



Attention: Mr Gary Brassington
Manager Mining Approvals
BHP Billiton Illawarra Coal
External Affairs Department

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5 December 2011

Via email: Gary.Brassington@bhpbilliton.com

Dear Gary

RE: TERRESTRIAL ECOLOGICAL ASSESSMENT FOR LONGWALL 34 - WEST CLIFF COLLIERY END OF
PANEL REPORT

As requested Niche Environment and Heritage has undertaken a site assessment and review of the predicted and observed impacts resulting from the extraction of Longwall 34 at West Cliff Colliery on terrestrial ecological values. This assessment is attached for inclusion in BHP Billiton Illawarra Coal's End of Panel Report for Longwall 34.

Our assessment and this report concludes that the minor environmental impacts observed in relation to mining Longwall 34 had no observed impact on terrestrial ecology.

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

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

Matthew Richardson
Director - Botanist



Background and Introduction

Niche Environment and Heritage (Niche) was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to conduct an End of Panel (EoP) assessment of the terrestrial ecological values within the limit of subsidence of Longwall 34 at West Cliff Colliery near Appin NSW. This brief 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 recent field observations by the BHPBIC Environmental Monitoring Team and Niche.

Subsidence Monitoring Results Summary (MSEC)

The End of Panel Subsidence Report for Longwall 34 prepared by MSEC (MSEC510_Revision 02) is a comprehensive report which addresses all aspects of the recorded subsidence parameters resulting from the extraction of Longwall 34.

A number of these parameters have the potential to impact terrestrial ecological values and Table 1 outlines the observed impacts and the terrestrial ecological values that may have some correlation with them.

Table 1: Observed impacts from Longwall 34 due to subsidence and their correlation to potential terrestrial ecology impacts

Subsidence Monitoring Results	Correlation to Terrestrial Ecological Values
In relation to the Georges River, measured subsidence parameters (incremental and total subsidence movements; incremental and total upsidence and closure) are similar to or less than the predicted maximum.	Subsidence parameters have the potential to alter the physical environment which may provide certain types of habitat for terrestrial flora and fauna.
There have been no reported impacts from increased levels of ponding, flooding and desiccation within the Georges River or the minor tributaries including Mallaty and Leafs Gully Creeks.	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.
Minor fracturing in the bed of the Georges River occurred following extraction of Longwall 34. No water loss or loss in water quality has yet been reported.	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 surface flow diversion within the Georges River as a result of Longwall 34 has been recorded. Minor fracturing within Mallaty Creek and the loss of standing water within some pools during low and no-flow periods has resulted from the extraction of Longwall 34.	Similar to the above, water loss has the potential to alter habitat types and availability within and adjacent to the affected streams.
No mining induced springs have been reported from the Georges River precinct or from the minor tributaries of Mallaty and Leafs Gully Creeks.	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 gas emissions have been reported from the Georges River precinct or from the other creeks and tributaries within the limit of subsidence for Longwall 34.	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 within the Nepean River.



Water Quality Monitoring Results (EcoEngineers)

EcoEngineers Pty Ltd have prepared a comprehensive report on the water quality monitoring program associated with Longwall 34 (EcoEngineers 2011, Document Reference: 2008/07A - End of Panel Assessment on Water Flow and Quality Effects West Cliff Colliery Longwall 34).

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 34:

- No significant water quality impacts have been observed in the Georges River, Mallaty Creek and Leafs Gully.

Environmental Monitoring - BHPBIC Environmental Monitoring Team

The BHPBIC Environmental Field Team assessment has reported only minor impacts from the ongoing monitoring of environmental values within the limit of subsidence of Longwall 34.

One impact has been the more rapid draining of standing water within a section of the ephemeral Mallaty Creek.

One other impact reported in the November 15, 2011 report is a small section of fracturing in a Sandstone rockbar downstream of Pool 43 in the Gorges River (BHPBIC 2011_Nov). This fracturing has not resulted in loss of water from Pool 43 or water quality changes which therefore indicates that in-stream and riparian habitats in the vicinity of this impact remain unaffected by Longwall 34.

