INDEPENDENT ENVIRONMENTAL AUDIT

for

THE DENDROBIUM MINE

FOR

BHP Billiton

Dendrobium Coal Pty Ltd
PO Box 275
Unanderra NSW 2526

28 November 2014

By

KADENZ Pty Ltd - Environmental Consultancy
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Dendrobium Project

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EXECUTIVE SUMMARY

Background:

The Dendrobium Project comprises the development of a new underground coal mine, and construction and operation of associated surface facilities ("the Development").

The Original Consent for the project was dated 20 November 2001 and construction work on the site commenced in January 2002. The Consent has been modified a number of times but the most recent modification is dated 8 December 2008 and that consent still applies. A copy of the Consent is attached as **Appendix A**. Consent Condition 6 of Schedule 8 of the Revised Consent dated 8 December 2008 which is reproduced here calls for an Independent Environmental Audit. More specifically:

INDEPENDENT ENVIRONMENTAL AUDIT

6. By 31 December 2011, and every 3 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:

(a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;

(b) include consultation with the relevant agencies;

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.
Note: This audit team must be led by a suitably qualified auditor and include experts in the fields of a) mine subsidence impacts and remediation and b) stream hydrology and water quality.

7. Within 6 weeks of the completing of this audit, or as otherwise agreed by the Director-General, the Applicant shall submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report.

8. Within 3 months of submitting the audit report to the Director-General, the Applicant shall review, and if necessary revise the strategies/plans/programs required under this consent to the satisfaction of the Director-General.

Dennis Zines of KADENZ Pty Ltd – Environmental Consultancy was commissioned by BHP Billiton to undertake the independent environmental audit. KADENZ was supported by several specialist consultants as follows:

- Air Quality – Damon Roddis of Pacific Environment Limited
- Noise – Aaron McKenzie of Pacific Environment Limited
- Subsidence - Steve Ditton of Ditton Geotechnical Services (DgS)

In accordance with the condition 6 (a) of Schedule 8, the Director-General of Planning and Infrastructure endorsed the audit team (Refer Appendix B).

The first audit under consent condition 8.1 of the original consent (first audit under the condition) covered the period from the date of the Consent to 31 December 2004 for site activities and to 31 March 2005 for approval documentation. The second Audit covered the period from the completion of the second audit to September 2008. The third audit covered the completion of the second audit to September 2011. This Audit covers the period from the completion of the third Audit to end September 2014.

Longwall mining commenced in April 2005 in Area 1. At present, longwall mining is taking place in LW10 in Area 3A (commenced January 2014).

The audit process consisted of:

- Pre-audit preparations and review of documentation;
- Consultation with Department of Planning and Environment as a follow up to their letter approving the Audit Team (condition 6(b));
- Consultation with Office of Environment and Heritage (OEH), Sydney Catchment Authority (SCA), NSW Office of Water (NOW), Environment Protection Authority (EPA), Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) and the Dam Safety Committee (condition 6(b));
- Site inspection of the main aspects of the pit top mining operation and KVCLF (1 September 2014 Dennis Zines, Damon Roddis and Aaron McKenzie), and subsidence areas (3 September 2014 Steve Ditton);
- Review of documentation, files, reports, records and data at the Mine Site Office
- Interviewing relevant Dendrobium personnel, Scott Coleman, Peter McMillan, David Thomas, Josh Carlon and Gary Brassington.
- Assessment against conditions 6 (c) and (d); and
- Preparation of this Audit Report including Recommendations as per condition 6 (e).

SUMMARY OF FINDINGS

This summary addresses the findings under the Schedules included with the 8 December 2008 consent. No comment is required in this summary on Schedules 1 and 2 which are largely administrative or not related to environmental performance.

At the end of the Schedules findings there is an Overview of Environmental Performance and Compliance.

SCHEDULE 3 – SPECIFIC ENVIRONMENTAL CONDITIONS – MINING AREA

SUBSIDENCE ISSUES

The Subsidence Environmental Management Plan (SEMP) for the landscape elements of Dendrobium Area 1 was prepared by GSSE in November 2004. This plan was subsequently modified to include Area 2 (GSSE, 2006) and the revised document was then incorporated into the Subsidence Management Plan (SMP) prepared for Area 3A (April, 2010). A separate SMP was then developed for Area 3B and approved in February 2013. Both of the SMPs fulfil the requirements for watercourse, upland swamp and landscape monitoring, impact management and groundwater impact research as required by the Dendrobium Development Consent and SMP Approvals. Two land offsets to SCA and NSW State Government have also been presented by the Mine as required.

Observed subsidence movements and impacts in Area 3A (LWs 7- 8) and Area 3B (LWs 9 - 10) for the reporting period from September 2011- September 2014 have been generally within predictions. There have been several Level 1, 2 and 3 surface landscape impacts due to surface cracking, rock falls, water course flow diversions and draining of several ponds above 1st and 2nd order watercourses or tributaries of Sandy, Wongawilli and Donalds Castle Creeks. Lowering of shallow groundwater levels and increased recession rates have been measured beneath several upland swamps in both Areas.

A revision to the swamp and watercourse TARPs has now occurred twice during mining in Areas 3A and 3B, with the replacement of relatively subjective terms such as ‘Minor’, ‘Moderate’ and ‘Severe’ with Levels 1 to 3 Impacts (as requested by OEH). Extensive Consultation occurred between the Mine and OEH/SCA/DCCC prior to and during the undermining of Areas 3A and 3B.

Monitoring details / frequency requirements and potential impact / management response outcomes for each feature are defined adequately in the TARPs as required by the Consent Conditions. The results of monitoring of impacts are also presented in monthly, 6th monthly and annual environmental management reports as well as End of Panel Reports.

Several Area 3A and 3B sites were inspected by DgS on 3/9/2014 and found to concur with the reported impacts.

Some of the issues raised by several government agencies during this audit period included:

- The SCA currently considers the hydrological model used by the Dendrobium Mine to be "inadequate, inappropriate and unproven for its intended use" (e-mail from SCA representative to Dennis Zines dated 27/08/14).

- OEH has raised ten issues concerning both apparent breaches and inadequate implementation of the Modified Development and SMP Approval Conditions of Consent in their recent letter to KADENZ (28/08/2014). OEH have previously sent seven more letters to DoPE and BHPB between 13/12/2012 and 06/08/2014 regarding apparent condition breaches and consultation lapses by the mine.

Most of the above issues are considered to have been addressed by the Dendrobium Mine's Environmental Field Team and Consultants or independent expert reports, or are likely to be addressed in the Swamp Rehabilitation and Research Program (SRRP) on several Area 3A and 3B swamps and watercourses over the next 5 years. However, if this SRRP does not achieve the desired levels, then independent input into the Dendrobium TARPs may be considered as part of the SMP Approval process for Area 3C.

Measured impacts to watercourses and upland Swamps are considered to be within the predicted ranges presented in the Environmental Assessments and SMP Application Reports provided by the mine and no breaches of consent conditions apparent (s*ee details in* ***DgS, 2014*** *in* **Appendix D** *of this document).*

There are several outstanding issues for the current audit period however:

(i) It is noted however that the observed subsidence exceedance above the starting end of LW9 has not been addressed adequately, and further review of the possible reasons for the increased subsidence magnitude should be reviewed by MSEC and an independent expert if necessary. It is considered however, that the issue could be resolved during the next audit period;
(ii) whether sub-surface cracking impacts on shallow groundwater levels and increased recession rates beneath the swamps will represent more than a 'minor' environmental consequence in terms of a vegetation or erosion response (the two key parameters defining swamp impacts);
(iii) whether the mine will be in breach of its consent conditions in regards to (ii)
(iv) It is recommended that environmental monitoring sites for groundwater below swamps be installed as early as possible and impact explanations be provided to consider limitations of available base line readings.
(v) the request by some stakeholders for raw monitoring data for all impacted areas of the mine is yet to be resolved. In the interests of transparency, it would probably be a beneficial exercise to present all raw, on-going monitoring data for previously mined areas to stakeholders if requested.

SCHEDULE 4 - SPECIFIC ENVIRONMENTAL CONDITIONS – SURFACE FACILITIES

NOISE

While minor exceedances of the noise impact assessment criteria have been recorded at non-mine related receptors during the audit period, the operation is for the most part compliant.

It is anticipated that a route towards further minor improvements in compliance may be made through the Continual Improvement Consent requirements.

All other Dendrobium actions under this section of the Consent comply. The strategies, plans or programs required under these approvals appear adequate. There are no additional measures or actions recommended for this audit component.

BLASTING AND VIBRATION

Reportedly no blasting operations have been undertaken at the surface facilities during the audit period, therefore requirements relating to blasting and vibration have been satisfied.

AIR QUALITY

Marginal exceedances of the annual dust deposition criterion have been observed at Point 13 at times during the audit period. Point 13 is located within the colliery boundary (pit top access road) and therefore the dust deposition criteria do not directly apply. The site is primarily used as an instructive site for operational dust management purposes.

Exceedance of the short term PM_{10} criterion was observed on a single occasion during the audit period at Point 21. This exceedance is considered to be minor, and the contextual information surrounding reasons for this exceedance, as provided by the mine, is considered adequate.

The Dendrobium actions under this section of the Consent comply and the strategies, plans or programs required under these approvals appear adequate.

METEOROLOGICAL MONITORING

Dendrobium maintains a 10m automatic weather station located adjacent to the main car park, on the roof of the main building. Monitoring has been undertaken for the period of the audit. Requirements relating to meteorological monitoring have therefore been satisfied.

WATER MANAGEMENT

There is appropriate catchment and treatment facilities on site as observed in earlier audits including clean, oily and dirty water at the pit top and clean and dirty at Kemira Valley.

The Recycled Water Project which won an award from Sydney Water has significantly reduced freshwater use.

Water from the old Kemira Mine workings is discharged through Licensed Discharge Point 5 (LDP5), located at Marley Place. The previous audit discussed the issue of non-compliances from the LDP5 sampling tank (which has since been removed and replaced by a grab sampling program as required in the Environmental Protection Licence).

Discharges comply with the Environmental Protection Licence (EPL) conditions. Data relating to compliance are reported in the AEMRs and the EPL Annual Returns. While some measurements exceeded the discharge criteria, explanations were provided demonstrating that these were not non-conformances.

The surface water monitoring program enables Dendrobium to maintain a database of regional water quality and to determine any changes to surrounding water quality.

The data (summarised in the AEMRs) suggests that neither the mine site nor the KVCLF has had an impact on the surrounding water quality during the three AEMR periods. The Auditor agrees with the conclusion.

Dendrobium is in compliance with this section of the consent.

LANDSCAPE MANAGEMENT

Rehabilitation associated with subsidence related impacts is summarised above.

Evidence of the rehabilitation activities are summarised in the AEMRs.

The rehabilitation security cost estimate for the Dendrobium operations was reviewed in August 2013. No major changes to the existing security estimate were identified. A copy of the revised security cost estimate is provided as Appendix B of the 2013/2014 AEMR.

No significant land pollution events occurred during the reporting period. Minor spills that occurred were cleaned up as soon as practical and had no environmental impact.

In addition, on 14 November 2014, soluble oil was spilled onto a public road as it was being delivered to Dendrobium Mine via Stones Road. This occurred when a roof-fall in mid-October blocked the main travel road into the mine. The spill was immediately contained and cleaned up with no environmental impacts. The incident was reported to the EPA.

The Landscape Management has been updated during the reporting period.

The Bushfire Management Plan has been updated during the reporting period. There are regular actions, inspections and responses according to the Bushfire Management Plan.

Dendrobium is in compliance with this section of the consent.

However, Dendrobium should re-visit the 2011/2012 AEMR information request in relation to Bushfire Management and respond more expansively in the next AEMR.

TRANSPORT

The allowable hours of operation on the Kemira Valley Rail Line were reduced on 30 April 2010 in accordance with the conditions of consent. There were no breaches of the curfew times during the audit period, records of train numbers and movements were kept.

The Department of Planning letter of 22/12/2009 indicates that the Traffic Management Plan has been submitted and approved as per the consent condition.

The AEMRs report on Road Safety initiatives.

The auditor is satisfied that Dendrobium complies with agreed procedures for road maintenance.

Dendrobium maintains full records of coal transport (evidence sighted). While these are not reported in the AEMRs as required by the Consent Approval, the Auditor does not consider this non-compliance to have any adverse significance.

The Auditor suggests that Dendrobium seek a revision to this condition at some appropriate time in the near future from DoPE reflecting that full data sets be maintained at the premises instead of reporting them in the AEMRs.

VISUAL

A Lighting Impact Assessment did not reveal any of Dendrobium Mine operations to exceed the requirements of AS 4282 at any of the identified sensitive receivers at any time. The Dendrobium actions under this condition comply.

WASTE

Dendrobium currently has six main waste streams. These waste streams include general waste, paper/cardboard, scrap steel, timber, industrial waste (diesel particulate filters) and waste oil.

The AEMRs list both the amounts of the materials generated on site and indicates whether they were recycled or disposed of. The AEMRs also identify on-site training and improvement initiatives.

Improvements made to the waste management system during FY12 included:

- The introduction of an off-site waste sorting program that commenced in July 2011. General waste bins are transported from Dendrobium pit top to Cleanaway's depot at Charcoal Place Unanderra. The waste is then tipped onto a sorting pad and waste is directed into its correct waste stream for recycling or disposal. If equipment or materials are found within the waste it is set aside and the mine site is contacted to see if it can be reused.
- The offsite waste sorting has resulted in 39% of the general waste from underground bins being recycled. This has resulted in 126 tonnes being diverted away from land fill.
- Overall improvement of 14% for amount of waste recycled.

Progress in this area continued with the 2013/2014 AEMR reporting a 43% recycle of the total waste streams (382 out of 900 tonnes).

The Dendrobium actions under this condition comply.

SCHEDULE 5 - SPECIFIC ENVIRONMENTAL CONDITIONS – OTHER SITE COMPONENTS –

COAL WASHERY

The auditor has seen BHPB advice that the Dryer never got past the trial stage and was shut down on the 25/10/2006. Accordingly the two conditions relating to Hot Gas Exhaust Stack Discharges and Fuel Source are no longer relevant.

WEST CLIFF COAL WASH EMPLACEMENT

As part of the Ministerial Approval for the West Cliff Stage 3 Coal Wash Emplacement, In November 2011, 154 ha of land were transferred from Illawarra Coal to the Minister for the Environment for inclusion into the Illawarra Escarpment State Conservation Area as part of the Stage 3 emplacement area offset.

The Bulli Seam Operation Approval of 22 December 2011 took over the management of the West Cliff Coal Emplacement Area. The Approval included Stage 4 of the West Cliff Emplacement Area. Since then emplacement activities for the West Cliff Emplacement have been addressed in the Bulli Seam Operation Annual Environmental Management Report.

The Stage 4 Emplacement Area will provide an additional 59.39 million tonnes of coal wash emplacement (refer to table below) with an expected life to 2041.

Illawarra Coal has and will continue to research, develop and implement alternative uses for coal wash.

During the 2011/2012 AEMR reporting period, Illawarra Coal diverted 316,505 tonnes of coal wash to beneficial uses such as engineered fill.

During the 2012/2013 AEMR reporting period, Illawarra Coal diverted 296,296 tonnes of coal wash for beneficial uses such as engineered fill.

During the 2013/2014 AEMR reporting period, Illawarra Coal diverted 177,000 tonnes of coal wash for beneficial uses such as engineered fill.

The AEMRs indicate details of specific projects.

The West Cliff Emplacement Management Plan (approved) outlines Monitoring for ground water, emplacement settlement, compaction and combustibility, subsurface drainage inspections, water monitoring, erosion and sediment control, Vegetation and Fauna Monitoring and Dust monitoring.

Progressive rehabilitation of the West Cliff Emplacement has been undertaken during the reporting period in accordance with the approved West Cliff Emplacement Management Plan (refer Table 57 of the BSO AEMR).

CONCLUSIONS:

(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and

(e) There are no measures or actions recommended for this condition.

SCHEDULE 6 - - SPECIFIC ENVIRONMENTAL CONDITIONS – EXTENDED SITE

GREENHOUSE GASES AND ENERGY EFFICIENCY

The Auditor has seen the advice from the Department of Planning and Infrastructure dated 22/12/09 which notes approval of the plans and documents relevant to this condition and has reviewed the relevant Management Plans (including recent modifications).

The development's greenhouse gas emissions and minimisation measures are reported in the AEMRs.

There are no GHG abatement projects currently in place at the Dendrobium mine site due to the relatively low methane content in the vent air. However, Illawarra Coal has current GHG abatement measures in place at its other mines (Appin and West Cliff) which satisfy this condition. The Consent conditions allow for the Dendrobium mine to be considered within the ambit of the Southern Coalfield Operations and related operations. The reviews of the AEMRs by the Director-General indicate acceptance or identify areas which need further information.

The Dendrobium actions under this condition comply.

SCHEDULE 7 – ADDITIONAL PROCEDURES FOR AIR QUALITY AND NOISE MANAGEMENT

NOTIFICATION OF LANDHOLDERS

Minor exceedances of the noise and air quality criteria have been noted at times during the audit period.

No information has been provided indicating that the Director-General and affected landowners were notified at these times.

However, noise and air quality monitoring results indicate that while these exceedances have been recorded, they have neither been high in magnitude, nor protracted in duration.

Further, monitoring results during the audit period indicate that Dendrobium is generally in compliance with respect to noise and air quality criteria.

In view of the above contextual information, this condition is deemed to have been satisfied.

INDEPENDENT REVIEW

It is understood that no requests for independent review of impacts on private land have been made during the audit period. Thus, this condition has been satisfied.

LAND ACQUISITION

It is understood that no requests for private land to be acquired have been made during the audit period. Thus, this condition has been satisfied.

SCHEDULE 8 – ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

The Department of Planning letter dated 22/12/09 indicates the Department's approval of the Environmental Management Strategy. An update of the Strategy was submitted to DoPE on March 2012. In addition to the requirements of this consent condition, Dendrobium supplements their environmental compliance with a number of additional internal and external audits which demonstrates the desire for environmental compliance.

Examples of the audit types are:

- ISO14001 Surveillance Audit
- EMS Systems Audit
- Internal BHPB Standards
- EPBC Legislative Audit
- KPMG Assurance Audit

The EMS audits include a review of aspects and impacts, performance improvement plans, legal compliance, document control, records, corrective action, monitoring and control, training and management of risks.

No non-conformances were recorded during audits for the EMS, EPBC or the KPMG audits.

ENVIRONMENTAL MONITORING PROGRAM

The Department of Planning letter dated 22/12/09 indicates the Department's approval of the Environmental Monitoring Program. An update of the Program was submitted to DoPE on March 2012.

Hazardous Material Management

Environmental risks associated with the Dendrobium Mine operations are recorded in an Environmental Aspects and Impacts Register. The Environmental Aspects and Impacts Register is reviewed on an annual basis and forms the basis of the Environmental Improvement Plan.

REPORTING

Incident Reporting

These conditions require notification to the Department of Planning & Environment (formerly Department of Planning & Infrastructure) of an incident that causes or may cause material harm to the environment within 24 hours and supplemented by detailed written reports within 21 days.

It is understood that no such incident has occurred within the period that this audit covers, so that the application of this condition has not been triggered.

Annual Reporting

This condition requires that at the end of each year and for at least 3 years following the cessation of mining at the development, the Applicant shall submit an AEMR to the Director-General, CCC and all relevant agencies. The condition sets out the requirements of the AEMRs in headings (a) to (j).

This audit has relied on the AEMRs for the periods 1 July 2011 -30 June 2012, (2011-2012 AEMR); 1 July 2012 – 30 June 2013 (AEMR 2012-2013) and 1 July 2013 – 30 June 2014 (AEMR 2013-2014). Accordingly, each AEMR has been carefully reviewed and found to be compliant with the requested conditions.

Each AEMR is submitted to all relevant agencies as per the requirements of Schedule 8 Condition 5 of the Dendrobium Development Consent. A copy of the report is publicly available via the BHP Billiton website under Dendrobium Mine (also refer to Section 8.5.1 of this document):

http://www.bhpbilliton.com/home/aboutus/regulatory/Pages/default.aspx

The outcome of each agency review is addressed in the following AEMR.

INDEPENDENT ENVIRONMENTAL AUDIT

This document represents compliance with this condition.

COMMUNITY CONSULTATIVE COMMITTEE

The DCCC was established in January 2002 in accordance with the Dendrobium Development Consent. Meetings are usually scheduled every 2 months.

The purpose of the DCCC (Auditor's paraphrasing) is to provide a forum for open discussion between representatives of Dendrobium Mine, the community, the relevant Councils and other stakeholders on issues directly relating to the mine's operations, environmental performance and community relations, and to keep the community informed on these matters.

Meetings are usually scheduled every 2 months and regular site visits are conducted. The AEMRs contain listings of activities during the reporting periods.

The Dendrobium Community Enhancement Program (DCEP) was developed in 2002 to facilitate funding to community projects with a vision to create a strong community and positive environment for the residents in the zone of influence of Dendrobium Mine. Since inception, Illawarra Coal has contributed over $1.2 million to the fund, and continues to contribute 3 cents per saleable tonne of coal from the Dendrobium operations (adjusted for CPI).

Illawarra Coal operates a 24hr Community Call Line (freecall 1800 102 210) and a general email address ICEnquiries@bhpbilliton.com. The call line and email address enables the community to request and provide feedback about operational activities and lodge complaints on any aspect of the Dendrobium operations. The call line number and the email address has been advertised throughout the reporting period in all correspondence distributed to the community.

Generally complaints peaked at over 450 in 2006, but have since reduced substantially. During FY10, 11 and 12 there were less than 50 complaints. The small increase since then (FY13 – 72; FY14 – 100) appears to be for the most part specifically related to the rail noise issue and also appears to emanate mostly from a single complainant.

ACCESS TO INFORMATION

Dendrobium maintains an active website with a very comprehensive set of information that is freely available and also distributes a large range of information via many other means and so for the most part complies with this condition.

A few deficiencies were noted in the material on the website that need to be rectified.

CONCLUSIONS:

- (c) The Dendrobium actions under the Schedule 8 conditions comply;
- (d) The strategies, plans or programs required under these approvals appear adequate; and
- (e) BHPB to take actions to address some noted deficiencies in the material available on their website.

OVERVIEW OF ENVIRONMENTAL PERFORMANCE AND COMPLIANCE

The previous Audit reported as follows:

"The project has reached a mature stage where systems and procedures for running the operation and complying with the consent conditions are now well established. Virtually all of the required Management Plans have been prepared and approved and the process is now largely one of continuing compliance in respect of monitoring, reporting, and responding where and when appropriate. An exception to this overview statement relates to the continued interest in the issue of Subsidence and in particular to the potential impact on Swamps (see later discussion)."

Three years on the position is similar. Apart from one resident's concerns about rail noise in his locale, the main issues raised by some authorities and some of the community are still related to the assessment of subsidence. This has been recognised by the mine and further improvements to the groundwater modelling and research into the potential environmental consequences have been on-going in Area 3B.

The modified Consent Conditions of 8 December 2008 have simplified the compliance and reporting process while still maintaining a comprehensive approach to a comprehensive project.

The Dendrobium management has demonstrated a very high level of compliance with approvals, licences and consents for approval conditions that are seen as being very comprehensive.

The audit has observed that there have been a limited number of non-compliances during the audit period, but that the non-compliances have not resulted in significant adverse impacts as of this audit. Dendrobium has demonstrated its willingness to respond to non-compliances in a positive manner and has also demonstrated several internal initiatives that extend beyond the consent and are seen to be beneficial.

The auditor notes that the consent conditions for this matter are extensive and there are many authorities and community members involved. Dendrobium has been assessed as complying with the consent conditions but consensus under the

circumstances with respect to perceived subsidence impacts for natural areas is a difficult matter and will require further cooperation between BHPB, the relevant authorities and the interested community. The auditor considers that consent condition **Swamp Impact Management** 6. (g) "incorporate means of updating the plan based on experienced gained as mining progresses" is key to achieving satisfactory resolutions to the noted requests for further analysis and assessment.

Overall, the environmental management for the project is also assessed as being very effective with most of the **recommendations** made in the previous audit period being implemented or addressed during this audit period. These included:

Subsidence

- Some (but not all) of the on-going monitoring data for previously mined areas are now being provided in the AEMRs and Dendrobium website.

- HydroSimulations and Ecoengineers have completed comprehensive reviews of the groundwater and surface water modelling based on recommendations from a number of stakeholders, including Professor MacMahon of Melbourne University. Measured groundwater levels are similar to predicted values for completed mining areas, although shallow groundwater levels have been under-predicted and models re-calibrated to reflect cracking network impacts.

- It is considered that the precipitation of iron oxide is a common occurrence when mine subsidence cracking in the Southern Coalfield results in the release or exposure of groundwater to the atmosphere. Expert water chemistry consultants have assessed that the impact of iron oxide precipitates observed in Areas 1 and 3A to-date are only short term effects and unlikely to result in any significant impact on aquatic ecology. The decrease in the frequency of iron-staining events and no reported aquatic flora/fauna kills due to the precipitation of iron oxide along flowing groundwater fed water courses above LW7 to 10 also demonstrates this to be the case.

Air Quality

The Dendrobium actions under this section of the Consent comply and the strategies, plans or programs required under these approvals appear adequate.

Landscape Management

Dendrobium is in compliance with this section of the consent.

However, Dendrobium should re-visit the 2011/2012 AEMR information request in relation to Bushfire Management and respond more expansively in the next AEMR.

Transport

- The Auditor suggests that Dendrobium seek a revision from DoPE to the condition requiring that the AEMRs report on train movements at some appropriate time in the near future. The revision should reflect that full data sets covering this topic and demonstrating compliance be maintained at the premises (as is the actual case). This is a minor matter.

Access to Information

- BHPB to take actions to address some noted deficiencies in the material available on their website.

1. INTRODUCTION

1.1 Dendrobium Mine Outline

The Dendrobium Mine comprises the development of a new underground coal mine, and construction and operation of associated surface facilities ("the Development").

The Dendrobium Mine Proposal was subject to extensive environmental examination under the NSW *Environmental Planning & Assessment Act 1979* (*EP&A Act*) and received Approval from the Minister for Urban Affairs and Planning for the Project to proceed on 20 November 2001, subject to conditions of approval ("the Consent"). A listing of the conditions and the state of compliance of each condition is kept by Dendrobium and included with their Annual Environment Management Report (AEMR) which is provided to the government authorities each year.

The Dendrobium Mine is owned and operated by Dendrobium Coal Pty Ltd, a wholly owned subsidiary of BHP Billiton (BHPB) and is located at Mt Kembla, approximately 8 km west of Wollongong NSW on the Illawarra Escarpment.

The Dendrobium Project consists of a number of sites in addition to the mine site. The sites associated with the Project and discussed in this audit are:

- Dendrobium Pit Top – administration, workshop and people and materials access, via the Dendrobium Tunnel, to the underground workings, a sediment pond, and a greywater treatment and oily water separation facility;

- Kemira Valley Coal Loading Facility (KVCLF) – Coal is transported from the underground workings to KVCLF via a conveyor network, reaching the surface via the Kemira Valley Tunnel. The coal is then fed through a coal sizer (commissioned in 2007) into a rill tower and deposited onto a 150,000 tonne capacity stockpile. Coal is loaded into trains via an enclosed rail-loading chute.

- Kemira Valley Rail Line - The private rail line is used to transport the coal from KVCLF to the Dendrobium Coal Preparation Plant. The Processing and Logistics Department at Illawarra Coal manage the rail operations.

- Dendrobium Coal Preparation Plant (DCCP) – The DCPP is located within the Port Kembla Steelworks. The plant provides washing facilities for Dendrobium coal product prior to being blended with the No. 1 Seam coal in the coke making process at the Port Kembla Steelworks. The Processing and Logistics Department at Illawarra Coal manages the DCPP.

- No.1 Ventilation Shaft – – originally operating as an upcast ventilation shaft but since decommissioned; The fan housings associated with Ventilation Shaft 1 were decommissioned in October 2008 and relocated to Ventilation Shaft 3. This shaft now provides intake air to the underground workings and an asset protection zone is maintained at this site.

- Nos.2 & 3 Ventilation Shaft (Mining Lease 1566) – Construction of Ventilation Shafts 2 and 3 commenced during 2006 and was completed in 2008. Ventilation Shaft 2 (downcast) and Shaft 3 (upcast) provide ventilation to the current and future underground workings in Area 3.

- Transport route from stockpile facilities to the Port Kembla Steel Works;

- The West Cliff Emplacement Area Stage 3 (administrative only as there are no on-ground works – this Area is now managed under the Bulli Seam Operation which accepts the Dendrobium coal wash material); and

- Mining Areas 1, 2 and 3.

Figure 1 in Section 9 of this report shows the location of all of the above apart from the West Cliff coal emplacement area. Figures 2-4 show the set out of the Pit Top, the set out of Kemira Valley, and the long wall progress at the end of the audit reporting period.

The Dendrobium Mine Pit Top facilities have been developed on the site previously known as Nebo Colliery, which was formerly combined with Wongawilli Colliery in 1993 to form Elouera Colliery. The Nebo Portal site was relinquished from the ownership and responsibility of Elouera Colliery in December 2001 to enable the Dendrobium Mine to acquire formal responsibility, ownership and identity of the site.

The Dendrobium Mine is designed to access and mine coal from the No.3 Seam of the Illawarra Coalfields, known as the Wongawilli Seam. Coal will be mined from 3 mining areas, known as Areas 1, 2 and 3 (previously noted as Areas A, B and C in the Environmental Impact Statement (EIS)).

Dendrobium primarily produces coking coal and is approved to produce up to 5.2 million tonnes per annum until 31 December 2030. The BlueScope Port Kembla Steel Works and Whyalla Steel Works are the major customers. In addition to these Australian based customers; coal is exported via the Port Kembla Coal Terminal to international markets.

Mt Kembla Village is located immediately adjacent to and below the Pit Top area and Kembla Heights is located immediately above the Pit Top area. The village has intimate historical links with mining in the area.

1.2 Project Status

Construction on the works commenced in January 2002. The mine became operational during early 2003. As at end 2008, all of the surface facilities and the underground development for Areas 1 and 2 were completed. This allowed commencement of the long wall mining in these areas in April 2005.

This audit reviews the information contained in the AEMRs for 2011-2012; 2012-2013 and from 2013-2014. The activities undertaken in each of these periods is summarised in the AEMRs and is repeated here for convenience.

Significant activities undertaken during 2011/2012 included:

- Addressed issues arising from previous AEMR Review including review of Mine Closure contamination investigations;
- Addressed issues arising from previous Triennial Independent Environmental Audit;
- Completion of longwall mining in LW6, Area 2 – 28/3/2011;
- Completion of longwall mining in LW7, Area 2 – 23/1/2012;
- Commencement of longwall mining in LW8, 24/2/2012;
- Completed review of the key site environmental management plans as per Development Consent requirements.
- Emplacement Operations - In November 2011, 154 ha of land was transferred from Illawarra Coal to the Minister for the Environment for inclusion into the Illawarra Escarpment State Conservation Area as part of the Stage 3 emplacement area offset (previously identified as being transferred to the SCA).

Significant activities undertaken during the 2012/2013 period included:

- Issues arising from the previous AEMR are addressed in this AEMR
- Issue of Radiation Licence (EPA) dated 27/07/2012
- SMP Approval for Long Walls 9-13 issued on 5/02/2013
- A Review of Environmental Factors (REF) within CCL768 was prepared and submitted to the Sydney Catchment Authority (SCA) and the NSW Department of Trade and Investment for exploration activities. During FY13 the Wongawilli Seam Exploration Program included nine coal quality exploration boreholes with one wedge and one redrill. The purpose of the coal quality boreholes was to assess coal thickness, depth of seam, quality, gas content, and to assist in determining possible future mining conditions by conducting geotechnical tests on the core samples.
- Completion of LW mining in LW8, December 2012;
- Commencement of LW9 (Area 3) in February 2013;

Significant activities undertaken during the 2013/2014 period included:

- Issues arising from the previous AEMR are addressed in this AEMR
- Issue of Water Access Licence from Office of Water dated 1/07/2013
- Continued exploration activities and rehabilitation of boreholes
- Completion of LW9 in June 2014 which finished 35m short of the design end line;
- EOPR for LW9 due in October 2014 (outside of the period for incorporation in this Audit)
- Commencement of longwall mining in LW10 in January 2014 in Area 3B (predicted completion December 2014)
- Commencement of longwall mining in LW 11 predicted in January 2015
- Development will continue in Area 3B Main Gate 11&12 and Wonga Mains.

Area 3C is the last remaining domain with Development Consent for Dendrobium. There is almost 10 mining years remaining in Area 3B. Note the Area 3B SMP Approval requires Dendrobium to submit to the DG a proposed mine layout and monitoring program for Area 3C by 30 June 2018.

It is noted that there are other areas adjacent to the approved areas which may contain resource. If Illawarra Coal seeks to mine in these areas, they would require a further Development Consent Approval.

Coal Production and Other Activities

Run of Mine (ROM) product for the AEMR 2011-2012 reporting period was 4,330,786 tonnes with a saleable product yield of 77.7%. During the reporting period 2,810 trains were loaded at KVCLF and transported 4,415,583 tonnes of ROM coal to DCPP.

The Run of Mine (ROM) product for the reporting period AEMR 2012-2013 was 4,542,753 tonnes with a saleable product yield of 81%. During the reporting period 2,769 trains were loaded at KVCLF and transported 4,569,455 tonnes of ROM coal to DCPP.

The Run of Mine (ROM) product for the reporting period AEMR 2013-2014was 3,842,886 tonnes with a saleable product yield of 79%. During the reporting period, 2,359 trains were loaded at KVCLF and transported 3,906,267 tonnes of ROM coal to DCPP.

The difference between ROM production and coal transported tonnes occurs as ROM coal is measured at Dendrobium Mine prior to placement on the stockpile and coal transported is measured at the coal preparation plant (i.e. stockpile balance accounts for the difference).

Coal Wash emplacement continued at the West Cliff Colliery Emplacement Area with proportions being beneficially reused.

The AEMRs contain summary tables of cumulative coal production totals.

Project Changes since the date of Consent

Changes to the project since the Consent include:

- Some minor amendments were made to the consent reported in the Annual Environmental Management Reports (AEMR) for 2002 and 2003 which addressed changes to names of government authorities, additional traffic conditions, the approval to submit an application for second workings, and specific limits on mine water discharge to Allans Creek.

- Dendrobium altered the longwall mining plan for Area 1 to reduce the number of longwalls from 3 to 2, which would result in less coal being mined from the area and correspondingly a reduction in associated subsidence impacts.

- The rail transport from KVCLF introduced longer rail cars, reducing the number of train journeys.

- In April 2006 there was a further modification to the consent which included the addition of the coal sizer and a number of conditions arising from the Department of Planning Audit of March 2006. In particular, the new conditions required upgrades to the Air Quality Management Plan and the Noise Management Plan.

- In April 2007, Dendrobium applied for a further modification to the consent to address proposed changes to Mining Area 3, incorporating the requirements of Staged Development Area C, and an administrative review of the conditions of consent. On 8 December 2008, the then Minister for Planning approved the modification of the Consent which applies to this audit.

- In 2007, Dendrobium withdrew longwall panel 5A from Area 2 due to difficult mining conditions.

- MOD 6 -2008 – revision by Department of Planning to the Development Consent –currently in force.

- The Bulli Seam Operation Approval of 22 December 2011 took over the management of the West Cliff Coal Emplacement Area.

- Minor approved updates to the various Management Plans (as noted in this Audit).

1.3 Purpose and Status of This Report

This report addresses Consent Condition 6 of Schedule 8 of the Revised Dendrobium Consent dated 8 December 2008 (which is reproduced here for convenience) which calls for an Independent Environmental Audit. More specifically:

INDEPENDENT ENVIRONMENTAL AUDIT

6. By 31 December 2011, and every 3 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:

(a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;

(b) include consultation with the relevant agencies;

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

Note: This audit team must be led by a suitably qualified auditor and include experts in the fields of a) mine subsidence impacts and remediation and b) stream hydrology and water quality.

7. Within 6 weeks of the completing of this audit, or as otherwise agreed by the Director-General, the Applicant shall submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report.

8. Within 3 months of submitting the audit report to the Director-General, the Applicant shall review, and if necessary revise the strategies/plans/programs required under this consent to the satisfaction of the Director-General.

The date of the Initial Consent was 20 November 2001 meaning that the first Audit report was due on 20 November 2004. Dendrobium sought from the Director-General and was granted a postponement of this date to 30 April 2005. Within the first audit report, there were three AEMRs for the periods Jan-Dec 2002, 2003 and 2004.

The three year anniversary for the second Audit was the end of April 2008. Due to the application for a change to the consent conditions of 11 April 2007 and the Director-General's agreement to do so (scheduled granting of the modified consent due approximately in September/October 2008 – pers. comm. Department of Planning), it was agreed between Dendrobium and Department of Planning that the second audit period would cover from May 2005 to end September 2008.

For the second Audit, there were the three AEMRs for the periods Jan-Dec 2005, 2006 and 2007. The AEMRs provide a substantial amount of data for the audit. In addition, there were several monitoring and investigation reports that have been undertaken during 2008 which have been referred to in the second audit.

The third audit included data from the AEMRs for the periods 1 January 2008 -30 June 2009, (2008-2009 AEMR); 1 July 2009 – 30 June 2010 (2009-2010 AEMR) and 1 July 2010 – 30 June 2011 (2010-2011 AEMR). Among other things, the AEMRs identify the relevant approvals pertaining to the operations.

The fourth audit (this document) includes data from the AEMRs for the periods 1 July 2011 -30 June 2012, (2011-2012 AEMR); 1 July 2012 – 30 June 2013 (2012-2013 AEMR) and 1 July 2013 – 30 June 2014 (2013-2014 AEMR). Among other things, the AEMRs identify the relevant approvals pertaining to the operations.

1.4 Authorities Names

There have been a number of organisational changes to State government authorities since the date of the Consent.

DUAP became the Department of Infrastructure and Planning (DIPNR), then became the Department of Planning (DoP), then became the Department of Planning and Infrastructure (DP&I) and is now known as the Department of Planning and Environment (DoPE).

The EPA and NPWS became part of the Department of Environment and Conservation (DEC) which name was subsequently altered to the Department of Environment and Climate Change (DECC) and later to Department of Environment, Climate Change and Water (DECCW) which was then part of the Office of Environment and Heritage (OEH). Subsequently DECCW became the EPA and now both the EPA and OEH are Agencies of DoPE.

The DMR became part of the Department of Primary Industries (DPI – Mineral Resources) after DPI became Industry and Investment (I&I) and then DPI - Resources and Energy (DRE) after I&I became Trade and Investment, Regional Infrastructure and Services (NSW Trade & Investment or DTIRIS). The Department of Primary Industry and the Department of Resources and Energy are now Divisions within the Department of Trade and Investment, Regional Infrastructure and Services.

DLWC which was referred to as the Department of Natural Resources (DNR) is now the NSW Office of Water (NOW) which is now part of the Department of Primary Industries. NSW Agriculture and NSW Fisheries became part of Department of Primary Industries.

While it is intended that the latest names be used in this document, direct references to the Consent Conditions may require use of the names included in the original consent.

1.5 Report Contents

This report consists of a further 9 Sections.

Section 2 of this report deals with Consent Conditions and Consultation,

Section 3 of this report deals with Subsidence issues in the Mining Area

Section 4 of this report deals with Environmental Issues at the Surface Facilities

Section 5 of this report deals with Environmental Issues at the Other Site Components

Section 6 of this report deals with Environmental Issues at the Extended Site

Section 7 of this report deals with additional procedures for Air and Noise

Section 8 of this report deals with Management, Monitoring and Reporting

Section 9 of this report contains the Figures referred to in the audit report.

Section 10 contains the Appendices referred to in the audit report.

1.6 Preparation of the Report and Sign-Off

Dennis Zines of KADENZ Pty Ltd – Environmental Consultancy was commissioned by BHP Billiton to undertake an independent environmental audit of the Dendrobium Mine to address their Consent Condition 6 of Schedule 8 Independent Environmental Audit. KADENZ was supported by several specialists as follows:

- Air Quality – Damon Roddis of Pacific Environment Limited
- Noise – Aaron McKenzie s of Pacific Environment Limited
- Subsidence - Steve Ditton of Ditton Geotechnical Services

The appointment of the KADENZ team was approved by the Department of Planning and Environment by a letter dated 3 July 2014 (refer **Appendix B**).

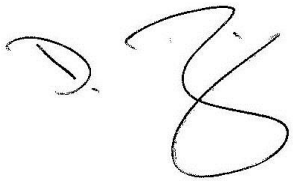
The audit process consisted of:

- Pre-audit preparations and review of documentation;
- Consultation with Department of Planning and Environment as a follow up to their letter approving the Audit Team (condition 6(b));
- Consultation with Sydney Catchment Authority (SCA), OEH, NSW Office of Water, EPA, Mineral Resources (Trade), and the Dam Safety Committee (condition 6(b));
- Site inspection of the main aspects of the mine top operation and the KVCLF (Dennis Zines, Damon Roddis and Aaron McKenzie) on 1 September 2014 and subsidence impacts in Areas 3A and 3B (Steve Ditton) on 3 September 2014;
- Review of documentation, files, reports, records and data at the Mine Site Office;
- Interviewing relevant Dendrobium personnel, Scott Coleman, Peter McMillan, David Thomas, Josh Carlon and Gary Brassington;
- Assessment against conditions 6 (c) and (d); and
- Preparation of this Audit Report including Recommendations as per condition 6 (e).

Information contained in the report is predominantly sourced from the Dendrobium reports supported by their consultants' reports backed up by the original approval Project EIS documents. Dendrobium personnel have also provided copies of certain correspondence between them and their approval authorities.

KADENZ and the specialist consultants have relied solely on these processes in respect of the integrity of the data included in this report.

KADENZ Representative:



Dennis Zines

Director Date: 28 November 2014

2. CONSENT CONDITIONS AND CONSULTATION

2.1 CONSENT CONDITIONS

The Revised Consent of 8 December 2008 (**Appendix A**) consists of a series of Schedules. The main headings of the list of schedules are included here with associated discussion (as relevant) or reference to other Sections of the Audit document where the conditions are assessed in detail.

SCHEDULE 1 – Identifies that the Minister for Urban Affairs and Planning granted approval for the Dendrobium Project on 20 November 2001.

SCHEDULE 2 – ADMINISTRATIVE CONDITIONS

This updates the Original Consent to the 8 December 2008 Consent and sets out the relevant Administrative Conditions:

- Obligation to Minimise Harm to the Environment
- The Terms of the Approval
- Limits on Approval
    - Mining Operations may take place in the mining Area until 31 December 2030 – **Complies**
    - The Applicant shall not extract more than 5.2 million tonnes of ROM coal a year from the mining area – **Complies**
    - The Applicant shall only transport coal from the surface facilities by rail – **Complies**
- Staged Submission of Management Plans/Monitoring Programs
- Structural Adequacy
- Demolition
- Operation of Plant and Equipment
- Community Enhancement
- Cost of Management Measures

The Audit does not address these issues except where they relate specifically to environmental matters. Such discussion is included in Sections 3 to 8 of this document.

SCHEDULE 3 – SPECIFIC ENVIRONMENTAL CONDITIONS – MINING AREA

All of the topics below are assessed in **Section 3** of this Audit.

SUBSIDENCE including:

- Watercourse Impact Management
- Swamp Impact Management
- Subsidence Management Plans
- End of Panel Reporting
- Subsidence Expert Assessments

ABORIGINAL HERITAGE

GROUNDWATER MONITORING

ENVIRONMENTAL OFFSETS

SCHEDULE 4 - SPECIFIC ENVIRONMENTAL CONDITIONS – SURFACE FACILITIES

All of the topics below are assessed in **Section 4** of this Audit.

