

Attention: Mr Gary Brassington
Manager Mining Approvals
BHP Billiton Illawarra Coal
External Affairs Department
PO Box 514 Unanderra
New South Wales 2526

18 June 2014

Via email: Gary.Brassington@bhpbilliton.com

Dear Gary

RE: Terrestrial ecological assessment for Longwall 705 – Appin Colliery Area 7 end of panel report

As requested Niche Environment and Heritage (Niche) has undertaken a review of the predicted and observed impacts resulting from the extraction of Longwall 705 at Appin Colliery on terrestrial ecological values. This assessment is attached for inclusion in BHP Billiton Illawarra Coal's End of Panel Report for Longwall 705.

Our assessment is based on results of environmental monitoring undertaken by the MSEC, BHPBIC Environmental Field Team and EcoEngineers and concludes that the minor environmental impacts observed in relation to mining Longwall 705 are not likely to have had any noticeable impact on terrestrial ecological values.

The minor impacts were in line with the mining impact assessments and are not likely to have resulted in significant impacts to Endangered Ecological Communities (EECs), threatened species or endangered populations listed on either the NSW *Threatened Species Conservation Act 1995* (TSC Act) or the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

I trust that the following report is adequate for your purposes. Please do not hesitate to contact me should you require any further information.

Yours sincerely



Luke Baker

Botanist

Introduction

Longwall 705 at Appin Colliery near Appin NSW completed extraction on the 27th March 2014. BHP Billiton Illawarra Coal (BHPBIC) is required to develop an End of Panel (EOP) Report for Longwall 705, to comply with Condition 20 of the SMP Approval, dated 28th February 2012. Niche Environment and Heritage (Niche) was commissioned by BHPBIC to conduct an EOP assessment of the terrestrial ecological values within the limit of subsidence of Longwall 705.

This report takes into consideration the predicted and observed impacts on terrestrial ecological values within this area and relies on previous assessments, expert advice from Mine Subsidence Engineering Consultants (MSEC) and field observations by the BHPBIC Environmental Monitoring Team and Ecoengineers.

Subsidence Monitoring Results Summary (MSEC)

The End of Panel Subsidence Report for Longwall 705 prepared by MSEC (2014 - MSEC686) is a comprehensive report which addresses all aspects of the recorded subsidence parameters resulting from the extraction of Longwall 705.

Subsidence has the potential to impact terrestrial ecological values. Table 1 outlines the observed subsidence impacts and the potential consequences for terrestrial ecological values. Overall, the recorded subsidence on natural landscape features resulting from the extraction of Longwall 705 was similar to or less than predicted.

Table 1. Observed impacts from Longwall 705 due to subsidence and their correlation to potential terrestrial ecology impacts

Subsidence Monitoring Results	Correlation to Terrestrial Ecological Values	Terrestrial Ecology Impacts Due to Longwall 705
No visible fracturing observed, however, the flooded valley and sediment profile limits observations of the river bed	Subsidence parameters have the potential to alter the physical environment which may provide certain types of habitat for terrestrial flora and fauna.	No impact to terrestrial ecological values.
No reported impacts of surface water flow diversion to Nepean River	Change in water levels due to ponding, flooding and the resultant inundation or desiccation has the potential to alter the distribution of water plant habitat for amphibians, drown riparian vegetation or remove foraging habitat for any fauna dependant on pools.	No impact to terrestrial ecological values.
No reported change in water level to Nepean River apart from the normal fluctuations associated with rainfall and SCA discharges	Similar to the above, water loss has the potential to alter habitat types and availability within and adjacent to the affected streams. Water quality impacts have also previously been linked to surface fracturing which has the potential to alter habitat quality within the streams/ponds for some terrestrial fauna groups who may be reliant on them.	No impact to terrestrial ecological values.
No additional iron staining or iron seeps were observed in the Nepean River as the result of LW705	Mining induced springs have the potential to have localised water quality impacts which has the potential to alter habitat availability within the affected streams and thus potentially affecting amphibians.	No impact to terrestrial ecological values.
Gas releases were observed at three sites, which are located closer to Longwalls 702 and 703. Whilst the gas releases were observed during the mining of Longwall 705, their	Gas emissions have previously resulted in temporary die back of riparian vegetation within the Cataract River Gorge and have possibly contributed to dissolved oxygen sags	No observed impact to terrestrial ecological values. No die back of native vegetation has been observed.

