li>• SIMMCP Section 3.2 and 3.6</li> <li>• WIMMCP Section 3.2, 3.6 and 3.7</li> </ul>
	Area 3B SMP Approval Condition 13: Groundwater Model: “By 31 October 2013, the Applicant shall review the Area 3B Groundwater Model to the satisfaction of the Director-General”	<ul style="list-style-type: none"> <li>• Revised EMP Section 16 Groundwater</li> <li>• Revision of the Dendrobium Numerical Groundwater Model</li> </ul>
	Additional shallow groundwater monitoring requested by Government Agencies	<ul style="list-style-type: none"> <li>• Revised EMP Section 16 Groundwater</li> <li>• SIMMCP Section 2.7</li> <li>• WIMMCP Section 2.7</li> </ul>
Section 17 Surface Water	Area 3B SMP Approval Condition 9: Performance measures: <ul style="list-style-type: none"> <li>• Waterfall WC-WF54: “Negligible diversion of water from the lip of the waterfall”</li> <li>• Wongawilli and Donalds Castle Creeks: “Minor environmental consequences including: minor fracturing, gas release and iron staining; minor impacts on water flows, water levels and water quality”</li> <li>• Avon Reservoir: “Negligible reduction in the quality or quantity of surface water inflows to the reservoir”</li> </ul>	<ul style="list-style-type: none"> <li>• Revised EMP Section 17 Surface Water</li> <li>• Revision of the Dendrobium Numerical Groundwater Model</li> <li>• SIMMCP Sections 2.6 and 2.8</li> <li>• WIMMCP Sections 2.6, 2.8, 3.6 and 3.7</li> </ul>
Section 18 Landscape	Update to account for completion of the baseline assessments for the Landscape Monitoring Program  Area 3B SMP Approval Condition 9: Performance measures: <ul style="list-style-type: none"> <li>• Swamps: “Minor environmental consequences including: negligible erosion of the surface of the swamps; maintenance or restoration of the structural integrity of the bedrock base of</li> </ul>	<ul style="list-style-type: none"> <li>• Revised EMP Section 18 Landscape</li> <li>• SIMMCP Sections 2.5, 2.9, 2.10, 2.12, 3.3, 3.4, 3.6, 4 and 5</li> <li>• WIMMCP Sections 2.5, 2.9, 2.10, 2.12, 3.4, 3.7, 4 and 5</li> </ul>

	<p>any significant permanent pool or controlling rockbar within the swamp”</p> <ul style="list-style-type: none"> <li>Waterfall WC-WF54: “Negligible environmental consequences including: no rock fall occurs at the waterfall or from its overhang; no impacts to the structural integrity of the waterfall, its overhang and its pool; negligible cracking in Wongawilli Creek within 30m of the waterfall; negligible diversion of water from the lip of the waterfall”</li> </ul>	
Section 19 Aquatic Ecology	Update to account for completion of the baseline assessments for aquatic ecology	<ul style="list-style-type: none"> <li>Revised EMP Section 19 Aquatic Ecology</li> <li>SIMMCP Sections 2.11, 3.5 and 5</li> <li>WIMMCP Sections 2.11, 3.5 and 5</li> </ul>
Section 20 Terrestrial Ecology	Update to account for completion of the baseline assessments for terrestrial ecology	<ul style="list-style-type: none"> <li>Revised EMP Section 20 Terrestrial Ecology</li> <li>SIMMCP Sections 2.11, 3.5 and 5</li> <li>WIMMCP Sections 2.11, 3.5 and 5</li> </ul>
Section 21 Cultural Heritage	Reviewed and no changes required	<ul style="list-style-type: none"> <li>Revised EMP Section 21 Cultural Heritage</li> </ul>
SMP (Trade and Investment) Condition 13	The Leaseholder must submit to the Director Environmental Sustainability and Land Use for approval an EMP	<ul style="list-style-type: none"> <li>SMP submitted 4 October 2012</li> <li>SIMMCP submitted 5 June 2014</li> <li>WIMMCP submitted 5 June 2014</li> <li>Revised SIMMCP submitted 22 June 2015</li> <li>Revised WIMMCP submitted 22 June 2015</li> <li>Revised EMP submitted 25 June 2015</li> </ul>
	<p>The EMP is to include:</p> <ul style="list-style-type: none"> <li>a detailed monitoring program</li> <li>trigger levels for subsidence impacts that require actions and responses</li> <li>the procedures that would be followed in the event that the monitoring indicates an exceedance of trigger levels</li> <li>measures to mitigate, remediate and/or compensate any identified impacts</li> <li>a protocol for the notification of identified exceedances of the trigger levels</li> </ul>	<ul style="list-style-type: none"> <li>SMP Sections 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25 and Appendix A</li> <li>SIMMCP Sections 2, 3, 4, 5, 6 and Attachment 1</li> <li>WIMMCP Sections 2, 3, 4, 5, 6 and Attachment 1</li> <li>Revised EMP (Attachment A)</li> </ul>