NOISE including:

- Land Acquisition Criteria
- Rail Haulage Impact Assessment Criteria
- Additional Noise Mitigation Measures
- Monitoring

BLASTING AND VIBRATION

AIR QUALITY including:

- Impact Assessment Criteria
- Vibration

METEOROLOGICAL MONITORING

WATER MANAGEMENT including:

Discharges

- Water Management Plan
- Site Water Balance
- Erosion and Sediment Control
- Surface Water Monitoring Program
- Surface and Ground Water Response Plan

LANDSCAPE MANAGEMENT including:

- Rehabilitation
- Landscape Management Plan
- Rehabilitation Management Plan
- Mine Closure Plan
- Bushfire Management Plan

TRANSPORT including:

- Rail Transport of coal
- Road Transport
- Road Maintenance

VISUAL including:

- Visual Amenity
- Lighting Emissions

WASTE

SCHEDULE 5 - SPECIFIC ENVIRONMENTAL CONDITIONS – OTHER SITE COMPONENTS

All of the topics below are assessed in **Section 5** of this Audit.

COAL WASHERY including:

- Hot Gas Exhaust Stack Discharges

- Fuel Source

WEST CLIFF COAL WASH EMPLACEMENT including:

- Coal Washery Reject
- Pollution Reduction Program
- Water Quality Monitoring Program
- Brennans Creek Diversion Bypass Rehabilitation Plan
- General Management of the Emplacement

SCHEDULE 6 – SPECIFIC ENVIRONMENTAL CONDITIONS – EXTENDED SITE

All of the topics below are assessed in **Section 6** of this Audit.

GREENHOUSE GASES AND ENERGY EFFICIENCY

SCHEDULE 7 – ADDITIONAL PROCEDURES FOR AIR QUALITY AND NOISE MANAGEMENT

All of the topics below are assessed in **Section 7** of this Audit.

NOTIFICATION OF LANDHOLDERS

INDEPENDENT REVIEW

LAND ACQUISITION

SCHEDULE 8

All of the topics below are assessed in **Section 8** of this Audit.

ENVIRONMENTAL MANAGEMENT STRATEGY

ENVIRONMENTAL MONITORING PROGRAM

REPORTING

- Incident Reporting
- Annual Reporting

INDEPENDENT ENVIRONMENTAL AUDIT

COMMUNITY CONSULTATIVE COMMITTEE

ACCESS TO INFORMATION

2.2 CONSULTATION WITH AUTHORITIES

TO SATISFY CONDITION 6(b)

2.2.1 Department of Planning and Environment

The Department was contacted and replied by email from Mrs Jesse Evans Senior Planning Officer – Mining Projects |Development Assessment Systems and Approvals in substance that:

"For the upcoming Dendrobium Coal Mine Audit being undertaken by yourself and the team, the Department would be particularly interested in swamp impacts and management, adherence to performance measures and the effectiveness of the Trigger Action Response Plan."

These issues are considered in the Section 3 of this report dealing with Subsidence issues.

2.2.2 Office of Environment and Heritage

OEH provided extensive correspondence which is included in **Appendix C** of this document. The majority of issues raised relate to subsidence impacts and these issues are addressed in Section 3 of this document.

OEH also comments on:

- Access to information (discussed in Section 8.5.1 of this document)
- Lack of meaningful consultation (discussed in Section 3 of this document)
- Lengthy delays in fulfilling requirements (Extensions are granted by DoPE and the Auditor makes no further comment on this matter).

2.2.3 Sydney Catchment Authority

The SCA was contacted and replied by email from Mr Ravi Sundaram Manager - Mining & Utilities as follows:

(Note: the Point numbers have been added by the Auditor)

"Thank you for consulting the SCA and seeking its input. Key issues the SCA would like the Audit to address are as follows:

- The SCA has not been provided a copy of the last audit done three years ago and has not found a copy of the same on the Dendrobium Mine website. The SCA requests the auditor to investigate whether this is a breach of Schedule 8 condition 11. (*Point 1*)
- The SCA considers that the most important aspect for the Audit to report is whether mining has been undertaken in accordance with the performance measures contained in the development consent and the SMP approval for Area 3B. The relevant performance measures are:
    - Development consent
        - Schedule 3 – condition 1, condition 2, condition 3, condition 5
    - SMP Approval
        - Schedule 3 – condition 9 (*Point 2*)
- The SCA requests that the auditor determine whether the various strategies/plans/models/programs/monitoring required by the SMP approval have been prepared in accordance with the specified timeframes and requirements for consultation with agencies including the SCA. (*Point 3*)
- The company informed the SCA at a meeting on 15 August 2014 about its Biodiversity Offset Strategy required under Schedule 3 condition 6. The SCA was provided a copy of the Offset Strategy sent to the Department of Planning and Environment on 18 August 2014. The SCA is disappointed at the lack of consultation by the company with the SCA in preparing the Offset Strategy prior to it being submitted to the Department. The SCA is currently reviewing this document and will provide a formal response to the Department. (*Point 4*)
- The SCA notes that the auditor is required to carry out an extensive audit of the impacts of mining in Area 3B and the efficacy of the Biodiversity Offset Strategy – Schedule 3 condition 17. The findings of the auditor with respect to impacts will be of great interest to the SCA (and others). The SCA requests that in determining the impacts of mining the auditor focus on the environmental consequences and recognise that consequences may arise well after subsidence impacts occur. (*Point 5*)
- In auditing the impacts of mining, the SCA requests the auditor to investigate specific issues identified below regarding the hydrological modelling and lack of linkage between upland swamp groundwater monitoring and related performance measures:
    - The SCA considers the hydrological model used by Dendrobium Mine to be inadequate, inappropriate and unproven for its intended use, and not capable of identifying loss of water in the catchment watercourses, nor confirm whether water flowing within surface fracture network and drained pools re-emerge downstream of the mining area. The SCA has had the RUNOFF2005 hydrological model used by the Mine's consultants Ecoengineers peer reviewed by Mr. Grantley Smith of the Water Research Laboratory UNSW and found the model to be inadequate and unproven for its intended use (refer SCA's submission to the Department of Planning & Environment on the Dendrobium Area 3B SMP in December 2012). A recent review of Dendrobium Mine's hydrological modelling done by Professor Thomas McMahon of the University of Melbourne on behalf of the Dendrobium Community Consultative Committee also found limitations in the

RUNOFF2005 model and its ability to predict catchment water losses due to mining. (*Point* 6)

- The Swamp Impact Monitoring Management and Contingency Plan (SIMMCP) Table 1.1 lists extensive monitoring of moisture content and shallow groundwater levels (approximately 50 piezometers in and around swamps in Area 3A and 3B). Table 1.2 of the SIMMCP presents the impacts, triggers and response while Table 5-2 presents the linkage between performance measures and the predicted impacts, mitigation and contingency measures for swamps. The SCA considers that the extensive shallow groundwater monitoring in swamps is not linked to the performance measure relating to the Subsidence Impact Performance Measures for swamps in the approval (Schedule 3 condition 9). The hydrology and groundwater levels in swamps is the key parameter affecting the ecosystem functionality of swamps and the extensive monitoring proposed need to be linked to its related performance measure for decision makers to understand the impact and management strategies including swamp rehabilitation. (*Point* 7)

Please call me in case you wish to discuss or require any more information."

Auditor Response to Point 1:

BHPB advise that the results of the previous Audit were conveyed to the DCCC. The previous Audit was not on the website at the time of the SCA response, but this has now been rectified. The Auditor considers that if this was an important issue to the SCA that the SCA could have requested a copy any time within the last three years.

Auditor Response to Point 3:

This SCA request is part of the overall audit and is addressed throughout the document. Notwithstanding, the Auditor notes that most submissions have met the original Consent specified dates and in other cases, extensions have been granted by DoPE for certain submissions. As such, Dendrobium has effectively met their submission time requirements. The Auditor understands that consultation has taken place with the noted authorities in preparing specific plans and strategies, although it is noted that Dendrobium does not appear to have given equal weight to SCA compared to OEH into consulting about the preparation of the Draft Biodiversity Strategy with SCA having been given a draft after submission to DoPE. However, since the document is not yet finalised nor approved, SCA does have the opportunity to provide its input. (Also refer to response to Point 4 below).

Auditor Response to Point 4:

The SCA point is basically a comment. The Auditor understands that consultation on Subsidence issues has taken place extensively since 2007 (including with the SCA). BHPB advises that there have been extensive discussions about Swamp Management and Impacts which are closely related to the Biodiversity Offset Strategy. The Auditor is of the understanding that the SCA Response will be considered by Planning before any approval of the Strategy is given.

Auditor Response to Points 2, 5, 6 and 7:

These issues are considered in the Section 3 of this report dealing with Subsidence issues.

2.2.4 NSW Office of Water

The NOW response from Ms Keti Nikolovski of the Wollongong Office is as follows:

Further to your email below requesting a response from the NSW Office of Water (NOW) in relation to Dendrobium's licensing requirements under their current Approval **10WA118772** and Water Access Licence **10AL118771**, we now provide the following advice.

As the conditions for the approval and access licence under the Water Sharing Plan for the *Greater Metropolitan Region Groundwater Sources* have not yet been developed, the Water Act conditions under prior licence 10BL161946 still apply.

The existing Water Act conditions stipulate that:

- An estimate of the annual volume of groundwater intercepted must be approved by the NOW one month prior to the beginning of each water year;
- A map of the licensed site to be provided to the NOW showing areas of alluvial sediments and mine works;
- Measures to be implemented to prevent surface and/or alluvial groundwater flows from entering the mine work;
- A Management Plan is to be developed and implemented in consultation with the NOW;
- An annual Compliance Report to be provided to the NOW;
- A meter to be installed and maintained on each extraction work;
- An independent environmental audit is to be carried out at the end of the 5 year licence period and submitted to the NOW;
- The groundwater extracted must not exceed the authorised allocation limit;
- The licence will lapse at the conclusion of mining operation.

The NOW have no specific comments to make regarding this matter at this time.

Auditor Response:

The Approved Groundwater Management Plan has been developed in consultation with NOW.

Annual details of the Groundwater monitoring (summary of activities, annual volumes, tarp levels etc.) are provided in the Annual Environmental Management Report – refer to the Groundwater sections. The AEMR serves as the main reporting mechanism to NOW.

The licence was issued in 2013 and hence the 5 year audit requirement has not yet been triggered.

2.2.5 EPA

The EPA reply from Mr William Dove was as follows:

I have attached a link to the NSW EPA Public Register, and the Dendrobium Environment Protection Licence (EPL) 3241.

http://www.epa.nsw.gov.au/prpoeoapp/SearchResult.aspx?SearchTag=licence&searchrange=licence&range=licence

This link includes information about non-compliances reported by Dendrobium with their Annual Return going back to 2000/2001.

As you carry out the audit against Approval Conditions, the EPA requests that you consider Dendrobium compliance with their EPL conditions, in particular any non-compliances identified in Dendrobium Annual Returns and compliance with any corrective actions identified by Dendrobium Coal to address these non-compliances.

The EPA requests that you also carefully review Dendrobium compliance with noise conditions, both site noise and train noise.

These matters are addressed in Section 4 of this report.

2.2.6 Department of Trade and Investment, Regional Infrastructure and Services

The Department of Trade and Investment reply from Mr Greg Kininmonth Manager & Principal Inspector Environment (Wollongong) was as follows:

"I am with the Dept. of Trade and Investment Environmental Sustainability Unit. Hence, this email only covers issues relating to environmental and rehabilitation aspects of Dendrobium's operations.

I don't have any specific issues to be addressed in the audit other than determining compliance with approval conditions generally (including conditions of Mining Leases and Subsidence Management Plan approval(s) if that is part of your scope).

I also provide the following general comments from the Dept. of Trade and Investment's Environmental Sustainability Unit for your information:

Dendrobium's environmental performance is generally satisfactory. I believe there are still regular noise complaints but this is predominantly an EPA issue and I will leave comment on this issue to that agency.

The standard and quality of submitted reports is generally excellent.

Compliance with approval conditions etc. appears to be a very strong focus at Dendrobium and I would expect your audit will find results consistent with this focus.

A current Mining Operations Plan is in place (expiry 31 December 2014)

Annual Environmental Management Reports are up to date.

The level of reporting of subsidence impacts in accordance with lease conditions, approval conditions, management plans etc. is generally satisfactory and in some cases (reporting of subsidence impacts for example) is standard setting for the region.

There appears to be a high level of disagreement/dispute between Dendrobium and some agencies as to whether monitoring of subsidence related impacts is representative/effective/satisfactory and, or whether modelling, monitoring, impact identification and analysis are deficient. Therefore, there is also ongoing debate about whether conclusions drawn from the obtained data are accurate. I would expect SCA and OEH in particular will provide you with more detailed feedback regarding this issue.

Please advise if you require further information regarding this issue."

2.2.7 Dam Safety Committee

The Dams Safety Committee reply from Mr Steve Knight Executive Engineer (Parramatta) dated 19 August 2014 was as follows:

"This letter contains a reply to your email requesting feedback from the Dams Safety Committee on Dendrobium's compliance with their Approval conditions. The DSC's comments are limited to approval conditions to mine within Notification Areas around Cordeaux and Avon Reservoirs.

The DSC monitors reporting under the prescribed dam conditions of the Dendrobium leases. These conditions require monitoring and reporting on:

- Mine water make
- Water chemistry sampling of the Reservoirs, underground workings and groundwater in overlying strata
- Ground water pressure heads
- Subsidence measurements
- Conditions of workings and geological structures intersected in the workings

Over the last three years the mine has been in compliance with the monitoring and reporting conditions required under various approvals to mine within Notification Areas.

The mine provides regular reports on the condition of the workings, the mine water balance and water sampling, with reports on groundwater pressure heads and subsidence as the results become available.

Subsequently a further letter dated 12 November 2014 was received which replaced the last two paragraphs with the following:

The DSC's current view is that the mine is non-compliant with the monitoring and reporting conditions required under various approvals to mine within Notification Areas.

The DSC has become aware that the groundwater pressure heads have been incorrectly calculated since the vibrating wire piezometers were installed. This issue was picked up by the DSC and recently brought to the mine's attention for an explanation. Even though the mine had been aware of the issue for some time, it was not forthcoming with the information about the problem or what was being done about the problem or what was being done to correct the problem.

Sampling of water chemistry from overlying strata via boreholes has been contaminated because of the method used to install the sampling sites within the boreholes. Even though this problem would have been obvious to the mine for a considerable length of time, no mention has been made to the DSC that the water chemistry sampling has effectively been rendered meaningless. The only mention has been in an End of Panel Report for LW9 by Hydro Simulations.

The condition for monitoring piezometric heads states:

- Annexure D1 Condition 2.3: The company shall prepare and submit to the Committee an analysis and interpretation of the results of the monitoring monthly, or as specified in Annexure E. The report shall include: piezometric monitoring data from each hole in terms of pressure and the equivalent height in meters above AHD; comments on the results and trends displayed by the data; graphs to demonstrate piezometric trends over time, overlain with an indication of longwall mining or other mining activities. The details of the presentation shall be determined by the Committee from time to time.

The condition for monitoring groundwater chemistry states:

- Annexure D1 Condition 3.3: Before mining within 300m of the Notification Area, or before some other time as determined by the Committee from time to time, the company shall install boreholes, or other facility acceptable to the Committee, which enables groundwater samples to be taken directly from both the Scarborough Sandstone and Bulgo Sandstone in the area located between LW6 and the Sandy Creek Arm of Lake Cordeaux, or some other areas acceptable to the Committee.

- Annexure D1 Condition 3.4: The company shall prepare and submit to the Committee an analysis and interpretation of the results of the monitoring, within seven days of the end of each month, or at some other frequency as determined by the Committee from time to time. The report shall include: details of the significance of the results.

Monitoring results for water chemistry show contamination since 2010. However, the mine has made no mention of the problem. Because the problem has not been acknowledged, there has been no attempt to rectify the problem. Reporting on monitoring data that are known to be faulty does not satisfy the approval conditions. Hence in the opinion of the Dams Safety Committee the mine is non-compliant. The DSC has requested of Dendrobium a series of rectification measures and provision of a program in which such measures will be undertaken.

Illawarra Coal has replied by letter to DSC dated 27 November 2014 responding to all of these matters (copy in **Appendix F** of this document). The Auditor is of the opinion that the mine is compliant with the monitoring and reporting conditions required under various approvals to mine within Notification Areas.

3. SPECIFIC ENVIRONMENTAL CONDITIONS – MINING AREA

This section applies the following consent conditions to assess the technical areas covered under Schedule 3 of the 2008 Development Consent.

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

The 2008 consent specifically applies to Area 3A, 3B and 3C. Reference has also been made to the SMP Approval for Area 2 (1/5/07).

Appendix D contains the Subsidence Consultant DgS Report and Site Inspection Photo Log. The information in **Appendix D** supplements the information provided below.

3.1 SUBSIDENCE

3.1.1 Watercourse Impact Management

The SMP for Area 3A (LWs 6-8 and 19) and 3B (LWs 9-18) required a Watercourse Impact Monitoring, Management and Contingency Plan for surface water (quality and quantity) that was to be developed in consultation with the relevant stakeholders. It is understood that the SMP for Areas 1 and 2 has now been integrated into the Conditions of Consent for Area 3 (A, B, C).

The DA Conditions of Consent and SMP Approvals required the following mining impact limitations in Areas 3A (LWs 6-8 & 19) and 3B (LWs 9-18):

- Negligible environmental consequences and impact to the over hangs or water flows within 30 m of Sandy Creek Waterfall.

- Minor environmental consequences and impacts along Sandy Creek, Wongawilli Creek and Donalds Castle Creek.

- Negligible reduction in surface and ground water inflows to Lake Cordeaux, Lake Avon, and surface water inflows to the Cordeaux River at its confluence with Wongawilli Creek.

- Prepare a suitable on-going monitoring and reporting program which includes surface water levels, flows, water quality, changes in surface gradients, erodibility, aquatic flora and fauna (including threatened species & their habitats) and ecosystem function.

- Include an impact management program to demonstrate how impacts are to be measured and defining an appropriate mine planning, corrective action or mitigation response to predicted and unpredicted impacts, based on a Trigger, Action, Response Plan (TARP) management structure.

- Plans to be prepared in consultation with OEH, SCA and DoPE.

- Incorporate an adaptive approach to mine planning based on knowledge gained from previously mined longwalls.

The mine has assessed pre-and post-mining conditions of the watercourses with stakeholders via IC Environmental Field Team inspections and specialist consultant assessments.

Watercourse impacts such as surface alluvium and rock bar cracking, flow path adjustment, iron staining, and gradient changes have been monitored and reported at monthly (IC Environmental Team) and 6-monthly intervals during mining and up to 2 years after mining.

IC also established a "technical committee" of IC, DRE, MSEC and independent subsidence and geotechnical experts to prepare an appropriate TARP to monitor and manage mining impacts at Sandy Creek Water Fall as LW 6 - 8 approached their finishing points. The longwalls were stopped up to 50 m short of their approved locations, based on the stringent valley closure and horizontal strain limits applied to avoid impact within 30 m of the waterfall.

Comparisons between predicted and observed subsidence effects and impacts have been assessed in End of Panel and Annual Environmental Management Reports by the IC Environmental Field Team.

Overall, the subsidence predictions have generally been greater than observed movements and impacts have been within the limits defined in the revised Watercourse Monitoring TARP for the 1st, 2nd and 3rd Order watercourses within the study areas.

Further details of monitoring and management outcomes are provided in **DgS, 2014** in **Appendix D** of this document.

3.1.2 Swamp Impact Management

The SMP for Area 3A (LWs 6-8 and 19) and 3B (LWs 9-18) required a Swamp Impact Monitoring, Management and Contingency Plan (SIMMCP) for all upland swamps that are likely to be affected by subsidence impacts. The Plan must:

- Be prepared by suitably qualified persons and implemented before longwall mining occurs

- Include base line information on the condition of the swamps

- Detail procedures for rehabilitation of the swamps if impacted, and

- Include completion criteria and a programme to monitor the effectiveness of the rehabilitation.

The DA conditions of consent and SMP Approvals required the following mining impact limitations:

- Minor environmental consequences or impacts such as erosion, changes in size, ecosystem functionality, species diversity of Swamps 1a, 1b, 5, 8, 11, 12, 14, 15b and 23 and that the structural integrity of its bed rock base of any controlling rock bar or significant permanent pool is maintained or restored.

- No significant environmental consequences or impacts to Swamps 3, 4, 10, 13, 15a, 16, 35a and 35b beyond predictions in SMP.

- Prepare the Swamp Impact Monitoring, Management and Contingency Plan in consultation with OEH, SCA and DoPE that demonstrates how the subsidence impact limits for maintaining the functionality of swamps are to be achieved.

- The monitoring program and reporting mechanisms must enable the DoPE and DRE to complete on-going review of the impacts of individual and cumulative effects of the Area 3A and 3B longwalls on impacted and control swamps.

- The management plan should include a TARP that focuses on linking measured impacts with CMA and remediation measures.

- Incorporate an adaptive approach to mine planning based on knowledge gained from previously mined longwalls.

- The management plans to be implemented prior to any longwall effects on swamps occurring to the satisfaction of the Director General.

The mine has assessed the pre-and post-mining conditions of Swamps 12, 15b and 16 above LWs 7 and 8 and Swamps 1a, 1b, 5 and 8 above LW9 and 10 using the IC Environmental Field Team and specialist consultants. The management plan includes monitoring frequency and timing and impact levels (cracking of rock bars, soil moisture, groundwater level changes and flora and fauna changes such as vegetation dieback and alteration of fauna and habitat).

Surface water and shallow groundwater (level/flows and quality) have been monitored in accordance with the Watercourse Impact TARP.

The outcome of the monitoring program in Area 3A after LWs 7 and 8 has indicated minor fracturing of rock bars in Swamps 12 and 16 and surface flow losses through fractured rock bars with no changes to geochemistry or hydrology of the swamps detected. Shallow groundwater level drawdowns of up to 1 m and recession rate increases above pre-mining conditions have been detected.

Similar impacts and environmental consequences to Swamps 1a, 1b, 5 and 8 have occurred in Area 3B above LWs 9 & 10.

Level 1 to 3 impacts to swamps in Areas 2 to 3 have been assessed as having 'minor environmental consequences' with CMAs included as part of the SRRP over the next 5 years. Field grouting trials to seal sub-surface and surface cracking will be conducted on Swamps 1a, 1b, 5 and 15b to restore diverted surface flows, groundwater levels and recession rates. Further details of monitoring and management outcomes are provided in **DgS, 2014** in **Appendix D** of this document.

3.1.3 Subsidence Management Plans

The Subsidence Management Plans (SMP) for Areas 3A, 3B and 3C are required to:

- include plans for monitoring subsidence effects
- integrate with on-going impact management in Areas 1 and 2
- integrate with Watercourse and Swamp Impact TARPs
- include the SCA Assets Protection Plan
- include impact management TARPs for all other significant natural and man-made features such as:
    - cliffs and steep slopes
    - groundwater
    - terrestrial flora and fauna and ecological communities and their habitats
    - Aboriginal Heritage sites
    - Power, communications and other infrastructure
- Be prepared in consultation with OEH, SCA and DPI

In regards to Areas 2 (LWs 4 and 5) and 3A & 3B (LWs 6-18) the mine has obtained subsidence effect predictions and subsidence impact assessment from MSEC and prepared the relevant TARPs for the following features:

- Cliffs
- Steep Slopes
- Watercourses (1st, 2nd and 3rd Order Streams)
- Sandy Creek Water Fall

- Swamps
- Terrestrial flora and fauna
- Aquatic ecology in creeks and tributaries
- Aboriginal Archaeology
- 4WD track and Fire Trails
- 330 kV Power Transmission line
- 33 kV Power line
- Upper Cordeaux Dam Wall
- Upper Cordeaux and Avon Reservoir
- State Survey Control Marks

The Subsidence Environmental Management Plan (SEMP) for the landscape elements of Dendrobium Area 1 was prepared by GSSE in November 2004. This plan has been subsequently modified to include Area 2 (GSSE, 2006) and the revised document was incorporated into the Subsidence Management Plan (SMP) prepared for Area 3A in accordance with DPI NSW guidelines. This SMP fulfils the requirement for landscape monitoring and management for Area 3A and 3B as required by the Dendrobium Consent and the SMP Guidelines.

The TARPs include monitoring details / frequency requirements and potential impact / management response outcomes. The results of monitoring and impacts are presented in monthly, 6 monthly and Annual Environmental Management Reports as well as End of Panel Reports.

Overall, there have only been a few minor exceedances noted for the predictions with impacts typically assessed as either 'negligible' or 'minor'. 'Moderate' impacts are the highest level of impact noted to-date (from cliff line rock fall impacts in Area 2 and 3A) with no significant impact exceedances occurring. *Note: the revised TARPs now refer to either Level 1, 2 or 3 Impacts that are linked to appropriate Corrective Management Actions (CMAs).*

Several Area 3A and 3B sites were inspected by DgS on 3/9/2014 and found to concur with the reported impacts. No impacts were observed at the Sandy Creek Water Fall.

Iron staining has been identified in WC17 and SC10C in Areas 3A and 3B. It is considered that the precipitation of iron oxide is a common occurrence when mine subsidence cracking occurs in the Southern Coalfield which results in the release or exposure of groundwater to the atmosphere.

There are no reported aquatic flora/fauna kills due loss of pond habitat or the precipitation of iron oxide along flowing, ground water fed water courses. This issue should continue to be discussed in subsequent AEMRs.

It is noted that the TARPs have been revised twice during LW7 to 9 and reviewed by DoPE, OEH, SCA and DRE. The subsidence impact levels were amended to be more consistent with actual impacts and appropriate CMAs.

It is understood that there are several outstanding issues for which DRE, SCA, OEH and DoPE require further explanation (responses are provided below for each issue raised in context of system requirements):

- Ground water level drops below Area 3A and 3B are considered to be a higher impact than the 'Minor' impact assessed by IC and its consultants.

  Response: Environmental consequences due to ground water level drops are within approved TARPs.

- The available environmental impact monitoring reports still only present data on current mining area (i.e. Area 3A - LWs 7 and 8) and do not update data or provide on-going assessment of previous mining areas.

  Response: The mine is required to continue monitoring for a minimum period of 2 years after mining first occurs. While this data has not always been reported in the AEMRs, the data has been collected and is understood to have been presented at DCCC meetings and to government agencies.

- Shallow and deep groundwater level drawdown responses to mining have been reviewed by **Ecoengineers** and **HydroSimulation.** Modelling deficiencies have been identified and will be amended in the next audit period.

3.1.4 End of Panel Reporting

End of Panel reports (EoPs) for Areas 3A and 3B are required to and have been submitted within 4 months of completion of each longwall panel. The reports include:

- All measured subsidence effects (both individual and cumulative)

- Discussion of all subsidence and environmental impacts and consequences for watercourses, swamps, water yield, water quality, aquatic ecology, terrestrial ecology, groundwater, cliffs and steep slopes, and

- Comparison of the above impacts and environmental consequences to predictions.

EoP reports have been submitted to DoPE and DRE and comply with SMP approval and Development Consent Conditions.

3.1.5 Subsidence Expert Assessments

IC engages numerous expert consultants to prepare subsidence impact studies and provide advice for mitigation against significant long-term impacts. All of these companies have good experience with assessing and predicting longwall mining impacts in the Southern Coalfield.

3.2 ABORIGINAL HERITAGE

The Aboriginal Heritage Plan sets out the requirements to satisfy the Consent Conditions for Aboriginal Heritage management in Dendrobium Area 3A. Aboriginal Heritage Impact Permit (AHIP) No: 1098243 was issued to BHP Billiton Illawarra Coal on 27 March 2009. AHIP No: 1098243 allows for potential impacts (associated with subsidence movements from longwall mining) to Aboriginal archaeological sites within Dendrobium Area 3A.

The management measures described in this Aboriginal Heritage Plan are the same as those to be implemented for AHIP No: 1098243. This plan fulfils the requirements of DTIRIS NSW in relation to their SMP Guidelines. This plan is available on the BHP Billiton website under Dendrobium Mine:
http://www.bhpbilliton.com/home/aboutus/regulatory/Pages/default.aspx

The Cultural Heritage Management Plan (CHMP) is based on the cultural heritage requirements in the Dendrobium Development Consent and the Dendrobium SMP.

Subsidence predictions and potential impacts have included fracturing of sandstone, isolated rock falls and seepage through joints. To-date no impacts to rock shelters with art have occurred, with Low to Moderate likelihood of impact assessed. The only impact identified within Area 3A to date was associated with the expansion of an existing vertical joint at the back of the shelter No. SCR 26.

3.3 GROUNDWATER MONITORING

Deep and shallow groundwater levels and quality monitoring have been obtained before (base line), during and after longwall mining effects. Net groundwater inflows into the mine (water make or balance) are based on water pumped out of the mine less water pumped in.

Specialist hydrogeological reports by HydroSimulations and Ecoengineers have reviewed impacts of Area 2 and 3 to-date and indicate that no impact to Lake Cordeaux or Avon storage or subsurface aquifers in the rock mass has occurred.

Shallow groundwater monitoring below existing swamps indicate that only minor impacts or fracturing of rock mass below the swamps has occurred in Areas 3A and 3B, with no significant impact on geochemistry or hydrology of the swamps. Soil moisture contents have reduced across all of the monitoring sites. Other swamps outside of the mining area have also shown similar decreases.

Shallow piezometers in the sedimentary material which makes up the swamps have shown a decline in water level and recession rate increases compared to baseline data. It is understood however, that monitoring results for groundwater impacts in Areas 2 and 3 are of concern with the OEH, SCA and DCCC and likely to require further review and response from IC in regards to possible remediation options.

The Dendrobium groundwater monitoring program was implemented during the reporting period as defined in the Groundwater Management Plan (Oct 2012). The Groundwater Management Plan has been developed to comply with the Dendrobium Development Consent. The purpose of the program is to analyse the water quality and quantity within the mine to satisfy health, safety and environmental aspects of the Development Consent and BHP Billiton Policies and Standards. The Plan was developed in consultation with the DSC, SCA, DoPE, NOW and DRE.

Monthly water sampling is performed underground with samples analysed onsite and at NATA registered laboratories. Mine water usage, water flows and volumes within the mine are analysed and reported on regularly (on a daily to weekly basis). Surface and underground vibrating wire piezometers are utilised to monitor groundwater response to mining. Monthly reports are prepared and submitted to the DSC, SCA and DTIRIS summarising water quality and the water balance at Dendrobium.

AEMR 2011/2012 text follows:

In the 2011 review of the DSC Management Plans, including the Principal Response Flowchart (PRF) it was recognised that the triggers in the PRF needed to be revised upwards in order to accommodate the normal groundwater flows from the mine. The revised DSC Management Plans were submitted in September 2011, within the AEMR reporting the DSC had not provided any comments on the revised Plans.

During the reporting period the mine generally operated at Level 1 or Level 2 conditions as described in the Principal Response Flowchart (PRF see Figure 9 of the AEMR 2011/2012). The mine entered an Unacceptable Level during Inflow Event 10.

The groundwater reporting to the mine workings during normal conditions is characteristic of coal measure water, relatively higher salinity and older water based on water chemistry analysis and isotope analysis.

Water samples from inflow events have been typical of near seam coal and shale water. To date there has been no quantitatively significant evidence that modern surface, dam or rain water has reported through to the mine workings (Ecoengineers 2012).

Inflow events, periods of rapid increase in flow, continued to occur into Area 2 goaf after periods of significant rainfall.

The piezometers in Area 2 primarily monitor the groundwater between longwall extraction and Cordeaux Reservoir to the east of the longwalls. The piezometers have not responded to the mining of Longwall 7 & 8 during the reporting period. There has

been no response to inflow events and this is consistent with previous events, indicating a localised source which is not linked to the stratigraphy monitored by the piezometer array.

The piezometers in Area 3A have evidence that the pressure increases with depth closely mimic the Hydrostatic Piezometric Gradient while a noticeable pressure loss occurs at the Bulli and Wongawilli Seams for most holes associated with the progressive development into Area 3A.

AEMR 2012/2013 text follows:

Between 1st of July 2012 and 6th of January 2013 Dendrobium operated under a Principal Trigger Action Response Plan (TARP) outlined in the "Cordeaux Reservoir DSC Notification Area Contingency Plan".

During this period the mine generally operated at Level 1 or Level 2 conditions as described in the Principal Response Flowchart (see Figure 3-8 of the AEMR 2012/2013).

Dendrobium began operating under a new Principal TARP on the 7th of January 2013 following approval of the "Avon and Cordeaux Reservoirs DSC Notification Area Management Plan" (DSCNAMP) on the 12th of December 2012. Figure 3-9 of the AEMR 2012/2013 shows the current Principal Response Flowchart.

The groundwater reporting to the mine workings during normal conditions is characteristic of coal measure water, relatively higher salinity and older water based on water chemistry analysis and isotope analysis.

Water samples from inflow events have been typical of near seam coal and shale water. To date there has been no quantitatively significant evidence that modern surface, dam or rain water has reported through to the mine workings (Ecoengineers 2013).

Whilst operating within Level 1 or Level 2 TARPs between the 1st of July and 7th of December 2012, no abnormal or hazardous inflow events were detected. Level 1 and 2 TARPs were triggered as the "Cordeaux Reservoir DSC Notification Area Contingency Plan" did not account for increased water make due to the expansion within Areas 3A and 3B.

Inflow events (periods of rapid increase in flow) continued to occur in the Area 2 goaf after periods of significant rainfall. Inflow Event 11 into the Area 2 goaf occurred between the 2nd of March and the 27th of June 2013 as a result of heavy rainfall. Approximately 131 ML of water was pumped from Area 2 during this period. Notification is carried out by Illawarra coals External Affairs team.

It should be noted that Inflow Event 11 did not trigger any TARPs as the new Notification Area Management Plan states that "The trigger levels specifically exclude Area 2 rainfall related inflows".

The piezometers in Area 2 primarily monitor the groundwater between longwall extraction and Cordeaux Reservoir to the east of the longwalls. The piezometers have not responded to the mining of Longwall 8 & 9 during the reporting period. There has been no response to inflow events and this is consistent with previous events, indicating a localised source which is not linked to the stratigraphy monitored by the piezometer array.

Piezometers located in the Scarborough Sandstone and Lower Bulgo Sandstone have continued to show a pressure drop due to Longwall mining in Area 3A. Piezometers in the Upper Bulgo Sandstone adjacent to Longwall 8 have recently seen an effect from the Longwall passing the piezometer. The Hawkesbury Sandstone piezometers do not show a mining influence as demonstrated by DDH 103 in Figure 3-11. For mine safety reasons, some piezometers were disconnected during the reporting period (DEN36, 41, 93, 97 and 98).

In Area 3B, piezometers located in the Scarborough Sandstone and Lower Bulgo Sandstone have shown a pressure drop due to Longwall mining in Areas 3A and 3B. The Lower Hawkesbury Sandstone piezometers also show a pressure drop of 0 to 40 m with 1 m to 5 m drop in the Upper Hawkesbury piezometers in Figure 3-12. The Hawkesbury Sandstone piezometers typically show a response to rainfall.

AEMR 2013/2014 text follows:
During the reporting period, Dendrobium operated under a Principal Trigger Action Response Plan (TARP) as outlined in the "Cordeaux Reservoir DSC Notification Area Contingency Plan". During this period the mine operated at 'Normal' in the Principal Response Flowchart.

A Regional Groundwater Model for Dendrobium is maintained by Dr Noel Merrick of Heritage Computing. This model is routinely revised and updated to incorporate new data and the conceptual understanding of the groundwater regime in the mining areas.

The following conclusions were derived from the Dendrobium Regional Groundwater Model (2014) attributed to mining activities.

- No more than negligible reduction in the quantity of surface water inflows to the reservoir;
- No more than negligible reduction in the quantity of groundwater inflows to the reservoir;
- Negligible leakage from the reservoir to underground workings.

The Model also indicates that the mining is not resulting in greater than a negligible reduction in the quality or quantity of surface or groundwater inflows to Lake Cordeaux or Lake Avon or surface water inflow to the Cordeaux River at its confluence with Wongawilli Creek.

The Regional Groundwater Model has been developed by Coffey Geosciences in consultation with Dr Noel Merrick. The model is currently being revised to incorporate shallow groundwater. A local 3D numerical model has been developed

recently for the longwalls in Area 3b (**HydroSimulations, 2014**) to give more quantitative groundwater predictions than has been possible in the past. Measured groundwater inflows into the workings were also lower than predicted flows. Further details of deep and shallow groundwater monitoring and modelling impacts are provided in **DgS, 2014 Appendix D** of this document.

3.4 ENVIRONMENTAL OFFSETS

On 19 May 2009, Illawarra Coal wrote to SCA offering a land transfer of 33 ha as an environmental offset against this condition. On 10 July 2009, SCA wrote back to Illawarra Coal agreeing to the offer. Subsequently on 28 July 2009, Illawarra Coal wrote to Planning who agreed to the offer on 18 November 2010 while noting the possibility of further offsets should unforeseen impacts occur.

In November 2011, 154 ha of land was transferred from Illawarra Coal to the Minister for the Environment for inclusion into the Illawarra Escarpment State Conservation Area as part of the Stage 3 emplacement area offset.

Accordingly, this condition has been satisfied.

Condition 6 of the Subsidence Management Plan Approval for Area 3B dated 5/03/2013 requires BHPB to prepare and implement a Biodiversity Offset Strategy (BOS) to the satisfaction of the Director-General. The Plan was to be submitted by 31 October 2013. BHPB in consultation with Planning has sought and been granted several extensions to this submission date.

The BOS dated August 2014 has been submitted to the Department of Planning and Environment with a copy sent to the SCA for comment. The document states that it had been prepared in consultation with DoPE and OEH. BHBP also advises that the SCA has been involved in the closely related Swamp Impact Assessments since 2007 as well as recently discussing the BOS with the SCA.

Schedule 3 condition 17 of the 3B SMP Approval requires that the auditor is required to carry out an extensive audit of the impacts of mining in Area 3B and the efficacy of the Biodiversity Offset Strategy.

The Auditor has reviewed the BOS document in its present state and notes that the Strategy addresses all of the headings under the SMP Approval conditions. As the Strategy is not yet approved the Auditor is unable to advise on its efficacy within this Audit.

CONCLUSIONS:

(a) Occasional subsidence effect prediction exceedances have occurred but no apparent impact assessment criteria have been exceeded during the audit period;
(b) The strategies, plans or programs required under these approvals appear adequate; and

(c) The following recommendations apply:

- It is noted however that the observed subsidence exceedance above the starting end of LW9 has not been addressed adequately, and further review of the possible reasons for the increased subsidence magnitude should be reviewed by MSEC and an independent expert if necessary.

- It is recommended that environmental monitoring sites for groundwater below swamps be installed as early as possible and impact explanations be provided to consider limitations of available base line readings.

- In the interests of transparency, it would probably be a beneficial exercise to present all raw, on-going monitoring data for previously mined areas to stakeholders if requested.

- It is considered that the proposed SRRP for Area 3A and 3B watercourses and swamps will probably alleviate and address the majority of the OEH et al concerns if groundwater and surface water levels can be restored. However, if this SRRP does not achieve the desired levels, then independent input into the Dendrobium TARPs may be considered as part of the SMP Approval process for Area 3C.

4. SPECIFIC ENVIRONMENTAL CONDITIONS – SURFACE FACILITIES

This section uses the following consent conditions to assess the technical areas covered under Schedule 4 of the 2008 Consent.

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

Appendix E contains a photo log of the site inspections completed by Pacific Environment Limited with respect to air quality and noise aspects of the audit.

4.1 NOISE

4.1.1 Noise Impact Assessment Criteria

Consent Condition 1 of Schedule 4 reads:

The Applicant shall ensure that the noise generated at the surface facilities does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25% of any privately-owned land. The applicable criteria for any residence not listed in Table 1 shall be the criteria applying at the nearest listed residence.

These noise impact assessment criteria are shown below.

Table 1: Noise impact assessment criteria dB(A)

Day $L_{Aeq\ (15min)}$	Evening $L_{Aeq\ (15min)}$	Night		Residence (as shown in the Noise Monitoring Program)
		$L_{Aeq\ (15min)}$	$L_{A1\ (1min)}$	
42	42	38	48	R2
41	41	40	50	R22
40	40	39	49	R1
				R9
				R15a
40	40	37	47	R3a
				R5a
				R6a&b
37	35	35	45	R39a

Notes:

- *To determine compliance with the $L_{Aeq(15\ minute)}$ limit, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the development is impractical, DECC may accept*

alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.

- *To determine compliance with the $L_{A1(1\ minute)}$ limit, noise from the development is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the development is impractical, DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*
- *The noise emission limits identified in the above table apply under meteorological conditions of: wind speeds of up to 3 m/s at 10 metres above ground level ; or up to 3˚C/100 m temperature inversion strength for all receivers, plus a 2 m/s source-to-receiver component drainage flow wind at 10 metres above ground level for those receivers where applicable.*
- *These limits do not apply if the Applicant has an agreement with the relevant owner/s of these residences to generate higher noise levels, and the Applicant has advised the Department and DECC in writing of the terms of this agreement.*.

The AEMRs provide details of minor non-compliances with respect to the noise impact assessment criteria, as summarised below.

Eleven 'quarterly' monitoring campaigns were conducted during the audit period to evaluate performance against the L_{AMax} criterion (referred to as $L_{A1\ (1\text{-}min)}$ above).

Exceedances of the L_{AMax} criterion were measured on the following sites / occasions:

- R1 (17 High St): two exceedances of the 49dBA criterion recorded. Observations indicate that vehicle movements at the pit top area were the source of the exceedance;

- R6a (374 Cordeaux Road): two exceedances of the 47dBA criterion recorded. Observations indicated that operational noise moving ballast at pit top was the noise source;

- R39a (Figtree Farm): four exceedances of the 45dBA criterion recorded from operation of the train horn at the Kemira Valley Coal loading facility.

Eleven 'quarterly' monitoring campaigns were conducted during the audit period to evaluate each of the daytime / evening / night time criteria.

Exceedances of the $L_{Aeq\ (15\text{-}min)}$ criteria were measured on the following sites / occasions:

Eleven 'quarterly' monitoring campaigns were conducted during the audit period to evaluate each of the daytime / evening / night time criteria.

Exceedances of the $L_{Aeq\ (15\text{-}min)}$ criteria were measured on the following sites / occasions:

- R1 (17 High Street): daytime criterion exceeded during one monitoring event(October 2011– up to 42dBA recorded);

- R1 (17 High Street): evening criterion exceeded during one monitoring event (two measurements January 2012– up to 47dBA recorded);

- R6a (374 Cordeaux Road): daytime criterion exceeded during three monitoring events (two measurements October 2011 – up to 42dBA recorded, two measurements April 2012 – up to 45dBA recorded, February 2013 - 43dBA);

- R6a (374 Cordeaux Road): evening criterion exceeded during two monitoring events (July 2012– up to 41dBA recorded, February 2013 up to 43dBA recorded);

- R6a (374 Cordeaux Road): night time criterion exceeded during three monitoring events (two measurements April 2012– up to 43d BA recorded, two measurements July 2012– up to 42dBA recorded, one measurement in October 2012– up to 40dBA recorded);

- R39a (Figtree Farm): daytime criterion exceeded during three monitoring events (February 2013 – up to 38dBA recorded, May 2013 – up to 40dBA, July 2013 – up to 39dBA);

- R39a (Figtree Farm): evening criterion exceeded during four monitoring events (two measurements April 2012 – up to 40dBA recorded, October 2012 – up to 37dBA recorded, February 2013 – up to 44dBA recorded, July 2013 – up to 41dBA recorded, two measurements October 2013 – up to 39dBA);

- R39a (Figtree Farm): night time criterion exceeded during two monitoring events (October 2012 – up to 38dBA recorded, May 2014 – up to 37dBA).