Subsidence Monitoring Results	Correlation to Terrestrial Ecological Values	Terrestrial Ecology Impacts Due to Longwall 705
locations are close to where gas release have been previously observed during the mining of Longwalls 701 to 704 and Tower Longwall 17.	within the Nepean River.	
No impacts observed in the creeks as a result of fracturing.	Fracturing may result in change in water levels due to ponding, flooding and the resultant inundation or desiccation has the potential to alter the distribution of water plant habitat for amphibians, drown riparian vegetation or remove foraging habitat for any fauna dependant on pools.	No impact to terrestrial ecological values.
No reported impacts from cliff instabilities		No impact to terrestrial ecological values.
No reported impacts from soil slippage		No impact to terrestrial ecological values.

Water Quality Monitoring Results (EcoEngineers)

EcoEngineers Pty Ltd have prepared a comprehensive report on the water quality monitoring program associated with Longwall 705 (EcoEngineers 2014, Document Reference: 2014/05A – End of Panel Assessment on Water Flow and Quality Effects West Cliff Colliery Longwall 705).

Water quality changes resulting from mining or any other activity have the potential to impact terrestrial ecological values by altering the condition of the habitat available to riparian and in-stream vegetation as well as various fauna groups reliant on in-stream habitat.

In summary, Ecoengineers conclude that in relation to Longwall 705:

- No surface water flow diversion has been observed.
- No associated reduction in riverine dissolved oxygen has been observed.
- No new iron staining or iron seeps resulting from the extraction of Longwall 705 were identified.
- No subsidence induced fracturing or iron staining has been observed in Harris Creek.
- The extraction of Longwall 705 has not led to the creation of any newly identified ferruginous springs in the Nepean River.

Environmental Monitoring – BHPBIC Environmental Monitoring Team

The monitoring program for Longwall 705 undertaken by the BHPBIC Environmental Field Team is detailed in Table 2 below.

Table 2. Environmental Monitoring

SMP Commitments	Monitoring to date	Future Monitoring
Monthly observational monitoring of riparian vegetation, including extent and recovery of any gas release related vegetation die-off	<p>The monitoring program for Longwall 705 undertaken by the BHPBIC Environmental Field Team involves weekly inspections of the Nepean River valley, including (BHPBIC 2012):</p> <ul style="list-style-type: none"> <input type="checkbox"/> observations <input type="checkbox"/> water level measurements <input type="checkbox"/> photographic records <input type="checkbox"/> impact monitoring (i.e. strata gas and iron staining) <input type="checkbox"/> cliff line and steep slope visual inspections 	Ongoing monitoring by BHPBIC Environmental Field Team occurring.

SMP Commitments	Monitoring to date	Future Monitoring
EOP flora and fauna assessment	<input type="checkbox"/> water quality monitoring. The BHPBIC Environmental Field Team has carried out regular inspections following the completion of Longwall 705 (see Field Team report)	None proposed

The BHPBIC Environmental Field Team assessment has reported minor impacts from the ongoing monitoring of environmental values within the limit of subsidence of Longwall 705. All observed impacts were within predicted levels. Impacts from mining of Longwall 705 identified by the Illawarra Coal Environmental Field Team (BHPBIC 2014) include:

- Gas release observed at three sites (Gas Zones 16, 17 and 18) on the Nepean River. Gas Zone 16 was first observed on the 4th October 2012 and consisted of multiple releases in an approximate 60m x 5m area. This release has not been active since the 17th January 2014. Gas Zone 17 was first observed on the 12th February 2013 and has not been active since the 19th February 2014. It consisted of up to seven releases (Photos 4 & 5). Gas Zone 18 was first observed on the 18th March 2013 and consisted of up to 20 releases. No associated mining induced vegetation dieback has been observed, indicating riparian habitats in the vicinity of gas releases remain unaffected by Longwall 705.
- No cliff falls or slope instability was observed and consequently there were no associated impacts on terrestrial ecology.
- No identifiable changes in water levels or flow were observed, and no significant changes in water quality resulting from the mining were observed so no associated impacts to terrestrial ecology occurred (Ecoengineers 2014).