No other impacts have been reported to date.

Site Inspection

A site inspection was carried out on 2 November 2011 by Matthew Richardson (Niche Environment and Heritage).

During the inspection the length of the Georges River from the southern limit of Longwall 33 extending north to approximately the northern limit of Longwall 35 was assessed. That is, the entire length of the Georges River within the limit of subsidence for Longwall 34 was inspected. Similarly the length of both Mallaty and Leafs Gully Creeks that may have been affected by Longwall 34 were also inspected. Incidental observations of terrestrial ecological values were made en-route to these sites.

Georges River

A single area of minor surface cracking was observed on Rockbar 41. Associated with this minor cracking was a small area of iron staining (very minor discolouration was observed at the base of one of the cracks within the Georges River). Surface cracking also has the potential to alter habitat quality (water quality) which may affect some terrestrial fauna groups. It is however noted that no water quality impacts have been observed. Plate 1 and Plate 2 below show the minor cracking and the iron discolouration observed within the Georges River.

No other evidence of impact from the extraction of Longwall 34 (including gas emissions, desiccation or scouring, vegetation die off etc) was observed within the Georges River. It should be noted that at the time of the site inspection the Georges River was flowing well.



The extraction of Longwall 34 is not likely to have had any impact on terrestrial ecological values that occur within the Georges River or those that are periodically reliant on the River as habitat.



Plate 1: minor cracking observed within the base of the Georges River at Rock Bar 41



Plate 2: minor iron discolouration within the Georges River at Rock Bar 41

Mallaty Creek

Within the ephemeral Mallaty Creek a length of the creek approximately 100-150 m long was observed to have lost standing water from most of the pools. At the time of the site assessment the creek was not flowing and therefore the loss of standing water from the pools is considered a loss of ephemeral pools which otherwise persist between regular flow events. As stated above the loss of standing water has the potential to reduce the availability of standing water habitat for some terrestrial fauna groups (notably amphibians and bats).

No other evidence of impact from the extraction of Longwall 34 (including gas emissions, desiccation or scouring, vegetation die off etc) was observed within Mallaty Creek.

Plate 3 below shows the section of Mallaty Creek which was observed to have lost standing surface water. Plate 4 shows the pools that remain within the creek downstream of Longwall 34. It should be noted that ongoing access to the creek by livestock continues to degrade the creek banks and ensures that the remaining standing water is of poor quality and is therefore likely to provide only marginal habitat for terrestrial ecological values.

Given the highly degraded nature of Mallaty Creek and the minor loss of standing pool habitat, the extraction of Longwall 34 is not likely to have had any impact on terrestrial ecological values that occur within it or those that are periodically reliant on the creek for habitat.



Plate 3: A section of Mallaty Creek which has lost standing water apparently as a result of the extraction of Longwall 34.



Plate 4: Standing water within a larger pool of Mallaty Creek downstream of Longwall 34.

Leafs Gully

Leafs gully has been significantly impacted by past land use including the constriction of a very large farm dam within the creek bed at or about the location where the creek crosses Longwall 34.

Standing water was observed to remain within the pools of Leafs Gully during the site inspection. The creek was not flowing at the time of the site inspection.

No evidence of impact from the extraction of Longwall 34 (including gas emissions, desiccation or scouring, vegetation die off etc) was observed within the Leafs Gully.

The extraction of Longwall 34 is not likely to have had any impact on terrestrial ecological values that occur within Leafs Gully or those that are periodically reliant on the creek for habitat.



Plate 5: The dam wall constructed in the base of Leafs Gully taken from the downstream side and looking upstream.



Plate 6: Standing water within the pools of Leafs Gully immediately downstream of the large dam within the creek valley.

Endangered Ecological Communities

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Two Endangered Ecological Communities (EEC's), both of which are listed on the TSC Act and EPBC Act, occur within the limit of subsidence for Longwall 34 (Biosis Research 2007). These EEC's are Cumberland Plain Woodland and Shale Sandstone Transition Forest.