All other criteria set out in Table 1 have been met for the period of this audit.

Regarding exceedances at Receptor R1, this location is noted to be within ~100m of the portal entrance in Kembla Heights. The Mine Manager's residence is owned by Illawarra Coal but is leased. As such, it is considered that compliance with impact assessment criteria should be evaluated at this receptor.

Exceedances at Receptor R6a were from pit top vehicle movements, ballast loading and compressor operations. Upgrades to the pit top compressors and a voluntary noise curfew has resulted in no exceedances at this location since February 2013.

Receptor 39a (Fig Tree Farm) is located in the Kemira Valley, and is potentially impacted by both coal handling and train noise. The mine notes that exceedances have been identified as being a result of train loading, specifically dozer movements on the coal handing stockpile (PEL photo log Picture E6). Noise testing of the (three) locomotives that are regularly used by the mine to transport coal were reported to all be in compliance, and no complaints from the Figtree Farm residence have been reported.

When assessing noise compliance the NSW Industrial Noise Policy (Environment Protection Authority 2001) states that a development is considered in exceedance of the noise limit when noise levels are greater than 2dBA above the limit. Taking this statement into consideration over the three year audit period a total of: one event

exceeded at Receptor R1, seven events exceeded at Receptor R6a and five events exceeded at Receptor R39a.

Where these exceedances have occurred they are typically up to 5 dBA above the limit which is considered noticeable but not significantly elevated. Two events exceeded the criteria by up to 7 dBA in year 2011 to 2012 and 9 dBA in year 2012 to 2013 occurred.

Review of the frequency of noise exceedances and complaints from surface operations (excluding rail noise) over the three year audit period and in comparison to the previous audit period has shown an overall trend of reducing exceedances and a reduction in noise complaints.

Some minor exceedances of the noise impact assessment criteria at non-mine related receptors indicate a technical non-compliance with this Condition.

It is anticipated that rectification of this may be achieved through the Continuous Improvement Consent Conditions (refer Section 4.1.4).

4.1.2 Land Acquisition Criteria

Consent Condition 2 of Schedule 4 reads:

If the noise generated at the surface facilities exceeds the relevant criteria in Table 2 at any residence on privately-owned land or on more than 25% of any privately-owned land, the Applicant shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8 - 10 of Schedule 4. The applicable criteria for any residence not listed in Table 2 shall be the criteria applying at the nearest listed residence. These noise impact assessment criteria are shown below.

Table 2: Noise acquisition criteria dB(A)

Day $L_{Aeq\ (15min)}$	Evening $L_{Aeq\ (15min)}$	Night $L_{Aeq\ (15min)}$	Residence (as shown in the Noise Monitoring Program)
47	**47**	**43**	**R2**
46	**46**	**45**	**R22**
45	**45**	**44**	**R1**
			R9
			R15a
45	**45**	**42**	**R3a**
			R5a
			R6a&b
42	**40**	**40**	**R39a**

Notes:

- *Noise generated by the development is to be measured in accordance with the notes to Table 1.*

In view of the results provided to Pacific Environment, it is noted that exceedances of the above criteria have been noted at the following receptors / times:

- R1 (17 High St): one exceedance of the evening time criterion;
- R6a (374 Cordeaux Road): one exceedance of the night time criterion;
- R39a (Fig Tree Farm): one exceedance of the evening criterion.

Since Receptor R1 is the mine manager's residence and owned by Dendrobium, the land acquisition criteria are never anticipated to be triggered.

It is understood that no written request for acquisition has been received from either Receptors R6a or R39a, and accordingly the above exceedances are considered to be technical non-compliances only.

As such this condition is deemed to be satisfied.

4.1.3 Rail Haulage Impact Assessment Criteria

Consent Condition 3 of Schedule 4 reads:
The Applicant shall ensure that noise generated by locomotives using the Kemira Valley rail line does not exceed the rail noise impact assessment criteria in Table 3.

Table 3: Rail noise impact assessment criteria

Operating Condition	Measurement Conditions	Criteria $L_{A1\ (1\text{-}min)}$
Locomotive at idle, with compressor radiator fans and air conditioning operating at maximum load	Stationary 15m contour	70dB(A)
All other throttle settings under self-load, with compressor radiator fans and air conditioning operating at maximum load	Stationary 15m contour	87dB(A) 95dB(Lin)
All service conditions	Up to 50 km/hour, 15m from centreline of rail track	87dB(A) 95dB(Lin) Must be non-tonal Linear noise levels must not exceed A-weighted noise levels by more than 15dB

Notes:
All measured noise levels must be assessed for tonality in accordance with the NSW Industrial Noise Policy, unless otherwise specified.

As reported within Dendrobium's AEMRs corresponding to the audit period, attended rail haulage noise measurements were conducted during 2011, 2012, 2013 and 2014). Additional rail haulage monitoring reports were provided by Dendrobium corresponding to an additional two occasions (October 2012 and August 2014).

The results indicated compliance with the overall dBA noise levels. Tonality and low frequency emission requirements were also satisfied on all occasions.

Complaints relating to rail haulage noise have increased significantly from 11 complaints in 2011-2012 to 72 complaints during 2012-2013 and 90 complaints during 2013-2014. The majority of complaints are from a single resident located amongst a group of potential residential receivers with line of sight onto the Kemira Valley rail line. The complaints are specific to train pass by events with wheel and brake squeal noise indicated as the subject of the complaint. Details of actions taken to reduce rail haulage noise are identified in the following section 4.1.4 (continuous improvement).

This condition has been satisfied.

4.1.4 Continuous Improvement

Consent Conditions 4 and 5 of Schedule 4 read:

4. The Applicant shall:

(a) continue to investigate ways to reduce the noise generated by the development (including off-site road noise, noise and vibration impacts from the operation of the Kemira Valley rail line and maximum noise levels which may result in sleep disturbance);

(b) continue to implement all reasonable and feasible best practice noise mitigation measures; and

(c) report on these investigations and the implementation and effectiveness of these measures in the AEMR, to the satisfaction of the Director-General.

5. The Applicant shall use its best endeavours to minimise wheel squeal, brake squeal and locomotive wheel slippage arising from rail haulage on the Kemira Valley rail line.

Noise abatement had been previously conducted within the Kemira Valley area as mentioned in previous audit reports, including the use of polyethylene rollers on the conveyor, acoustic lining / rubber doors at the top of the rill tower and lining of the rill tower bash plate. Since the previous audit additional mitigation from upgrade to the conveyor belt has resulted in removing periodic belt clip noise events (PEL photo log Picture E5).

The pit top compressor building noise source has been controlled during the installation of new compressors housed in a noise attenuating housing (PEL photo log Picture E3).

The Mine has been investigating noise complaints from operation of the Kemira Valley rail line associated with wagon bunching and wheel squeal noise. This has involved the purchase of rail noise monitoring equipment and ongoing rail noise monitoring trials to better understand rail noise causes and the effectiveness of procedural and engineering controls. Operational mitigation measures implemented include a Best Practice Train Handling Procedure which optimises operating speeds to minimise rail squeal, coaching drivers on the procedure and logging locomotive operations and continuing to monitor rail noise.

Engineering measures implemented to minimise squeal noise have included:

- A new maintenance program with increased focus on noise minimisation
- An increased fleet of wagons to allow greater capacity for preventative maintenance
- A rake (chain of wagons) brake alignment system to minimise brake noise

Previous works undertaken include:

- Upgraded track geometry to include superelevation in curves; and
- Optimisation of track lubrication.

This condition has been satisfied.

4.1.5 Additional Noise Mitigation Measures

Consent Condition 6 of Schedule 4 relates to the implementation of additional noise mitigation (e.g. double glazing, insulation or air conditioning) should the mine receive a written request from the owner of any residence where subsequent noise monitoring shows the noise generated by the development is 3 dB(A) greater than the noise impact assessment criteria in Table 1.

It was reported that no such requests have been received.

As such this condition is deemed to be satisfied.

4.1.6 Monitoring

A noise monitoring program has been developed by Dendrobium mine and is documented within Section 6 of their Noise Management Plan. The Approved Noise Management Plan was subject to a Triennial Review (Revision 05) dated March 2012

as required by the Development Consent. The latest version, Revision 6.0 is dated 17/07/2014. The changes made within this version of the document include the removal of monitoring locations R5a and R15a and the frequency of locomotive monitoring from six monthly to annually. These changes to the development consent were advised as approved by NSW Planning and Environment on the 28 August 2014.

This condition has been satisfied.

4.2 BLASTING AND VIBRATION

Reportedly no blasting operations have been undertaken at the surface facilities during the audit period.

This condition has been satisfied.

CONCLUSIONS:
a) While minor exceedances of the noise impact assessment criteria have been recorded at non-mine related receptors during the audit period, the operation is for the most part compliant;
b) It is anticipated that a route towards further minor improvements in compliance may be made through the Continual Improvement Consent requirements;
c) All other Dendrobium actions under this section of the Consent comply;
d) The strategies, plans or programs required under these approvals appear adequate; and
e) There are no additional measures or actions recommended for this audit component.

4.3 AIR QUALITY

The Approved Air Quality Management latest version 5.0 is dated 28 May 2014 and contains the following modifications:

- Three yearly review as required by Development Consent and to reflect changes in Licensed monitoring point within the Environmental Protection Licence (removal of point 15) - March 2012.
- Removed Dust Deposition monitoring sites Point 10 and Point 12 following EPL 3241 Variation – June 2014.

4.3.1 Impact Assessment Criteria

The Condition 9 of Schedule 4 of the Development Consent sets out relevant air quality impact assessment criteria for Total Suspended Particulates (TSP) and Particulate Matter less than 10 µm in aerodynamic diameter (PM_{10}) (Tables 4 and 5) and in Table 6 (for dust deposition).

These air quality criteria are shown below.

Table 4: Long term impact assessment criteria for particulate matter

Pollutant	Averaging Period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m^3
Particulate Matter less than 10 Microns (PM_{10})	Annual	30 µg/m^3

Table 5: Short term impact assessment criteria for particulate matter

Pollutant	Averaging Period	Criterion
Particulate Matter less than 10 Microns (PM_{10})	24-Hour	50 µg/m^3

Table 6: Long term impact assessment criteria for deposited dust

Pollutant	Averaging Period	Maximum Increase	Maximum Total
Deposited Dust	Annual	2 g/m^2/month	4 g/m^2/month

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, 1991, AS/NZS 3580.10.1-2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter – Gravimetric Method.

Rolling annual average dust deposition results were below the annual average assessment criteria for all points except Point 13.

Point 13 (Dendrobium Colliery Surface - PEL photo log Picture E1) rolling annual average dust deposition was marginally above the 4/g/m^2/month criterion during April, June, July and August 2014. Observed exceedances of the rolling annual average criterion at Point 13 were principally related to a highly elevated sample (16.1 g/m^2/month) recorded in November 2013. Visual Analysis performed on this sample confirmed that it was "90% dirt".

Point 13 is located within the boundary of the mining lease. As such, this point is not considered to be used for compliance monitoring, but is instructive for operational dust management purposes.

Point 15 was removed from the monitoring program at the end of the 2011 – 2012 monitoring year following the previous independent environmental audit and the removal of the monitoring point from the EPL.

High Volume Air Sampling (HVAS) is conducted at two locations:

- Point 20 (located at the entrance to Kemira Valley; and
- Point 21 (located on top of the bathhouse building, Pit Top; PEL Photo log Picture E4).

Consistent with the Air Quality Monitoring Program, monitoring is undertaken for TSP and PM_{10} at these locations on alternate weeks (i.e. TSP monitoring is undertaken at Point 20 concurrent with PM_{10} monitoring at Point 21, and vice versa).

The long term TSP and PM_{10} criteria have been satisfied at both locations for the duration of the audit period.

The short-term PM_{10} criterion of 50µg/m^3 has been exceeded on one occasion, at Point 21, during sampling in August 2013. The maximum recorded 24-hour average concentration at this location was 61.4 µg/m^3.

4.3.2 Monitoring

An air quality monitoring program has been developed by Dendrobium mine and is documented within Section 6 of their Air Quality Management Plan. This document includes Revision 5 (dated May 2014) which removed the EPL deposition monitoring points 10 and 12 and Revision 4 (dated March 2012) removing EPL licence point 15. The removal of these monitoring points was also reflected in the EPL variation notice number 1503454 dated 16 January 2012 and notice number 1521876 dated 19 May 2014.

This condition has been satisfied.

CONCLUSIONS:

a) Marginal exceedance of the annual dust deposition criterion have been observed at Point 13 at times during the audit period;
b) Point 13 is located within the colliery boundary (pit top access road). This site is not considered suitable for compliance monitoring, but is instructive for operational dust management purposes;
c) Exceedance of the short term PM_{10} criterion was observed on a single occasion during the audit period;
d) This exceedance is considered to be minor, and the contextual information surrounding reasons for this exceedance, as provided by the mine, is considered adequate;
e) The Dendrobium actions under this section of the Consent comply;
f) The strategies, plans or programs required under these approvals appear adequate.

4.4 METEOROLOGICAL MONITORING

This condition has been noted to be satisfied in earlier audits. The AEMRs note at various points the collection of relevant rainfall and other meteorological data.

Dendrobium maintains a 10m automatic weather station located adjacent to the main car park, on the roof of the main building. Monitoring has been undertaken for the period of the audit.

This condition has been satisfied.

4.5 WATER MANAGEMENT

Underground and surface operations at Dendrobium utilise fresh water and recycled mine water. The Recycled Water Project was implemented during the first quarter of 2008. This project resulted in recycled water being used for all general-purpose applications on the surface significantly decreasing fresh water usage.

Fresh Water use
Fresh water, supplied by Sydney Water, is currently used for the longwall hydraulic roof supports, which require high quality water for use in the emulsion process, and for kitchen and bathhouse facilities.

Fresh water usage for the AEMR 2011-2012 period was 24.5ML. Fresh water usage for the AEMR 2012-2013 period was 26.7ML. Fresh water usage for the AEMR 2013-2014 period was 30.6ML. Usage is tracked on a weekly basis and reported annually via the AEMR.

Recycled Water use
The recycled water component, sourced from the Nebo Workings, is pumped to the surface and used in the Portal Road dust suppression system; wash down bay, general hose down and cleaning and firefighting. Recycled water underground is used in secondary support, development units, dust suppression and firefighting.

The Recycled Water Project won an award from Sydney Water for the significant reduction of water usage achieved in 2008.

The Recycled Water Project led to a reduction in freshwater usage from between 89.3-105.5 ML/a (in 2007-08), to 22.8-26.7 ML/a (between 2009-13) ML/a.

There are appropriate catchments and treatment facilities on site as observed in earlier audits including clean, oily and dirty water at the pit top, at the rear of the workshop, at the diesel re-fuelling area and clean and dirty at Kemira Valley. The AEMRs also include details of maintenance activities.

The auditor was able to observe these systems during the site inspection.

All of the AEMRs report that:

Bunded areas are checked on a nominal weekly basis and are pumped out when required to maintain sufficient capacity.

In addition to the permanent bunded areas, portable bunds are used for transient storage or transportation of oils and fuels around the site. Various spill kits and/or bins containing oil absorbent material are located around the site in areas where there is highest potential for a spill to occur. Surface personnel are made aware of the locations of these spills kits and absorbent material bins in their work area. The contents of the spill kits and the oil absorbent material bins are checked on a regular basis.

The AEMR 2012/2013 reports that:

Hydrocarbon management was covered within the Environment and Community Awareness Training Package that was rolled out during FY13. An Emergency Response Scenario was held in May 2013 with the personnel from Kemira Valley, simulating a Hydrocarbon (diesel) onto the road next to the stockpile.

The AEMR 2013/2014 does not add to the previous reports except with an additional table of stored water volumes.

4.5.1 Discharges

Licensed Discharge Point 5 (LDP5) Monitoring Program
Water from the old Kemira Mine workings is discharged through Licensed Discharge Point 5 (LDP5), located at Marley Place. The monitoring results from the LDP5 sampling program are reviewed regularly and reported to site management, via EPL Annual Returns and the AEMR. The AEMRs contain listings of compliance.

The mean volume of discharge from LDP5 during AEMR 2011-2012 was 5.83ML/d (min. 2.43 and max. 10.26ML/d). A total volume of 2,204 ML (with 72ML of Brine from Appin West Desalination Plant) was discharged in FY12 from LDP5.

The mean volume of discharge from LDP5 during AEMR 2012-2013 was 4.15ML/d (min. 1.36 and max. 7.98ML/d). A total volume of 1,438 ML (with 74ML of Brine from Appin West Desalination Plant) was discharged in FY13.

The total volume of discharge from LDP5 during AEMR 2013-2014 was 2,070ML (including 71.65ML of brine from the Appin West Desalination Plant).

On 19 May 2014, Monitoring Points 24 and 25 were added to the EPL via a variation notice (dated 19/05/14) to replace LDP5 for the purposes of volume measurement. The mean volume of discharge from MP24 during the period was 6.6ML/d (min. 4.9 and max. 7.1ML/d). The mean volume of discharge from MP25 during the period was 0.2ML/d (min. 0 and max. 2.3ML/d). This information is in the EPL Return but not the AEMR.

The 2011-2012 EPL return reports three non-compliances. One was due to high conductivity during a brine discharge. The second related to an electrical fault not allowing a volume to be measured one day. The third was an exceedance of TSS (with a simultaneous exceedance of zinc) associated with turbid water from underground mine flooding. In this case a new turbidity measuring device has been installed. None of the events led to any serious environmental harm.

The 2012-2013 EPL return reports no non-compliances during the period. There was one high conductivity reading explained as being a blend of brine and mine water and one high suspended solids which was not an exceedance due to the rainfall exceeding 60mm in the preceding 5 days.

The 2013-2014 EPL return reports no non-compliances during the period. There was one high conductivity reading explained as being a blend of brine and mine water and one high suspended solids which was not an exceedance due to the rainfall exceeding 60mm in the preceding 5 days.

All EPL breaches are recorded and tracked via an event reporting system, reported to site management and via EPL Annual Returns.

The results for the audit period were compliant with the EPL criteria.

Related Pollution studies and reduction programs

No pollution reduction programs were required to be carried out during the AEMR three reporting periods.

4.5.2 Water Management Plan

The AEMR 08-09 noted that the WMP was submitted to the Director-General for approval (Section 3.2 of AEMR). A letter from Department of Planning dated 22/12/09 indicated approval of the WMP.

The latest version of the Water Management Plan 4.0 is dated 28 May 2014 and contains the following amendments:

- Update to meet GLD.009 requirements - October 2011.
- Update to reflect change to EPL and following Triennial Environmental Independent Audit – March 2012
- Update to reflect recent EPL Variation and new BHPB Template – May 2014.

The Auditor has observed that the updated WMP has been approved and is available on the website.

The WMP condition (c) must include the following four items:

Site Water Balance

The AEMRs report details of sources, usage on site and in mine; water management; off-site transfers and disposal as well as minimisation efforts.

Erosion and Sediment Control

The Erosion and Sediment Control Management Plan (ESCMP) was previously approved as noted in earlier audits.

This plan addresses erosion and sediment controls for the Dendrobium Pit Top, KVCLF, Ventilation Shaft 1 and 2/3 sites and the Kemira Valley Rail Line. A Construction Soil and Water Management Plan was developed for the Ventilation Shaft 2/3 site.

Surface Water Monitoring Program

The surface water monitoring program enables Dendrobium to maintain a database of regional water quality and to determine any changes to surrounding water quality.

The surface water monitoring program has been developed in accordance with the requirements of the Dendrobium Consent and in consultation with relevant stakeholders. The monitoring programs for Areas 1 and 2 have been established with the methodology being finalised during the baseline data collection program and approved in subsequent SMPs. The surface water monitoring program is reported in the Area 1 SEMP, Area 2 SMP and Area 3A SMP. The auditor notes that monitoring is primarily related to Subsidence management.

Monitoring Regime

During the FY12 reporting period the spillways for the Pit Top Sediment pond and Kemira Valley Sediment Ponds were added to the Environmental Protection Licence as Licensed Discharge Point 22 and 23 respectively (see plan 7B of the AEMR). Sediment ponds are managed in accordance with the water management plan.

At the end of the FY13 reporting period, the surface water monitoring network consisted of five regular sites (See Plans 8A and 8B) including sites upstream and downstream of both the Pit Top and Kemira Valley sites. Additional samples were taken during year in line with the Site's Water Management Plan.

The monitoring program includes:

- Recording of field observations
- In-situ monitoring for temperature, pH, conductivity and dissolved oxygen levels; and
- Water chemistry analysis of the water for pH, conductivity, total suspended solids (TSS) and oil and grease. The analysis is performed at a NATA accredited laboratory.

There is no significant difference between the upstream and downstream results for points Dend 7 (upstream) and Dend 10 (downstream) at KVCLF indicating that the facility is having minimal influence on the surrounding Brandy and Water Creek.

During the reporting period foam was detected downstream of the pit top. The EPA was contacted and the investigation identified ingress into the clean stormwater runoff system. The ingress point was subsequently sealed and no further contamination has been observed from this point.

When the water quality is compared between Dend 12 (Table 3-4 AEMR 12/13 upstream of pit top) & Dend 13 (Table 3-5 AEMR 12/13 downstream of pit top) there was no variation in oil and grease; and a slight increase in conductivity, total suspended solids and pH. Average water quality remained below the default trigger values from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 for slightly disturbed ecosystems in south-east Australia.

The data suggests that neither the mine site nor the KVCLF has had an impact on the surrounding water quality during the 2012-13 reporting period. A summary of the results is provided in the AEMR.

At the end of 2013-14 reporting period there were four main monitoring points (refer Plans 8A and 8B of the AEMR).

Dend 7 is upstream of KVCLF and Dend 10 is downstream of KVCLF. During the reporting period, there was no significant difference between these points indicating that the water management system in operation at the Kemira Valley site is effective with minimal influence on the surrounding Brandy and Water Creek.

Dend 12 is upstream of the pit top and Dend 13 is downstream of the pit top. A comparison indicates that:

- No variation in oil and grease
- A slight reduction in the total suspended solids level; and
- A slight increase in conductivity and pH.

The Auditor agrees with these conclusions.

Stream Stability

Stream stability is monitored by a series of photo points as part of the SMP approval requirements. Photos are taken both upstream and downstream at each monitoring point. Any changes identified, particularly where there has been evidence of erosion, will be investigated to determine the root cause.

A review of the photos taken during the reporting period suggests that neither the mine site nor the KVCLF has had an impact on stream stability during the reporting period. Any changes observed have been the result of increased flows during heavy rainfall periods.

Surface and Ground Water Response Plan

This issue is addressed in the Subsidence Section 3 of this Audit Report.

CONCLUSIONS:
(c) The Dendrobium actions under this condition comply;
(d) The strategies, plans or programs required under these approvals appear adequate; and
(e) The auditor notes that the discharge point from the pond which takes the pit top overflow is now licensed in accordance with the recommendation of the previous Audit.

4.6 LANDSCAPE MANAGEMENT

4.6.1 Rehabilitation

Rehabilitation of Disturbed Land
Rehabilitation associated with subsidence related impacts is detailed in Section 3 of this audit report. Evidence of rehabilitation of surface facilities is provided below (from the AEMRs). Sign-off of the AEMRs by the authorities indicates their satisfaction.

Table 5-1 of the AEMR provides a summary of the rehabilitation during the reporting period. Rehabilitation activities for the emplacement operations are included in the Bulli Seam Operations AEMR.

Exploration boreholes drilled during the reporting period have been rehabilitated. Most of these boreholes contain piezometers which are used for groundwater monitoring. The piezometers are embedded in the sealing cement, attached to surface head-works or an in-ground pit with a data logger.

Once monitoring is not required the monitoring sites are remediated. Remediation includes removal of any monitoring headworks/standpipes and cutting off the surface casing to below ground level. During rehabilitation erosion controls and re-vegetation are utilised as required.

The rehabilitation security cost estimate for the Dendrobium operations was reviewed in August 2013. No major changes to the existing security estimate were identified. A copy of the revised security cost estimate is provided as Appendix B of the 2013-14 AEMR.

Monitoring of the 2/3 Ventilation Shaft site was inspected on six monthly basis during the reporting period by Environmental representatives. Information provided in the 2013-14 AEMR demonstrates the success of the rehabilitation.

Inspections and maintenance works continue.

The agreed post rehabilitation land use is native bushland. Further rehabilitation will be undertaken at mine closure following decommissioning of site infrastructure.

In 2002, with the development of Dendrobium Mine, a commitment was made by Illawarra Coal to provide an area of land for the establishment of the Mount Kembla Mine Memorial Pathway (the Pathway). The Pathway was planned to be in three stages, with Stage 1 commencing at the start of Mount Kembla to Stones Road, Stage 2 incorporating an area of land between Stones Road and Benjamin Road, and Stage 3 from Benjamin Road to the old Bradford Breaker station. Stage 1 was completed in 2008 and Stage 2 in April 2013.

Kembla Heights Wetland Rehabilitation Project was completed during the 2011-12 reporting period with the removal of a large number of coral trees and other weed

species. Conservation Volunteers have been utilized to progress planting out the area and to undertake weed control.

The Mount Kembla Rehabilitation Project was an innovative approach to mine rehabilitation and beneficial final land use of a degraded mine site where social, environmental and economic values are strengthened by the outcomes.

Weed tree removal was undertaken in September 2011. Civil works contractor mobilisation and construction commenced in February 2012. Civil works and rehabilitation planting were completed in March 2013.

These works included the removal of weed species, including Coral Trees and Privet. Coral Trees are particularly detrimental to the health of streams, choking the stream bed with their trunks and fallen branches causing flooding issues and preventing the regeneration of native species. These weed trees were removed and replaced with native species. American Creek is a wildlife corridor between the Illawarra Escarpment State Conservation Area and the coastal plains, and the replanting of this area with native vegetation will facilitate wildlife movement along this corridor. Significant erosion points were repaired and stream stabilisation works were undertaken. Over 10,000 tonnes of coal wash was beneficially utilised in the project.

A portion of the rehabilitated land was subdivided for residential development. The size of the sub-division was reduced from the initial plans of six blocks to four as a result of community feedback. All four blocks of land were recently sold at auction.

The stage 2 pathway area will be removed from the mining lease when the lease is renewed.

Southern Habitat have been contracted to maintain and monitor the rehabilitation works conducted at the Stage 2 pathway project until June 2016. Ongoing maintenance activities will include erosion and sediment control, weed management and vegetation health.

Weed Management

Weeds are managed in accordance with Illawarra Coal's Weed Management Plan. Dendrobium carried out regular maintenance including weed control during the reporting period. In November 2009, Dendrobium contracted Biosis Pty Ltd to undertake a detailed weed assessment of the Dendrobium Pit Top and surrounding land owned by Illawarra Coal. The weed management plan was implemented in FY13.

Conservation Volunteers Australia (CVA) continued bushland restoration works in the area Kembla Heights village.

Within the Dendrobium Pit Top area some of the more accessible areas were targeted for weed species removal. This included the removal or treatment of Crofton Weed, Lantana, Privet, Ginger Lily and other woody and herbaceous weeds.

During the year more than 240 grasses, trees and shrubs have been planted including locally sourced native tube stock. There has also been a reasonable amount of natural regeneration of native plants at the site; particularly Kangaroo Apple, Bleeding Hearts as some Eucalypts species.

Throughout the year Dendrobium and Illawarra coal staff also participated in land rehabilitation activities at the old Mt Kembla Mine site.

Other Infrastructure
A project scope has been developed for the removal of structures associated with O'Briens Drift (OBD). Some of the old offices have been removed. A plan is being developed for the removal of the tipping sheds at the top of the drift and the bins and conveyors at the bottom of OBD. The project is currently on hold due to financial pressures.

All three AEMRs reports issued during the audit period commented as follows:

No significant land pollution events occurred during the reporting period. Minor spills that occurred were cleaned up as soon as practical and had no environmental impact.

In addition, on 14 November 2014, soluble oil was spilled onto a public road as it was being delivered to Dendrobium Mine via Stones Road. This occurred when a roof-fall in mid-October blocked the main travel road into the mine. The spill was immediately contained and cleaned up with no environmental impacts. The incident was reported to the EPA.

4.6.2 Landscape Management Plan

The latest version of the Approved Landscape Management Plan 5.0 is dated 29 April 2014 and contains the following amendments:

- Reviewed and updated to include contaminated land, land classification (freshwater and marine areas, protected areas and high conservation areas) and threatened species -.
- Triennial Review as required by the revised Development Consent – March 2012
- Added Section 5.5, Front page updated to comply with BHPB brand standard – April 2014.

The Landscape Management Plan includes the following two items:

Rehabilitation Management Plan

Note that this deals with the surface facilities sites excluding Mine subsidence areas.

Mine Closure Plan

In a letter dated 18 Aug 2009, the Department of Planning noted as follows:

"Delayed submission of the Mine Closure Plan should be formally requested by the company. At this point, the Department is unlikely to agree to a delay beyond 31 December 2020".

The Conceptual Closure Plan for Dendrobium Colliery was submitted to I & I – Mineral Resources on 12 January 2010.

An updated Security Assessment for the Rehabilitation Cost Estimates sent to I & I – Mineral Resources in October 2011.

An updated Rehabilitation Security Cost Estimate is included as Appendix B in the 2013/2014 AEMR and can be viewed on the BHPB website.

CONCLUSIONS:
(c) The Dendrobium actions under this condition comply;
(d) The strategies, plans or programs required under these approvals appear adequate; and
(e) There are no measures or actions recommended for this condition.

4.6.3 Bushfire Management Plan

The Bushfire Management Plan was submitted and approved prior to this audit.

The latest version of the Approved Bushfire Management Plan 4.0 is dated 19 April 2012 and contains the following amendments:

- Three yearly reviews in line with Development Consent conditions. Minor changes to roles and responsibilities section, references – March 2012

Asset protection zones were maintained or established in the following areas over all three AEMR periods in accordance with the Bushfire Management Plan:-

- Dendrobium Mine Pit Top
- Windy Gully - Cordeaux Road - Kembla Heights
- 28 -38 Harry Graham Drive - Kembla Heights
- Benjamin Road Fire Trail - Kembla Heights
- Containment Line southern side of Dendrobium Mine Pit Top

There are regular actions, inspections and responses according to the Bushfire Management Plan.

Comments received on the 2012/2013 AEMR asked for further detail on bushfire management measures. The 2013/2014 AEMR separately identified Asset Protection Zones and Fire Management Trails but the extra detail was minimal.

CONCLUSIONS:
(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and
(e) Dendrobium should re-visit the 2011/2012 AEMR information request and respond more expansively in the next AEMR.

4.7 TRANSPORT

4.7.1 Rail Transport of Coal

Condition 23

The allowable hours of operation on the Kemira Valley Rail Line are now 6am to 11pm seven days a week.

No breaches of the curfew times associated with the Kemira Valley Rail Line have been reported in any of the AEMRs.

Coal tonnages are reported in the AEMRs but not the rail movements.

Condition 24

This condition requires a record of the date and time of each train movement in the Kemira Valley and the amount of coal transported from the KVCLF each year.

The condition requests "a comprehensive summary and discussion of the results of this monitoring in each AEMR".

Dendrobium maintains full records of coal transport (evidence sighted by the Auditor). The operation is now in a mature phase and curfew hours and coal volumes/train movements are in compliance.

The Auditor notes that there is no reporting of these in the AEMRs, but does not consider that "a comprehensive summary and discussion of the results of this monitoring in each AEMR" would add any value to the reporting.

As such, the Auditor does not consider this non-compliance to have any adverse significance.

CONCLUSIONS:
(c) The Dendrobium actions under this condition comply;
(d) The strategies, plans or programs required under these approvals appear adequate; and
(e) The AEMRs do not report on train movements. The Auditor suggests that Dendrobium seek a revision to this condition at some appropriate time in the near future from DoPE reflecting that full data sets be maintained at the premises.

4.7.2 Road Transport

The Department of Planning letter of 22/12/2009 indicates approval of the submitted Traffic Management Plan as per the consent condition.

The latest version of the Approved Traffic Management Plan 3.0 is dated 23 March 2012 and contains the following amendments:

- Three yearly reviews in line with Development Consent conditions. – March 2012

The AEMRs report on Road Safety initiatives as follows:

A Drivers' Code of Conduct is in place at Dendrobium to ensure appropriate driver behaviour by all those who drive through the village to the mine including employees, contractors and truck transports (as required by the Dendrobium Development Consent and Traffic Management Plan). The Code of Conduct is communicated to all employees and contractors during the site induction and copies are periodically distributed to major suppliers and transport companies. Compliance with the Code of Conduct is strictly enforced.

If the public have any safety related concerns regarding the Dendrobium operations they are invited to use the 24 hour call line. Complaints received during the reporting period are recorded.

CONCLUSIONS:
(c) The Dendrobium actions under this condition comply;
(d) The strategies, plans or programs required under these approvals appear adequate; and
(e) There are no measures or actions recommended for this condition.

4.7.3 Road Maintenance

BHPB undertakes regular road maintenance as required.

CONCLUSIONS:
(a) The Dendrobium actions under this condition comply;
(b) The strategies, plans or programs required under these approvals appear adequate; and
(c) There are no measures or actions recommended for this condition.

4.8 VISUAL

4.8.1 Visual Amenity

The earlier audits noted that this condition had been satisfied and that compliance was linked to the preparation of the Landscape Management Plan. Sections 4.6 and 4.8.2 of this audit indicate that this condition is being satisfied.

4.8.2 Lighting Emissions

All three AEMRs in the Audit period included the following:

Lighting at Dendrobium is managed in accordance with the Lighting Management Plan. The Dendrobium Pit Top site is shielded by established vegetation with minimal stray light leaving the site.

The Kemira Valley site is shielded within the valley and the majority of the lighting is turned off during night-time operations unless work is being carried out on site. The ventilation shaft sites are located in remote locations within the Metropolitan Special Area.

No complaints regarding lighting were received during the reporting period.

CONCLUSIONS:
(c) The Dendrobium actions under this condition comply;
(d) The strategies, plans or programs required under these approvals appear adequate; and
(e) There are no measures or actions recommended for this condition.

4.9 WASTE

Dendrobium currently has six main waste streams. These waste streams include general waste, paper/cardboard, scrap steel, timber, industrial waste (diesel particulate filters), oily water and waste oil.

The 2008/2009 AEMR and subsequent AEMRs report that specifically designed hydrocarbon bunded areas, located along the Pit Top site portal road and at the rear of the workshop, and a bunded diesel refuelling area were utilised during the reporting periods. Bunded areas are checked on a regular basis and are pumped out when required to ensure that sufficient capacity is maintained at all times.

In addition to the permanent bunded areas, portable bunds were used for transient storage or transportation of oils and fuels around the site. Various spill kits and/or bins containing oil absorbent material were located around the site in areas where there is greatest potential for a spill to occur.

Site personnel are made aware of the locations of these spills kits and absorbent material bins in their work area. The contents of the spill kits and the oil absorbent material bins are checked on a regular basis. Hydrocarbon management is covered

within the Environment and Community Awareness Training Package that was rolled out during November 2008.

General waste collected from site is transported to Huntley Heritage for disposal.

Timber, steel/scrap metal, paper and cardboard are recycled at licensed off site facilities. These wastes are transported to the following facilities:

- Timber: Transpacific take to Wollongong Recycling.
- Steel and scrap metal: Transpacific deliver to OneSteel Recycling, Unanderra
- Paper and cardboard: The Flagstaff Group, Unanderra, for recycling

Particulate filters are classified as industrial waste and are disposed of at the Elizabeth Drive Landfill Facility (SITA Australia Pty Ltd), Kemps Creek.

Waste oil is collected by Nationwide Oil Pty Ltd (Transpacific Industries Group Pty Ltd) on an as needed basis and is recycled. Solcenic waste is collected from the Dendrobium site (solcenic bund) by Transpacific. Waste is taken to the Transpacific/Cleanaway facility at Unanderra.

Oil extracted from the separation process is used by BlueScope Steel in the steel making process.

The AEMRs list both the amounts of the materials generated on site and indicated whether they were recycled or disposed of. The AEMRs also identify on-site training and improvement initiatives.

The 2010/2011 AEMR reported that an off-site waste sorting trial will be conducted in FY12 and results will be included in the FY12 AEMR.

Improvements made to the waste management system during FY12 included:

- The introduction of an off-site waste sorting program that commenced in July 2011. General waste bins are transported from Dendrobium pit top to Cleanaway's depot at Charcoal Place Unanderra. The waste is then tipped onto a sorting pad and waste is directed into its correct waste stream for recycling or disposal. If equipment or materials are found within the waste it is set aside and the mine site is contacted to see if it can be reused.
- The offsite waste sorting has resulted in 39% of the general waste from underground bins being recycled. This has resulted in 126 tonnes being diverted away from land fill.
- Overall improvement of 14% for amount of waste recycled.

Progress in this area continued with the 2013/2014 AEMR reporting a 43% recycle of the total waste streams (382 out of 900 tonnes).

The consent conditions require that the Applicant shall:

- Monitor the amount of waste generated by the development. This is being done.

- Investigate ways to reuse, recycle, or minimise waste. The AEMRs indicate that this is being done.
- Implement reasonable and feasible measures to minimise this waste. The records of the fate of the wastes indicate that this is being achieved.
- Report on waste management and minimisation in the AEMR. This is being done.

CONCLUSIONS:
(c) The Dendrobium actions under this condition comply;
(d) The strategies, plans or programs required under these approvals appear adequate; and
(e) There are no measures or actions recommended for this condition.

5. SPECIFIC ENVIRONMENTAL CONDITIONS – OTHER SITE COMPONENTS

This section uses the following consent conditions to assess the technical areas covered under Schedule 5 of the 2008 Consent.

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

5.1 COAL WASHERY

The drying plant is located at the back end of the coal washery. The auditor has seen BHPB advice that the Dryer never got past the trial stage and was shut down on the 25/10/2006. Accordingly the next two conditions are no longer relevant.

5.1.1 Hot Gas Exhaust Stack Discharges

Not in use.

5.1.2 Fuel Source

Not in use.

5.2 WEST CLIFF COAL WASH EMPLACEMENT

5.2.1 Coal Washery Reject

Coal wash is the material produced as a by-product of processing run-of-mine coal at the Dendrobium coal preparation plant.

As described in the Area 2 and 3 MOPs, long term experience and known characteristics of the coal wash material produced from Dendrobium Mine have resulted in it being defined as ‘inert waste’. Therefore, coal wash may be deposited to landfill without further processing. This has also been confirmed through leachate analysis.

The Bulli Seam Operation Approval of 22 December 2011 took over the management of the West Cliff Coal Emplacement Area. The Approval included Stage 4 of the West Cliff Emplacement Area. Since then emplacement activities for the West Cliff Emplacement have been addressed in the Bulli Seam Operation Annual Environmental Management Report.

The Stage 4 Emplacement Area will provide an additional 59.39 million tonnes of coal wash emplacement (refer to table below) with an expected life to 2041.

The Table below outlines the capacity and status of each of the West Cliff coal wash emplacement areas.

Table - West Cliff Emplacement Area status table.

Emplacement Stage	**Estimated Capacity (Mt)**	**Emplacement Status**
1	4.6	Complete
2	20.8	Complete
3	33.5	Current
4	59.36	Not yet commenced

As of 1 November 2009, DECCW introduced a $15 levy applicable to coal wash generated at Dendrobium Washery and emplaced at the West Cliff Emplacement Area.

As part of the Ministerial Approval for the West Cliff Stage 3 Coal Wash Emplacement, In November 2011, 154 ha of land were transferred from Illawarra Coal to the Minister for the Environment for inclusion into the Illawarra Escarpment State Conservation Area as part of the Stage 3 emplacement area offset.

Illawarra Coal has and will continue to research, develop and implement alternative uses for coal wash. To help fast track this process, Illawarra Coal has become a member of Sustainability Advantage, a business support service within DECCW. As part of this program DECCW provides tailored support and technical assistance to help implement alternative uses for coal wash.

During the 2011/2012 AEMR reporting period, Illawarra Coal diverted 316,505 tonnes of coal wash to beneficial uses such as engineered fill.

During the 2012/2013 AEMR reporting period, Illawarra Coal diverted 296,296 tonnes of coal wash for beneficial uses such as engineered fill.

During the 2013/2014 AEMR reporting period, Illawarra Coal diverted 177,000 tonnes of coal wash for beneficial uses such as engineered fill.

One of the projects from the ‘Sustainability Advantage’ is a road base mixture which utilises coal wash with other materials such as fly ash and lime to produce a material suitable for a variety of applications.

StabilCo have constructed roads in the Central West and Hunter regions that incorporate between 85% and 93% coal wash reject, together with other wastes, to produce 98% to 100% recycled construction materials.

In April/May of 2013 Illawarra Coal and StabilCo began a trial to explore the use of Dendrobium coal wash in road and pavement materials. Two sites were targeted, Port Kembla Copper for pavement/capping material and West Cliff washery, for application for use as road base.

The 2013/2014 AEMR also reports a trial on an RMS Road in Kangaroo Valley which had positive outcomes.

These actions demonstrate compliance with this condition.

5.2.2 Pollution Reduction Program

The first part of the PRP, PRP 10.1 has been completed and was submitted in March 2010. The auditor has viewed the correspondence to OEH of 27 June 2011. Pollution Reduction Program (PRP) 10 was negotiated by Illawarra Coal as required by Condition 3 of the Further Approval (Dendrobium Mine development consent) with the Department of Environment, Climate Change and Water (DECCW) in 2008. The PRP was incorporated into the West Cliff Environment Protection Licence (EPL) 2504 via a Section 58 notice on the 2nd July 2008. The company is currently in the process of negotiating a new PRP with OEH following on from the outcomes of PRP10.1. PRP10.1 specifically addressed salinity as required.

The PRP work has been in train since 8 December 2008 and will continue for a minimum of 5 years. (This was reported in the last Audit).

The 2011/2012 AEMR reports:

PRP15 was completed during FY12 the requirements of the PRP were as follows:
PRP15 Coal Mine Particulate Matter Control Best Practice - Assessment and Report
• U1.1 The Licensee must conduct a site specific Best Management Practice (BMP) determination to identify the most practicable means to reduce particle emissions.
• U1.2 The Licensee must prepare a report which includes, but is not necessarily limited to, the following:
- Identification, quantification and justification of existing measures that are being used to minimise particle emissions;
- identification, quantification and justification of best practice measures that could be used to minimise particle emissions;
- evaluation of the practicability of implementing these best practice measures; and a proposed timeframe for implementing all practicable best practice measures.

The study was completed in February 2012 to address the requirements of the Coal Mine Particulate Matter Control Best Practice PRP. The study identified that the following activities represent the highest ranking activities in terms of particulate generation, when emissions alone are evaluated:
• Wind erosion from the stockpile;
• Working the stockpile by bulldozer/loader;
• Ventilation shaft; and
• Loading coal to the stockpile.

Potential Best Practice control measures for the above activities were identified, and their practicability evaluated. All of the recommended best practices for dust control were evaluated and costing exercises undertaken. Five of the best practices identified as being potentially applicable are already in place. Of the remaining best practice measures none were deemed feasible to implement.

The upgrade of the portal road is currently being progressed with asphalt being replaced with concrete in line with maintenance requirements.