Impacts on threatened biodiversity

The following is based on information from the flora and fauna assessment undertaken by Biosis Research in April 2006 for the SMP Area encompassing Longwalls 705 to 710 (Biosis Research 2008) and the results of the monitoring undertaken by the BHPBIC Environmental Field Team (BHPBIC 2014). No separate field inspections were undertaken by Niche as no impacts were identified by the field team.

Endangered Ecological Communities

Two Endangered Ecological Communities (EEC's) occur within the limit of subsidence for Longwall 705 (Biosis Research 2008):

- Cumberland Plain Woodland: listed as Critically Endangered under both the TSC and EPBC Act; and
- Shale Sandstone Transition Forest: listed under both the TSC and EPBC Act.

Moist Shale Woodland and River Flat Eucalypt Forest, both listed as EECs under the TSC Act have also been mapped by NPWS (2002) as occurring within proximity to the limit of subsidence. Biosis Research (2008) predicted it was unlikely that Longwall 705 and associated subsidence impacts would have a significant impact on any plant community within the study area. Potential surface fracturing and gas emissions were considered unlikely to result in the broad scale alteration of species composition or distribution of plant communities within the study area. There have been no reported impacts to vegetation as a result of Longwall 705 (BHPBIC 2014). Mechanisms of subsidence that could potentially result in impacts to native vegetation, such as vegetation die-off due to surface cracking or gas releases, were not observed by the BHPBIC Environmental Field Team within these vegetation communities during monitoring inspections. It is

therefore concluded that there were negligible impacts on Endangered Ecological Communities due to Longwall 705.

Threatened Plants

No threatened plant species were recorded in the study area (Biosis Research 2008). However, three threatened species (*Eucalyptus benthamii*, *Pomaderris brunnea* and *Pterostylis saxicola*) were considered to have potential habitat within the study area that could potentially be impacted by the mechanisms of subsidence (Biosis Research 2008).

Impact assessments under the TSC and/or EPBC Act were conducted for these three threatened plant species. It was considered unlikely that any of the threatened flora listed on the TSC Act or EPBC Act or any other significant flora that have been recorded or have potential habitat within the study area, would be significantly impacted by subsidence resulting from the proposed mining (Biosis Research 2008).

No vegetation die-off or other vegetation impacts were observed within the Nepean River area by the BHPBIC Environmental Field Team. It is therefore concluded that the extraction of Longwall 705 has had negligible impact on potential habitat for threatened plants.

Subsidence associated with the extraction of Longwall 705 is considered to have had negligible impact on threatened plants.

Threatened Fauna

No threatened fauna were recorded in the study area (Biosis Research 2008). However, four threatened fauna (Giant Burrowing Frog, Little John’s Tree Frog, Red-crowned Toadlet and Large Footed Myotis) were considered to have potential habitat within the Nepean River (Biosis Research 2008). Further, the Spotted-tailed Quoll, Brush-tailed Rock Wallaby, Yellow bellied Sheathtail Bat, Large-eared Pied Bat, Eastern Bentwing Bat, Large-footed Myotis, Broad-headed Snake, and Rosenbergs Goanna were considered likely to have potential habitat within caves and crevices of cliff and steep slopes within the study area (Biosis Research 2008).