	<ul style="list-style-type: none"> <li>• a contingency plan</li> </ul>	
	<p>The plan must be prepared in consultation with relevant landholders and government agencies</p>	<ul style="list-style-type: none"> <li>• SMP Section 9</li> <li>• SIMMCP Section 1.4</li> <li>• WIMMCP Section 1.4</li> <li>• Revised EMP</li> </ul>
	<p>The Plan must be consistent with Sydney Catchment Authority's draft Guidelines titled "The Design of Hydrological and Hydrogeological Monitoring Programs to Assess the Impact of Longwall Mining in SCA catchment" and the Murray Darling Basin Authority's "Groundwater Quality Guideline" and "Groundwater Sampling and Analysis Field Guideline" and the National Water Commission's "Australian Groundwater Modelling Guidelines"</p>	<ul style="list-style-type: none"> <li>• SMP Section 16</li> <li>• SIMMCP Sections 2 and 7</li> <li>• WIMMCP Sections 2 and 7</li> <li>• Revised EMP</li> </ul>
	<p>The EMP must be developed in sufficient time to allow two years data to be collected prior to extraction commencing</p>	<ul style="list-style-type: none"> <li>• SMP Sections 15, 16, 17, 18, 19, 20 and 21</li> <li>• SIMMCP Section 2</li> <li>• WIMMCP Section 2</li> </ul>

# Attachment C - Dendrobium Area 3B SMP Approval Condition 13 EMP Checklist

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The Dendrobium Area 3B EMP consists of Attachment A (EMP) and Attachment B (EMP checklist). These documents were submitted to the Department of Trade and Investment 25 June 2015. The documents which address Condition 13 of the Department's SMP approval for Dendrobium Area 3B are:

- Swamp Impact Monitoring Management and Contingency Plan (SIMMCP)
- Watercourse Impact Monitoring Management and Contingency Plan (WIMMCP)
- Groundwater Management Plan (GMP)
- Dendrobium Area 3B Subsidence Management Plan, Volume 2 - Subsidence Management Plan" (SMP)
- Revised EMP Sections 16 to 21, 25 June 2015 (EMP)

The Swamp and Watercourse Plans have been refined in consultation with Government agencies; the Trigger Action Response Plans (TARPs) in these Plans supersede parts of the TARPs in Appendix A of the Subsidence Management Plan Volume 2. The revised EMP Sections 16 to 21 summarise the refinements implemented through the Swamp and Watercourse Plans. Where applicable the EMP supersedes the original SMP Sections 16 to 21.

The table below is a EMP Checklist which provides specific reference locations for each individual aspect referred to in Condition 13.

	Groundwater (quality and quantity)	Surface Water (quality and quantity)	Swamps	Landscape (including cliffs and steep slopes)	Flora and Fauna (aquatic ecology)	Flora and Fauna (terrestrial ecology)	Heritage Sites (including Aboriginal heritage sites)
Detailed monitoring program	EMP Section 16  SMP Section 16.3  SIMMCP Sections 2.7 and 3.2  WIMMCP Sections 2.7 and 3.2  GMP Section 2	EMP Section 17  SMP Section 17.4  SIMMCP Sections 2.6, 2.8, 2.12, 3.2, 3.3 and 3.4  WIMMCP Sections 2.6, 2.8, 2.12, 3.2, 3.3, 3.4 and 3.6	EMP Sections 16, 17, 18 and 20  SMP Sections 15.4.1, 17.4, 18.3 and 20.3  SIMMCP Section 2	EMP Section 18  SMP Section 18.3  SIMMCP Sections 2.5, 2.9, 2.10, 2.12 and 3.4  WIMMCP Sections 2.5, 2.9, 2.10, 2.12 and 3.4	EMP Section 19  SMP Section 19.3  WIMMCP Sections 2.5, 2.11 and 3.5	EMP Section 20  SMP Section 20.3  SIMMCP Sections 2.5, 2.11 and 3.5  WIMMCP Sections 2.5 and 2.11	EMP Section 21  SMP Section 21.3 and 21.5
Trigger levels for subsidence impacts that require actions and responses	SMP Sections 16.4 and 22  SIMMCP Section 5.2  WIMMCP Section 5.2	SMP Sections 17.5, 17.6 and 22  SIMMCP Section 5.2  WIMMCP Section 5.2	SMP Section 22  SIMMCP Section 5.2	SMP Sections 18.4 and 22  SIMMCP Section 5.2  WIMMCP Section 5.2	SMP Sections 19.4 and 22  SIMMCP Section 5.2  WIMMCP Section 5.2	SMP Sections 20.4 and 22  SIMMCP Section 5.2  WIMMCP Section 5.2	SMP Sections 21.1, 21.4, 21.5 and 22