5.2.3 Water Quality Monitoring Program

Dendrobium personnel advise that the water quality monitoring plan for Westcliff mine was developed with DECC and DWE as required. This plan is part of the overarching West Cliff Emplacement Management Plan (approved) now managed by BSO.

5.2.4 Brennans Creek Diversion Bypass Rehabilitation Plan

On 17 Sept 2007 Dendrobium received the DPI Permit for the reclamation of Brennans Creek.

The Brennans Creek Bypass Channel Rehabilitation Features West Cliff Colliery report (Rev 0) prepared by Cardno Forbes Rigby was submitted to the Department of Planning (DoP) in December 2008, and forwarded to the relevant Government agencies for review.

DoP wrote back on 9/6/09 noting that the plan had not been prepared in consultation with the relevant Government authorities but that DoP had consulted with these agencies. The DoP letter included a number of issues requiring to be addressed by a revised plan to be submitted by August 2009.

The Final Report 001 Rev 2 dated June 2009 was re-submitted before the required date and the revised report did satisfy the consultation part of the condition.

The Rehabilitation Plan (relevant to the Stage 3 section of the bypass channel) is now in place and has been approved. Rehabilitation of the bypass channel had not commenced at the date of the audit.

It is understood that this work has since been completed.

5.2.5 General Management of the Emplacement

The West Cliff Emplacement Management Plan (approved) outlines monitoring for groundwater, emplacement settlement, compaction and combustibility, subsurface drainage inspections, water monitoring, erosion and sediment control, Vegetation and Fauna Monitoring and Dust monitoring.

Management of this emplacement is now reported under the Bulli Seam Operations (BSO) AEMR.

Progressive rehabilitation of the West Cliff Emplacement has been undertaken during the reporting period in accordance with the approved West Cliff Emplacement Management Plan (refer Table 57 of the BSO AEMR).

CONCLUSIONS:

(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and

(e) There are no measures or actions recommended for this condition.

6. SPECIFIC ENVIRONMENTAL CONDITIONS – EXTENDED SITE

This section uses the following consent conditions to assess the technical areas covered under Schedule 6 of the 2008 Consent.

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

6.1 GREENHOUSE GASES AND ENERGY EFFICIENCY

The Auditor has reviewed the Illawarra Coal Greenhouse Gas & Energy Management Plan (dated November 2010) which addresses all coal mining related operations in the Illawarra and Wollondilly regions south of Sydney.

This plan has been updated as follows:

Date of Update	Details of Update
Sep 11	Updated to reflect GLD.009 requirements and current arrangements
Mar 12	Reviewed and Updated
Jun 13	Energy Mass Balance diagram amended to include fugitive mine gas emissions

There is a further document also reviewed by the Auditor – Greenhouse Gas & Energy Efficiency Plan Version 6.0 dated 1/08/12 which is a sub-plan to the Management Plan noted above. The Efficiency Plan was prepared to satisfy this condition of the 5 December 2008 consent. The Document appears to satisfy **Consent Conditions 1 (a) to (f) inclusive**. The Consent conditions allow for the Dendrobium mine to be considered within the ambit of the Southern Coalfield Operations and related operations.

The Auditor has seen the advice from the Department of Planning and Infrastructure dated 22/12/09 which notes approval of the following relevant documents:

- Illawarra Coal Greenhouse Gas and Energy Management Plan
- Dendrobium Mine Greenhouse Gas and Energy Efficiency Plan

- Dendrobium Coal Preparation Plant Greenhouse Gas and Energy Efficiency Plan

- West Cliff Coal Wash Emplacement Area Greenhouse Gas and Energy Efficiency Plan

Consent Condition 1. (g) requires the AEMRs to report on the development's greenhouse gas emissions and minimisation measures in the AEMRs. Each AEMR identifies the volumes of greenhouse gases emitted as follows:

During the reporting period, the underground mine workings were ventilated by drawing fresh air into the mine (intake air) via the Dendrobium Mine Portal Tunnel, Kemira Valley Portal Tunnel, and air intake Shafts No.1 and 2. The ventilation air drawn through the mine was extracted via the No.3 Shaft Main Mine Ventilation Fans. Three mine ventilation fans are installed at the No.3 Shaft site with two fans operating at any one time. Mine ventilation air was drawn through the mine at an average rate of 185 m3/s with the discharge air (mine vent air) having an average concentration of methane (CH4) of 0.26% and an average concentration of carbon dioxide (CO2) of 0.14%. Currently there are no mine methane abatement technologies or opportunities available which are viable due to the low methane concentration of the mine vent air.

The Greenhouse Gas & Energy Efficiency Plan indicates an approximate annual diesel usage of 920 kL.

Each of the AEMRs identifies that there are no GHG abatement projects currently in place at the Dendrobium mine site due to the relatively low methane content in the vent air.

However, Illawarra Coal has the following current GHG abatement measures in place at its other mines (reported in the Greenhouse Gas & Energy Efficiency Plan):

- Appin and Tower EDL Methane Gas Engine Power Plants – involves the use of mine drainage gas from Appin and West Cliff as primary fuel to generate electricity - routinely abate ~ 2.0 to 2.5 Mt CO2e pa.
- WestVAMP - utilisation of mine ventilation air at West Cliff - this project abates reduces GHG emissions by up to 0.25 Mt CO2e annually with potential to produce up to 40 GWh of electricity annually on CMWG alone
- Surface Gas Well Flaring – Appin Area Surface Gas Wells.
- Appin, Westcliff and Dendrobium Mines – New large scale mine vent air emissions reduction project in feasibility/assessment study phase with potential to Reduce methane reporting to the mine ventilation system and subsequent emission to atmosphere

- Other actions identified in Figure 6 of the Greenhouse Gas & Energy Efficiency Plan

As indicated above, the Consent conditions allow for the Dendrobium mine to be considered within the ambit of the Southern Coalfield Operations and related operations. The reviews of the AEMRs by the Director-General indicate acceptance or identify areas which need further information. The lack of any comment on the topic of GHG in the Authorities' AEMR reviews is a de facto approval by the Director-General that the abatement measures identified above satisfies the **Consent Condition 2**:

"The Applicant shall implement all reasonable and feasible measures to minimise the greenhouse gas emissions from the development to the satisfaction of the Director-General."

CONCLUSIONS:

(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and

(e) There are no measures or actions recommended for this condition.

7. ADDITIONAL PROCEDURES FOR AIR QUALITY AND NOISE MANAGEMENT

This section uses the following consent conditions to assess the technical areas covered under Schedule 7 of the 2008 Consent.

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

7.1 NOTIFICATION OF LANDHOLDERS

Consent Condition 1 of Schedule 7 reads:

1. If the results of monitoring required in Schedule 4 identify that the impacts generated by the development are greater than the relevant impact assessment criteria in Schedule 4, except where this is predicted in the documents listed in condition 2 of schedule 2 or where a negotiated agreement has been entered into in relation to that impact, then the Applicant shall notify the Director-General and the affected landowners and/or existing or future tenants (including tenants of mine-owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the development is complying with the criteria in Schedule 4.

As noted in Section 4.1.1 and Section 4.3.1, minor exceedances of the noise and air quality criteria have been noted at times during the audit period.

No information has been provided indicating that the Director-General and affected landowners were notified at these times.

However, noise and air quality monitoring results indicate that while these exceedances have been recorded, they have neither been high in magnitude, nor protracted in duration.

Further, monitoring results during the audit period indicate that Dendrobium is generally in compliance with respect to noise and air quality criteria.

In view of the above contextual information, this condition is deemed to have been satisfied.

7.2 INDEPENDENT REVIEW

Conditions 2 to 5 of Schedule 7 relate to the right of landowners to ask the Director-General in writing for an independent review of the impacts of the development on his/her land.

It is understood that no such requests have been made during the audit period.

This condition has been satisfied.

7.3 LAND ACQUISITION

Condition 6 of Schedule 7 relates to the right of landowners to request their land be acquired in the event that unacceptable noise / air quality impacts are recorded, per Conditions 2 to 5.

It is understood that no such requests have been made during the audit period.

This condition has been satisfied.

8. ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING

This section uses the following consent conditions to assess the technical areas covered under Schedule 8 of the 2008 Consent.

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

8.1 ENVIRONMENTAL MANAGEMENT STRATEGY

The Department of Planning letter dated 22/12/09 indicates the Department's approval of the Environmental Management Strategy. The Strategy was updated and re-submitted on March 2012.

In addition to the requirements of this consent condition, Dendrobium supplements their environmental compliance with a number of additional internal audits as indicated below:

During the 2011/2012 reporting period the performance of Dendrobium's EMS and overall HSEC Management System was assessed in a comprehensive series of audits shown in the following table.

Date	Type	Internal	External	Comments
July 11	ISO14001		X	Surveillance Audit
Sep 11	EMS	X		
Oct 11	Development Consent		X	Triennial Independent Environmental Audit
Oct 11	GLD	X		BHPB GLD environmental audit
Apr 12	EMS			Internal EMS Audit

During the 2012/2013 reporting period the performance of Dendrobium's EMS and overall HSEC Management System was assessed in a comprehensive series of audits shown in the following table.

Date	Type	Internal	External	Comments
Oct 12	EMS	X		Internal EMS Audit
Dec 12	EMS		X	IC External EMS Audit
12/13	EPBC		X	Department of Sustainability, Environment, Water, Population and Communities
May 13	KPMG		X	Assurance audit for the BHP Billiton Sustainability Report

During the 2013/2014 reporting period the performance of Dendrobium's EMS and overall HSEC Management System was assessed in a comprehensive series of audits shown in the following table.

Date	Type	Internal	External	Comments
Jul 13	EMS		X	IC external EMS Audit
Oct 13	EMS	X		Internal EMS Audit
May 14	KPMG		X	Assurance audit for the BHP Billiton Sustainability Report.
Jun 14	EMS	X		Internal EMS Audit

The EMS audits include a review of aspects and impacts, performance improvement plans, legal compliance, document control, records, corrective action, monitoring and control, training and management of risks.

No non-conformances were recorded during audits for the EMS, EPBC or the KPMG audits.

CONCLUSIONS:

(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and

(e) There are no measures or actions recommended for this condition.

8.2 ENVIRONMENTAL MONITORING PROGRAM

The Department of Planning letter dated 22/12/09 indicates the Department's approval of the Environmental Monitoring Program. The Plan was updated and re-submitted on March 2012.

Hazardous Material Management
The previous Independent Environmental Audit reported on a Hazardous Materials Survey conducted at Dendrobium Mine in March 2010 by Hibbs & Associates Pty Ltd. The Auditor is unaware of any subsequent audits on this topic during this audit period.

All three AEMRs contain the following text:
Dendrobium Mine holds Dangerous Goods Licence 35/035790, issued by Work Cover. The Dangerous Goods kept at Dendrobium Mine include compressed gases, flammable and combustible liquids, and corrosive substances. A Licence to Store Explosives (No. 07-1000152-001) has been issued. A limited quantity of explosives was stored at Dendrobium over the reporting period. A Site Emergency Information Container is installed adjacent to the front gate in accordance with legislative requirements. This information box includes the site manifest along with Safety Data Sheets (SDS's) for each of the dangerous goods kept on site.

Dendrobium assesses new substances before their use on site by completing a Substance Evaluation Form and a risk assessment. SDS's and substance evaluation are available electronically from Chemalert, with a hard copy of all approved substances available in the Control Room. The Hazardous Materials Coordinator is responsible for the overall coordination of the hazardous materials system on site and the Materials Controller is responsible for the day-to-day management of hazardous materials. Regular inspections of the storage sites are undertaken to ensure compliance with relevant standards.

Environmental risks associated with the Dendrobium Mine operations are recorded in an Environmental Aspects and Impacts Register. The Environmental Aspects and Impacts Register is reviewed on an annual basis and forms the basis of the Environmental Improvement Plan.

CONCLUSIONS:

(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and

(e) There are no measures or actions recommended for this condition.

8.3 REPORTING

8.3.1 Incident Reporting

These conditions require notification to the Department of Planning & Environment (formerly Department of Planning & Infrastructure) of an incident that causes or may cause material harm to the environment within 24 hours and supplemented by detailed written reports within 21 days.

It is understood that no such incident has occurred within the period that this audit covers, so that the application of this condition has not been triggered.

8.3.2 Annual Reporting

This condition requires that at the end of each year and for at least 3 years following the cessation of mining at the development, the Applicant shall submit an AEMR to the Director-General, CCC and all relevant agencies. The condition sets out the requirements of the AEMRs in headings (a) to (j).

This audit has relied on the AEMRs for the periods 1 July 2011 -30 June 2012, (2011-2012 AEMR); 1 July 2012 – 30 June 2013 (AEMR 2012-2013) and 1 July 2013 – 30 June 2014 (AEMR 2013-2014). Accordingly, each AEMR has been carefully reviewed and found to be compliant with the requested conditions.

Each AEMR is submitted to all relevant agencies as per the requirements of Schedule 8 Condition 5 of the Dendrobium Development Consent. A copy of the report is publicly available via the BHP Billiton website under Dendrobium Mine:

http://www.bhpbilliton.com/home/aboutus/regulatory/Pages/default.aspx

The outcome of each agency review is addressed in the following AEMR.

The Auditor observes that the AEMRs now contain the Annual EPL Return, a Rehabilitation Summary and a Compliance Summary in their appendices which enhances the documents.

CONCLUSIONS:

(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and

(e) The Auditor notes that each AEMR now contains a review of compliance against the 8 December 2008 consent requirements as an Appendix to the AEMR which was one of the Auditor's previous recommendations.

8.4 INDEPENDENT ENVIRONMENTAL AUDIT

This Audit document satisfies this condition.

8.5 COMMUNITY CONSULTATIVE COMMITTEE

Dendrobium Community Consultative Committee (DCCC)
The DCCC was established in January 2002 in accordance with the Dendrobium Development Consent. The Committee provides a mechanism to bring the community, environmental groups, local councils and BHP Billiton together:

- To establish good working relationships between the company, the community and other stakeholders in relation to Dendrobium Mine.
- For the ongoing communication and discussion of mining operations and the environmental performance of the mine.
- To discuss community concerns and review the resolution of community complaints.
- To discuss communication of relevant information on the mine and its environmental performance to the wider community, including results of environmental monitoring, environmental management reports and the result of audits.
- To work together towards outcomes of benefit to the mine, immediate neighbours and the local and regional community.

The committee is comprised of an independent Chairperson, up to five community members, two environmental group representatives, one representative from the Wollongong City Council and BHP Billiton representatives. Representatives from Department of Planning NSW and various BHP Billiton representatives also attend meetings as required.

Meetings are usually scheduled every 2 months and regular site visits are conducted. The AEMRs contain listings of activities during the reporting periods.

The Dendrobium Community Enhancement Program (DCEP) was developed in 2002 to facilitate funding to community projects with a vision to create a strong community and positive environment for the residents in the zone of influence of Dendrobium Mine. Since inception, Illawarra Coal has contributed over $1.2 million to the fund, and continues to contribute 3 cents per saleable tonne of coal from the Dendrobium operations (adjusted for CPI).

The program is administered by the Dendrobium Community Enhancement Committee (DCEC) which consists of an independent Chairperson, community representatives and Illawarra Coal representatives. The committee meets regularly with extraordinary meetings also convened to conduct business planning and review operations.

The DCEC has recently adopted a strategic approach to the way applications for funding are received and considered with a Business Strategy which is reviewed annually. Individuals and organisations in the local community are encouraged to apply for funding. Applications for funding under the DCEP are assessed against a

range of selection criteria, which can be viewed at: http://www.bhpbilliton.com/home/society/regulatory/Pages/default.aspx)

The AEMRs identify a range of projects that have received approval for funding.

Environmental Complaints
Illawarra Coal operates a 24hr Community Call Line (freecall 1800 102 210) and a general email address ICEnquiries@bhpbilliton.com. The call line and email address enables the community to request and provide feedback about operational activities and lodge complaints on any aspect of the Dendrobium operations. The call line number and the email address has been advertised throughout the reporting period in all correspondence distributed to the community.

For all calls to the community call line, an initial call back is made within 24 hours of the call. All complaints are investigated and the details , including any follow up action required, are recorded in the internal event reporting system. Complaint information is provided to the DCCC, Dendrobium mine site and Illawarra Coal management, and government agencies on a regular basis. Complaints made against the operations and their resolutions are reported each month on the BHP Billiton website.

A total of 24 community complaints were received during the 2011/2012 AEMR reporting period. Of these, approximately 46% related to Rail complaints.

A total of 72 community complaints were received during the 2012/2013 AEMR reporting period. Of these, approximately 90% related to Rail complaints.

During the 2013/2014 AEMR period there were 100 community complaints of which about 90% were related to rail noise.

Note: See Section 4.1 of this document in relation to Noise issues.

Generally complaints peaked at over 450 in 2006, but have since reduced substantially. During FY10, 11 and 12 there were less than 50 complaints. The small increase since then appears to be specifically related to the rail noise issue and also appears to emanate mostly from a single complainant.

CONCLUSIONS:

(c) The Dendrobium actions under this condition comply;

(d) The strategies, plans or programs required under these approvals appear adequate; and

(e) There are no measures or actions recommended for this condition.

8.5.1 ACCESS TO INFORMATION

This condition calls for posting of various pieces of information on the website.

The auditor visited the website several times and identified that there were an extensive array of reports available and that this demonstrated significant compliance.

However, there are a number of deficiencies that the Auditor recommends being rectified. For example:

- The SCA noted that the previous Independent Environmental Audit was absent – this has now been rectified.
- The OEH correctly noted that Consent Condition 12 of Section 8 re supply of a "comprehensive, running summary of monitoring results required under this consent etc." was not available.
- There was only one AEMR available (at September 2014), that being the 2012/2013 AEMR. Also, the Appendices for this AEMR were not included on the website. While the Auditor was able to access the other two relevant AEMRs for this audit, this opportunity is not available to the general public, notwithstanding that all agencies and the DCCC have had access when the documents were available. It is likely that the website manager removes previous AEMRs when the latest version is available.

In the previous Audit, it was suggested that Dendrobium supply an archive of all approval/monitoring report material for public access. This recommendation does not appear to have been adopted.

Dendrobium staff advises that management of the website lies with another BHPB Office and that while Dendrobium supply the reports for the website, the other office manages what is kept and what is removed. As this is the case, Dendrobium could consider a local repository of all approval/monitoring report materials that can be publicly accessed. In any case, Dendrobium needs to take some action to more fully address Consent Condition 12 of Section 8 requirements.

In addition to the website, Dendrobium has the following activities designed to keep the community informed.

- Community Call Line
- Community Open Days
- Community Attitude surveys
- Regular meetings of the DCCC and DCEC committees
- Events
- Project activities
- Newsletters and Information sheets.

During the AEMR 2012/2013 reporting period, Dendrobium distributed community newsletters quarterly to the local community (Mt Kembla, Kembla Heights and communities located along the KVRL) covering a range of topics including:

- Events and organisations supported by Dendrobium, including the Clean Up Australia Day, and
- charity OZTAG match
- DCCC and DCEC activities, including information on inspections and projects supported; Environmental improvement works undertaken by Dendrobium, including rehabilitation works-Stage 2 of the Mt Kembla Mine Memorial Pathway and Kembla Heights Wetland Rehabilitation
- Weed removal conducted by Conservation Volunteers Australia;
- Public safety issues; and
- Operational updates, including progress with longwall extraction and development.

This is a typical sample of what occurred over the total Audit period.

CONCLUSIONS:

- (c) The Dendrobium actions under this condition comply;

- (d) The strategies, plans or programs required under these approvals appear adequate; and

- (e) BHPB to consider addressing some deficiencies (as noted) in the material available on their website.

9. FIGURES

Figure 1 – Location Plan for the Various Dendrobium Mine Sites including the Rail Line and BlueScope Steel.

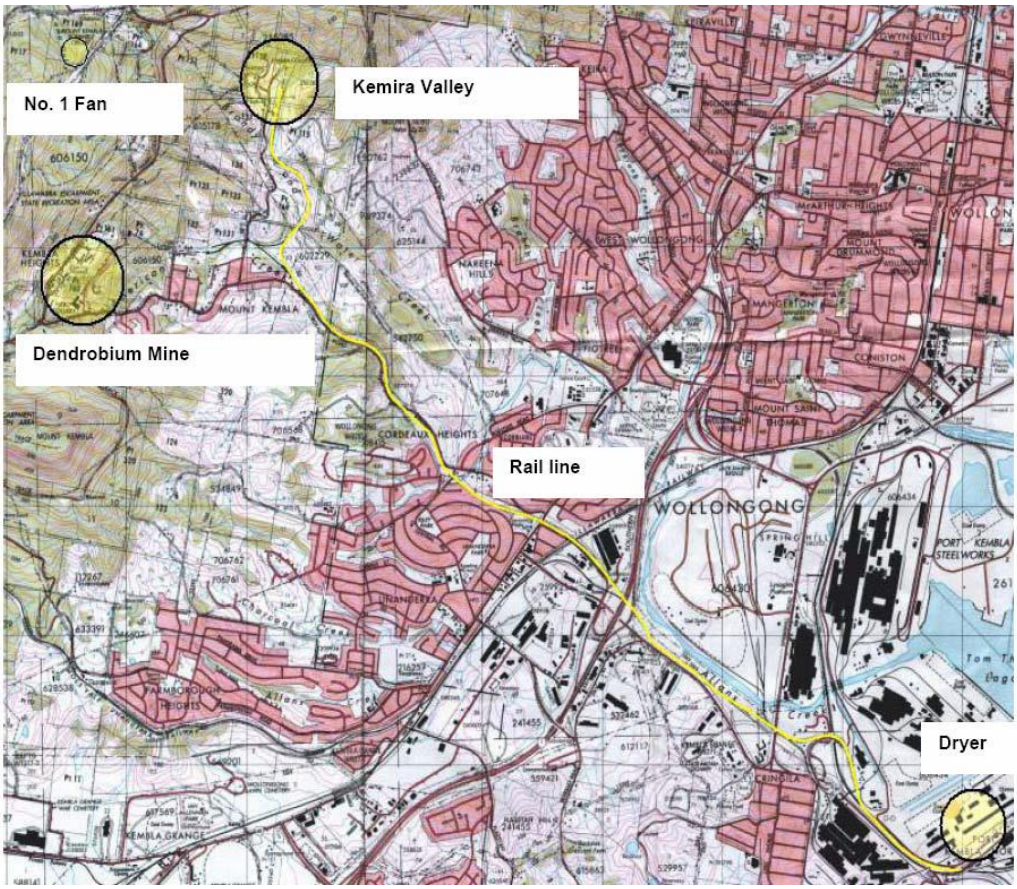


Figure 2 – Site Layout – Pit Top

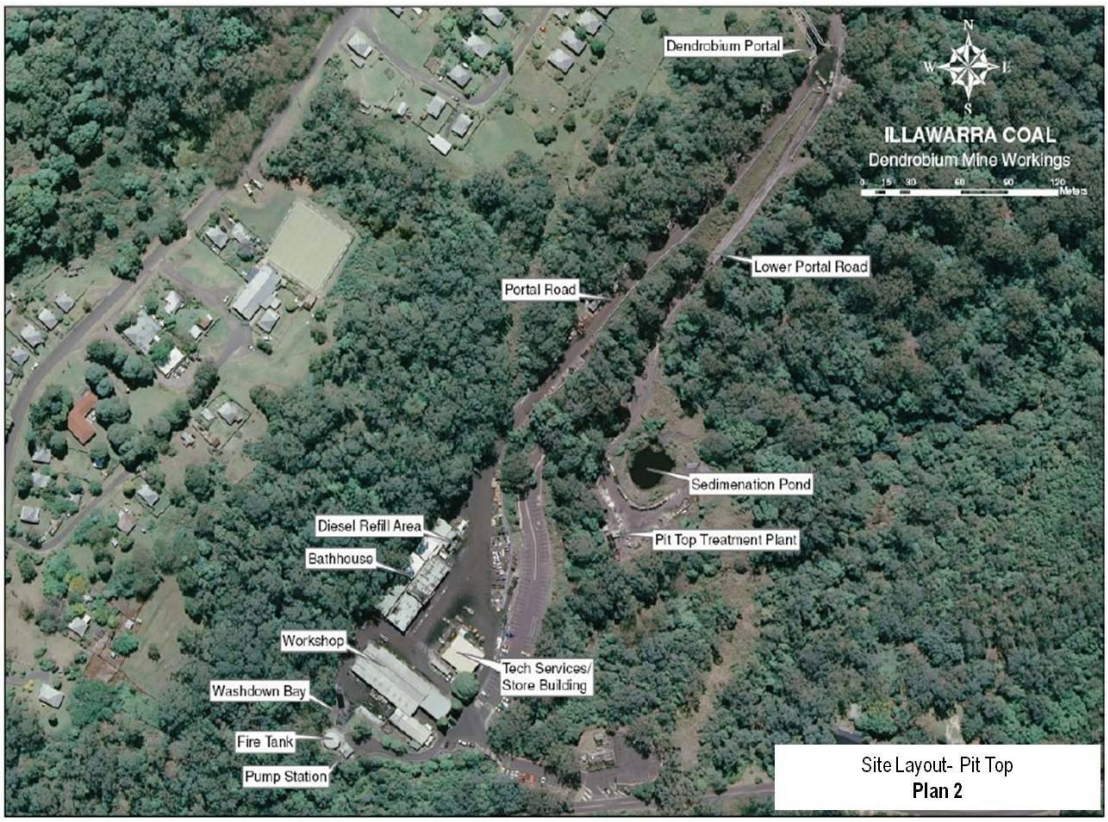


Figure 3 – Site Layout – Kemira Valley

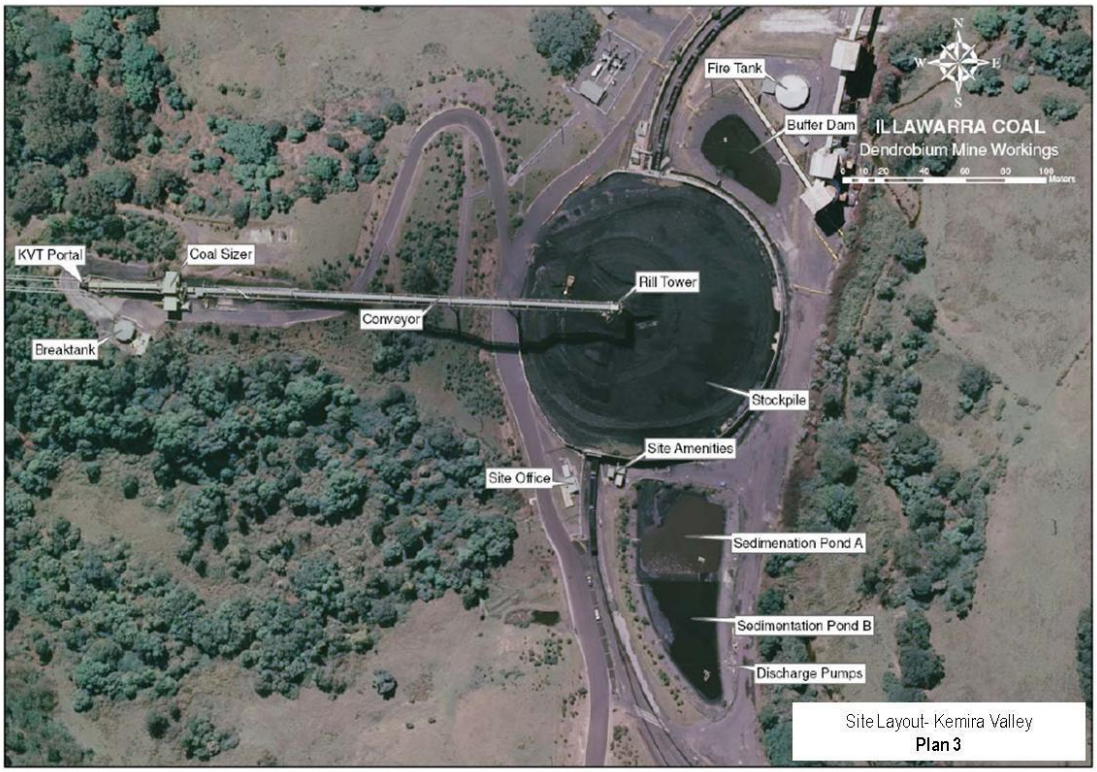
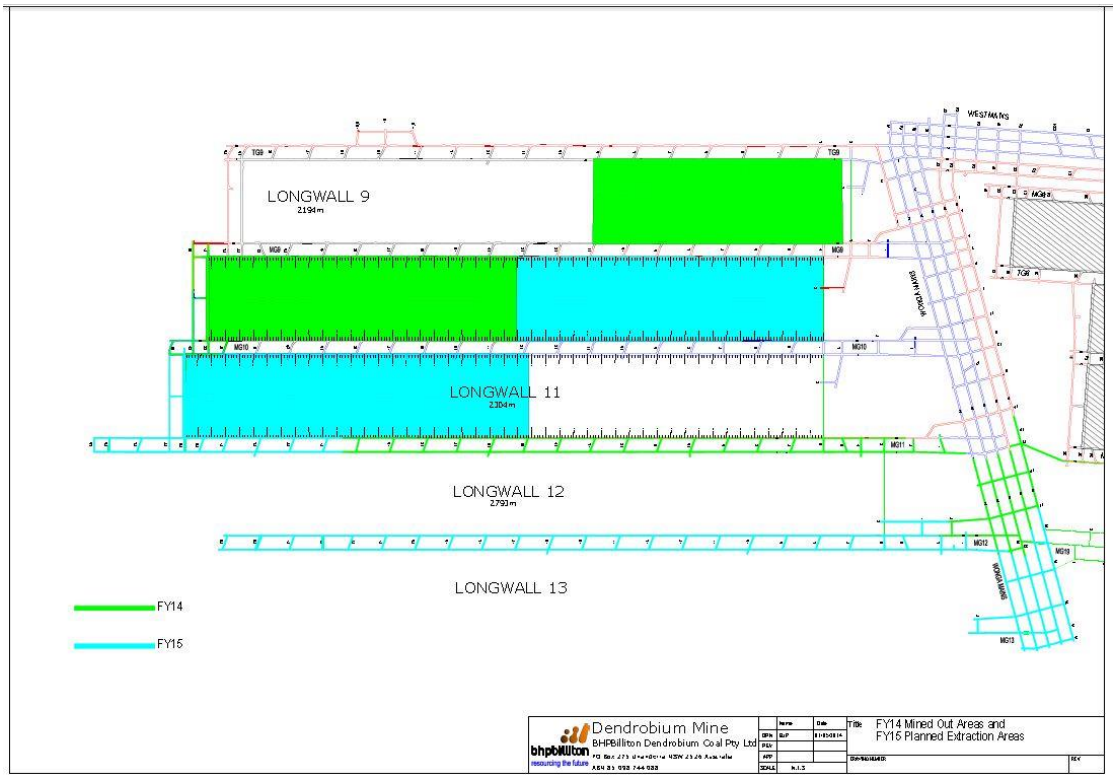


Figure 4 – Long Wall Progress for end of FY14 reporting period.



10. APPENDICES

Appendix A

8 December 2008 Dendrobium Consent

Notice of Modification

Section 75W of the *Environmental Planning and Assessment Act 1979*

I modify the development consent referred to in Schedule 1, subject to the conditions in Schedule 2.

These conditions are required to:
- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring, reporting and independent review; and
- provide for the ongoing environmental management of the development.

The Hon Kristina Keneally MP
Minister for Planning

Sydney 5 December 2008

SCHEDULE 1

The development consent for the Dendrobium underground coal mine and associated infrastructure granted by the Minister for Urban Affairs and Planning on 20 November 2001 (DA 60-03-2001).

SCHEDULE 2

1. Delete Schedule 1, Schedule 2 and all subsequent text and figures and replace with the following:

Schedule 1

Application Number:	DA 60-03-2001
Applicant:	BHP Billiton Illawarra Coal Holdings Pty Limited
Site:	See Appendix 1
Development:	Dendrobium Underground Coal Mine and associated surface facilities and infrastructure

TABLE OF CONTENTS

DEFINITIONS

AEMR	Annual Environmental Management Report
Affected councils	Wingecarribee Shire Council, Wollondilly Shire Council and Wollongong City Council
Applicant	BHP Billiton Illawarra Coal Holdings Pty Ltd, or its successors
BCA	Building Code of Australia
CCC	Community Consultative Committee
Coal washery	Dendrobium coal washery and drying facility located within the Steelworks
Consent	This development consent
Construction	The demolition of buildings or works, carrying out of works and erection of buildings covered by this consent
CPI	Consumer Price Index, as published by the Australian Bureau of Statistics
DA	Development application
Day	The period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
DECC	Department of Environment and Climate Change
Department	Department of Planning
Director-General	Director-General of Department of Planning, or delegate
DPI	Department of Primary Industries
DSC	Dams Safety Committee
DWE	Department of Water and Energy
EA	*Dendrobium Colliery Modification to Dendrobium Area 3 Environmental Assessment* (including Attachments A to I), prepared for the Applicant by Cardno Forbes Rigby and dated November 2007
EIS	*Environmental Impact Statement for the Dendrobium Underground Coal Mine*, prepared for the Applicant by Olsen Environmental Consulting and dated March 2001, including the Species Impact Statement prepared by Biosis Research and dated April 2001
Environmental consequences	Environmental consequences of Subsidence Impacts, including loss of surface flows to the subsurface, loss of standing pools, adverse water quality impacts, development of iron bacterial mats, cliff falls, rock falls, damage to Aboriginal heritage sites, impacts on aquatic ecology, ponding, etc
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPL	Environment Protection Licence issued under the *Protection of the Environment Operations Act 1997*
Evening	The period from 6pm to 10pm
Extended site (or site)	All land to which the development application applies, comprising the mining area, surface facilities, coal washery and the West Cliff Coal Wash Emplacement (see Appendix 1)
First workings	Development of main workings and gateroads to establish access within the mining area
Independent Dispute Resolution Process	The independent dispute resolution process as described in Appendix 5
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this approval
KVCLF	Kemira Valley Coal Loading Facility and coal sizer
Kemira Valley rail line	The rail line and associated infrastructure between the KVCLF and the coal washery
Mining operations	First workings and second workings
Mining area	Area 1, Area 2, Area 3A, Area 3B and Area 3C, as shown in Appendix 2
Minister	Minister for Planning, or delegate
MSB	Mine Subsidence Board
Mtpa	Million tonnes per annum
Night	The period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays
Privately-owned land	Land that is not owned by a public agency, or a mining company (or its subsidiary)
Reasonable and feasible	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential

	improvements. Feasible relates to engineering considerations and what is practical to build
Response to Submissions	The Applicant's response to issues raised in submissions, dated 24 April 2008
RTA	Roads and Traffic Authority
ROM coal	Run-of-mine coal
SCA	Sydney Catchment Authority
Second workings	Extraction of coal from longwall panels, miniwall panels or pillar extraction
SMP	Subsidence Management Plan
Statement of Commitments	The Applicant's Statement of Commitments for Area 3A – 3C (see Appendix 4)
Steelworks	Port Kembla Steelworks
Subsidence *or* subsidence effects	Deformation of the ground mass due to mining, including all mining-induced ground movements, including both vertical and horizontal displacement, tilt, strain and curvature
Subsidence impacts	Physical changes to the ground and its surface caused by Subsidence Effects, including tensile and shear cracking of the rock mass, localised buckling of strata caused by valley closure and upsidence and surface depressions or troughs
Surface facilities	Pit top facilities, mine access drift portal, conveyors, three ventilation shafts and fans, ROM coal stockpile, Kemira Valley Coal Loading Facility, Kemira Valley rail line, access roads and all associated development allowed to be constructed under the consent
TARP	Trigger, Action, Response Plan
WCC	Wollongong City Council
West Cliff Coal Wash Emplacement	Stage 3 of the West Cliff Coal Wash Emplacement, located at West Cliff Coal Mine

SCHEDULE 2
ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Applicant shall implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

Terms of Approval

2. The Applicant shall carry out the development generally in accordance with the:
   (a) Development Application (DA 60-03-2001), EIS and associated submissions to the Dendrobium Underground Coal Mine Project Commission of Inquiry, and in particular its:
      - Primary Submission (the Dendrobium Project, dated 30 July 2001);
      - Submission in Reply (the Dendrobium Project, undated); and
      - Environmental Effects of Subsidence Associated with the Dendrobium Project, prepared by National Environmental Consulting Services and dated August 2001;
   (b) Modification Application dated 12 February 2002 and supporting information dated 27 January 2002;
   (c) Modification Application and supporting information dated 24 May 2002 and additional supporting information dated 14 June 2002;
   (d) Modification Application and Statement of Environmental Effects for the Dendrobium Coal Sizer, prepared by Olsen Environmental Consulting and dated March 2005;
   (e) Application for Further Approval of West Cliff Emplacement Area Stage 3, Vol 2 (including Appendices), prepared by Cardno Forbes Rigby and dated July 2007, associated Response to Submissions dated 1 November 2007 and associated Statement of Commitments dated 28 November 2007 (see Appendix 3);
   (f) Modification Application – Modification of Area 3 Footprint and Review of Conditions of Consent dated 27 November 2007, EA and associated Statement of Commitments (see Appendix 4); and
   (g) conditions of this consent.

   Note: The general layout of the development is shown in Figure 1 of Appendix 2.

3. If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this consent shall prevail to the extent of any inconsistency.

4. The Applicant shall comply with any reasonable and feasible requirement/s of the Director-General arising from the Department's assessment of:
   (a) any reports, plans, programs, strategies or correspondence that are submitted in accordance with the conditions of this consent; and
   (b) the implementation of any actions or measures contained in these reports, plans, programs, strategies or correspondence.

Limits on Approval

5. Mining operations may take place in the mining area until 31 December 2030.

   Note: Under this consent, the Applicant is required to rehabilitate the site to the satisfaction of the Director-General and DPI. Consequently this consent will continue to apply in all other respects other than the right to conduct mining operations until the site has been rehabilitated to a satisfactory standard.

6. The Applicant shall not extract more than 5.2 million tonnes of ROM coal a year from the mining area.

7. The Applicant shall only transport coal from the surface facilities by rail.

Staged Submission of Management Plans/Monitoring Programs

8. With the approval of the Director-General, the Applicant may submit any management plan or monitoring program required by this consent on a progressive basis.

9. The Applicant shall ensure that monitoring programs, management plans and the Environmental Management Strategy, as in existence at the date of modification of consent in November 2008, continue to

be implemented (to the satisfaction of the Director-General) until replaced by monitoring programs and management plans approved in accordance with the conditions of this consent.

Structural Adequacy

10. The Applicant shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

    Notes:
    - *Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.*
    - *Part 8 of the EP&A Regulation sets out the requirements for the certification of the development.*

Demolition

11. The Applicant shall ensure that all demolition work is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures*, or its latest version.

Operation of Plant and Equipment

12. The Applicant shall ensure that all plant and equipment used on site is:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

Community Enhancement

13. The Applicant shall contribute $0.03 per tonne of saleable coal production each financial year to fund the provision of significant present and future benefits to local communities directly affected by the development. These funds shall be:
    (a) administered and expended in accordance with procedures which are to the satisfaction of WCC and the Director-General;
    (b) provided by 30 September each year over the life of the consent;
    (c) based on saleable coal production in the previous financial year; and
    (d) indexed in accordance with the CPI, with April 2005 used as the commencement date for indexation calculations.

    Any dispute over the operation of this fund shall be referred to the Director-General for resolution.

Costs of Management Measures

14. The Applicant shall be responsible for the costs of all management measures (including measures to minimise, mitigate, offset or remediate impacts of the development which are not recoverable by a third party through the *Mine Subsidence Compensation Act 1961* or the *Mining Act 1991*) including but not limited to remediation of natural features, rehabilitation of ecological systems, the provision of supplementary waters and monitoring of the effectiveness of the works, as determined by the Director-General.

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS – MINING AREA

SUBSIDENCE

Note: These conditions should be read in conjunction with the Statement of Commitments.

Watercourse Impact Management

1. The Applicant shall ensure that, as a result of the development:
   (a) no rock fall occurs at Sandy Creek Waterfall or from its overhang;
   (b) the structural integrity of the waterfall, its overhang and its pool are not impacted;
   (c) cracking in Sandy Creek within 30 m of the waterfall is of negligible environmental and hydrological consequence; and
   (d) negligible diversion of water occurs from the lip of the waterfall
   to the satisfaction of the Director-General.

2. The Applicant shall ensure that underground mining operations do not cause subsidence impacts at Sandy Creek and Wongawilli Creek other than "minor impacts" (such as minor fracturing, gas release, iron staining and minor impacts on water flows, water levels and water quality) to the satisfaction of the Director-General.

   Note: In this condition, "minor impacts" are those defined as minor triggers in Table 23.2 of the draft SMP submitted by the Applicant for Dendrobium Area 3A.

3. 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, to the satisfaction of the Director-General.

4. Prior to carrying out any underground mining operations that could cause subsidence in either Area 3A, Area 3B or Area 3C, the Applicant shall prepare a Watercourse Impact Monitoring, Management and Contingency Plan to the satisfaction of the Director-General. Each such Plan must:
   (a) demonstrate how the subsidence impact limits in conditions 1 - 3 are to be met;
   (b) include a monitoring program and reporting mechanisms to enable close and ongoing review by the Department and DPI of the subsidence effects and impacts (individual and cumulative) on Wongawilli Creek, Sandy Creek and Sandy Creek Waterfall;
   (c) include a general monitoring and reporting program addressing surface water levels, water flows, water quality, surface slope and gradient, erodibility, aquatic flora and fauna (including Macquarie Perch, any other threatened aquatic species and their habitats) and ecosystem function;
   (d) include a management plan for avoiding, minimising, mitigating and remediating impacts on watercourses, which includes a tabular contingency plan (based on the Trigger Action Response Plan structure) focusing on measures for remediating both predicted and unpredicted impacts;
   (e) address third and higher order streams individually but address first and second order streams collectively;
   (f) be prepared in consultation with DECC, SCA and DPI;
   (g) incorporate means of updating the plan based on experience gained as mining progresses;
   (h) be approved prior to the carrying out of any underground mining operations that could cause subsidence impacts on watercourses in the relevant Area; and
   (i) be implemented to the satisfaction of the Director-General.

   Notes:
   - *Should review by the Department of reports by the Applicant under paragraph (b) indicate that subsidence impacts have exceeded or threaten to limits imposed in conditions 1-3, then under condition 4 of Schedule 2 the Director-General may instruct the Applicant to implement reasonable and feasible requirements, which may include to cease mining within the operative longwall, shorten the length of that longwall or shorten the length and/or width of future longwalls.*
   - *Requirements under paragraphs (a) and (b) in respect of Sandy Creek and Sandy Creek Waterfall relate only to the Watercourse Impact Monitoring, Management and Contingency Plan for Area 3A.*

Swamp Impact Management

5. The Applicant shall ensure that subsidence does not cause erosion of the surface or changes in ecosystem functionality of Swamp 15a and that the structural integrity of its controlling rockbar is maintained or restored, to the satisfaction of the Director-General.