Biosis Research (2008) concluded that predicted subsidence impacts on the Nepean River were unlikely to have a significant impact on species dependent on the Nepean River. Biosis Research also concluded that threatened species dependant on caves and crevices within cliffs and steep slopes were unlikely to be significantly impacted by predicted subsidence to these habitats. The remaining threatened fauna species known to occur or with potential habitat within the study area were considered unlikely to be significantly impacted by subsidence as habitat for these species occurs within woodland, or other habitats that are unlikely to be impacted by subsidence.

As there has been no noticeable change to habitat features within either the Nepean River gorge or its tributaries and no impacts to cliff and steep slopes as a result of the extraction of Longwall 705, it is concluded that there has been negligible impact on threatened fauna or their habitats in these areas.

Assessment of predicted and observed impacts

The predicted and observed impacts on EEC’s and threatened species (and their habitats) resulting from the extraction of Longwall 705 is provided in Table 3. The table focuses on the three main ecological values which were the subject of the assessment undertaken by Biosis Research (2008) for the development of Longwalls 705 to 710.

Table 3: Summary of the predicted and observed impacts on general habitat and threatened flora and fauna Associated with Longwall 705

Ecological Values	Predicted Impact*	Observed Impact**	Within Prediction (yes/no)
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Ecological Values	Predicted Impact*	Observed Impact**	Within Prediction (yes/no)
Endangered Ecological Communities (and other vegetation)	Potential gas emissions may result in small, isolated areas of vegetation dieback in the Nepean River gorge. Potential surface fracturing and gas emissions considered unlikely to result in alteration of species composition or distribution. Unlikely to have a significant impact on any plant communities.	Gas release observed at three sites restricted to the Nepean River. No surface fracturing observed. No significant impacts to plant communities.	Yes
Threatened flora	Volume of water available for plant use is unlikely to be significantly impacted. It is considered unlikely that subsidence impacts would result in a broad change in the floristic composition of the riparian zone. No significant impact to threatened flora.	No significant vegetation impacts. No significant impacts to flora and flora habitat.	Yes
Threatened fauna and fauna habitat	Changed surface water conditions, such as effects to pools and streams. Impacts to steep slopes and cliffs. Impacts of gas emissions on water quality and riparian vegetation. Unlikely to result in a significant impact to threatened fauna.	No observed rock falls, rock collapses or rock fracturing. No noticeable change to habitats. No significant vegetation impacts. No significant impacts to fauna and fauna habitat.	Yes

*as defined by Biosis Research 2008.

**as defined in BHPBIC Environmental Field Team monitoring reports (BHPBIC 2014).

Conclusion

This report compares the observed impacts of subsidence associated with the extraction of Longwall 705 at Appin Colliery against the impacts predicted prior to extraction in relation to terrestrial ecological values. This assessment is based on a review of monitoring observations and measurements undertaken by MSEC, BHPBIC Environmental Field Team and EcoEngineers.

Minor impacts (gas zones in the Nepean River) which have occurred within the limit of subsidence for Longwall 705 are within the parameters of the predicted impacts outlined in the terrestrial ecological assessment for Longwalls 705 to 710 (Biosis Research 2008).

It is concluded that the extraction of Longwall 705 has had a negligible effect on any terrestrial ecological values.

Recommendations

Given the nature of the impacts observed within the Longwall 705 SMP Area on terrestrial ecological values, and given that reported impacts are all within predicted levels, no further monitoring is recommended.

References

BHPBIC 2012_Oct. Nepean River Impact Report. BHPBIC Environmental Field Team. Dated 5 October 2012.

BHPBIC 2014 Longwall 705 Landscape Monitoring Report

Biosis Research 2006 Appin Colliery Area 7 – Longwalls 705-710 Impacts of subsidence of terrestrial flora and fauna. Prepared for BHP Billiton Illawarra Coal. Dated April 2006.

EcoEngineers 2014 End of Panel Assessment of Water Quality Effects Appin Colliery Longwall 705.

MSEC (2014) MSEC686 _Revision 01. End of Panel Subsidence Monitoring Report. BHP Billiton Illawarra Coal, Appin Colliery – Longwall 705.