	GMP Section 4						
Procedure to be followed in the event that the monitoring indicates an exceedence of trigger levels	SMP Section 23  SIMMCP Sections 5.2, 5.7 and 7.1  WIMMCP Sections 5.2, 5.7 and 7.1  GMP Sections 4 and 5	SMP Section 23  SIMMCP Sections 5.2, 5.7 and 7.1  WIMMCP Sections 5.2, 5.7 and 7.1	SMP Section 23  SIMMCP Sections 5.2, 5.7 and 7.1	SMP Section 23  SIMMCP Sections 5.2, 5.7 and 7.1  WIMMCP Sections 5.2, 5.7 and 7.1	SMP Section 23  SIMMCP Sections 5.2, 5.7 and 7.1  WIMMCP Sections 5.2, 5.7 and 7.1	SMP Section 23  SIMMCP Sections 5.2, 5.7 and 7.1  WIMMCP Sections 5.2, 5.7 and 7.1	SMP Sections 21.1, 21.4, 21.5 and 23
Measures to mitigate, remediate and/or compensate any identified impacts	SMP Sections 23, 24 and 25  SIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1  WIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1  GMP Sections 4 and 5	SMP Sections 23, 24 and 25  SIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1  WIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1	SMP Sections 23, 24 and 25  SIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1	SMP Sections 23, 24 and 25  SIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1  WIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1	SMP Sections 23, 24 and 25  WIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1	SMP Sections 23, 24 and 25  SIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1  WIMMCP Sections 5.2, 5.3, 5.4, 5.5, 5.7 and 7.1	SMP Sections 21.1, 21.4, 21.5, 23, 24 and 25



Protocol for the notification of identified exceedances of the trigger levels	SMP Sections 22, 23 and 25  SIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6  WIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6  GMP Sections 4 and 5	SMP Sections 22, 23 and 25  SIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6  WIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6	SMP Sections 22, 23 and 25  SIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6	SMP Sections 22, 23 and 25  SIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6  WIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6	SMP Sections 22, 23 and 25  WIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6	SMP Sections 22, 23 and 25  SIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6  WIMMCP Sections 5.2, 5.7, 6, 7.1 and 7.6	SMP Sections 21.1, 21.4, 21.5, 23 and 25
Contingency plan	SMP Sections 23, 24 and 25  SIMMCP Sections 5, 6, 7.1, 7.2 and 7.3  WIMMCP Sections 5, 6, 7.1, 7.2 and 7.3  GMP Sections 4 and 5	SMP Sections 23, 24 and 25  SIMMCP Sections 5, 6, 7.1, 7.2 and 7.3  WIMMCP Sections 5, 6, 7.1, 7.2 and 7.3	SMP Sections 23, 24 and 25  SIMMCP Sections 5, 6, 7.1, 7.2 and 7.3	SMP Sections 23, 24 and 25  SIMMCP Sections 5, 6, 7.1, 7.2 and 7.3  WIMMCP Sections 5, 6, 7.1, 7.2 and 7.3	SMP Sections 23, 24 and 25  WIMMCP Sections 5, 6, 7.1, 7.2 and 7.3	SMP Sections 23, 24 and 25  SIMMCP Sections 5, 6, 7.1, 7.2 and 7.3  WIMMCP Sections 5, 6, 7.1, 7.2 and 7.3	SMP Sections 21.1, 21.4, 21.5, 23 and 25