6. Prior to carrying out any underground mining operations that could cause subsidence in either Area 3A, Area 3B or Area 3C, the Applicant shall prepare a Swamp Impact Monitoring, Management and Contingency Plan to the satisfaction of the Director-General. Each such Plan must:
   (a) demonstrate how the subsidence impact limits in condition 5 are to be met;
   (b) include a monitoring program and reporting mechanisms to enable close and ongoing review by the Department and DPI of the subsidence effects and impacts (individual and cumulative) of each Area 3A longwall on Swamp 15a;
   (c) include a general monitoring and reporting program addressing surface water levels, near-surface groundwater levels, water quality, surface slope and gradient, erodibility, flora and ecosystem function;
   (d) include a management plan for avoiding, minimising, mitigating and remediating impacts on swamps, which includes a tabular contingency plan (based on the Trigger Action Response Plan structure) focusing on measures for remediating both predicted and unpredicted impacts;
   (e) address headwater and valley infill swamps separately and address each swamp individually;
   (f) be prepared in consultation with DECC, SCA and DPI;
   (g) incorporate means of updating the plan based on experience gained as mining progresses;
   (h) be approved prior to the carrying out of any underground mining operations that could cause subsidence impacts on swamps in the relevant Area; and
   (i) be implemented to the satisfaction of the Director-General.

   Notes:
   - *Should review by the Department of reports by the Applicant under paragraph (b) indicate that subsidence impacts have exceeded or threaten to exceed limits imposed in condition 5, then under condition 4 of Schedule 2 the Director-General may instruct the Applicant to implement reasonable and feasible requirements, which may include to cease mining within the operative longwall, shorten the length of that longwall or shorten the length and/or width of future longwalls.*
   - *Requirements under paragraphs (a) and (b) relate only to the Swamp Impact Monitoring, Management and Contingency Plan for Area 3A.*

Subsidence Management Plans

7. Prior to carrying out any underground mining operations that could cause subsidence in either Area 3A, 3B or 3C, the Applicant shall prepare a Subsidence Management Plan (SMP) to the satisfaction of the Director-General and the Director-General of DPI. Each such SMP must:
   (a) integrate ongoing management of Areas 1 and 2;
   (b) integrate the Watercourse and Swamp Impact Monitoring, Management and Contingency Plans required under conditions 4 and 6;
   (c) include monitoring of subsidence effects;
   (d) include a SCA Assets Protection Plan;
   (e) include monitoring, management, and contingency plans for all other significant natural features and all significant man made features which may be impacted by subsidence, including:
      - landscape (including cliffs and steep slopes);
      - groundwater (see condition 13);
      - terrestrial flora and fauna and ecology (including all threatened species assessed as being likely to be significantly affected by the development and their habitats);
      - Aboriginal and other cultural heritage (see condition 12); and
      - electrical, communications and other infrastructure;
   (f) be prepared in consultation with DECC, SCA and DPI;
   (g) be approved prior to the carrying out of any underground mining operations that could cause subsidence in the relevant Area; and
   (h) be implemented to the satisfaction of the Director-General and the Director-General of DPI.

   Notes:
   - *The SCA Assets Protection Plan required under this condition must also be prepared and implemented to the satisfaction of the SCA.*
   - *The contingency plans required under paragraph (e) must address remediation (as appropriate) and be based on a TARP structure.*

8. The SMPs prepared under condition 7 for Areas 3B and 3C must:
   (a) include a mine plan for the relevant Area;
   (b) include a detailed subsidence impact assessment, clearly setting out all predicted subsidence effects, subsidence impacts and environmental consequences;
   (c) include a minimum of 2 years of baseline data, collected at appropriate frequency and scale, for all significant natural features;
   (d) identify and assess the significance of all natural features located within 600 m of the edge of secondary extraction;
   (e) distinguish between, clearly describe and adequately quantify all subsidence effects, subsidence impacts and environmental consequences;
   (f) propose limits on subsidence impacts and environmental consequences to be applied within the relevant Area;
   (g) be otherwise prepared in accordance with any guidelines for SMPs developed by the Department and/or DPI;
   (h) be approved prior to the carrying out of any underground mining operations that could cause subsidence in the relevant Area; and
   (i) be implemented to the satisfaction of the Director-General and the Director-General of DPI.

   Note: In approving an SMP, the Director-General may impose conditions containing subsidence impact limits (similar to conditions 1- 3 & 5), subsidence management mechanisms (similar to conditions 4 & 6) or other conditions.

End of Panel Reporting

9. Within 4 months of the completion of each longwall panel, or as otherwise permitted by the Director-General, the Applicant shall:
   (a) prepare an end-of-panel report:
      - reporting all subsidence effects (both individual and cumulative) for the panel and comparing subsidence effects with predictions;
      - describing in detail all subsidence impacts (both individual and cumulative) for the panel;
      - discussing the environmental consequences for watercourses, swamps, water yield, water quality, aquatic ecology, terrestrial ecology, groundwater, cliffs and steep slopes; and
      - comparing subsidence impacts and environmental consequences with predictions; and

   (b) submit the report to the Department, DPI, SCA, DECC, DWE and any other relevant agency to the satisfaction of the Director-General.

10. The Applicant shall include a comprehensive summary, analysis and discussion of the results of monitoring of subsidence effects, subsidence impacts and environmental consequences in each AEMR.

    Note: Conditions 9 and 10 apply to Area 2, as well as to Areas 3A, 3B and 3C.

Subsidence Expert Assessments

11. The Applicant shall pay the reasonable costs of the Department in engaging independent experts to advise it when it assesses SMPs prepared under condition 7 for Areas 3B and 3C.

ABORIGINAL HERITAGE

12. The SMPs prepared under condition 7 must include an Aboriginal Heritage Plan, which must include a:
   (a) description of known Aboriginal heritage sites;
   (b) protocol for the ongoing consultation and involvement of the Aboriginal community in the conservation and management of Aboriginal heritage;
   (c) description of the measures that would be implemented to protect Aboriginal sites generally, including measures that would be implemented to secure, analyse and record sites at risk of subsidence;
   (d) description of the measures that would be implemented to protect Aboriginal site 52-2-1646, including:
      - a full recording and assessment of the site's rock art;
      - a more detailed subsidence assessment for the site;
      - measures which seek to avoid any significant impact on the site and any necessary contingency plans to protect the site against collapse or substantial impact on its rock art; and

   (e) description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the development.

GROUNDWATER MONITORING PROGRAM

13. The SMPs prepared under condition 7 must include a Groundwater Monitoring Program, which must include:
    (a) proposals to develop a detailed regional and local groundwater model, with special reference to flows to and from nearby water storages;
    (b) detailed baseline data to benchmark the natural variation in groundwater levels, yield and quality;
    (c) groundwater impact assessment criteria;
    (d) a program to monitor the impact of the development on:
        - groundwater levels, yield and quality (particularly any potential loss of flow to, or flow from, SCA water storages);
        - coal seam aquifers and overlying aquifers; and
        - groundwater springs and seeps; and
    (e) consideration of the requirements of the latest version (or subsequent replacement) of SCA's *The Design of a Hydrological and Hydrogeological Monitoring Program to Access the Impacts of Longwall Mining in SCA Catchment*.

ENVIRONMENTAL OFFSETS

14. The Applicant shall provide suitable offsets for loss of water quality or loss of water flows to SCA storages, clearing and other ground disturbance (including cliff falls) caused by its mining operations and/or surface activities within the mining area, unless otherwise addressed by the conditions of this consent, to the satisfaction of the Director-General. These offsets must:
    (a) be submitted to the Director-General for approval by 30 April 2009;
    (b) be prepared in consultation with SCA;
    (c) provide measures that result in a beneficial effect on water quality, water quantity, aquatic ecosystems and/or ecological integrity of SCA's special areas or water catchments.

SCHEDULE 4
SPECIFIC ENVIRONMENTAL CONDITIONS – SURFACE FACILITIES

NOISE

Noise Impact Assessment Criteria

1. The Applicant shall ensure that the noise generated at the surface facilities does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25% of any privately-owned land. The applicable criteria for any residence not listed in Table 1 shall be the criteria applying at the nearest listed residence.

Table 1: Noise impact assessment criteria dB(A)

Day	***Evening***	***Night***		***Residence***
$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$	*(as shown in the Noise Monitoring Program)*
42	42	38	48	**R2**
41	41	40	50	**R22**
40	40	39	49	**R1**
				R9
				R15a
40	40	37	47	**R3a**
				R5a
				R6a&b
37	35	35	45	**R39a**

Notes:

- *To determine compliance with the $L_{Aeq(15\ minute)}$ limit, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the development is impractical, DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ limit, noise from the development is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the development is impractical, DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*
- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level ; or*
  - *up to 3°C/100 m temperature inversion strength for all receivers, plus a 2 m/s source-to-receiver component drainage flow wind at 10 metres above ground level for those receivers where applicable.*
- *These limits do not apply if the Applicant has an agreement with the relevant owner/s of these residences to generate higher noise levels, and the Applicant has advised the Department and DECC in writing of the terms of this agreement.*

Land Acquisition Criteria

2. If the noise generated at the surface facilities exceeds the relevant criteria in Table 2 at any residence on privately-owned land or on more than 25% of any privately-owned land, the Applicant shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8 - 10 of schedule 4. The applicable criteria for any residence not listed in Table 2 shall be the criteria applying at the nearest listed residence.

Table 2: Noise acquisition criteria dB(A)

Day	***Evening***	***Night***	***Residence***
$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	*(as shown in the Noise Monitoring Program)*
47	47	43	**R2**
46	46	45	**R22**
45	45	44	**R1**
			R9
			R15a
45	45	42	**R3a**
			R5a
			R6a&b
42	40	40	**R39a**

Note: Noise generated by the development is to be measured in accordance with the notes to Table 1.

Rail Haulage Impact Assessment Criteria

3. The Applicant shall ensure that noise generated by locomotives using the Kemira Valley rail line does not exceed the rail noise impact assessment criteria in Table 3.

Table 3: Rail noise impact assessment criteria

Operating Condition	***Measurement Conditions***	***Criteria*** $L_{A1(1\ min)}$
Locomotive at idle, with compressor radiator fans and air conditioning operating at maximum load	Stationary 15 metre contour	70 dB(A)
All other throttle settings under self-load, with compressor radiator fans and air conditioning operating at maximum load	Stationary 15 metre contour	87 dB(A) 95 dB(Lin)
All service conditions	Up to 50 kilometres per hour, 15 metres from centreline of rail track	87 dB(A) 95 dB(Lin) Must be non-tonal Linear noise levels must not exceed A-weighted noise levels by more than 15 dB

Note: All measured noise levels must be assessed for tonality in accordance with the NSW Industrial Noise Policy, unless otherwise specified.

Continuous Improvement

4. The Applicant shall:
   (a) continue to investigate ways to reduce the noise generated by the development (including off-site road noise, noise and vibration impacts from the operation of the Kemira Valley rail line and maximum noise levels which may result in sleep disturbance);
   (b) continue to implement all reasonable and feasible best practice noise mitigation measures; and
   (c) report on these investigations and the implementation and effectiveness of these measures in the AEMR,

   to the satisfaction of the Director-General.

5. The Applicant shall use its best endeavours to minimise wheel squeal, brake squeal and locomotive wheel slippage arising from rail haulage on the Kemira Valley rail line.

Additional Noise Mitigation Measures

6. Upon receiving a written request from the owner of any residence where subsequent noise monitoring shows the noise generated by the development is 3 dB(A) greater than the noise impact assessment criteria in Table 1 (except where a negotiated noise agreement is in place) the Applicant shall implement reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at any residence on the land in consultation with the landowner.

   If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Monitoring

7. The Applicant shall prepare and implement a Noise Monitoring Program for the development to the satisfaction of the Director-General. This program must:
   (a) be submitted to the Director-General for approval by 30 April 2009;
   (b) be prepared in consultation with DECC;
   (c) provide for quarterly attended noise monitoring and real-time noise monitoring (where appropriate) to monitor the performance of the development, especially in residential areas close to the surface facilities; and

(d) include a noise monitoring protocol for evaluating compliance with the noise impact and land acquisition criteria in this consent.

Note: This program must expressly monitor the modifying factors referred to in the NSW Industrial Noise Policy (such as intermittency, tonality and low frequency)

BLASTING AND VIBRATION

8. The Applicant is not permitted to undertake blasting operations at the surface facilities except with the prior written approval of DECC and subject to any conditions which DECC may impose.

AIR QUALITY

Impact Assessment Criteria

9. The Applicant shall ensure that dust generated by the development does not cause additional exceedances of the criteria listed in Tables 4 to 6 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 4: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	30 µg/m^3

Table 5: Short term impact assessment criteria for particulate matter

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3

Table 6: Long term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, 1991, AS/NZS 3580.10.1-2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method.

Monitoring

10. The Applicant shall prepare and implement an Air Quality Monitoring Program for the surface facilities (excepting those surface facilities within the mining area) to the satisfaction of the Director-General. This program must:
    (a) be submitted to the Director-General for approval by 30 April 2009;
    (a) be prepared in consultation with DECC;
    (b) use a combination of high volume samplers and dust deposition gauges to monitor the performance of the development; and
    (c) include an air quality monitoring protocol for evaluating compliance with the air quality impact assessment criteria in this consent.

METEOROLOGICAL MONITORING

11. During the development, the Applicant shall ensure that it has a suitable meteorological station in the vicinity of the site that is generally in accordance with the requirements in the guideline *Approved Methods for Sampling of Air Pollutants in New South Wales*.

WATER MANAGEMENT

Discharges

12. The Applicant shall ensure all surface water discharges from the surface facilities:
    (a) meet the relevant ANZECC water quality objectives for the protection of aquatic ecosystems and water quality of existing receiving waters; and
    (b) comply with the discharge limits (both volume and quality) set for the development in any EPL.

Water Management Plan

13. The Applicant shall prepare and implement a Water Management Plan for the surface facilities to the satisfaction of the Director-General. This plan must:
    (a) be submitted to the Director-General for approval by 30 April 2009;
    (b) be prepared in consultation with DECC, SCA and DWE by suitably qualified expert/s whose appointment/s have been approved by the Director-General; and
    (c) include a:
        - Site Water Balance;
        - Erosion and Sediment Control Plan;
        - Surface Water Monitoring Program; and
        - Surface and Ground Water Response Plan.

Site Water Balance

14. The Site Water Balance must:
    (a) include details of:
        - sources and security of water supply;
        - water use on site;
        - water intercepted by mining operations;
        - water management on site;
        - off-site water transfers and water stored or disposed of underground;
        - reporting procedures; and
    (b) describe measures to minimise water use by the development.

Erosion and Sediment Control

15. The Erosion and Sediment Control Plan must:
    (a) be consistent with the requirements of the *Managing Urban Stormwater: Soils and Construction Manual* (Landcom 2004, or its latest version);
    (b) identify activities that could cause soil erosion and generate sediment;
    (c) describe measures to minimise soil erosion and the potential for transport of sediment to downstream waters;
    (d) describe the location, function, and capacity of erosion and sediment control structures; and
    (e) describe what measures would be implemented to monitor and maintain the structures over time.

Surface Water Monitoring Program

16. The Surface Water Monitoring Plan must include:
    (a) baseline data on surface water flows and quality in streams and other waterbodies that have been or could be affected by the surface facilities;
    (b) surface water quality and stream health assessment criteria, including trigger levels for investigating any potentially adverse surface water impacts;
    (c) a program to monitor the impact of the surface facilities on surface water flows and quality, stream health and channel stability; and
    (d) procedures for reporting the results of this monitoring.

Surface and Ground Water Response Plan

17. The Surface and Ground Water Response Plan must describe what measures and/or procedures would be implemented to:
    (a) respond to any exceedances of the surface water, stream health, and groundwater assessment criteria; and

(b) mitigate and/or offset any adverse impacts on groundwater dependent ecosystems, aquatic ecosystems or riparian vegetation.

LANDSCAPE MANAGEMENT

Rehabilitation

18. The Applicant shall rehabilitate the surface facilities sites to the satisfaction of DPI. For rehabilitation works within the Metropolitan Special Area, the Applicant shall also ensure that these works are carried out to the satisfaction of SCA.

Landscape Management Plan

19. The Applicant shall prepare and implement a Landscape Management Plan for the surface facilities to the satisfaction of the Director-General and the Director-General of DPI. This plan must:
    (a) be submitted for approval by 30 April 2009;
    (b) be prepared by suitably qualified expert/s whose appointment/s have been endorsed by the Director-General;
    (c) be prepared in consultation with DECC and SCA; and
    (d) include a:
        - Rehabilitation Management Plan; and
        - Mine Closure Plan.

    Note: The Mine Closure Plan may be submitted at a date agreed by the Director-General, provided that this date is at least 2 years prior to the planned cessation of mining at the site.

Rehabilitation Management Plan

20. The Rehabilitation Management Plan must include:
    (a) the rehabilitation objectives for the surface facilities sites;
    (b) a general description of the short, medium and long term measures that would be implemented to rehabilitate these sites;
    (c) performance and completion criteria for the rehabilitation of these sites;
    (d) a description of how the performance of the rehabilitation works would be monitored over time to achieve the stated objectives and against the relevant performance and completion criteria;
    (e) any measures necessary to ensure that abandoned mine workings do not impact on stored waters or dams; and
    (f) details of who is responsible for monitoring, reviewing and implementing the plan.

Mine Closure Plan

21. The Mine Closure Plan must:
    (a) be prepared in consultation with the affected councils and CCC;
    (b) define the objectives and criteria for mine closure;
    (c) investigate options for the future use of the surface facilities sites;
    (d) include the proposed management and use of any heritage-listed buildings;
    (e) investigate ways to minimise the adverse socio-economic effects associated with mine closure, including reduction in local and regional employment;
    (f) describe the measures that would be implemented to minimise or manage the on-going environmental effects of the development; and
    (g) describe how the performance of these measures would be monitored over time.

Bushfire Management Plan

22. The Applicant shall prepare and implement a Bushfire Management Plan for the site, with particular reference to the mining area, in consultation with SCA and to the satisfaction of the Rural Fire Service.

TRANSPORT

Rail Transport of Coal

23. The Applicant shall ensure that trains do not travel on the Kemira Valley rail line:
    (a) between 12 midnight and 6 am, until 29 April 2010; and
    (b) between 11 pm and 6 am, from 30 April 2010

    unless written approval is obtained from DECC for emergency use of the rail line.

24. The Applicant shall record the:
    (a) date and time of each train movement on the Kemira Valley rail line; and
    (b) amount of coal transported from the KVCLF each year
    and include a comprehensive summary and discussion of the results of this monitoring in each AEMR.

Road Transport

25. The Applicant shall prepare and implement a Traffic Management Plan for the development to the satisfaction of the Director-General. This plan must:
    (a) be submitted to the Director-General for approval by 30 April 2009;
    (b) be prepared in consultation with the WCC, Mt Kembla Primary School and the CCC;
    (c) include traffic control measures for truck movements through residential areas, including Stones Road and its intersection with Cordeaux Road;
    (d) provide that mine shift changeover times and deliveries by heavy vehicle to the pit top facilities and KVCLF do not conflict with pick-up and drop-off times for Mt Kembla Primary School students;
    (e) provide heavy vehicle speed limits;
    (f) include a Driver's Code of Conduct to be applied to the Applicant's employees and contractors working at the development and measures for the enforcement of this code; and
    (g) include procedures for regular monitoring of compliance with this plan.

Road Maintenance

26. The Applicant shall enter into an agreement with SCA, to the satisfaction of the Director-General, to share the reasonable costs of maintenance of all access roads, bridges and creek crossings located on land controlled by SCA and used by the Applicant.

27. The Applicant shall establish an agreement with WCC to share the reasonable costs of maintenance of Stones Road for the life of the development. Prior to decommissioning of the mine, Stones Road must be inspected, to the satisfaction of WCC, and the road restored by the Applicant to a standard not less than its condition prior to the development's approval. If roadworks are not carried out by the Applicant within one month of being informed by WCC that these works are required under the maintenance agreement, WCC shall be entitled to carry out such maintenance work at the Applicant's cost. Any dispute over implementation of this condition is to be referred to the Director-General for resolution.

VISUAL

Visual Amenity

28. The Applicant shall minimise the visual impacts of the surface facilities to the satisfaction of the Director-General.

Lighting Emissions

29. The Applicant shall:
    (a) ensure that all external lighting associated with the surface facilities complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*;
    (b) take all practicable measures to mitigate off-site lighting impacts from the surface facilities;
    (c) ensure that light emitted from headlights of locomotives operating on the Kemira Valley rail line are screened from residences; and
    (d) report on the effectiveness of lighting emission controls in the AEMR
    to the satisfaction of the Director-General.

WASTE

30. The Applicant shall:
    (a) monitor the amount of waste generated by the development;
    (b) investigate ways to reuse, recycle, or minimise this waste;
    (c) implement reasonable and feasible measures to minimise this waste; and
    (d) report on waste management and minimisation in the AEMR
    to the satisfaction of the Director-General.

SCHEDULE 5
SPECIFIC ENVIRONMENTAL CONDITIONS – OTHER SITE COMPONENTS

COAL WASHERY

Hot Gas Exhaust Stack Discharges

1. The Applicant shall:
   (a) ensure that the concentration of pollutants discharged from the coal dryer hot gas exhaust complies with discharge limits set for the development in any EPL;
   (b) regularly monitor the concentration of pollutants discharged from the coal dryer hot gas exhaust; and
   (c) report on waste management and minimisation in the AEMR
   to the satisfaction of the Director-General.

Fuel Source

2. The Applicant shall ensure the coal drying plant only uses blast furnace offgas or natural gas as fuel for the drier.

WEST CLIFF COAL WASH EMPLACEMENT

Coal Washery Reject

3. The Applicant shall:
   (a) monitor the amount of coal washery reject emplaced in the West Cliff Coal Wash Emplacement;
   (b) investigate ways to reduce emplacement of coal washery reject at West Cliff, including beneficial use or improved disposal options; and
   (c) report on these matters in the West Cliff AEMR
   to the satisfaction of the Director-General.

Pollution Reduction Program

4. The Applicant shall develop with DECC a new Pollution Reduction Program (PRP) to be incorporated into the West Cliff Colliery's EPL. Subject to the satisfaction of DECC, the PRP shall:
   (a) include investigation, trial and implementation of appropriate strategies, technologies or works to achieve agreed water quality discharge criteria for licensed discharges from the West Cliff Colliery site with particular reference to salinity; and
   (b) cover a period of not less than five years.

Water Quality Monitoring Program

5. The Applicant shall review its water quality monitoring program for the West Cliff Mine in consultation with DECC and DWE and to the satisfaction of the Director-General.

Brennans Creek Diversion Bypass Rehabilitation Plan

6. The Applicant shall, by 30 June 2009, develop a Brennans Creek Diversion Bypass Rehabilitation Plan in consultation with DECC, DWE and DPI and to the satisfaction of the Director-General.

General Management of the Emplacement

7. Subject to condition 2 of schedule 2 and conditions 3- 6 above, the Applicant shall monitor and manage the West Cliff Coal Wash Emplacement as part of the Environmental Management Plan for the West Cliff Mine. Monitoring and management of the Emplacement shall be reported within the West Cliff AEMR, rather than the AEMR for this development.

8. All references in this consent (including conditions 3 – 7 of this schedule and Appendix 3) that have direct application to the West Cliff Coal Wash Emplacement shall cease to have force and effect subsequent to the grant of any project approval under Part 3A of the Environmental Planning & Assessment Act 1979 which includes the West Cliff Colliery and the West Cliff Coal Wash Emplacement Area.

SCHEDULE 6
SPECIFIC ENVIRONMENTAL CONDITIONS – EXTENDED SITE

GREENHOUSE GASES & ENERGY EFFICIENCY

1. The Applicant shall prepare and implement a Greenhouse and Energy Efficiency Plan for the development. This plan must:
   (a) be prepared in consultation with DECC and generally in accordance with the Guidelines for Energy Savings Action Plans (DEUS 2005, or its latest version);
   (b) be submitted to the Director-General by 30 April 2009 for approval;
   (c) include a program to monitor greenhouse gas emissions and energy use generated by the development;
   (d) include a framework for investigating and implementing measures to reduce greenhouse gas emissions and energy use at the development;
   (e) include a research program to inform the continuous improvement of the greenhouse gas minimisation measures at the development;
   (f) describe how the performance of these measures would be monitored over time; and
   (g) report on the development's greenhouse gas emissions and minimisation measures in the AEMR to the satisfaction of the Director-General.

   Note: The Applicant may consider the Dendrobium Mine's greenhouse gas minimisation measures within its overall greenhouse gas minimisation measures across its Southern Coalfield mines and related operations.

2. The Applicant shall implement all reasonable and feasible measures to minimise the greenhouse gas emissions from the development to the satisfaction of the Director-General.

SCHEDULE 7
ADDITIONAL PROCEDURES FOR AIR QUALITY AND NOISE MANAGEMENT

NOTIFICATION OF LANDOWNERS

1. If the results of monitoring required in Schedule 4 identify that the impacts generated by the development are greater than the relevant impact assessment criteria in Schedule 4, except where this is predicted in the documents listed in condition 2 of schedule 2 or where a negotiated agreement has been entered into in relation to that impact, then the Applicant shall notify the Director-General and the affected landowners and/or existing or future tenants (including tenants of mine-owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the development is complying with the criteria in Schedule 4.

INDEPENDENT REVIEW

2. If a landowner considers the development to be exceeding the impact assessment criteria in schedule 4, except where this is predicted in the EA, then he/she may ask the Director-General in writing for an independent review of the impacts of the development on his/her land.

   If the Director-General is satisfied that an independent review is warranted, the Applicant shall within 2 months of the Director-General's decision:
   (a) consult with the landowner to determine his/her concerns;
   (b) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to conduct monitoring on the land, to:
      - determine whether the development is complying with the relevant impact assessment criteria in schedule 4; and
      - identify the source(s) and scale of any impact on the land, and the development's contribution to this impact; and
   (c) give the Director-General and landowner a copy of the independent review.

3. If the independent review determines that the development is complying with the relevant impact assessment criteria in schedule 4, then the Applicant may discontinue the independent review with the approval of the Director-General. If the landowner disputes the results of the independent review then either the Applicant or the landowner may refer the matter to the Director-General for resolution.

   Where matters referred to the Director-General under this condition cannot be resolved by the Director-General within 28 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process.

4. If the independent review determines that the development is not complying with the relevant impact assessment criteria in Schedule 4, and that the development is primarily responsible for this non-compliance, then the Applicant shall:
   (a) take all reasonable and feasible measures, in consultation with the landowner, to ensure that the development complies with the relevant criteria and conduct further monitoring to determine whether these measures ensure compliance; or
   (b) secure a written agreement with the landowner to allow exceedances of the relevant criteria; or
   (c) offer to acquire all or part of the landowner's land in accordance with the procedures in conditions 6-8 below

   to the satisfaction of the Director-General.

5. If further monitoring under condition 4(a) determines that the development is complying with the relevant impact assessment criteria, then the Applicant may discontinue the independent review with the approval of the Director-General.

   If further monitoring under condition 4(a) determines that measures implemented under that condition have not achieved compliance with the impact assessment criteria in schedule 4, and the Applicant cannot secure a written agreement with the landowner under condition 4(b) to allow these exceedances, then the Applicant shall, upon receiving a written request from the landowner, acquire all or part of the landowner's land in accordance with the procedures in conditions 6-8 below.

LAND ACQUISITION

6. Within 3 months of receiving a written request from a landowner with acquisition rights, the Applicant shall make a binding written offer to the landowner based on:
   (a) the current market value of the landowner's interest in the property at the date of this written request, as if the property was unaffected by the development the subject of the development application, having regard to the:
      - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
      - presence of improvements on the property and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date, but excluding any improvements that have resulted from the implementation of the 'additional noise mitigation measures' in condition 6 of schedule 4;
   (b) the reasonable costs associated with:
      - relocating within the local government areas of the affected Councils, or to any other local government area determined by the Director-General;
      - obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is required; and
   (c) reasonable compensation for any disturbance caused by the land acquisition process.

   If, within 28 days of the Applicant making this offer, the Applicant and landowner cannot agree on the acquisition price of the land and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Director-General for resolution.

   Upon receiving such a referral, the Director-General shall request the President of the NSW Division of the Australian Property Institute (the API) to appoint a qualified independent valuer to:
      - consider submissions from both parties;
      - establish a fair market valuation for the land and determine reasonable costs and compensation for the acquisition, in accordance with paragraphs (a)-(c) above and any guidance or guidelines that the Director-General may prepare relating to this condition; and
      - propose any appropriate fair and reasonable terms of acquisition.

   The appointed valuer is to provide a full report and explanation of their valuation, determinations and proposed terms of acquisition to the Director-General, the Applicant and the landowner. The Director-General shall consider the report and decide whether the valuation, determinations and any proposed terms of acquisition are fair and reasonable and advise the parties accordingly.

   Within 14 days of receiving the Director-General's decision that the independent valuer's report is fair and reasonable, the Applicant shall make a written offer to purchase the land at a price and according to terms not less than set out in the independent valuer's report.

   If the Director-General is of the opinion that the valuation and/or determination is not fair and/or reasonable, they shall give notice to the parties that a further independent valuation and determination will be undertaken in accordance with this condition and duly request a further appointment by the API.

   If the landowner refuses to accept within 6 months a written offer duly made by the Applicant under this condition, then the Applicant's obligations to acquire the land shall cease, unless otherwise agreed by the Director-General.

7. The Applicant shall bear the full costs of any independent valuer's valuation, determination and report.

8. If the Applicant and landowner agree that only part of the land shall be acquired, then the Applicant shall pay all reasonable costs associated with obtaining Council approval for any plan of subdivision (where permissible), and registration of the plan at the Office of the Registrar-General.

SCHEDULE 8

ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

1. The Applicant shall prepare and implement an Environmental Management Strategy for the development to the satisfaction of the Director-General. This strategy must be submitted to the Director-General for approval by 30 April 2009, and:
   (a) provide the strategic framework for environmental management of the development;
   (b) identify the statutory requirements that apply to the development;
   (c) describe in general how the environmental performance of the development would be monitored and managed for the:
      - mining area;
      - surface facilities;
      - other site components; and
      - extended site;
   (d) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise during the course of the development;
      - respond to any non-compliance;
      - manage cumulative impacts; and
      - respond to emergencies; and
   (e) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development.

ENVIRONMENTAL MONITORING PROGRAM

2. The Applicant shall prepare and implement Environmental Monitoring Programs for the:
   (a) mining area; and
   (b) surface facilities
   to the satisfaction of the Director-General. These programs must consolidate the various monitoring requirements in Schedules 3-6 of this consent into single documents, include plans showing the monitoring sites and be submitted to the Director-General by 30 April 2009.

REPORTING

Incident Reporting

3. Within 24 hours of detecting the occurrence of an incident that causes (or may cause) material harm to the environment, the Applicant shall notify the Department and other relevant agencies of the incident.

4. Within 21 days of notifying the Department and other relevant agencies of such an incident, the Applicant shall provide the Department and these agencies with a written report that:
   (a) describes the date, time, and nature of the incident;
   (b) identifies the cause (or likely cause) of the incident;
   (c) describes what action has been taken to date; and
   (d) describes the proposed measures to address the incident.

Annual Reporting

5. By the end of September each year, and for at least 3 years following the cessation of mining at the development, the Applicant shall submit an AEMR to the Director-General, CCC and all relevant agencies. This report must relate to the previous financial year and:
   (a) identify the standards and performance measures that apply to the development;
   (b) describe the works carried out in the previous financial year;
   (c) describe the works that would be carried out in the current financial year;

(d) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;
(e) include a summary of the monitoring results for the development during the past year;
(f) include an analysis of these monitoring results against the relevant:
- impact assessment criteria/limits;
- monitoring results from previous years; and
- predictions in the EIS, EA or other documents listed in condition 2 of schedule 4;

(g) identify and discuss all exceedances of consent and licence conditions and other applicable standards and performance measures;
(h) identify any trends in the monitoring results over the life of the development;
(i) identify any non-compliance during the previous year; and
(j) describe what actions were, or are being, taken to ensure compliance.

INDEPENDENT ENVIRONMENTAL AUDIT

6. By 31 December 2011, and every 3 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
(a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;
(b) include consultation with the relevant agencies;
(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);
(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,
(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

Note: This audit team must be led by a suitably qualified auditor and include experts in the fields of a) mine subsidence impacts and remediation and b) stream hydrology and water quality.

7. Within 6 weeks of the completing of this audit, or as otherwise agreed by the Director-General, the Applicant shall submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report.

8. Within 3 months of submitting the audit report to the Director-General, the Applicant shall review, and if necessary revise the strategies/plans/programs required under this consent to the satisfaction of the Director-General.

COMMUNITY CONSULTATIVE COMMITTEE

9. The Applicant shall maintain a Community Consultative Committee (CCC) for the development to the satisfaction of the Director-General. This CCC must be operated in general accordance with the *Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects (Department of Planning, 2007*, or its latest version) to the satisfaction of the Director-General.

Note: The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent. In accordance with the Guideline, the Committee should comprise an independent chair and appropriate representation from the Applicant, affected councils, recognised environmental groups and the general community in Mt Kembla and the area of the development.

10. If required by the CCC, the Applicant shall establish and maintain a trust fund, or other funding arrangement that may be agreed between the Applicant and the CCC. This fund shall be:
(a) managed by the Chair of the CCC to facilitate the functioning of the CCC;
(b) used only if required for the engagement of consultants to interpret technical information and the like;
(c) provided with $8,000 per annum (indexed according to the CPI) by the Applicant for the duration of mining operations and other activities under the consent, or as otherwise directed by the Director-General;
(d) managed so that any monies unspent during each year are returned to the Applicant;
(e) managed so that the Chair of the CCC causes a record of the finances of the fund to be kept and provided to the Applicant and the Director-General at the end of each year the fund is used.

ACCESS TO INFORMATION

11. Within 3 months of the approval of any strategy/plan/ program required under this consent (or any subsequent revision of these strategies/plans/ programs), or the completion of the audits or AEMRs required under this consent, the Applicant shall:
    (a) provide a copy of the relevant document/s to the relevant agencies and CCC; and
    (b) put a copy of the relevant document/s on its website.

12. From 30 April 2009, and thereafter during the development, the Applicant shall:
    (a) provide a copy of this consent as may be modified from time to time on its website;
    (b) provide a comprehensive, running summary of monitoring results required under this consent on its website; and
    (c) update these results on a regular basis (at least every three months).

APPENDIX 1
SCHEDULE OF DEVELOPMENT LAND – EXTENDED SITE

PLAN	LOT NUMBER	Site Component
DP606434	Part 1	Coal Washery
DP227274	1	Kemira Valley Rail Line
DP1061983	1	Kemira Valley Rail Line
DP606431	1	Kemira Valley Rail Line
DP606430	1	Kemira Valley Rail Line
DP41756	1	Kemira Valley Rail Line
DP221602	1	Kemira Valley Rail Line
DP157009	1	Kemira Valley Rail Line
DP156521	1	Kemira Valley Rail Line
DP602229	102	Kemira Valley Rail Line
DP41756	2	Kemira Valley Rail Line
DP1061983	2	Kemira Valley Rail Line
DP157009	2	Kemira Valley Rail Line
DP208440	2	Kemira Valley Rail Line
DP208744	2	Kemira Valley Rail Line
DP216637	25	Kemira Valley Rail Line
DP214572	3	Kemira Valley Rail Line
DP157009	3	Kemira Valley Rail Line
DP203034	3	Kemira Valley Rail Line
DP159797	3	Kemira Valley Rail Line
DP203034	4	Kemira Valley Rail Line
DP867936	6	Kemira Valley Rail Line
DP259919	67	Kemira Valley Rail Line
DP259919	68	Kemira Valley Rail Line
DP432516	70	Kemira Valley Rail Line
DP751278	19	Mining Area
DP196993	2	Mining Area
DP606150	2	Mining Area
DP751278	216	Mining Area
DP751278	217	Mining Area
DP751278	275	Mining Area
DP751278	276	Mining Area
DP751278	277	Mining Area
DP751278	278	Mining Area
DP751278	279	Mining Area
DP751278	284	Mining Area
DP751278	285	Mining Area
DP751278	289	Mining Area
DP751278	74	Mining Area
DP401354	8	Mining Area
259 - 672		Mining Area

PLAN	LOT NUMBER	Site Component
DP196406	1	Surface facilities - Kemira Valley
DP164689	1	Surface facilities - Kemira Valley
DP615178	1	Surface facilities - Kemira Valley
DP159797	1	Surface facilities - Kemira Valley
DP41756	1	Surface facilities - Kemira Valley
DP221602	1	Surface facilities - Kemira Valley
DP44334	1	Surface facilities - Kemira Valley
DP157009	1	Surface facilities - Kemira Valley
DP156521	1	Surface facilities - Kemira Valley
DP250762	11	Surface facilities - Kemira Valley
DP1101896	11	Surface facilities - Kemira Valley
DP751278	114	Surface facilities - Kemira Valley
DP751278	115	Surface facilities - Kemira Valley
DP751278	116	Surface facilities - Kemira Valley
DP250762	12	Surface facilities - Kemira Valley
DP751278	134	Surface facilities - Kemira Valley
DP751278	137	Surface facilities - Kemira Valley
DP751278	138	Surface facilities - Kemira Valley
DP41756	2	Surface facilities - Kemira Valley
DP157009	2	Surface facilities - Kemira Valley
DP196371	2	Surface facilities - Kemira Valley
DP157009	3	Surface facilities - Kemira Valley
DP159797	3	Surface facilities - Kemira Valley
DP196371	3	Surface facilities - Kemira Valley
DP751278	Part 160	Surface facilities - Nebo
DP751278	Part 161	Surface facilities - Nebo
DP1076092	Part 21	Surface facilities - Nebo
DP1076092	Part 22	Surface facilities - Nebo
DP751278	Part 74	Surface facilities - Nebo
DP1055279	Part 11	Surface facilities - Ventilation Shafts
DP751278	Part 169	Surface facilities - Ventilation Shafts
Crown Land under CCL 724		West Cliff Coal Wash Emplacement

APPENDIX 2
SITE MAPS OF THE DEVELOPMENT

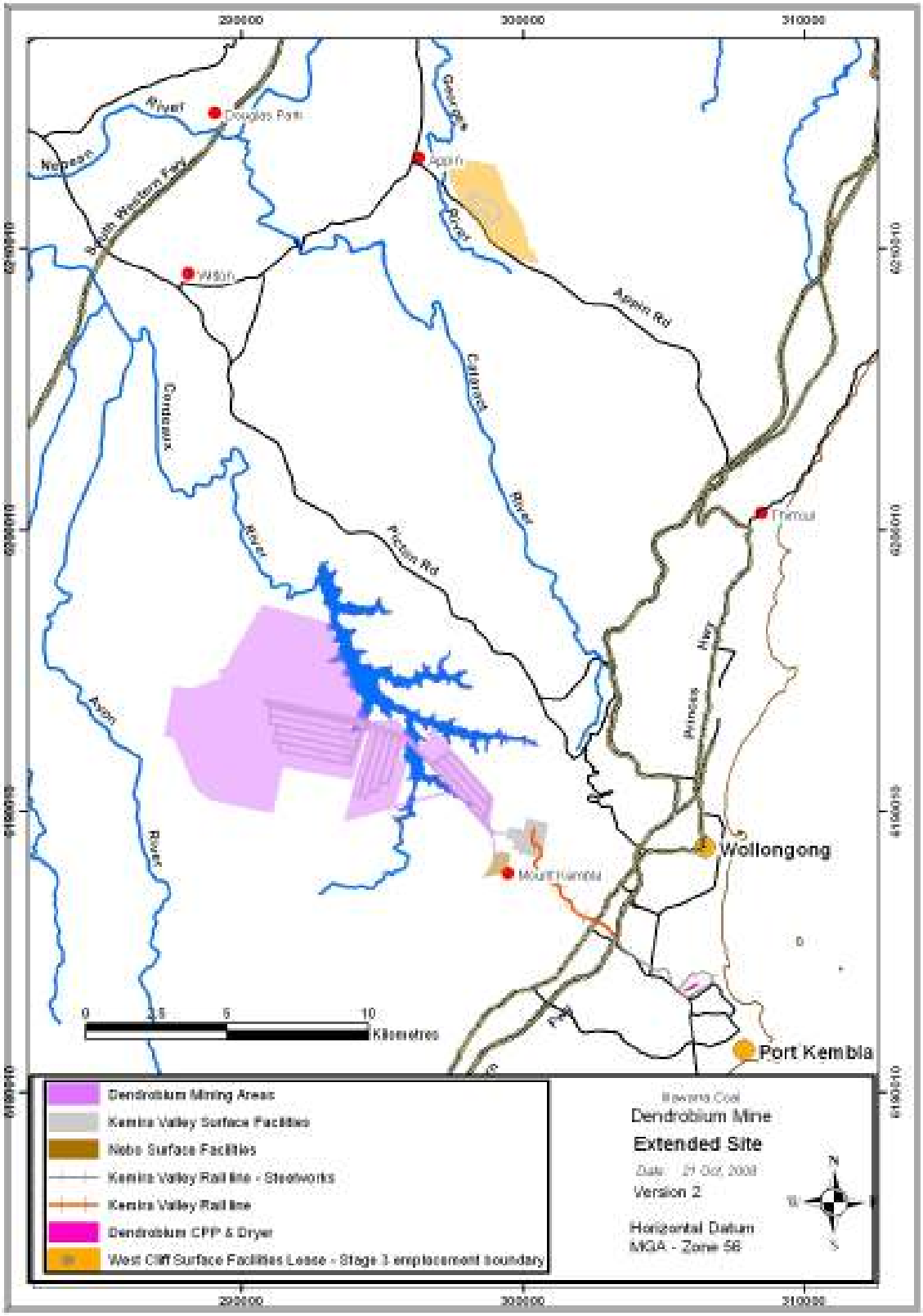


Figure 1 – Extended Site

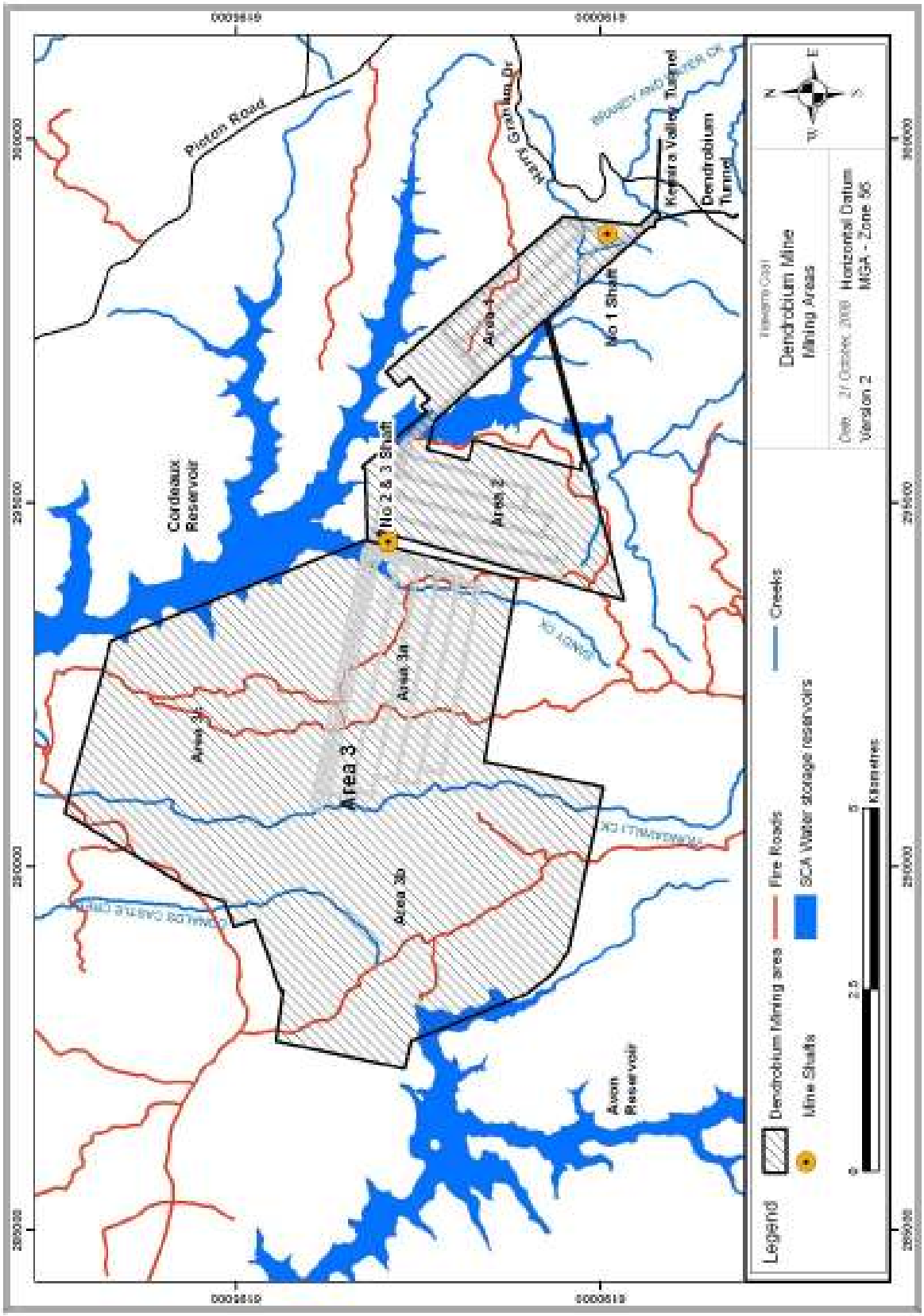


Figure 2 – Mining Area

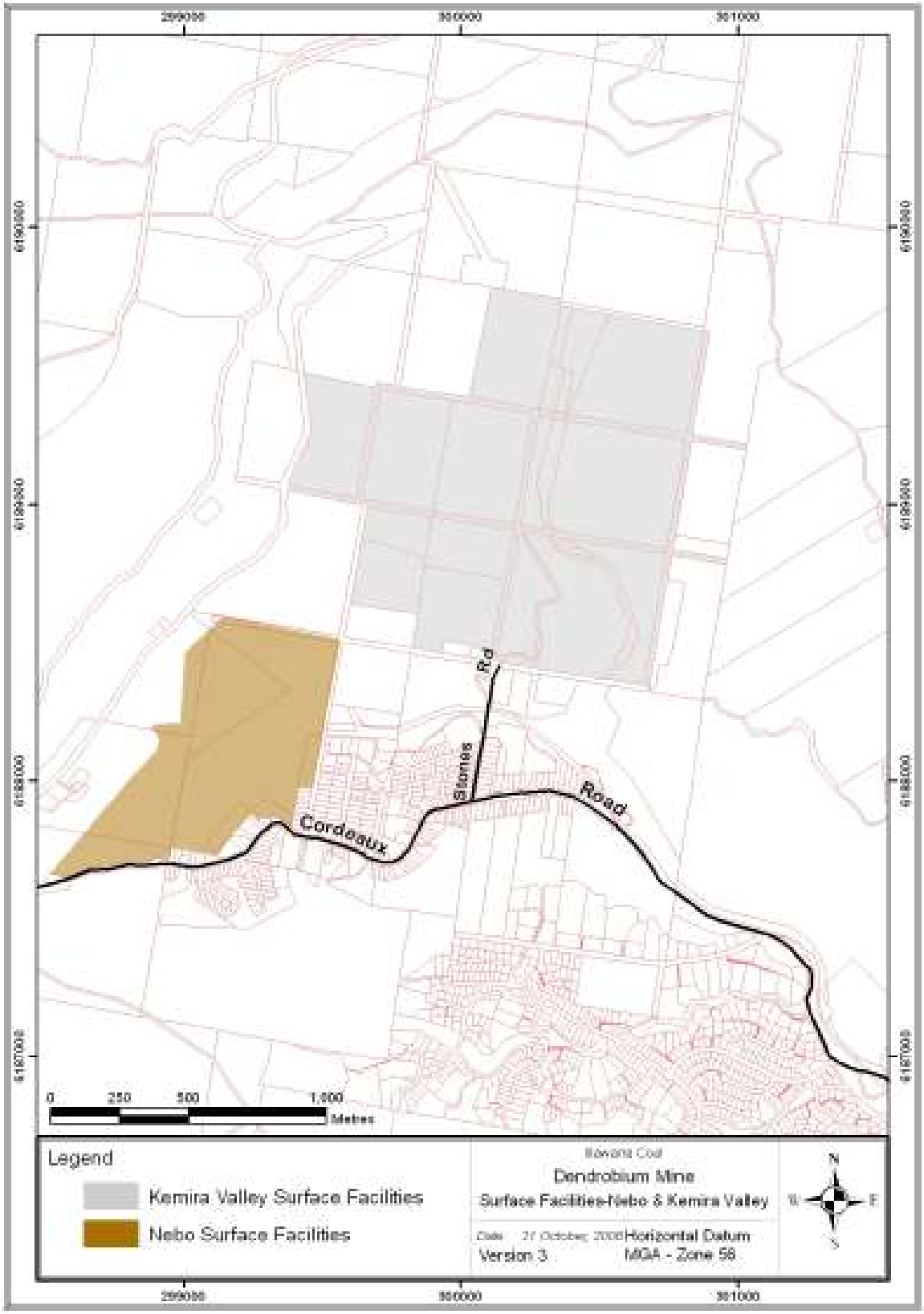


Figure 3 – Surface Facilities

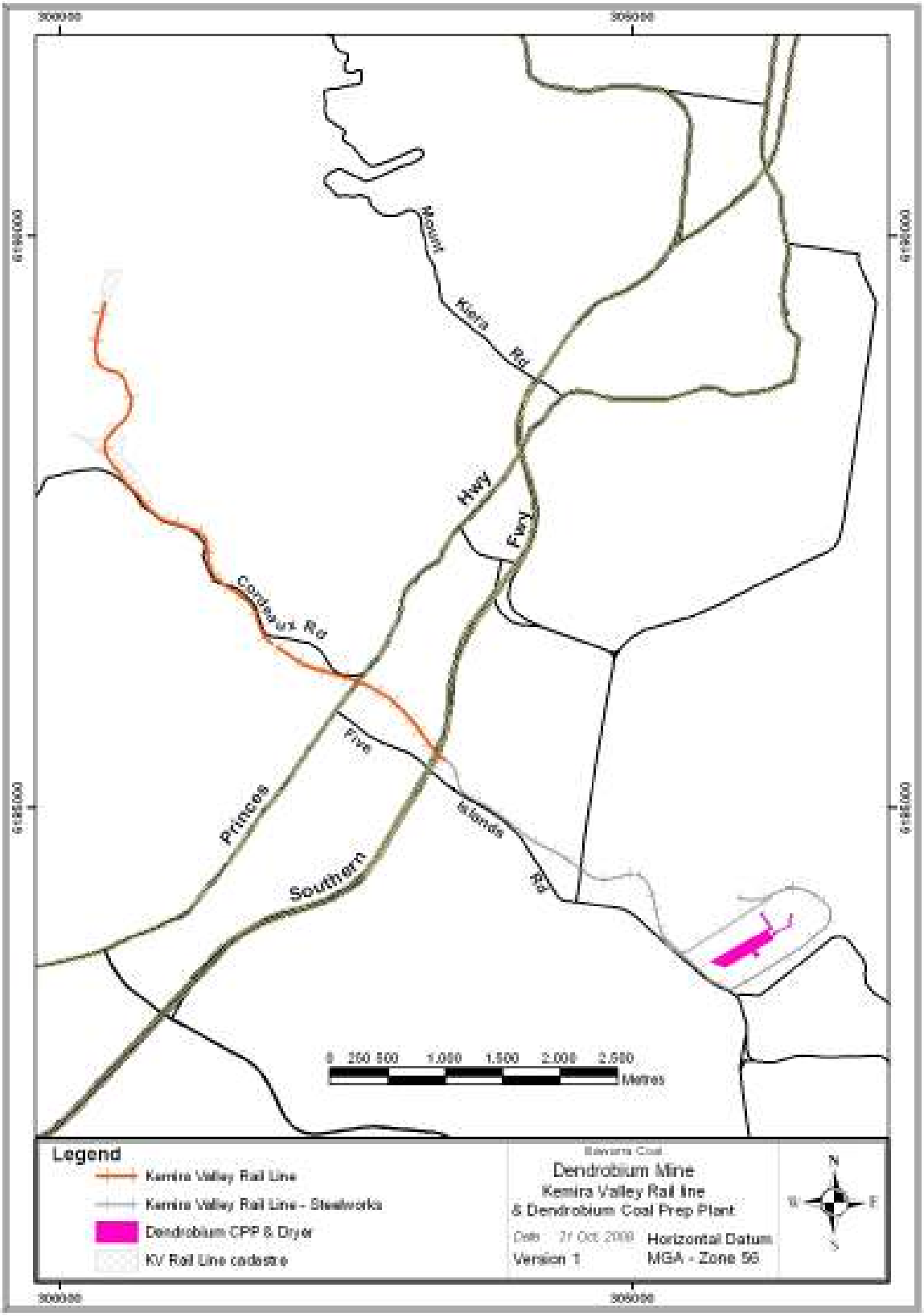


Figure 4 – Kemira Valley Rail Line and Dendrobium Coal Washery & Drying Facility

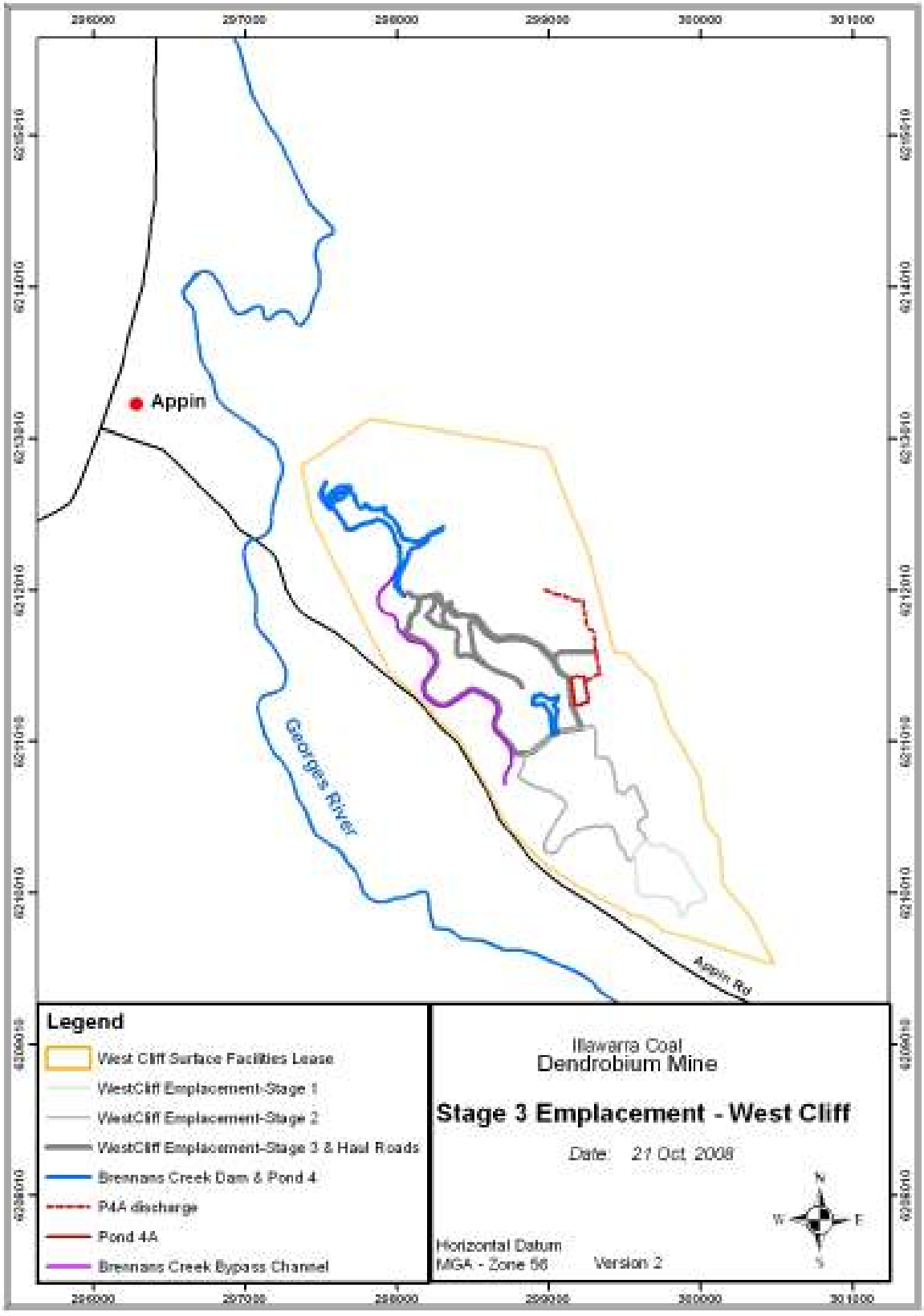


Figure 5 – West Cliff Coal Wash Emplacement Area

APPENDIX 3:
WEST CLIFF STAGE 3 COAL WASH EMPLACEMENT
STATEMENT OF COMMITMENTS

Coal Wash Alternatives

(a) Prepare an implement an End of Resource coal wash strategy within 5 years of the issue of the Stage 3 emplacement approval issue date. The strategy should be reviewed every three years from the date of the State 3 emplacement approval. The strategy should be provided to the Department of Planning (DoP), Department of Environment and Climate Change (DECC) and Department of Primary Industries – Minerals (DPIM).

(b) Give priority to the development and implementation of coal wash management solutions and strategies that maximise the beneficial use of coal wash and offer long term, large volume and sustainable opportunities.

(c) Maximise the reuse of coal wash as fill in development sites. Reusing should be carried out in a safe, practical and commercially effective way.

(d) Report the volume of coal wash reuse and the annual progress on the development of coal wash management solutions to the Government via the West Cliff Colliery Annual Environment Management Report (AEMR), submitted to DPI and copied to the DoP and DECC.

Stage 3 Emplacement

(e) The West Cliff Stage 3 Emplacement and associated infrastructure will be entirely contained within the footprint shown in Figure 1.

(f) The management and operation of the Stage 3 emplacement will be undertaken in accordance with the Emplacement Management Plan as amended from time to time in light of current best practice.

Vegetation and Fauna

(g) No more than 60.5 ha of native vegetation will be cleared for the West Cliff Stage 3 emplacement.

(h) The management of vegetation and fauna at the West Cliff site (including the Stage 3 coal wash emplacement) will be undertaken in accordance with the Vegetation and Fauna Management Plan as amended from time to time in light of current best practice.

(i) The Vegetation and Fauna Management Plan will be implemented to achieve the following performance indicators and targets.

Performance Indicator	Performance Target	Proposed Monitoring Methods
Weed management	• Zone 1; Low levels of weed infestation in soil translocation compartments. • Zone 2; A reduction in weed cover of perennial exotic grasses on disturbed edges. • Zone 3; Weed free condition maintained. • Eradication of noxious and serious environmental weeds from the colliery. Focus particularly on *Cortaderia selloana* and *Juncus acutus*.	• Control methods used and justification • Species treated and rates of herbicide application • Weed density/condition of bushland mapping • Inspections targeting noxious weeds
Success of Emplacement Area Rehabilitation (Zone1)	• Adequate regeneration of translocated communities, Exposed Sandstone Scribbly Gum Woodland and Sandstone Gully Peppermint Forest. Regeneration to reflect composition and structure of the two communities. • Condition; no more than 20 per cent weed cover in translocated compartments after 2 years. • 15 per cent accepted plant losses over 2 years. Additional losses to be replaced by tubestock. • 50 per cent vegetative cover of compartments achieved after 2 years. • The degree to which fauna, threatened or otherwise, use the rehabilitated emplacement area including constructed habitats and nest boxes.	• Permanent photographic points within translocated compartments. • Monitoring vegetation quadrats in translocated patches measuring species richness, structure and composition, condition, death rates and replacement requirements, growth rates of key indicator species. • Control sites to be set up in remnants. • Random meanders for threatened flora that may have regenerated from translocation. • Site assessments. Condition of bushland mapping. • An assessment of areas regenerated per unit effort. A comparison of the environmental outcome to the type and size of the input. • Soil testing (materials characterisation where revegetation fails). • A BHPBIC staff member qualified and experienced in natural area restoration to project manage monitoring system.
Site stabilisation	• Success of translocation as per the above targets. • Stabilisation of sediment and erosion control measures.	• Regular self audit and inspections including photographs of structures and the Emplacement benching, especially post storm flows.
Protection of Threatened Flora	• Loss of threatened plants *(Persoonia hirsuta*, *Acacia bynoeana and Pultenaea aristata)* restricted to those identified in area described by Figure 1.	• Inspections of on-site exclusion zones to ensure protection of remnant populations. • Inspections and assessment of translocated *Persoonia hirsuta* (if required)
Protection of Threatened Fauna Habitats	• No additional losses or loss of potential habitat outside the area described by Figure 1.	• Annual habitat level surveys.
Phytophthora infection	• Prevention of the introduction of Phytophthora • Identification of Phytophthora infection • If detected, development and implementation of a Phytophthora infection control plan	• Annual soil sampling in vegetation within proximity to on site traffic (track, drainage and roadside edges) and areas of previous disturbance. If detected, further sampling from areas within the stage 3 footprint pre-construction and post construction will be undertaken.
Bushfire	• The entire West Cliff mine lease currently operates under a fire exclusion policy. This policy will continue. • Boundary and internal fire trails and other	• Reporting by exception on the extent and intensity of unplanned bushfire.

Performance Indicator	Performance Target	Proposed Monitoring Methods
	suppression advantages will be maintained. • A hot work permit system will be maintained on the site. • The Rural Fire Service will be offered regular orientations of the lease site. • West Cliff Colliery is not currently subject to a hazard reduction burn regime and hazard reduction burns are not planned for the site. Any future bushfire management will consider fire regimes that are appropriate to ecological requirements (including management of threatened species and their habitats) of the site. Any proposed hazard reduction activities will only be undertaken in consultation with all relevant stakeholders.	
Reporting	• Annual Report to be supplied to regulatory authorities addressing outcomes of the project to date in relation to the above performance targets.	• Reporting of project to regulatory authorities. • Annual review of monitoring system and management methods. • Adjustments made to systems and methods as required. • Pro formas.

(j) Emplacement clearing and rehabilitation actions will take place in the following manner as specified in the Vegetation and Fauna Management Plan.

Vegetation clearing

Pre-clearing actions

- Flagging area to be cleared and habitat features to be preserved or redistributed

Two staged vegetation clearing

- Clearing of sub-canopy vegetation first to allow fauna opportunity to move
- Relocation of any fauna species encountered during the initial clearing of non-habitat trees
- Removal of habitat trees the next day
- Relocation of any remaining fauna prior to and during clearing of habitat trees

Habitat reinstatement

- Transplanting dead stags
- Addition of habitat logs and woody debris
- Nest box use and installation
- Reconstruction of rocky outcrops
- Maintenance and monitoring

Rehabilitation

Pre-translocation actions

- Identify clearing compartments
- Timing of vegetation clearing
- Collection and storage of seed
- Identification and preparation of recipient sites

Soil salvage and handling

- Vegetation clearing and stockpiling
- Stripping of soil in relevant horizons

- Soil and rock stockpiling

Soil replacement

- Respreading soil horizons
- Redistribution of rocks, logs, cleared/stockpiled vegetation and habitat features on recipient sites
- Sediment and erosion control

Revegetation supplementary to soil translocation

- Direct seeding of previously collected seed
- Weed control (where necessary)

(k) The Broad headed Snake Management Plan will be implemented in three key stages including:

- Relocation of Broad headed snakes during the pre-clearing period, preferably during the winter season;
- Progressive two-stage clearing and habitat translocation;
- Monitoring and maintenance during the post-clearing period

Water

(l) All stormwater runoff storage and treatment systems will be designed to cater for a 1:10 year ARI 72 hour duration rainfall event.

(m) All emplacement stormwater runoff will be captured and treated in a *two pond in series* treatment system. The first pond will provide passive setting and the second pond chemically assisted settling. An automated chemical dosing system will be installed and operated between the first and second pond.

(Note: During the last phase of emplacement, there will be only one stormwater treatment pond available. The area of the active emplacement will be minimised during this phase.)

(n) Clean water will be separated from dirty water to minimise dirty water volumes that must be captured and treated.

(o) The Brennans Creek diversion channel will be designed and constructed to cater for a 1:100 year ARI 2 hour duration storm event.

(p) The Brennans Creek diversion channel will be rehabilitated to incorporate; riffles, pools, bedslope, channel roughness, floodplain pockets and riparian vegetation that approximate as close as possible the characteristics of Brennans Creek.

(q) Illawarra Coal will negotiate a Pollution Reduction Program (PRP) with the Environment Protection Authority that will be incorporated into the West Cliff Colliery Environment Protection Licence to investigate, trial and implement appropriate strategies, technologies or works to achieve an agreed water quality discharge criteria from Brennans Creek Dam over an agreed time period.

Final landform

(r) The emplacement final landform will be contoured to form a stable landform that is sympathetic to the surrounding landscape.

Dust

(s) The emission of dust generated at the emplacement will be minimised by the use of water spray cart.

Compensatory measure

(t) Illawarra Coal will transfer ownership of 153.4 ha of land at Bulli Tops to the Minister for the Environment and Climate Change for gazettal under the National Parks and Wildlife Act and/or the Sydney Water Catchment Management Act. This commitment also includes:
- funding the transfer costs to transfer land title from Illawarra Coal to the NSW Government;
- funding the agreed scope of site improvement works

Aboriginal cultural heritage

(u) Aboriginal cultural heritage site impacted by the Stage 3 Coal Wash Emplacement will be restricted to:

Site	Impact
BC2 (Shelter with Art)	Destroyed by Emplacement landform
BC5 (Axe Gr. Groove)	Destroyed by Emplacement landform
BC6 (Shelter with Art)	Destroyed by Emplacement landform
WC4 (Shelter with Art)	Destroyed by Emplacement landform
BCPAD4	Destroyed by Emplacement landform
BCPAD5	Destroyed by Emplacement landform
BC7 (Shelter with Art)	Indirect via Landscape context – low potential for damage
D11 (Shelter with Artefacts)	Indirect via Landscape context – low potential for damage

(Note: relevant s87/90 consents under the National Parts and Wildlife Act will be sought for the Aboriginal cultural heritage site impacted by the Stage 3 Coal Wash Emplacement)

(v) An Aboriginal Cultural Heritage Management Plan will be developed and implemented in consultation with relevant Aboriginal stakeholders for all sites located at West Cliff.

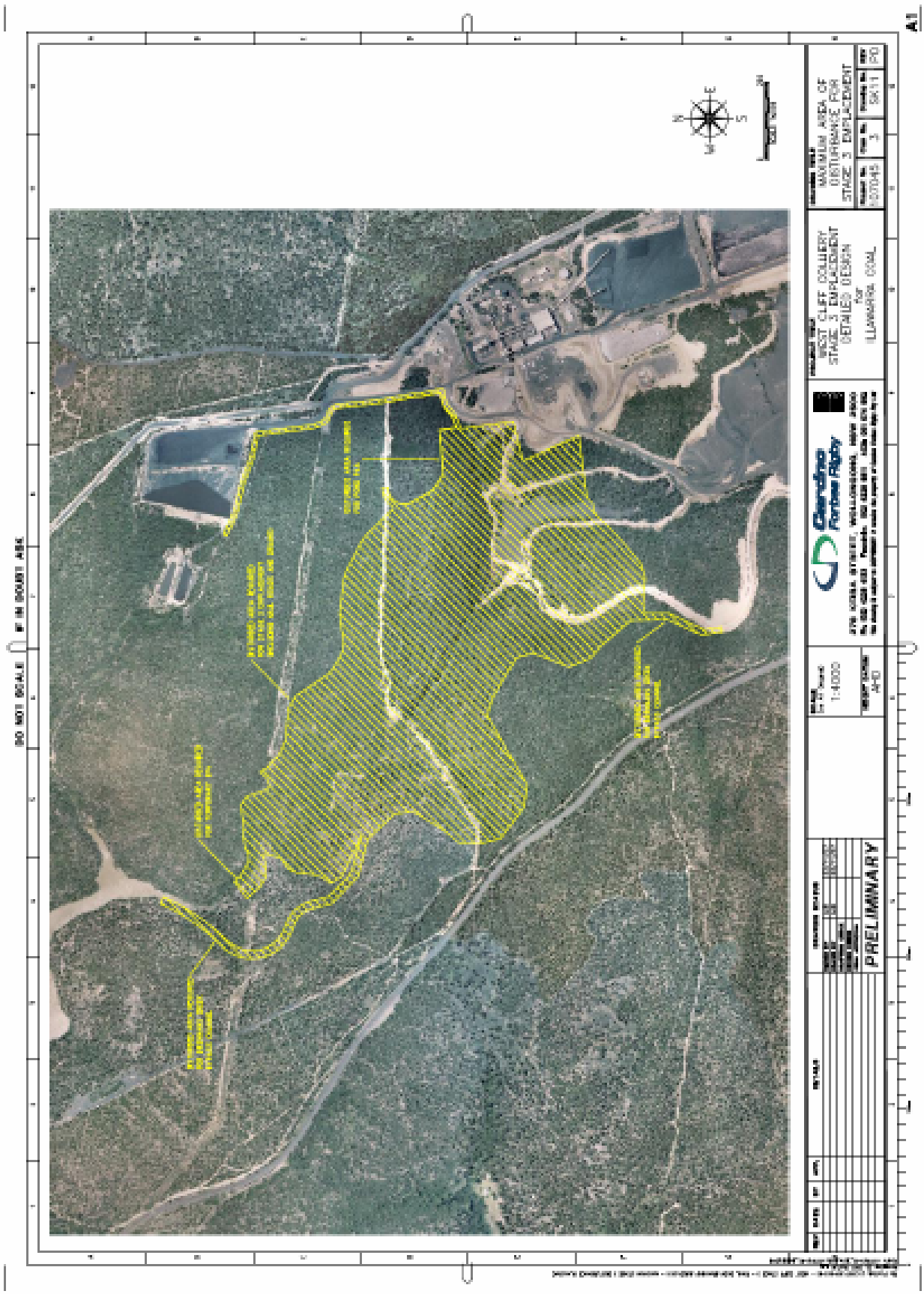
(w) Illawarra Coal will enter into an agreed Aboriginal Community Enhancement Program with the Tharawal Local Aboriginal Land Council.

Community consultation

(x) Illawarra Coal will continue to operate an office in a local Shopping Precinct to enable the community easy access to information and Illawarra Coal staff

(y) Illawarra Coal will continue to operate the 24-hour contact telephone line.

Figure 1: Areal extent of the Stage 3 Coal Wash Emplacement



APPENDIX 4:
STATEMENT OF COMMITMENTS

Dendrobium Area 3
Amended Statement of Commitments

1. Longwall layouts in Dendrobium Area 3

Optimal longwall layouts will be designed to achieve the following objectives for Dendrobium Area 3:

- Avoid fracturing in controlling rockbars of Sandy and Wongawilli Creek that is sufficient to result in water loss from pools (e.g. lower pool levels due to increased flow through controlling rockbars due to fracturing),
- Avoid fracturing in the Sandy Creek waterfall that is sufficient to result in increased water flow through the rockmass (e.g. water flowing through the rock overhang at the Sandy Creek waterfall), and
- Minimise volume of sterilised coal which could be efficiently extracted within the mining and environmental constraints of the area.

2. Subsidence Impact – Monitoring

Pre, during and post mining subsidence impact monitoring will be undertaken in accordance with the approved Subsidence Management Plan. The monitoring component of the Subsidence Management Plan includes but is not necessarily limited to:

- Subsidence movement of natural and man made features
- Surface waters
- Groundwater
- Terrestrial flora and fauna
- Aquatic flora and fauna
- Aboriginal cultural heritage sites
- Swamps

3. Subsidence Impact – Avoidance, Mitigation and Rehabilitation

If the monitoring program identifies impacts to natural features that exceed those predicted, the following contingent measures will be implemented.

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
Permanently Flowing Creeks (Flow)	**Predicted Impacts** Minor fracturing in the beds of Wongawilli and Sandy Creeks.	**Avoidance & Mitigation** Not mining under Wongawilli & Sandy Creeks to avoid major fracturing and loss of surface flow. Commitment to avoid significant impacts to major natural features in Area 3b

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
		and 3C
	Fracturing in the bed of SC10 leading to pool water level loss in some pools or loss of stream flow at some controlling rockbars.	Grouting and repair of significant surface water controlling features within SC10, where it is appropriate to do so, in consultation with SCA, DPIM, DECC and other stakeholders.
	Impacts Exceeding Those Predicted	**Contingent Measure**
	Major fracturing in the beds of Wongawilli and Sandy Creeks leading to pool water level loss or loss of stream flow.	Grouting and repair of significant surface water controlling features where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders.
	Major fracturing in the bed of SC10 leading to pool water level loss in all pools or loss of stream flow at all controlling rockbars.	
	Major fracturing in the rockmass of Sandy Creek waterfall leading to significant flow through the rock overhang.	Grouting and repair of the waterfall rockmass where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders.
Ephemeral watercourses	**Predicted Impacts**	**Avoidance & Mitigation**
(Flow)	Fracturing of the beds of some minor streams & diversion of flows.	Not mining under Wongawilli & Sandy Creeks reducing subsidence movements in the more deeply incised parts of the tributaries. Commitment to avoid significant impacts to major natural features in Areas 3B and 3C.
	Impacts Exceeding Those Predicted	**Contingent Measure**
	Major fracturing in the beds of streams leading to total pool water loss or complete loss of surface flow through controlling rockbars.	Grouting and repair of significant surface water controlling features where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders.
Lakes	**Predicted Impacts**	**Avoidance & Mitigation**
	Negligible impacts.	The layout has been designed to avoid or minimise impacts on the lake. Potential impacts are considered negligible.

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
	Impacts Exceeding Those Predicted Connectivity of the lake with the mining area.	**Contingent Measure** As per the DSC Contingency Plan.
Cliffs	**Predicted Impacts** Isolated rockfalls estimated to occur along ~ 10% of the cliff lines.	**Avoidance & Mitigation** Monthly monitoring during subsidence. Signage & Fencing where they present safety risks. Communication strategy to stakeholders where they present safety risks.
	Impacts Exceeding Those Predicted Rock falls occurring along >10% of the cliff lines or total cliff failure (e.g. entire length of cliff impacted).	**Contingent Measure** As above. Scaling rocks loosened by subsidence where they present safety risks. Minor civil/earthworks to prevent erosions such as overland flow diversion works, establishment of banks, smoothing and re-contouring, where this is practical. Revegetation works such as planting, seeding, mulching, weed control and plant maintenance, where this is practical.
Steep slopes	**Predicted Impacts** Some impacts are possible if slopes are marginally stable. Large cracks or compressive ridges. No significant diversion of surface water flow direction or increase in soil erosion/sedimentation of waterways.	**Avoidance & Mitigation** Monthly monitoring during subsidence. Signage & Fencing where they present safety risks. Communication strategy to stakeholders where they present safety risks. Minor sediment control works such as silt fencing.
	Impacts Exceeding Those Predicted Large cracks, large compressive ridges or mass movements causing	**Contingent Measure** As above. Minor civil/earthworks to prevent erosions such as

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
	significant erosion if left untreated.	overland flow diversion works, establishment of banks, smoothing and re-contouring, where this is practical. Revegetation works such as planting, seeding, mulching, weed control and plant maintenance, where this is practical. Erosion control and revegetation establishment where required to prevent further impacts. Infill of surface cracks with soil or other suitable material where appropriate, local regrading or compacting of the surface. Temporary sediment and erosion control measures. Monitoring – event specific mitigation and rehabilitation.
Aquatic fauna and flora	**Predicted Impacts** Impacts on fauna are possible due to 'loss' of water from pools. Impacts on vegetation expected to be very small. **Impacts Exceeding Those Predicted** Major reduction in pool water level or complete loss of pool water. Major reduction in aquatic habitat for an extended timeframe or complete loss of habitat. Identified mortality of fauna/flora in proximity to identified mining impact.	**Avoidance & Mitigation** Not mining under Wongawilli & Sandy Creeks to avoid major fracturing and loss of surface flow. Commitment to avoid significant impacts to major natural features in Areas 3B and 3C. **Contingent Measure** Grouting and repair of significant surface water controlling features where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders. Active preservation of life such as relocation of stranded fish. Temporary ecosystem maintenance such as watering aquatic plants until final rehabilitation completed, where this is practical.
Terrestrial fauna and flora	**Predicted Impacts** Impacts on fauna are possible	**Avoidance & Mitigation** Monthly monitoring during

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
including endangered ecological communities	due to 'loss' of water in creeks. Proposal assessed as likely to have a significant local impact on three frog and one dragonfly species.	subsidence. Not mining under Wongawilli & Sandy Creeks to avoid major fracturing and loss of surface flow. Commitment to avoid significant impacts to major natural features in Areas 3B and 3C.
	Impacts Exceeding Those Predicted Large areas of impacted vegetation (by rockfalls, soil slippage) that is unlikely to commence natural regeneration within 6 months. Significant surface soil cracking or rock bar fracturing resulting in loss of standing water and or erosion in creeks or swamps. Gas emissions with extensive vegetation die off and no evidence of self regeneration within 6 months of cessation of gas release.	**Contingent Measure** Site rehabilitation to reinstate habitat values – increased monitoring. Remediation of subsidence related fracturing or dilation within creek beds and surface cracks where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders. Minor civil/ earthworks to prevent erosions such as overland flow diversion, establishment of banks, smoothing and re-contouring, where this is practical. Revegetation such as planting, seeding, mulching, weed control and plant maintenance, where this is practical. Active preservation of life such as relocation of stranded fauna and watering of stressed vegetation where this is beneficial and practical. Temporary ecosystem maintenance such as watering plants until final rehabilitation completed, where this is practical.
Aboriginal Places of Cultural Significance - Archaeological sites	**Predicted Impacts** Unlikely that the sites will sustain structural impacts. Empirical data suggests the probability of impacts to a site is less than 10%.	**Avoidance & Mitigation** Baseline, active subsidence and post mining monitoring. Appropriate consultation and approvals.

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
	Impacts Exceeding Those Predicted Change in shelter conditions not attributable to natural weathering or preservation – cracking or exfoliation of art panel, movement of existing planes and joints at panel, block fall within shelter or overhang, shelter or overhang collapse.	**Contingent Measure** Site and event specific mitigation and rehabilitation will be developed with appropriate Aboriginal representatives, DECC and SCA. Techniques may involve installing artificial drip lines, detailed recording of art, stabilising and cleaning rock faces. Refer Area 3A SMP section 22.9.
Water quality– Permanently Flowing Creeks ***Wongawilli Creek*** ***Sandy Creeks***.	**Predicted Impacts** Impacts on water quality are possible due to reduced flow and/or increased interaction of ground and surface water. These impacts are likely to include reduced oxygen, higher dissolved ions and precipitates. There is also a possibility of lower pH and lower temperature variation as a result of groundwater inflows.	**Avoidance & Mitigation** Not mining under Wongawilli & Sandy Creeks to avoid major fracturing and loss of surface flow. Commitment to avoid significant impacts to major natural features in Areas 3B and 3C.
	Impacts Exceeding Those Predicted Major reduction in water quality when comparing baseline period to mining period, i.e. comparing baseline data to mining period: pH drop of >2 EC increase >100 uS/cm ORP* drop >200 mV A > 2 standard deviation reduction in water quality apparent at downstream monitoring site when comparing pre-mining to baseline data.	**Contingent Measure** Grouting and repair of surface water controlling features and the beds of streams where fracturing is evident where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders. Limestone emplacement to raise pH where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders.
Water quality– ephemeral streams	**Predicted Impacts** Some buckling and fracturing of creek beds & diversion of flows. Impacts on water quality are	**Avoidance & Mitigation** Monitoring, measurement and reporting.

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
	possible due to reduced flow and/or increased interaction of ground and surface water. These impacts are likely to include reduced oxygen, higher dissolved ions and precipitates. There is also a possibility of lower pH and lower temperature variation as a result of groundwater inflows. However, volumes of pooled water in ephemeral streams are small relative to the entire catchment. **Impacts Exceeding Those Predicted** Major reduction in water quality when comparing baseline period to mining period, i.e. comparing baseline data to mining period: pH drop of >2 EC increase >100 uS/cm ORP* drop >200 mV A > 2 standard deviation reduction in water quality apparent at downstream monitoring site when comparing pre-mining to baseline data.	**Contingent Measure** Grouting and repair of surface water controlling features and the beds of streams where fracturing is evident where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders. Limestone emplacement to raise pH where it is appropriate to do so in consultation with SCA, DPIM, DECC and other stakeholders.
Groundwater quality, quantity and levels	**Predicted Impacts** Impacts on groundwater are possible due to increased interaction of ground and surface water as well as increased interaction of groundwater with existing and freshly created fractures within the rock and soil mass. These impacts are likely to include reduced oxygen, higher dissolved ions and lower pH. Shallow groundwater systems are likely to be depressed by increased permeability as a result of fracturing. **Impacts Exceeding Those Predicted** Major reduction (monitoring bore dry where it has not been prior to mining) in	**Avoidance & Mitigation** Monitoring, measurement and reporting. Not mining under Wongawilli & Sandy Creeks to avoid major fracturing and loss of surface flow. Commitment to avoid significant impacts to major natural features in Areas 3B and 3C. **Contingent Measure** Mitigation of flow-on ecological effects as described above.

Description of Item	Key Potential Impacts	Avoidance, Mitigation and Rehabilitation
	groundwater level at the majority of bores within any particular aquifer or swamp system or complete loss of groundwater. High reduction in water quality, i.e. comparing baseline data to mining period: pH drop of >2 EC increase >100 uS/cm ORP* drop >200 mV	
Surface of the land	**Predicted Impacts** Some surface cracking posing safe access constraints. **Impacts Exceeding Those Predicted** Major surface cracking preventing safe access.	**Avoidance & Mitigation** Monitoring, measurement and reporting during active subsidence. Signage & Fencing where they present safety risks. Communication strategy to stakeholders where they present safety risks. Fill crack with appropriate material in consultation with infrastructure owner. Install temporary erosion and sediment controls were appropriate. **Contingent Measure** As above. Establishment of alternative access to critical areas.
Swamps	**Predicted Impacts** No change in hydrology or ecological function of swamps. **Impacts Exceeding Those Predicted** Major controlling rockbar cracking leading to water loss in swamp Burning and/or erosion of peat material.	**Avoidance & Mitigation** Monitoring before, during and after active subsidence. **Contingent Measure** Implement swamp contingency plan.

4. Swamp Contingency Plan

Prior to the commencement of mining within Dendrobium Area 3A, 3B and 3C, Illawarra Coal will prepare a swamp remediation contingency plan for all swamps within each area.

5. Water Quality Offset

Illawarra Coal will negotiate an offset with the SCA to account for the small and unquantifiable water quality impact resultant from the proposal.

6. Sandy Creek Waterfall

Prior to the commencement of longwall mining within Dendrobium Area 3A, Illawarra Coal will:

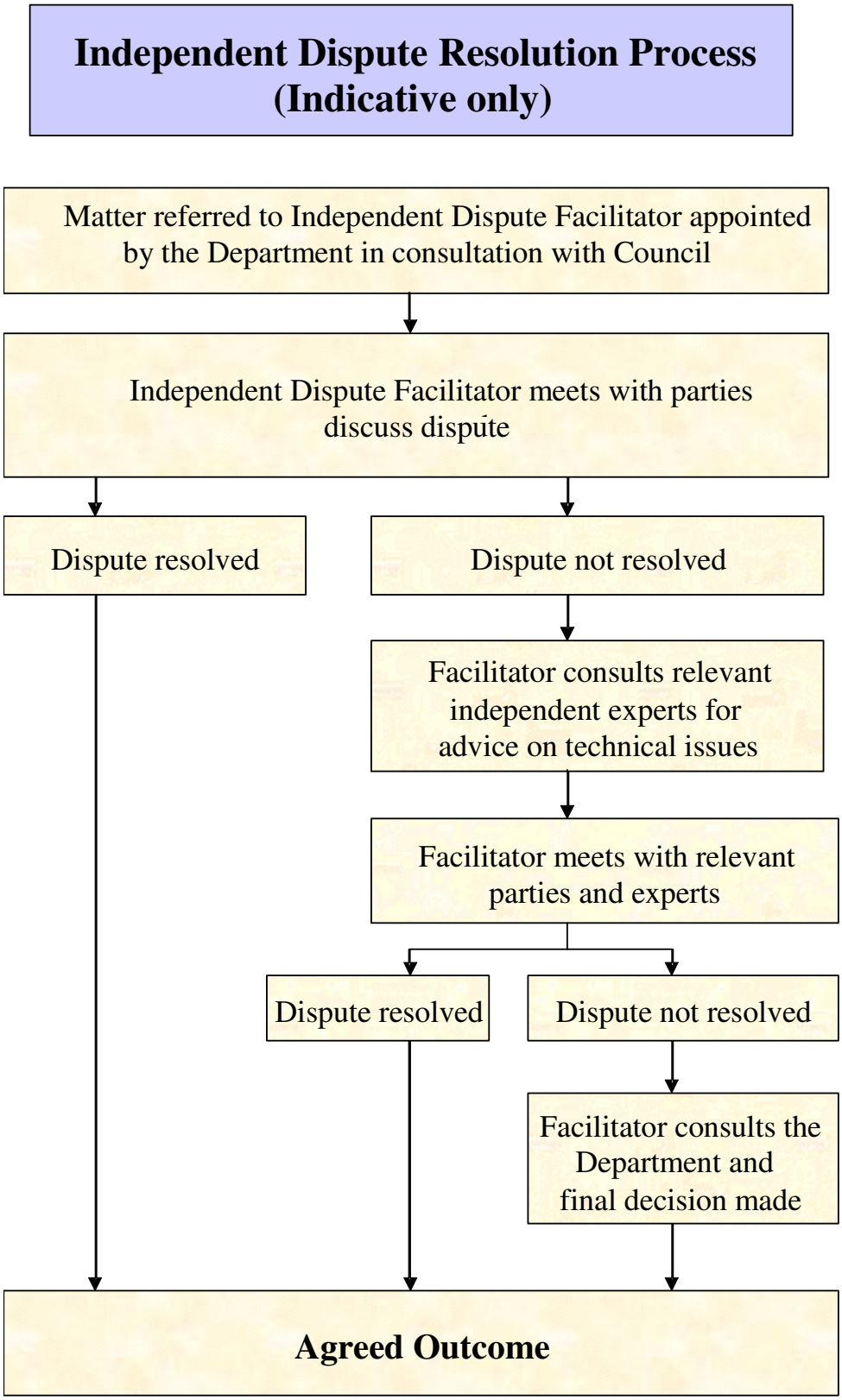
- establish a "technical committee" that includes BHPB, DPI, MSEC, and independent subsidence and geotechnical experts to advise on Sandy Creek Waterfall,
- develop and implement detailed management outcomes such as a Trigger Action Response Plan (TARP) that identifies detailed monitoring and management triggers, including but not necessarily limited to a decision to stop mining, where Longwalls 6-8 extract coal within 400 m of the Sandy Creek Waterfall.

Illawarra Coal will establish cut throughs at 50 m intervals at the finishing end of Longwalls 6 and 7 in order to be able to comply with any decision to stop mining based on the triggers in the TARP. Consideration will be given in the design of development roads for Longwalls 8-10 in regard to the provision of Longwall take off cut throughs in order to achieve compliance with the triggers in the TARP.

7. Green House Gas Emission - Measuring and Reporting

Illawarra coal is required to monitor and report green house gas emissions from Dendrobium Mine in accordance with the National Greenhouse and Energy Reporting Act 2007. This emissions data will be reported in the AEMR. The AEMR will also discuss current and proposed future action to minimise and/or abate green house gas emissions.

APPENDIX 5:
INDEPENDENT DISPUTE RESOLUTION PROCESS



Appendix B

Copy of letter from NSW Department of Planning and Environment dated 3 July 2014 approving the audit team.

Development Assessment Systems and Approvals
Mining Projects

Contact: Jessie Evans
Phone: 9228 6419
Fax: 9228 6466
Email: jessie.giblett@planning.nsw.gov.au

Our Ref: 10_13245-5

Mr Scott Coleman
Manager Environment
Illawarra Coal Holding Pty Ltd
PO Box 514
UNANDERRA NSW 2529

Dear Mr Coleman

Dendrobium Coal Mine (DA 60-03-2001)
Independent Environmental Audit
Expert Approval

I refer to your letter dated 2 July 2014 requesting the Secretary's endorsement of a suitably qualified, experienced and independent team of experts to undertake the independent environmental audit, in accordance with condition 6 of Schedule 8 of the mine's consent (DA 60-03-2001).

The Department has reviewed the attached CVs and is satisfied that these experts are suitably qualified and experienced to independently assess the environmental performance of the project. Consequently, I can advise that the Secretary endorses the following experts:

Expert	Company	Aspect
Dennis Zines	Kadenz Pty Ltd	Lead auditor and all aspects not covered below
Damon Roddis	Pacific Environment Limited	Air Quality
Chris Marsh	Pacific Environment Limited	Noise
Steve Ditton	Ditton Geotechnical Services	Subsidence

If you require any more information, please call Jessie Evans on 9228 6419.

Yours sincerely

Howard Reed 3-7-14
Manager
Mining Projects
As nominee of the Secretary

Appendix C

Correspondence from OEH in response to the Auditor's Consultation.

NSW GOVERNMENT | Office of Environment & Heritage

Date 29/08/2014
Our reference DOC14/185060
Contact: James Dawson 4224 4125

Mr Dennis Zines
Kadenz Pty Ltd Environmental Consultancy
1 Fairweather Street,
BELLEVUE HILL NSW 2023

Dear Dennis,

RE: 4th Triennial Independent Environmental Audit of Dendrobium Approvals Compliance

The Office of Environment and Heritage (OEH) has taken considerable interest in the Dendrobium Coal Mine due to requirements that the proponent consults with OEH on a range of approval conditions. The mine has impacts on sensitive ecological communities, including threatened species and their habitats, and high conservation and biodiversity values occur above the mine.

OEH considers that BHP Billiton Illawarra Coal is currently in breach of the Dendrobium 3B SMP Approval. A recent impact report regarding swamps 1a and 1b in Area 3B documented groundwater loss consistent with fracturing of swamp bedrock at all undermined piezometers. This represents an impact greater than the "minor environmental consequences" in relation to ecosystem functionality permitted under the project approval. This matter was raised with Department of Planning and Environment (DPE) and BHP Billiton Illawarra Coal by correspondence dated 9/7/14. As yet, there has been no response from either party about this matter.

In undertaking the Triennial Independent Environmental Audit OEH also highlights the following issues.

Condition	Issue/Comment
Condition 6, Schedule 3 Area 3B SMP Approval	**Biodiversity Offset Strategy** The condition is not yet satisfied. OEH is assessing the latest draft strategy but considers there are significant outstanding issues before it will meet the requirements of this condition. OEH also notes that the company has already had four time extensions on this condition, with mining having commenced over 18 months ago.
Condition 9, Schedule 3 Area 3B SMP Approval	**Performance Measures for Area 3B** OEH considers that BHPBIC is **in breach of this condition** in relation to ecosystem function of swamps 1a, 1b and 5. See correspondence dated 9/7/14 for further information. OEH considers that predicted impacts to Donalds Castle Creek exceed the "minor impacts" under this condition. OEH considers that the hydrological model used by BHPBIC to assess reductions in the quantity of water reporting to the reservoir or leaking to underground mine working to be inappropriate, inadequate and unproven for this use. Multiple independent peer reviews have come to this conclusion.
Condition 11, Schedule 3 SMP Approval	**Watercourse Impact Monitoring, Management and Contingency Plan** This condition is not yet satisfied. The intention of the approval was to ensure that monitoring and management plans were in place prior to mining so that

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and Condition 6 Schedule 3 Development Consent	the impacts of mining could be adequately assessed and to ensure mining was undertaken in accordance with the performance measures. The draft of this plan is still considered inadequate by OEH and the SCA, despite mining having commenced 18 months ago. OEH does not consider that the latest drafts provided fulfil the requirements of the approval in that the monitoring plan identified is not capable of assessing whether the performance measures identified in Condition 9 Schedule 3 of the SMP Approval are achieved.
Condition 12, Schedule 3 SMP Approval and Condition 6 Schedule 3 Development Consent	**Swamp Impact Monitoring, management and Contingency Plan** This condition is not yet satisfied. The intention of the approval was to ensure that monitoring and management plans were in place prior to mining so that the impacts of mining could be adequately assessed and to ensure mining was undertaken in accordance with the performance measures. The draft of this plan is still considered inadequate by OEH and the SCA, despite mining having commenced 18 months ago. OEH does not consider that the latest drafts provided fulfil the requirements of the approval in that the monitoring plan identified is not capable of assessing whether the performance measures identified in Condition 9 Schedule 3 of the SMP Approval are achieved.
Condition 11 and 12 Schedule 3 SMP Approval and Condition 6, Schedule 3 Development Consent	**Trigger Action Response Plans** OEH is not satisfied with the Trigger Action Response Plans (TARPS) included in the Swamp and Water Impact, Monitoring, Management and Contingency Plans. The TARPs are intended to assist monitoring and management of the mine by identifying environmental triggers and appropriate actions to undertake. OEH considers that the TARPs should be strongly linked to the monitoring undertaken and the Performance Measures specified in the Approval. Clear, quantifiable triggers and definitions should be used: In addition the TARP should clearly identify when the performance measures have been exceeded. Often impacts in Impact Reports are assessed against the TARP and no consideration of the limits of the approval is included.
Condition 13 Schedule 3 SMP Approval	**Groundwater Model** Status unknown. OEH considers that the hydrological model used by BHPBIC to assess reductions in the quantity of water reporting to the reservoir or leaking to underground mine working to be inappropriate, inadequate and unproven for this use. Multiple independent peer reviews have come to this conclusion. Whether this model has been approved to the satisfaction of the Director-General in not known.
Condition 15 Schedule 3 SMP Approval	**Swamp Rehabilitation Research Program** This condition is not yet satisfied, despite mining having commenced 18 months ago. OEH has provided advice on three occasions and still considers that the Program does not meet the requirements of the Approval. In particular it attempts to include a monitoring program that is the requirement of an entirely separate condition of approval (Condition 14, SMP Approval).
Condition 14 Schedule 3 Development Consent	**Environmental Offsets** Status unknown. OEH is not aware of any offset for loss of water quality or quantity to SCA storages despite loss being reported.
Condition 12 Schedule 8 Development Consent	**Access to Information** BHP is in breach of this condition. A comprehensive, running summary of monitoring results required under these consent is required on BHPBIC's website. The most recent documents with any relation to the environment on its website are an Annual Environmental Management Report for July 2012 to June 2013 and an End of Panel report for Longwall 8 from May 2012. OEH does not consider that this fulfils this requirement. OEH recommends that all impact reports required under the consent on monitoring/management programs are included on the website.
A number of conditions in Development Consent and SMP Approval	**Lack of meaningful consultation** OEH has been disappointed with the extent of consultation by BHPBIC in developing a number of post approval plans that required consultation with OEH. DPE have stated to BHP that they require "meaningful consultation" with the agencies involved. OEH has provided clear and consistent advice over the course of up to 20 months on some plans such as the Swamp Impact

	Monitoring, Management and Contingency Plan. Generally OEH advice and comments have not been incorporated into revised drafts, nor addressed in any manner. **Lengthy delays in fulfilling approval requirements** OEH notes that timeframes specified in the relevant approvals have frequently been exceeded and that extensions appear to be freely granted. OEH believes there should be an expectation that timeframes are met unless exceptional circumstances apply. In some cases extensions granted for plans that were supposed to be in place prior to mining has resulted in only draft plans being in place when mining commenced. These draft plans have not been considered satisfactory by OEH, SCA and DPE.

More detailed information can be derived from the attached correspondence OEH has formerly provided to BHPBIC, DP&E and DRE.

If you would like to discuss the matters raised, please contact James Dawson (Senior Team Leader, Ecosytems and Threatened Species) on james.dawson@environment.nsw.gov.au or 4224 4125.

Yours sincerely,

Gabrielle Pietrini
A/Regional Manager, Illawarra
Regional Operations Group, South Branch
Office of Environment and Heritage

Cc: Greg Kininmonth, DRE
Cc: Howard Reed, DP&I

Appendix D

Subsidence Consultant DgS Report and Site Inspection Photo Log.

Ditton Geotechnical Services Pty Ltd
82 Roslyn Avenue Charlestown NSW 2290
PO Box 5100 Kahibah NSW 2290

DgS
Ditton Geotechnical Services

25 November, 2014

Dennis Zines
Kadenz Pty Limited
1 Fairweather Street
Bellevue Hill NSW 2023

Report No. DEN-003/1

Dear Dennis,

Subject: Subsidence Impact Management Compliance Assessment for the 4th Triennial Independent Audit of Dendrobium Mine, Mount Kembla

1.0 Introduction

This report provides an independent review by Ditton Geotechnical Services Pty Ltd (DgS) on the environmental performance of the Dendrobium Mine in regards to subsidence impact management within Areas 3A and 3B at the Dendrobium Mine, Mount Kembla.

This report forms part of the 4th Triennial Independent Audit Report by Kadenz Pty Ltd, which is required by the NSW Department of Planning & Environment's Consent Condition 8.6 *Independent Environmental Audit* in the Modified Development Approval (DA-60-03-2001) dated 8/12/2008 for the Dendrobium Mine.

This audit has included the outcomes of mining impacts for the period from September, 2011 to September, 2014. Mining activities resulting in the development of subsidence and associated impacts during this period include the extraction of longwalls LWs 7 and 8 in Area 3A (April, 2011 - December, 2012) and LW 9 & 10 in Area 3B (February, 2013 to September, 2014). LW9 was completed in June, 2014 and LW10 is currently being extracted.

Separate Subsidence Management Plans (SMPs) were developed for Areas 3A and 3B before mine subsidence impact occurred in accordance with Consent Condition 3.7 of the Modified DA. Monitoring and reporting of the impacts and consulting with the relevant stakeholders in regards to these have been on-going through the audit period.

2.0 Abbreviations

The abbreviations used in this report are as follows:

CMA - Corrective Management Action

DCCC - Dendrobium Community Consultative Committee

DP&E - Department of Planning and Environment (*formerly Planning & Infrastructure*)

DRE - Department of Resources & Energy *(an agency of T&I)*

DSC - Dams Safety Committee

T&I - Department of Trade and Investment

IC - Illawarra Coal

ICEFT - Illawarra Coal Environmental Field Team

NOW - NSW Office of Water *(an agency of T&I)*

OEH - Office of Environment and Heritage

SCA - Sydney Catchment Authority

SIMMCP - Swamp Impact Monitoring, Management and Contingency Plan

TARP - Trigger Action Response Plan

WIMMCP - Watercourse Impact Monitoring, Management and Contingency Plan

3.0 Scope of Work

The requirements of the Schedule 8.6 of the Modified DA are provided below:

6. By 31 December 2011, and every 3 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:

(a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;

(b) include consultation with the relevant agencies;

(c) assess the environmental performance of the development and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or mining lease (including any strategy, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate,

(e) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

Note: This audit team must be led by a suitably qualified auditor and include experts in the fields of a) mine subsidence impacts and remediation and b) stream hydrology and water quality.

The work completed by DgS for the review period included:

(i) A desktop review of the relevant subsidence impact prediction, monitoring and management documentation for Areas 3A and 3B:

- Dendrobium Mine's Modified Development Approval Conditions of Consent and Statement of Commitments (DA 60-03-2001, dated 8/12/2008)
- Environmental Assessment for Area 3 (dated November, 2007)
- Subsidence Management Plans (SMPs) for Areas 3A (April, 2010) and 3B (Feb, 2013)
- Swamp Impact Monitoring, Management & Contingency Plans (SIMMCP)
- Watercourse Impact Monitoring, Management & Contingency Plans (WIMMCP)
- Revised Swamp and Watercourse TARPS (Oct 2013 and Dec 2013)
- Annual Environmental Management Reports (AEMRs) for 2011/2012, 2012/2013 and 2013/2014.
- End of Panel Reports (EoPRs) for LWs 7, 8 and 9 (LW10 is still being extracted)
- Relevant Government Agency Correspondence (DRE, SCA and OEH)
- Bio-diversity Offset Strategy for Area 3B (approval pending from OEH & SCA)
- Swamp Rehabilitation and Research Program (04/06/2014)
- Independent Hydrological Model reviews by SCA (Mr Grantley Smith of the Water Research Laboratory UNSW) and DCCC (Professor McMahon of Melbourne University).
- OEH submission to Ministers Department (Martin Krogh, 2012)
- OEH submission to DP&E (13/12/2012)
- OEH submission to T&I (30/09/2013)
- OEH submission to BHPB (21/10/2013)
- OEH submission to DP&E (13/12/2012)
- OEH submission to BHPB (17/01/2014)
- OEH submission to DP&E (09/07/2014)
- OEH submission to DP&E (31/07/2014)
- OEH submission to DP&E (06/08/2014)
- SCA submission to Kadenz (Sep, 2014)
- T&I/DRE submission to Kadenz (Sep, 2014)
- OEH submission to Kadenz (Aug, 2014)

- Dendrobium response to OEH Submission to Kadenz (Sep, 2014)
- DSC submission to Kadenz (12/11/2014)
- Dendrobium response to DSC submission to Kadenz (Nov, 2014)

(ii) A walkover inspection of Area 3A (LW 7 & 8) and Area 3B (LW 9) on 3/9/2014 with Garry Brassington (Dendrobium Mine's Approvals Manager) and Josh Carlon (ICEFT) to view surface impacts and identify possible inconsistencies in the application of the SMP/SIMMCP/WIMMCPs.

(iii) Provide an assessment of the effectiveness of the SMP/SIMMCP/WIMMCPs and possible avoidance of remediation measures or strategies.

(iv) Provide recommendations on any changes to the SMP/SIMMCP/WIMMCPs and or the overall reporting process such that it may improve the effectiveness of above plans in future mining areas.

4.0 Desktop Review

4.1 Conditions of Consent and Subsidence Management Plan (SMP) Overview

The DA's Conditions of Consent and SMPs for Areas 3A and 3B provides a framework for addressing monitoring and impact management strategies / requirements for the following features within the area of longwall mining influence:

- Sandy Creek, Wongawilli Creek and Donalds Castle Creek and their tributaries (1st, 2nd and 3rd Order Watercourses according to the Strahler System)
- Steep slopes (up to 2V:1H) and rock face features < 10 m high.
- Sandy Creek Waterfall
- Upland Swamps (12, 15b, 16, 1a, 1b, 5 and 8)
- Shallow and deep groundwater aquifers.
- Terrestrial and aquatic flora and fauna.
- Aboriginal Heritage Sites (rock shelters/overhangs with art or artefacts)
- Lake Cordeaux and Avon storage areas.
- 330 kV Transgrid Powerline easement.
- 33 kV Powerline easement.
- Fire trails.

The conditions require that subsidence predictions and impact management plans (with TARPs) are to be developed for each feature in consultation with the relevant stakeholders.

Baseline studies of pre-mining conditions for natural features such as swamps and watercourses should be completed for a minimum period of two years to allow a reasonable assessment of post-mining impacts. The monitoring program must be carefully designed to capture the relevant data and environmental response to mine subsidence effects and impacts. The measured impacts are compared to predicted impacts, TARPs and Performance Measures

to ascertain if the project complies with the approval conditions and/or whether remediation works or CMAs are necessary to restore functionality.

The Performance Measures provided in the DA generally allow for a 'minor' or temporary impact to sensitive natural, culturally significant and man-made features. In some cases, the impacts will naturally recover within a reasonable time frame or be able to be remediated to the satisfaction of Stakeholders if necessary. Overall, the intended outcome is to satisfy both Schedule 2.1 of the DA:

1. The Applicant shall implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

and 1.3 of the Statement of Commitments in Appendix 4 of the DA:

Minimise volume of sterilised coal which could be efficiently extracted within the mining and environmental constraints of the area.

The mine must therefore (i) develop mining layouts that seek to meet the required Performance Measures for each recognised feature and minimise the loss of coal resource, (ii) predict and measure the impacts due to subsidence movements against relevant performance measures defined in the SMP, and (iii) determine if impacts are within predictions or if exceedances have occurred, what CMAs (if any) should be considered in consultation with the relevant Stakeholders.

The mine was also required by Schedule 3.14 of the DA to provide Environmental Offsets for "losses to water quality and flows to SCA storages" and measures to have a "beneficial effect on water quality, water quantity, aquatic ecosystems and/or ecological integrity of SCA's special areas or water catchments".

It is of note that the mine has considered requests by various departments and stakeholders to adjust proposed mining layouts if the uncertainties and consequences of possible subsidence impacts are considered too great a risk to the environment and the mine operations. Examples of this include the re-orientation and shortening of Area 3 longwalls to avoid undermining Wongawilli Creek, Sandy Creek and geological structure.

IC established a "technical committee" of subsidence and geotechnical experts (as requested in the DA) to prepare a TARP to monitor and manage mining impacts at Sandy Creek Water Fall. The longwalls were stopped 50 m short of some of the approved locations, based on the stringent valley closure and horizontal strain limits applied to avoid cracking and rock fall impacts occurring within 30 m of the overhang.

Several changes to the swamp and watercourse impact management plans are noted for the audit period:

- The development of the SIMMCP and WIMMCP for Area 3B resulted in the revision of Trigger Action Response Plans (previously referenced in Table 24.2 in the SMP -

Part B for Area 3A) in consultation with OEH and SCA to reduce impact assessment ambiguity and objectively ascertain the impacts of mining on upland swamps and watercourses due to measured subsidence effects. The TARPs for the Landscape Features (cliffs, steep slopes, fire trails and aboriginal archaeological sites) have remained unchanged in Area 3. OEH claims that the mine is in breach of its consent conditions in regards to the development of and measured swamp impacts (refer to **Section 4.4.3**).

- A Bio-diversity offset strategy was also required in the SMP Approval to "compensate for the impacts of Longwalls 9 to 13 on Upland Swamps". The mine submitted its Draft Bio-offset Strategy to OEH for review. OEH has subsequently requested further details on the proposed bio-banking scheme and claim that the strategy has not been completed to their satisfaction in recent correspondence (refer to **Section 4.4.3**).

Comparison between predicted v. observed subsidence effects and impacts have been assessed in End of Panel (EoP) and Annual Environmental Monitoring Reports (AEMRs).

The performance of the SMP/SIMMCP/WIMMCPs during and after mining of LWs 7 to 9 has been assessed in the EoPs and AEMRs for 2011 to 2014. The outcomes are summarised in **Section 4.2**.

A Swamp Rehabilitation Research Program (SRRP) is also being undertaken in Area 3 that will attempt to restore shallow groundwater levels and surface water diversions that have occurred along watercourses and beneath swamps due to the surface and subsurface fracture network caused by subsidence. A program to improve our understanding of sub-surface interaction of the fracture network in the Constrained Zone (between the surface cracking zone and base of Bulgo Sandstone) has also been undertaken during LW9 extraction. Further details are provided in **Section 4.3**.

4.2 Annual Environmental Management Reports (AEMRs) and EoP Reports

Three AEMRs and three EoPRs have been submitted to DP&E/DRE during the audit period.

As previously mentioned, the TARP trigger levels for Landscape Management Plans (LMPs) were originally defined using the subjective terms of 'minor', 'moderate' and 'severe' impact. Consideration of CMAs were invoked when mine subsidence damage was assessed by mining representatives as being 'moderate' or 'severe'.

Subsequent review of observed impacts and consequences above LW7 in Area 3A resulted in the modification of the TARPs in the SIMMCP, WIMMCP and LMPs to a Level 1 to 3 Impact-based system. The new TARP system was developed in consultation with OEH and linked observed impact magnitudes with associated environmental consequences and appropriate CMA responses.

No Corrective Management Action (CMA) were invoked during the current audit period by the Dendrobium SIMMCP, WIMMCP Trigger Levels except for back filling of surface cracks across fire trails to make the roads safe and serviceable. Swamp and watercourse

rehabilitation trials are going to be assessed in Areas 3A and 3B over the next 5 years however.

According to the SMP/SIMMCP and WIMMCPs, monitoring of all significant features will continue for a period of 2 years after mining is completed. Periodic inspections (i.e. annual) by ICEFT of the subsided areas will be undertaken to identify any impacts that may require CMAs to be implemented in consultation with the relevant Stakeholders.

A summary of the predicted subsidence effects and associated impacts within the completed mining areas (as described in the EoPRs) are presented below:

Area 3A - LWs 6, 7 and 8

- Subsidence predictions (p) along SCW North and South Centrelines above LWs 6 & 7 were higher than measured (m) values (1.55 m (p) v. 1.525 m (m) and 1.775 m (p) v. 1.416 m (m) respectively) with minor exceedances of the predicted tilts and compressive strains due to "irregular" subsidence profile movements of the overburden.

  Note: It is the author's experience over the past 20 years that differential subsidence predictions based on continuous or 'smooth' subsidence profiles are likely to be exceeded occasionally as the surface profile of subsiding, jointed rock mass is invariably 'smooth' or regular. Provided the predicted impacts that are based on the 'smooth' subsidence model are reasonably conservative, the occasional tilt and strain exceedances are not usually significant in terms of environmental impact management.

- Valley closure measurements due to LWs 6 to 8 across the Sandy Creek arm of Lake Cordeaux and Wongawilli Creek were within predicted values. No surface impacts were observed.

- IC established a "technical committee" of subsidence and geotechnical experts to prepare an appropriate TARP to monitor and manage mining impacts at Sandy Creek Water Fall as LWs 6 to 8 approached their finishing points. The longwalls were stopped up to 50 m short of the approved locations, based on the stringent valley closure and horizontal strain limits applied to avoid cracking impact. Measured closure on High Resolution Survey Lines were found to provide sufficient sensitivity in controlling horizontal rock mass stress induced by the differential displacements associated with regional stress relief above the extracted longwall panels.

- Minor surface cracks and soil/rock displacements were expected to occur along water courses with rock bars, beneath the upland swamps, across fire trails and on ridges and steep slopes due to the predicted subsidence effects. The surface cracks were assessed to be within Level 1 or 2 Impact ranges, which refer to cracking along watercourses without and with surface flow diversion and pond losses respectively. No CMAs have been invoked at this stage in watercourses and swamps. CMAs have been taken for infilling of several fire trail cracks to maintain public safety requirements.

- One moderate sized rock fall (240 m^3) occurred along WC17 and just outside the extraction limits of LW7. An underlying section of a 1.2 m deep rock ledge or step along WC17 collapsed after fracturing was first noted 3 weeks earlier.

- Level 1 and 2 fracturing occurred in rock bars along two intermittent watercourses with pond drainage recorded at three locations (Pools 7, 8 & 10) along creeks WC12 and SC10C. Loss of aquatic habitat was recognised with no flora or fauna 'kills' detected. No CMAs have been attempted at this stage, however, a proposal by the mine to remediate SC10C pond with low pressure grouting has been submitted to DP&E for approval.

- Level 2 Stream flow diversion and loss of pond water occurred downstream of Swamp 12 and 15b with no gas emissions, change to catchment yields or water quality detected.

- Iron oxide / hydroxide deposits and rock bar staining occurred along WC17 and SC10C due to exposure of groundwater to fresh rock mass surfaces. Iron oxide staining/deposits were noted along the flowing creek beds. *Note: It is understood that an independent water chemistry consultant has assessed that the effects of iron oxide staining and precipitation is temporary and unlikely to become a serious issue for aquatic biota.*

- The water quality monitoring included Fe, Mn, Ni, pH, Electrical Conductivity, Oxidation-Reduction Potential readings that did not exceed TARP limits or any other geomechanical effects of aquatic ecological concern.

- There were no discernible consequences to the vegetation within Swamps 12 and 15b in the sub-catchments of Wongawilli and Sandy Creeks. There have been shallow groundwater declines due to near surface cracking of the rock mass below the swamps however, which have Triggered Level 1, 2 and 3 TARPs.

- The Swamp TARP Impact levels indicate an increasing area of groundwater level impact beneath the swamps and Dendrobium Mine will continue to monitor for any changes to swamp extent, bio-diversity and soil moisture. It is considered that die-back of Pouched Coral Fern within the lower reaches of Swamp 15b (Level 1 Trigger) may be a natural life-cycle response and therefore an inconclusive indicator of mining impact at this stage. Further monitoring of the development or extent of this phenomenon will be on-going to ascertain its significance.

- Minor fracturing with no flow diversions were predicted along reaches of Wongawilli and Sandy Creeks within 250 m of the longwalls. No cracking or water quality impacts have been reported to-date and were not expected, due to the intention of the mine to provide adequate set-back distances from the longwall panels.

- There have been losses of aquatic biota habitat where Pools 7, 8 & 10 on WC17 and SC10C were drained as a consequence of surface cracking above LW7. There have generally been no detectable changes to aquatic and terrestrial plant communities and fauna habitats (or threatened species), except for a lack of breeding and decline in population of Littlejohn's Tree Frog, according to specialist environmental consultants.

- Groundwater level drawdowns in deep piezos after LW7 and 8 typically ranged from 4 to 20 m in the Wongawilli Seam, 10 m to 20 m in the Bulli Seam with < 5 m drawdowns as in the Scarborough and Bulgo Sandstone. The groundwater heads were in general agreement with the predicted responses with < 10 m of additional drawdown in the Coal Seams and < 5 m of additional draw down in the Scarborough and Bulgo Sandstones after LW 8. Drawdown extents in the seams continued to expand into Area 3B and south of Area 3A as expected.

- Groundwater level recovery of a few metres has been measured above Area 2 between May 2011 and January 2012. The recovery response after mining was predicted by the groundwater modelling.

- A regional approach has now been adopted for groundwater monitoring in Areas 1, 2, 3A and 3B. A local 3D numerical model has been developed recently for the longwalls in Area 3b (**HydroSimulations, 2014**) to give more quantitative groundwater predictions than has been possible in the past. Measured groundwater inflows into the workings were also lower than predicted flows.

- Surface cracking and soil displacement developed along the Fire Trails in Area 3A. Several cracks observed along the Fire Trail were within the predicted values, with no CMA required at this stage.

- The impacts of subsidence, tilt and strain on the Transgrid 330 KV power line towers have been controlled through the installation of cruciform footings on the towers. Cracking was observed around two towers (No.s 14 and 15) but did not affect the structures.

Area 3B - LW9

- Subsidence predictions above LW9 were higher and lower than measured values by up to 30%. The predicted (p) values for Swamp 1a and 1b were lower than measured (m) values (e.g. 1.30 m (p) v. 1.70 m (m); and 1.55 m (p) v. 1.7 m (m)) and approximately equal to or higher than the measured values for Swamps 5 and 8 (1.30 m (p) v 1.31 m (m); and 1.95 m (m) v. 1.44 m (m)).

  Note: It is assessed that the explanation for the subsidence exceedance by MSEC is not related to the accuracy of the LIDAR surveys, based on similar exceedances measured by the conventional surveys. It is also misleading to apply the LIDAR accuracy limits to the predicted subsidence profile along the panel (it should have been applied to the measured LIDAR profile). It is considered more likely that the exceedance may be related to starting end of the panel, where higher subsidence can occur due to first goafing effects.

- No tilt and strain data have been provided or discussed in the EoP Report for LW9, although reference has been made to the relevant MSEC report for these.

- Maximum valley closure measurements of 56 mm to 313 mm due to LW9 across Donalds Castle Creek and Tributary and Wongawilli Creek were all within predicted values. Level 1 and 2 Impacts such as rock bar buckling (resulting in uplift), cracking and flow diversion were observed and also within the predicted ranges.

- The first and second order streams associated with Wongawilli and Donalds Castle Creeks were impacted by Level 1 to Level 2 cracking of rock bars, changes in water colour (iron staining or turbidity), flow diversion and pond water level losses. The observed impacts were considered by the mine to be within the predicted ranges presented in the SMP/SIMMCP/WIMMCPs for Area 3B.

- Level 1 surface cracks between 10 mm and 80 mm wide occurred on steep slopes and rock faces, with occasional rock falls up to 1.2 m^3 in size and effecting up to 2 m^2 in face area. The impacts were assessed to be within the predicted range. No CMAs have been required at this stage.

- There were no discernible consequences to Swamps 1a, 1b, 5 and 8 in regards to bio-diversity, erosion, soil moisture and surface water flow in the sub-catchments of Wongawilli and Donalds Castle Creeks due to LW9. However, there have been shallow groundwater declines and recession rate increases due to near surface cracking of the rock mass below the swamps, which have Triggered Level 1 and 2 TARPs. Shallow groundwater levels have not recovered since LW9 was completed.

- The increasing area of groundwater level impact beneath the swamps in Area 3B will be continued to be monitored. Hydrologic modelling indicates that the diverted surface waters have not been lost from the catchments at this stage.

- The water quality monitoring included Fe, Mn, Ni, pH, Ec, Oxidation-Reduction Potential readings that did not exceed TARP limits or any other geomechanical effects of aquatic ecological concern in watercourses and reservoirs (Avon and Cordeaux).

- Seven Level 1 triggers were reached in accordance with low pool water levels in WC21, DDC and DC13 and there have been losses of aquatic biota habitat as a consequence of surface cracking above LW9. There have generally been no detectable changes to aquatic and terrestrial plant communities and fauna habitats (or threatened species).

- Groundwater level drawdowns in deep piezos after LW9 were 40 m in the Wongawilli and Bulli Seams, with increased drawdowns up to 107 m in the Scarborough Sandstone and between 1 m and 82 m in the Bulgo Sandstone. Lower Hawkesbury Sandstone drawdowns ranged from 0 m to 40 m with 1 m to 5 m in the Upper Hawkesbury Sandstone.

  The groundwater heads were in general agreement with the predicted responses in Area 3B, however it was noted by **HydroSimulations, 2014** that higher drawdowns occurred beneath the swamps due to the lack of surface cracking effects adopted in the model and should be reviewed.

- One of the four Aboriginal Heritage rock shelter sites (with art) was impacted slightly by LW9. The shelter was impacted by the cracking and opening of an existing joint. The art was not impacted.

- Level 1 and 2 surface cracking and heaving (uplift) between 10 mm and 50 mm across access tracks or fire trails have generally in-filled naturally or required remediation as per the CMAs in the TARP.

- Level 1 cracking along the Maldon - Dombarton Railway Corridor has not caused any impact to the feature.

4.3 Swamp Rehabilitation Research Program

The purpose of the SRRP is to provide the framework of BHPBIC's swamp research program and comply with Condition 15 of the Area 3B SMP Approval. Rehabilitation and research activities described in the SRRP will be undertaken in accordance with the DP&E Area 3B SMP Approval.

The objectives of the SRRP are to:

- 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 field trial (for a 5 year duration or longer) for rehabilitation techniques at a swamp or swamps that have been impacted by subsidence;

- Provide for the expenditure of at least $3.5 million over this period; and

- Include a schedule for subsequent trials, development of work plans and ongoing reporting.

There are two broad mechanisms by which subsidence could cause changes in swamp hydrology:

- The bedrock below the swamp cracks as a consequence of strains and water drains into the fracture zone. The extent and permanence of these changes relate to the size of the fracture zone (increase in porosity/storage) and whether the fractures are connected to a deeper aquifer, the mine workings or bedding shear pathway to the surface lower in the catchment.

- Tilting, cracking, desiccation and/or changes in vegetation health result in concentration of runoff and erosion which alters water distribution in the swamp.

Changes to swamp hydrology can result in environmental consequences. The likelihood and timing of these consequences relate to the size and duration of the effect. The environmental consequences which could relate to changes in hydrology include:

- Increased rates or frequency of erosion events;
- Increased frequency and extent of the organic components of the swamp soil burning during intense bushfires;
- Increased rates of species composition change and/or changes in vegetation communities.

It is understood the mine will be applying their experience gained during crack sealing rehabilitation works along the Georges River above four West Cliff longwalls. The following remediation techniques will be assessed at Swamp 15b (Area 3A) and Swamps 1a/1b and 5 (Area 3B):

- grout type and injection methods;
- erosion and knick point control methods;
- water spreading.

The above techniques will be assessed on their ability to restore shallow groundwater levels, soil erosion and moisture losses, surface flows and pond levels during low-flow periods within an impacted catchment.

The mine intends to consult with key stakeholders (OEH/SCA/DCCC) and published the research findings and outcomes.

4.4 Correspondence with Stakeholders

4.4.1 SCA Issues with Further Surface Flow Monitoring and Hydrological Modelling in Area 3

It is understood that the outstanding issue from the previous 2011 Audit of establishing stream flow monitoring points at two locations along Wongawilli Creek has been resolved between the Mine and SCA.

However, the SCA currently considers the hydrological model used by the Dendrobium Mine (**Ecoengineers, 2014**) to be "inadequate, inappropriate and unproven for its intended use" (e-mail from SCA representative to Dennis Zines dated 27/08/14).

The SCA commissioned an independent review of the RUNOFF2005 Hydrological Model by UNSW Water Research laboratory and submitted a report in December 2012 to the DP&E. The review heavily criticised the use of the model, but did not provide any suggested alternatives. No action could therefore be taken by DP&E or the mine.

4.4.2 DCCC Issue with Hydrological Modelling in Area 3B

A further review of the RUNOFF 2005 model by Professor Thomas MacMahon of University of Melbourne was commissioned by the DCCC and submitted to DP&E in June, 2014.

Overall, the reviewer was satisfied with the use of the model to-date and provided several suggestions / recommendations to improve its performance. It is noted that the recommendations provided in the McMahon review were considered and where appropriate adopted by modelling consultants. The additional requirements were addressed in a report submitted to DP&E in March, 2014.

4.4.3 OEH Issues with SIMMCP and WIMMCP for Area 3b

OEH has raised ten issues concerning the interpretation and implementation of the Modified Development and SMP Approval Conditions of Consent in their recent letter to Kadenz (28/08/2014).

The issues raised relate to the following Conditions of Consent:

1. Area 3B SMP Condition 6.3 - Bio-Diversity Offset Strategy in DRAFT but not yet satisfied.
2. Area 3B SMP Condition 9.3 - Claimed breach of Performance Measures for Swamp Ecology (Swamp 1a, 1b & 5).
3. Area 3 SMP Condition 11.3 - Watercourse Impact Monitoring, Management and Contingency Plan not yet satisfied.
4. Area 3 SMP Condition 12.3 + DA Condition 6.3 - Swamp Impact Monitoring, Management and Contingency Plan not yet satisfied.
5. Area 3 SMP Condition 11 & 12.3 + DA Condition 6.3 - Swamp Impact Monitoring, Management and Contingency Plan not yet satisfied.
6. Area 3 SMP Condition 13.3 - Groundwater model status unknown.
7. Area 3 SMP Condition 15.3 - Swamp rehabilitation research not yet satisfied.
8. DA Condition 14.3 - Environmental Offsets status unknown.
9. DA Condition 12.8 - Claimed breach of access to information requirement.
10. A number of conditions in Development Consent and SMP Approval - lack of meaningful consultation and lengthy delays in full filling approval requirements.

A detailed response from Gary Brassington, Dendrobium Approvals Manager is attached that has addressed the claims made by OEH. Reference to these and previous OEH correspondences between 13/12/2012 and 6/08/2014 has highlighted several differences of opinion and objections put to DP&E and BHPB on how the Dendrobium Mine has not consulted with them during the development of the Area 3B TARPs and how the impacts to watercourses and swamps have been incorrectly interpreted.

It is however, considered that the majority of issues raised by OEH appear to be related mainly to their perceived lack of opportunity to contribute to the development of the Swamp and Watercourse TARPs and SRRP program. The main issue appears to be is that whilst they were invited to several workshops during the development of these documents, they were not

given any opportunity to contribute to the TARPs until after the draft report was submitted to DP&E. Subsequent requests to amend them have apparently not been responded to. OEH have subsequently claimed that the TARPs are deficient in their capability to identify significant impact to swamps and watercourses and groundwater losses and that the claims of 'minor' impact are actually more significant than this.

In regards to the SRRP, OEH were critical of the first component of sub-surface cracking research undertaken above LW9. OEH acknowledges that the research fulfils the deep groundwater modelling aspects of the project, but has done little to address our understanding of the shallow subsurface fracturing networks and whether grouting would be an effective swamp rehabilitation method of helping to restore pre-mining groundwater levels and recession rates. OEH claim that the external review of the SRRP would ensure scientific rigour and allow beneficial dissemination of swamp rehabilitation knowledge to other projects.

A request was also made by OEH (17/01/2014) that the Dendrobium Mine should acknowledge that subsidence impacts may be reduced by consideration of mining geometry changes in the SMP Documentation is also a valid CMA in future mining areas. OEH note that the Giant Dragonfly is also not included in the Fauna Impact TARP.

The lack of accessibility to raw swamp and watercourse impact data is still a significant issue to OEH/SCA, as it has not been provided on the Dendrobium website or at least made available to stakeholders as was requested of the mine in the previous audit report.

Further discussion on these issues in the context of SMP Compliance is provided in **Section 6.0**.

4.4.4 DSC Issues with Groundwater Level and Chemistry Monitoring

DSC has raised two issues concerning deep aquifer groundwater level and water chemistry monitoring in the Scarborough and Bulgo Sandstone in their recent letter to Kadenz (12/11/2014). The issues raised include:

- incorrect groundwater pressure heads calculated from vibrating piezometer data caused by the assumption applied to early spreadsheets that 1 m head of water = ~10kPa has been replaced with the conversion 1m head of water = 9.8041kPa.; and

- Some of the water chemistry anolytes have been contaminated by leachate from cementitious grout plugs that were installed to seal off the rock mass sections. DSC note that this issue has not been acknowledged or resolved at this stage.

DSC consider that the above issues represent a non-compliance with the required monitoring and reporting conditions within the Notification Areas.

It is considered by the auditors that the above issues have now been responded to adequately by IC in their letter to Kadenz (dated November 2014).

5.0 Site Inspection Results

Several impacted sites in Areas 3A and 3B were visited on 3/09/2014. The attached photos show typical subsidence impacts at the creeks, swamps and landscape sites visited above LWs 7 to 9. It was noted that the observed impacts were consistent with the documentation provided by the mine to government agencies and stakeholders.

6.0 Discussion and Recommendations

6.1 Predicted v. Measured Subsidence Effects

Measured subsidence effects at surface features within the area of influence of mining have generally been less than or consistent with the EA and SMP predictions for the Dendrobium Project Area. It is noted however that the observed subsidence exceedance above the starting end of LW9 has not been addressed adequately, and further review of the possible reasons for the increased subsidence magnitude should be reviewed by MSEC and an independent expert if necessary.

6.2 Effectiveness of SMP/SIMMCP/WIMMCP/SRRP

Overall, the SMP/SIMMCP/WIMMCPs appear to be performing reasonably well in regards to the predicted subsidence and management of impacts. The auditors note that the proposed SRRP and on-going monitoring of impacted features is occurring and that it also includes the potential for grouting and remediation of impacted pools to restore their function as aquatic biota habitats.

Measured impacts have been previously assessed as ranging from ‘negligible’ or no impact to ‘minor’ and ‘moderate’ impact, based on the trigger level definitions provided in the SMP. Several of the Stakeholders have had issues with the mine deciding on whether an impact is ‘minor’ or ‘moderate’ or greater. The mine has subsequently revised the TARPs at least twice in good faith by removing any subjective references to impact.

The previous amendment to the TARPs were applied to Area 3A after LW7 and referred to Impacts that were ‘Normal’, ‘Within Predictions’ or ‘Exceeding Predicted Impact Criteria’.

The TARPs for Area 3B have subsequently removed the references to the predicted impact values and now refer to Level 1, 2 or 3 impact magnitudes (i.e. crack size, erosion, gas release, iron staining, lowering or loss of pond and ground water level and recharge rate decline, water quality, etc) and the observed consequences or effects on the measured performance indicators (eg. changes to swamp size, declining richness and diversity of species, fauna habitat loss, surface water flow paths etc). The new approach allows measured impacts to be linked directly to the effects on the features (swamps and watercourses, cliffs etc) and is a direct response by the mine to an OEH request for this to be adopted (**Krogh, 2012**).

The overall performance of the TARPs to assign an appropriate CMA to the observed impacts and consequences to natural and man-made features are also considered to have been adequately defined by the TARPs.

Whilst the long-term consequences of mine subsidence on the Endangered Environmental Community are not clear at this stage, any deterioration of the swamps and water courses in Areas 3a and 3b are not apparent from the environmental monitoring results and lack of performance criteria exceedances to-date. It is also considered that the groundwater modelling work being undertaken by the mine and its consultants will continue to improve our understanding of longwall impacts to these areas.

Indeed, the ability of the EECs to survive years of drought and bush fire impacts indicates a high resilience to surface and groundwater level variation. However, the resilience of the swamps and watercourse ecologies might well have been reduced by the current mining layout impacts in the medium to long-term.

The proposed SRRP is therefore likely to contribute to our understanding of the effectiveness of crack sealing rehabilitation works to restore hydrogeological conditions to watercourses and swamps over the next 5 years.

6.3 SMP Compliance with Consent Conditions

The Southern Coalfields Inquiry (DP&E, 2008) defined the meaning of the terms *effects, impacts*, and environmental *consequences* as they pertain to subsidence of natural features:

- The term *effect* describes subsidence itself;
- Any physical change to the fabric of the ground, its surface, or man-made features is described as an *impact;*
- The environmental *consequence* is used to describe any change in the amenity or function of a feature that arises from an impact.

It is considered that the current TARPs applied at Dendrobium appear to have reasonably categorised and linked measured/observed *impacts* and their *consequences* in the appropriate Trigger Level Category for a particular feature or key performance indicator.

Based on the EoPRs and AEMRs, the TARPs have identified several Level 2 and 3 Impacts that are within the predicted ranges of the SMP Report, but are being considered for CMAs in consultation with SCA, T&I, DP&E and OEH. These impacts include the remediation of several drained pools 7 and 8 along WC17 and Pool 10 on SC10C watercourses.

The lowering of the shallow groundwater levels beneath all undermined swamps to-date are a concern in regards to swamp health and function to support EECs; however, as it was recognised as a potential impact in the SMP reports, they do not appear to represent a breach, based on the apparent lack of change to the swamps as required by the Performance Measures.

The lack of accessibility to raw swamp and watercourse impact data is still also a significant issue to stakeholders. It is considered by the auditors that the information required to be reported by the mine has been done so in accordance with the approval conditions of consent. It is not appropriate that the mine should have to provide unprocessed environmental monitoring data to Stakeholders. The raw data is first interpreted by experts in their field, peer reviewed and then subject to independent audit.

It is considered that the proposed SRRP for Area 3A and 3B watercourses and swamps will probably alleviate and address the majority of the OEH *et al* concerns if groundwater and surface water levels can be restored. However, if this SRRP does not achieve the desired levels, then independent input into the Dendrobium TARPs may be considered as part of the SMP Approval process for Area 3C.

For and on behalf of
Ditton Geotechnical Services Pty Ltd

Steven Ditton
Principal Engineer and Director
BE(Civil/Hons) C.P.Eng(Civil), M.I.E.(Aust)

NPER 342140

Attachments:

Photos

Dendrobium Mine's Response to OEH Issues (dated August, 2014)

References:

Ecoengineers, 2014. **End of Panel Surface and Groundwater Impacts Assessment-Dendrobium Mine Area 3B - LW9**. Ecoengineers Pty Ltd Report No. 2014/01 (01/06/2014).

HydroSimulations, 2014. **End of Panel Groundwater Assessment for LW9 (Area 3B)**. HydroSimulations Pty Ltd Report No. HC2014/015. (19/08/2014).

Krogh, 2012. **Assessment of Impacts over Dendrobium Mine**. Martin Krogh. Office of Environment and Heritage, Department of Premiers and Cabinet (31/08/12).

McMahon, 2014. **Independent Review of Surface Water Study for Dendrobium Community Consultative Committee**. Emeritus Professor T.A. McMahon, University of Melbourne (04/06/2014).

Photo 1 - Down stream Rock Bar Cracking and Iron staining along 1st Order Creek No. SC10C, Area 3A (>2 years since mining of LW 7)

Photo 2 - Cracked Pond Rock Bar after recent rains along 1st Order Creek No. SC10C, Area 3A (>2 years since mining of LW 7)

Photo 3 - Drained Pond No. 10 after recent rains along 1st Order Creek No. SC10C, Area 3A (>2 years since mining of LW 7)

Photo 4 - Uncracked creek bed upstream of Impacted Sections of 1st Order Creek No. SC10C, Area 3A (>2 years since mining of LW 7)

Photo 5 - Downstream of Sandy Creek Bridge after LWs 6 to 8 completed in Area 3A

Photo 6 - Immediately Upstream of the Sandy Creek Waterfall after LWs 6 to 8 completed in Area 3A

Photo 7 - Swamp No. 1b along Donalds Castle Creek in Area 3B above LW9

Photo 8 - Surface water and saturated peat within Swamp 1b along Donalds Castle Creek in Area 3B after LW9 Complete

Photo 9 - Shallow Ground Water Level & Soil Moisture Monitoring in Swamp 1b along Donalds Castle Creek in Area 3B

Photo 10 - Water Flowing Downstream of Swamp 1b along Donalds Castle Creek in Area 3B after LW9 Complete

Photo 11 - V-Notch Weir Constructed by OEH Contractors to Independently Measure Surface Water Discharge Variation over a Rock Bar Down Stream of Swamp No. 1b above LW9

Photo 12 - Location of IC Subsurface Fracturing Research Boreholes to Test Impact of LW9 on the Bald Hill Claystone

Appendix E

Pacific Environment Limited - Site Inspection Photo Log.

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

1 October 2014

Dennis Zines
Kadenz Consulting

Dear Dennis

Re: Dendrobium Mine Statutory Compliance Audit 2014 – Air and Noise Components - PEL Photo Log

The attached Appendix provides a photographic record of key components of the subject audit site inspection, as it relates to the air quality and noise aspects of the audit.

This correspondence should be read in conjunction with the final Statutory Compliance Audit documentation.

Yours sincerely

Damon Roddis
Principal / General Manager (NSW)
Pacific Environment Limited

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Picture E1: Dust Deposition Gauge Point 13 (Dendrobium Colliery pit top access road)

Picture E2: Dust suppression in operation (Dendrobium Colliery Pit top access road)

Picture E3: Acoustically treated compressor enclosures (Dendrobium Colliery Surface)

Picture E4: High Volume Air Sampler Point 21 with PM_{10} sampling head - located on top of the bathhouse building, Dendrobium pit top

Picture E5: Kemira Valley conveyor (view east to rill tower)

Picture E6: Kemira Valley Coal loading facility (view north to stockpile area)

Appendix F

Illawarra Coal Response (27 November, 2014) to DSC Letter

Illawarra Coal

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27 November 2014

Steve Knight
Executive Engineer
NSW Dams Safety Committee
Locked Bag 5123
Parramatta NSW 2124

Dear Steve

Dendrobium's approval to mine within the Cordeaux Notification Area

I refer to your letter 3 November 2014 in relation to the DSCs opinion that Dendrobium is non-compliant with our lease conditions to mine within Cordeaux Notification Area.

Vibrating wire piezometers installed at Dendrobium Mine are maintained by a specialist consultant. The DSC have been supplied this data and the calibration methods embedded within the data spreadsheets since 2005. Various calculation methods and assumptions have been applied over time, including the calibrations discussed in your letter. Since 31 June 2013 corrections have been made to all Illawarra Coal spreadsheets and all data supplied to the DSC has been corrected.

HydroSimulations has completed a comprehensive assessment of hydrological and hydrogeological data in light of recent communication from the DSC regarding mining within the Avon Notification Area (15/07/2014). The outcomes of this assessment have been reported with Illawarra Coal's application for mining Longwalls 12 to 18 within the Avon Notification Area. All recent assessments of groundwater levels undertaken by HydroSimulations have used appropriately calibrated data.

From 2007 to 2009 a number of monitoring holes were instrumented with micro-purge pumps with grout plugs separating target stratigraphic units. It is now understood there is potential for cement contamination of some (but not all) of the water samples. It was thought the contamination would be temporary as the cement cured however this is not proving to be the case.

Illawarra Coal recently trialled bentonite seals in two boreholes and expects to use this improved installation technique for the proposed Area 3B Avon Reservoir monitoring holes. Illawarra Coal has reported all water quality data (including any alkalinity impacted data) since September 2004 and has reported on the contamination issues to the DSC on a monthly basis since August 2013.

The attachment provides detailed responses to the points raised in your letter which demonstrate the company has met the conditions of its lease. Illawarra Coal has applied to mine Longwalls 12 to 18 within the Avon Notification Area. Illawarra Coal has arranged to meet with the DSC to discuss your letter and the application.

Yours sincerely

John Brannon
Head of Corporate Affairs

Attachment

Background

Dendrobium Mine has previously extracted Longwalls 1 and 2 in Area 1, Longwalls 3 to 5 in Area 2 and Longwalls 6 to 8 in Area 3A (Plan 1). Mining is currently within Area 3B which is partly within the Dams Safety Committee (DSC) Notification Area for Avon Reservoir (DSC Notification Area). Dendrobium has DSC Endorsement for Longwall 11 and Department of Planning and Environment (DoPE) Approval for the extraction of Longwalls 9 to 19.

The Avon and Cordeaux Reservoirs DSC Notification Area Management Plans define the standards, procedures and responsibilities to:

- describe the monitoring requirements to detect potential impacts on the Cordeaux and Avon Reservoirs,
- maintain a system for effectively managing the risk of inflow of stored water into the Mine, and
- protect the long term security of the dams and stored waters from any deterioration that may be caused directly or indirectly by operations associated with Dendrobium Mine.

DSC conditions for mining in the Notification Areas were detailed in correspondence dated 24 December 2008, 22 December 2009, 22 November 2010 and the attached DSC Annexure's 'D' (Standard Mining Conditions), 'D1' (Special Mining Conditions) and 'E' (Frequency of Monitoring and Reporting).

The DSC wrote to Illawarra Coal 15 July 2014 to indicate requirements for mining within the Avon Notification Area. The following requirements have been addressed and reported to the DSC with an updated Avon and Cordeaux Reservoirs DSC Notification Area Management Plan:

- Water chemistry data has been reviewed by an independent expert.
- Boreholes will be established between the mine workings and the Avon Reservoir. The purpose of the boreholes is to monitor the pressure heads in strata and to sample formation waters. Boreholes will be established in time to provide baseline data before Longwall 12 commences.
- Water sampling and analytical programme as well as interpretation will continue while mining progresses in Area 3B.
- A comprehensive review/analysis of water chemistry and piezometer data for Areas 2, 3A and 3B. The review includes a discussion of the deficits in the current sampling regime.

Groundwater monitoring is a Secondary Monitoring Control undertaken to determine and assess hydrogeological conditions within the rockmass between the Reservoirs and the Wongawilli Seam in Areas 1, 2, 3A and 3B.

This monitoring aims to detect the impacts of mining on groundwater, assess groundwater flow from stored water and provide verification of the results of hydrological modelling.

The monitoring consists of measuring and recording pressures from a series of piezometers to allow for estimation of a flow direction and quantity through the rockmass (i.e. from the stored water in the reservoir to the longwall extraction). These determinations are inputs used for the analysis of the source of groundwater reporting to the mine workings.

In Areas 1 and 2 groundwater monitoring was heavily focused on the area between the extraction and the Reservoir. The monitoring in Area 3 has been designed to provide regional groundwater data in addition to increased monitoring near the reservoir where access is available.

Calculation of Pressure Heads from VWPs

Vibrating wire piezometer (VWP) data spreadsheets and calibrations have been supplied to the DSC since 2005.

The calculation of pressure head of water over the Illawarra Coal piezometers were placed on a common basis for all piezometers maintained by the consultant, including Illawarra Coal, Tahmoor Colliery and others following a review at Tahmoor Colliery 31 June 2013.

Various calculation methods and assumptions had been applied to the spreadsheets over time. The main reason for this is that initially the earlier piezometer installations were not envisaged to require the accuracy now expected of them or subject to scrutiny to decimetre level.

Since 31 June 2013 corrections have been made to all Illawarra Coal spreadsheets as the need for correction was encountered and all data supplied to the DSC by Illawarra Coal has been corrected.

The assumption applied to early spreadsheets that 1 m head of water = ~10kPa has been replaced with the conversion 1m head of water = 9.8041kPa. This conversion factor is provided in Row 1 of the Illawarra Coal spreadsheets.

The effect of the change to 9.8041kPa from 10kPa corrects an underestimate of water head of 1.998m in every 100m of water head above the measuring piezometer. Using hole DEN94 as an example, the change of calibration from 10kPa to 9.8041kPa results in a change of 0.53m of measured head. These sorts of shifts in calculated water level are not significant in relation to the Dendrobium Regional Groundwater Model which the data supports.

When converting pressure to meters of water: Head of Water (m) = Pressure (kPa)/(density of water (kgm/m^3) x g(local gravitational constant)).

The density of (pure) water varies from 1kgm/m^3 at 4 deg C to 0.9922kgm/m^3 at 40 deg C. In the Dendrobium Area, water temperatures generally vary between 14 deg and 30 deg which introduces an under-estimate of head of between 0.157m to 0.381m per 100m of head. Consideration of water density in the piezometer calculation would make, at best, a relatively small change but would introduce interpretive difficulties around the assessment of density effects due to water chemistry. Presently there is no correction used for the density of water and for the above reason we do not favour implementing this calculation.

The second variable "g" is the local gravitational constant (vertical) at the site. Variable "g" varies nominally from 9.78m/s^2 at the equator to 9.832m/s^2 at the poles. This variation in "g" is due to bulging of the geod at the equator and the effects of centrifugal force from the rotation of the earth that is maximised at the equator.

Published equations estimate the value of "g" at -34.5 deg of latitude (~Dendrobium) at sea level to be 9.7969m/s^2.

An additional correction to the value of "g" needs to be made to correct for elevation (reduction in "g") and the mass of rock between the elevated observation point and sea level datum (increase in "g"). These corrections are small but important and routine in the management of data sets from geophysical surveys.

The conversion factor kPa/kHz^2 used in the conversion of measured VW frequency to pressure is the value cited by the supplier of the piezometer on their calibration sheet. Calibration values obtained at the time of installation by the installer are retained in the spreadsheet for audit purposes.

The field zero Fo, the datum for all calculations of head, is corrected to the same temperature as the calibration temperature used by the piezometer supplier. Where a field zero temperature is unavailable, then no correction is made. Where no field Fo is available then the manufacturer's Fo is used and is clearly identified in the Illawarra Coal spreadsheets.

All calculations include a correction for temperature. Where temperature cannot be measured but a good estimate can be made then this estimate is made and identified in the spreadsheet. Where no temperature data are available and an estimate cannot be made then no correction is made and this situation is identified in the Illawarra Coal spreadsheets.

Many spreadsheets now exceed the ranges possible within an Excel spreadsheet. In this situation, the data is re-sampled at a greater time interval (usually 12 hours) and this reduced dataset is displayed. In this situation the spreadsheet identifies the re-sampled dataset. All original data is retained within the Illawarra Coal spreadsheets.

Some editorial deletion of wild points may be necessary at times. Where this occurs, it is done in the calculation columns and no original field data is deleted.

Analysis of Groundwater Levels

HydroSimulations has completed a comprehensive assessment of hydrological and hydrogeological data in light of recent communication from the DSC regarding mining within the Avon Notification Area (15/07/2014). The outcomes of this assessment have been reported in the application for mining Longwalls 12 to 18 within the Avon Notification Area. The below analysis of groundwater levels is a summary of the above assessment which uses updated groundwater levels using the calibration methodology as discussed above. The assessments of groundwater level undertaken by HydroSimulations have used appropriately calibrated groundwater data.

Groundwater and lake data from Area 2, Area 3A and Area 3B has been analysed with reference to interactions between Lakes Avon and Cordeaux and the groundwater system.

Our conceptual model of interaction between Lake Cordeaux and groundwater in Area 2 is that the shallow groundwater system in the upper Scarborough Sandstone (SBSS) locally discharges to Lake Cordeaux. The potential interaction between the deeper SBSS strata and Wombarra Claystone (WBCS) and Lake Cordeaux closer to and above the Area 2 mine workings is however one of flow from the lake to these strata. The hydraulic data from DEN94, which is located closest to the lake and shows the strongest hydraulic connection with lake water levels, precludes this potential however, and we conclude that there is no evidence of observable migration of lake water into the SBSS towards Area 2 in response to mining.

The Area 2 hydraulic data does not support a proposition that the strong but variable correlation between Lake Cordeaux water levels and groundwater levels in DEN94 post-2007 is due to mining effects. The observed behaviour is more readily explained through natural hydrogeological conditions and behaviour, namely:

- Climatic effects: there is clear evidence that groundwater levels in DEN94 respond strongly during wetter periods and higher lake water levels. There is clear evidence that the lower the lake water level, the poorer the correlation between the lake and groundwater levels in DEN94. This behaviour has been shown to be a continuum, rather than a sudden shift in behaviour post-Area 2 mining. The behaviour is observed in the pre-and post-mining periods in DEN94, and, to a lesser degree, in DEN35;

- At least two likely stratigraphic controls on pressure propagation from lake water level fluctuations out into the SBSS groundwater system. The data indicates this is a strong control on the observed groundwater-lake water level behaviour outlined above. When lake water levels reach aquifer-confining (dense, clayey) sections of the stratigraphic column along the lake shore, the aquifer responsiveness to boundary condition stresses (such as lake water level fluctuations) increases by orders of magnitude, thereby increasing the “apparent” hydraulic connection between the SBSS and the lake as observed in DEN94;

- Evidence that the distance from the lake shore to DEN94 increases with lower lake water levels, and therefore adds to the above noted stratigraphic effects; and
- The possibilities that the permeability of lake-bed sediments decrease with depth in the lake or low k sediments are present in deeper parts of the lake bed. Therefore when lake water levels decline, low k bed sediments cover a greater proportion of the area through which connection might occur, and so connection weakens. This could also contribute to the above observed effects.

Our conceptual model of lake-groundwater interaction between Area 3A and the Sandy Creek Arm of Lake Cordeaux is that there was likely a natural (pre-mining) downward groundwater hydraulic gradient within both the Hawkesbury (HBSS) and the Bulgo Sandstone (BGSS), and from the HBSS to the underlying BGSS. This was also observed in Area 3B. Mining within Area 3A (Longwalls 6, 7 and 8) has increased the downward hydraulic gradients in most Area 3A BGSS monitoring bores. Despite this increased downward potential groundwater flow rate in response to mining, this does not appear to have increased the groundwater flow rate from the HBSS and/or Lake Cordeaux down into the BGSS. This is supported by the lack of observed drawdown effects adjacent to the lake in the shallower parts of the groundwater system (HBSS and BGSS). Shallow HBSS and BGSS heads in the area adjacent to the lake remain above lake levels in the pre- and post-mining periods; based on this and the supporting geochemical data it is concluded that mining has not induced groundwater flow from the Sandy Creek arm of Lake Cordeaux into the shallow groundwater system.

Our conceptual model of lake-groundwater interaction between Area 3B and Lake Avon is that there was a natural (pre-mining) downward groundwater hydraulic gradient within both the HBSS and the Colo Vale Sandstone (CVSS), and from the HBSS to the underlying CVSS. This was also observed in Area 3A. Whilst there is evidence that mining within Area 3B (Longwalls 9 and 10) has increased the downward hydraulic gradients in a majority of Area 3B monitoring bores, this is not the case in the area adjacent to Lake Avon, in which the shallow groundwater system (HBSS) locally discharges to Lake Avon in both the pre- and post-mining periods.

Groundwater levels from all 219 Dendrobium piezometers were recently reviewed in the calibration of the Dendrobium Regional Groundwater Model. The Root Mean Square error for groundwater levels of 3.9% is within the typically used criterion of 10%. The mean head error (13.6 m) is within the range of accuracy of vibrating wire piezometers when used in groundwater models with simplified stratigraphy with an accuracy of around +/-20 m.

Groundwater Sampling Contamination

Dendrobium DEN94 is a diamond drill hole (DDH) in Area 2 and it was one of the first boreholes that Illawarra Coal trialled micro-purge pumps for taking water samples from specific strata at depth. In this hole the pumps are hanging in the column of water, within the target stratigraphic unit (Scarborough Sandstone). There is an issue with this type of installation in that there is possible draw of water from above and below the pump unit and therefore the water sample is a mixture of the target strata and water within the water column. For DEN94 this is less of an issue in that all pumps target groundwater from the same overall stratigraphic unit.

The data from DEN94 proved reliable and pumps have subsequently been installed in additional holes in Area 3A and 3B. These subsequent installations were targeting multiple strata units and therefore the issue of drawing water from above and below the target stratigraphic unit was increased. The monitoring holes may also have VWPs installed to measure groundwater pressure. In these circumstances it is not appropriate to have a water column open between the stratigraphic units as the pressure would equalise between them, rendering the pressure data unusable.

In 2007 six additional holes were instrumented DDH85, 92, 93, 96, 97 and 98 each with two or three pumps targeting the Hawkesbury and Bulgo Sandstones. These holes were instrumented with

micro-purge pumps with grout plugs separating the target stratigraphic units. The advantage of the micro-purge pumps was in housing multiple pumps in different stratigraphic horizons, otherwise it required one hole per pump and there was no benefit compared to dipping for samples.

In 2008 and 2009 a further seven holes were instrumented DDH103, 108, 111, 114, 115, 118 and 125. Illawarra Coal has not installed any additional borehole pumps since 2009 due to the growing understanding of the potential for the cement based grout to contaminate the water and make it hyper-alkaline.

Initially it was postulated that the hyper-alkalinity would be temporary and that multiple sampling and associated draw-down would be sufficient to remove the contaminated water and subsequently obtain representative groundwater samples. This is proving not to be the case and the effect of the grout is persisting. The issue is further complicated by the fact that not all pumps produced hyper-alkaline water, even within the same hole. Illawarra Coal has engaged specialists in this field to investigate the matter further.

Ecoengineers identified the issue associated with the cement based grout used to seal the sections of hole between the sand packs that contained the pumps and recommended a solution. Geosensing has also identified other techniques associated with fresh drilling water (not recycling) to ensure sample integrity from borehole pumps.

Illawarra Coal recently trialled bentonite seals in two borehole installations and expects to use the improved drilling and installation techniques to install the Dendrobium Area 3B groundwater quality monitoring holes planned adjacent to Avon Reservoir.

Illawarra Coal has reported the contamination issues to the DSC on a monthly basis since August 2013. The following extracts are from a recent monthly report provided to DSC.

> *Generally, such anomalies were also indicated by a tell-tale rise in pH and EC whenever those tritium values were obtained; presumably as a result of leaching of incompletely cured cement from within the fine cracking of the respective cement plug though which the withdrawn water had passed.*
>
> *Moreover, the water is also consistently hyperalkaline (pH >12). In our opinion, it is therefore also likely that poorly competent cement (or cement/bentonite) plug 'packers' situated above and/or below this depth had cracked and the sampled 'groundwater' (if that is what it is) was being drawn through one and/or both of them thereby rendering it highly alkaline.*

All water quality data is maintained in a comprehensive Excel spreadsheet. Our records show the spreadsheet was initially provided to the DSC in September 2004 and then regularly as requested since then. The spreadsheets supplied to the DSC include the hyper alkalinity impacted data.

Addressing Contamination Issues and Interpretation of Water Analysis

In our analysis of water chemistry any of the micro-purge pumps returning pHs over 8.5 are closely assessed for a cement contamination issue. Where contamination is expected further weight is given to the tritium analysis and chloride (Cl) levels. As there is negligible Cl in cement and Cl solubility is only supressed above about pH 10.5 – 11, the Cl assessments can be undertaken even with the cement contamination. Cl is a fully conservative tracer and hence can be used when integrating regional flow modelling with geochemistry. Tritium data and analysis is not affected by the cement contamination.

In respect of the comments and recommendations in Table 1 it should be noted that:

- Pumps which provide water of pH generally above 9.0 provide valid data for tritium and chloride only – S1870 @ 160 m BGL; and

- Pumps which provide water of pH above 11.5 provide valid data for tritium only - S1907 @ 167 m BGL, S1911 @ 138 m BGL, and marginally S1970 @ 109 m BGL.

Code		Pump		Mean		Cement	Tritium	% 'modern'	Comments
S	DEN	Depth	Unit	pH	EC	issues	samples	water	and Recommendations
Area 2									
1886	94	22	SBSS	7.25	511	No	21	3.9±2.5	No sand pack or grout to provide isolation. Maintenance upgrade for the site.
		30	SBSS	7.30	530	No	22	3.9±2.1	No sand pack or grout to provide isolation. Maintenance upgrade for the site.
		38	SBSS	7.57	586	No	20	3.4±2.4	No sand pack or grout to provide isolation. Maintenance upgrade for the site.
Area 3A									
1870	85	10	HBSS	5.39	81.6	No	12	60.8±9.2	Sample annually.
		16.5	HBSS	5.86	94	No	12	24.9±5.6	Sample annually.
		160	BGSS	9.74	401	Yes	9	11.8±2.3	Faulty grout. Sample annually tritium & chloride only.
1907	103	10	HBSS	5.46	67.8	No	9	58.2±3.3	Sample annually.
		23.5	HBSS	5.61	98.9	No	10	70.3±7.6	Sample annually.
		167	BGSS	12.20	4891	Yes	9	20.5±2.6	Faulty grout. Sample annually tritium only & chloride if pH<11.5.
1888	96	7.3	HBSS	5.26	114	No	6	77.9±9.6	Sample annually.
		53	HBSS	12.58	11840	Yes	0		Faulty grout, abandoned
		199	BGSS	10.62	1702	Yes	0		Faulty grout, abandoned
1934	115	55	HBSS	6.23	142	No	7	3.4±2.0	Sample annually.
		86	HBSS						Dry
1879	92	10	HBSS	5.23	92.3	No	4	88.6±1.5	Sample annually.
		58	HBSS	6.15	163	No	4	3.9±2.8	Sample annually.
		210	BGSS	NIL	NIL	No	0		Dry
Area 3B									
1911	106	10	HBSS	4.92	100	No	10	89.7±16.9	Sample annually.
		138	HBSS	11.53	806	Yes	4	23.9±4.2	Faulty grout. Sample annually tritium only & chloride if pH<11.5.
		260	CVSS	NIL	NIL	Yes	0		Dry
1929	111	10	HBSS	5.54	107	No	5	11.1±2.9	Sample annually.
		44	HBSS	7.20	270	No	5	1.7±1.3	Sample annually.
		204	CVSS	8.24	406	Yes	4	18.5±2.3	Minor grout issues, sample quarterly.
1932	114	10	HBSS	7.52	176	No	1	6.8±1.6	Sample quarterly.
		98	HBSS	6.56	153	No	3	1.6±0.0	Sample quarterly.
2001	125	63	HBSS	6.33	196	No	7	1.4±1.0	Sample quarterly.
		106	HBSS	7.51	346	No	8	3.8±3.5	Sample quarterly.
Area 3C									
1970	118	43	HBSS	6.31	149	No	10	38.9±4.6	Probable modern water at depth, sample annually.
		109	CVSS	10.63	615	Yes	10	39.7±8.1	Probable modern water at depth. Faulty grout, sample annually tritium only & chloride if pH<11.5.
		230	SBSS						Dry

Table 1: Review of Dendrobium Groundwater Sampling Boreholes

Continued Sampling and Analysis

The Underground Water Sampling and Analysis Procedure (DENP0048) outlines the water 'fingerprinting' sampling and analysis methodologies in which samples of water inflowing to the working faces and selected discharge sites are taken and analysed for chemical composition and algal content by NATA approved laboratories.

The characteristics of the underground waters are compared to samples from the surface and aquifers in the overburden strata (Scarborough, Bulgo, Hawkesbury and Colo Vale Sandstones) to determine the origin of water entering the mine.

Current and proposed groundwater monitoring locations are provided in Plans 2 to 4.

Additional Monitoring and Site Maintenance

Dendrobium DEN94 has been in use since 2007 and in that time it has been struck by lightning, the calibration methodologies have been modified and it is now operating on its third replacement logger. Due to the importance the DSC places on the data collected from this site Illawarra coal propose to undertake the following maintenance overhaul at the monitoring site:

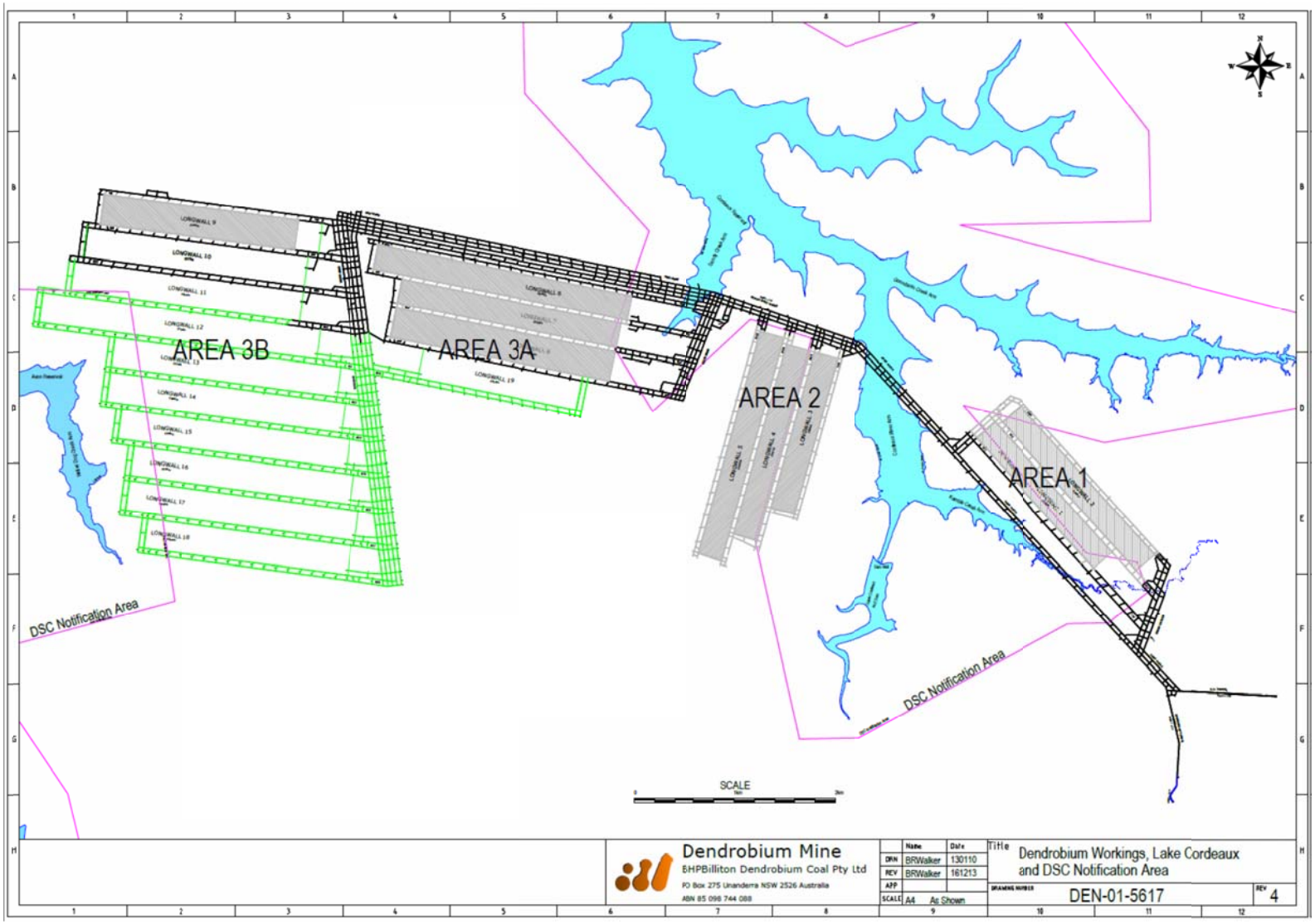
- re-establish the survey datum for the site
- withdraw the piezometers and accurately remeasure the cable length and consequently its location in the hole
- while on the surface, remeasure its zero calibration values
- once the piezometers are installed and logging, measure the true standing water level by dip meter
- reconcile dip meter to piezometer

- document all findings and reconcile the data spreadsheet

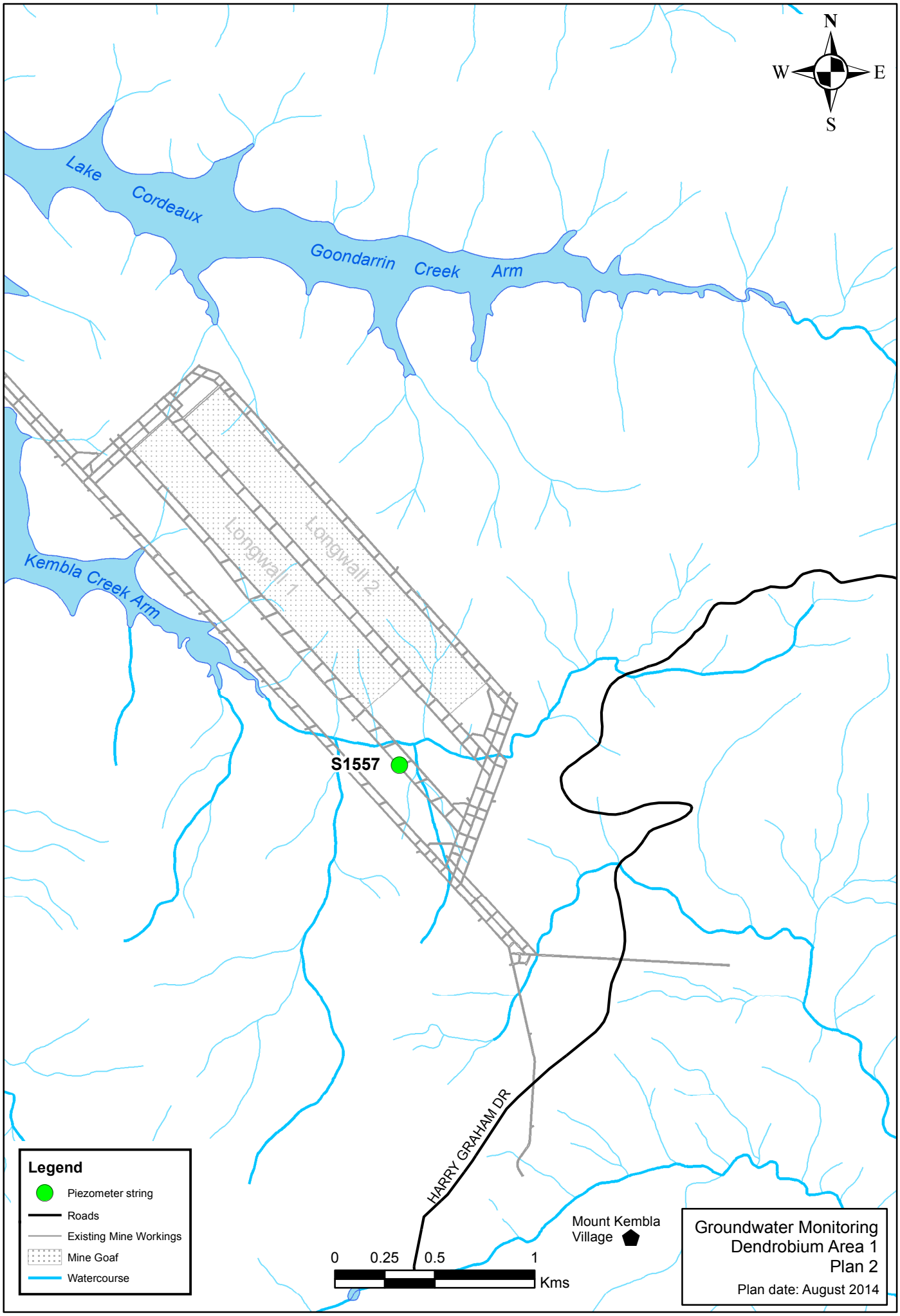
The current and proposed Dendrobium groundwater monitoring locations are provided in Plans 2 to 4. Three new groundwater monitoring holes are proposed and these are located next to the eastern bank of Lake Avon, between the lake and Area 3B mining.

The proposed groundwater monitoring bores adjacent Longwalls 12 and 13 will be installed early in 2015 and the third hole will be installed at a later date, taking into account the monitoring results from the first two holes. This will allow for any improvements in borehole design based on the first two holes.

The proposed monitoring holes (Avon Dam Hole 1 and 2) will be drilled into the Bulgo Sandstone. Piezometers will be installed in the Bulgo, in the lower Hawkesbury Sandstone and the upper Hawkesbury Sandstone. Micro purge sampling pumps will be installed in the lower Hawkesbury Sandstone. Bentonite packs will be used to separate the target strata rather than cement to reduce the potential for contamination of water samples.



Plan 1. Dendrobium Mining Areas



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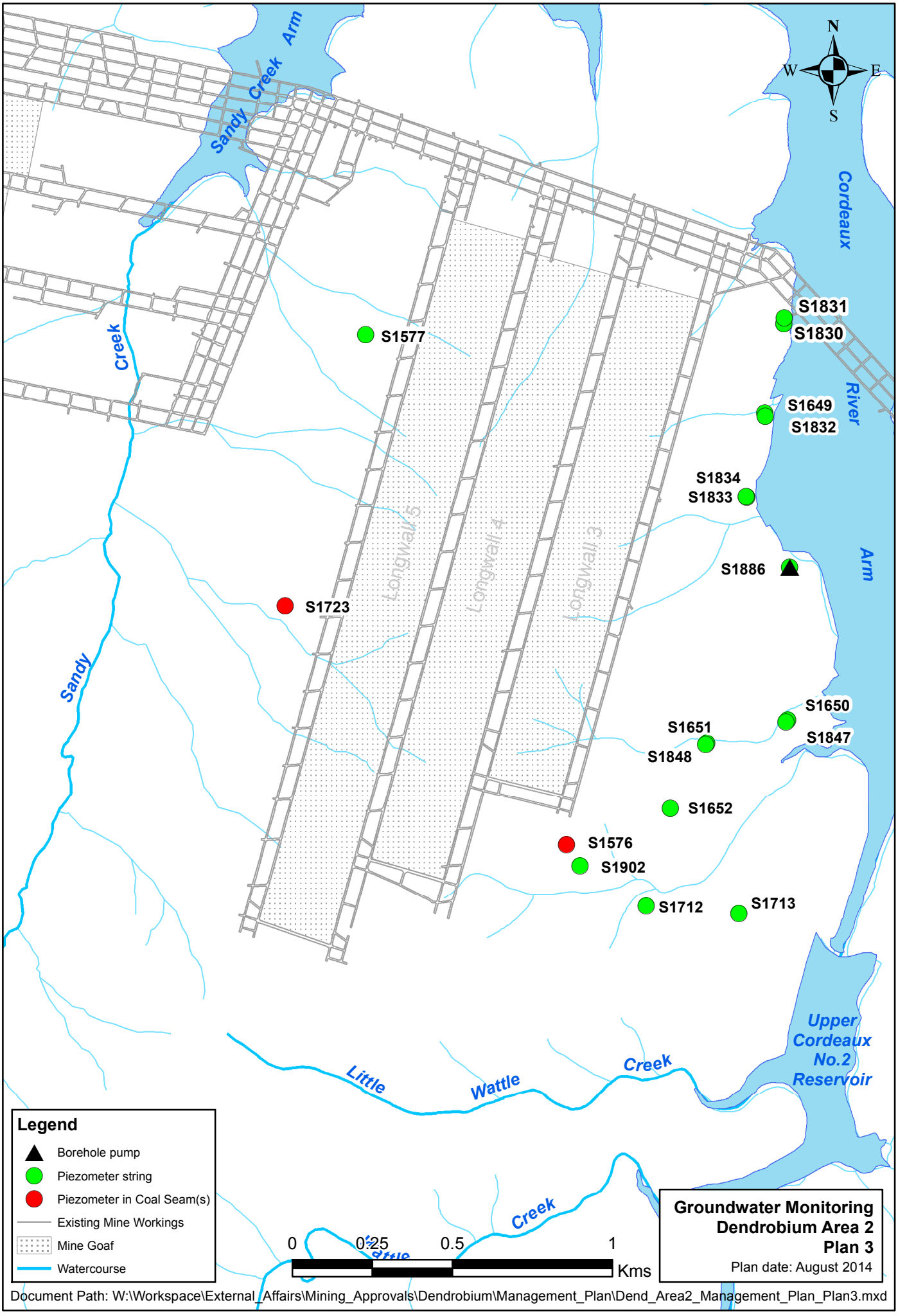
N
W
E
S
Sandy Creek Arm
Cordeaux River Arm
Sandy Creek
Sandy
Longwall 5
Longwall 4
Longwall 3
S1577
S1831
S1830
S1649
S1832
S1834
S1833
S1886
S1723
S1650
S1651
S1847
S1848
S1652
S1576
S1902
S1712
S1713
Little Wattle Creek
Upper Cordeaux No.2 Reservoir
Creek
Legend
Borehole pump
Piezometer string
Piezometer in Coal Seam(s)
Existing Mine Workings
Mine Goaf
Watercourse
0
0.25
0.5
1
Kms
Groundwater Monitoring
Dendrobium Area 2
Plan 3
Plan date: August 2014
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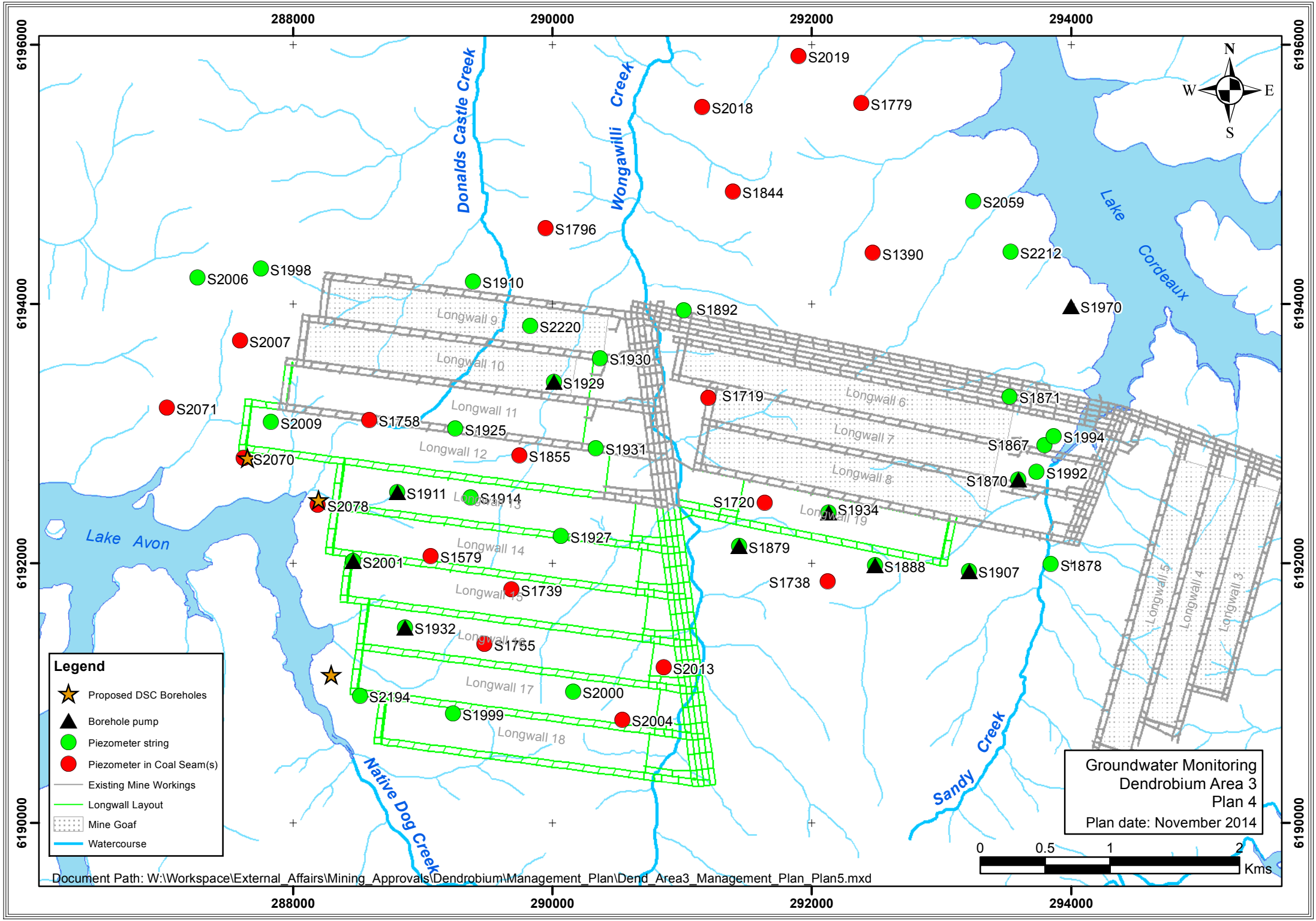
288000
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Donalds Castle Creek
Wongawilli Creek
Lake Cordeaux
Lake Avon
Native Dog Creek
Sandy Creek
S2019
S2018
S1779
S1844
S2059
S1796
S1390
S2212
S1998
S2006
S1910
S1892
S1970
S2220
S2007
S1930
S1929
S1719
S1871
S2071
S2009
S1758
S1925
S1931
S1867
S1994
S2070
S1855
S1870
S1992
S1911
S1914
S2078
S1720
S1934
S1927
S1879
S2001
S1579
S1888
S1907
S1878
S1738
S1739
S1932
S1755
S2013
S2194
S2000
S1999
S2004
Longwall 9
Longwall 10
Longwall 11
Longwall 12
Longwall 13
Longwall 14
Longwall 15
Longwall 16
Longwall 17
Longwall 18
Longwall 19
Longwall 6
Longwall 7
Longwall 8
Longwall 5
Longwall 4
Longwall 3
Legend
Proposed DSC Boreholes
Borehole pump
Piezometer string
Piezometer in Coal Seam(s)
Existing Mine Workings
Longwall Layout
Mine Goaf
Watercourse
Groundwater Monitoring
Dendrobium Area 3
Plan 4
Plan date: November 2014
0
0.5
1
2
Kms
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