Shale Sandstone Transition Forest occurs along the upper banks/plateau area associated with the Georges River and in close proximity to Mallaty Creek and Leaf's Gully.

Cumberland Plain Woodland typically occurs as smaller, isolated patches on shale soils away from the creek lines within the area assessed.

Patches of these vegetation communities were traversed on foot and in the vehicle when assessing the Georges River and the two streams and no evidence of die back or other disturbance which could be associated with subsidence were observed within these (or any other) vegetation communities. It is concluded that there were no significant impacts on Endangered Ecological Communities due to Longwall 34.

Other Vegetation Communities

Four vegetation communities which are not listed as Endangered Ecological Communities have previously been recorded within the study area (Biosis Research 2007). These vegetation communities include Sandstone Ridgetop Woodland, Moist Shale Woodland, Upper Georges River Sandstone Woodland and Western Sandstone Gully Forest.

All of these vegetation communities were encountered in the current site assessment. No evidence of any direct or indirect impacts associated with the extraction of Longwall 34 were observed within these vegetation communities. It is concluded that there were no significant impacts on any non-listed vegetation communities due to Longwall 34.

Threatened or Otherwise Significant Plants

One threatened plant species, *Grevillea parviflora* ssp. *parviflora*, which is listed on both the TSC and EPBC Acts was recorded within the limit of subsidence of Longwall 34. A large population of the species has previously been recorded to the east of Longwalls 34-36 (Biosis Research 2007) which is some distance from the study area. During the assessment of the Georges River precinct for this assessment *Grevillea parviflora* ssp. *parviflora* was a commonly observed plant species within the vegetation of the river valley.

Several ROTAP species were also recorded within the Georges River precinct. *Lomandra fluviatilis*, *Grevillea longifolia* and *Darwinia glauca* were recorded throughout the area inspected during this assessment.

As stated above no vegetation die-off or other vegetation impacts were observed within the Georges River area. Individuals of *Grevillea parviflora* ssp. *parviflora*, *Lomandra fluviatilis*, *Grevillea longifolia* and *Darwinia glauca* have not been impacted by the extraction of Longwall 34.

Subsidence associated with the extraction of Longwall 34 is not considered to have had any noticeable impact on threatened or otherwise significant plants.



Plate 7: *Grevillea parviflora* ssp. *parviflora* recorded within close proximity to the Georges River within the limit of subsidence of LW 34.



Plate 8: *Lomandra fluviatilis* recorded within the Georges River within the limit of subsidence of LW 34.

Threatened Fauna

No threatened fauna were recorded during the current assessment. One threatened animal, the Koala, has previously been recorded from within the Georges River Corridor within the study area (Biosis Research 2007). The study area is however considered likely to provide habitat for a range of threatened fauna (Biosis Research 2007).

As there has been no noticeable change to habitats within either the Georges River or Leafs Gully precincts as a result of the extraction of Longwall 34 it is unlikely that there has been any impact on threatened fauna or their habitats in these areas.

The loss of standing water within Mallaty Creek has the potential to reduce the available habitat for some fauna species. However due to the highly degraded nature of this habitat resource within Mallaty Creek it is a marginal habitat feature for terrestrial fauna. Never the less the loss of even marginal habitat has the potential to impact a threatened species.

As the loss of standing water within this area is restricted to a very small area of highly degraded standing water, the impacts associated with the extraction of Longwall 34 are assessed as negligible on threatened fauna. This is consistent with the assessment of impacts on threatened fauna as outlined by Biosis Research (2007).

Assessment of Predicted and Observed Impacts

Table 2 below presents a summary of the predicted and observed impacts on EEC's and threatened species (and their habitats) resulting from the extraction of Longwall 34. The table focuses on the three main ecological values which were the subject of the assessment undertaken by Biosis Research (Biosis Research 2007) for the development of Longwalls 34 to 36.

Table 2: Summary of the Predicted and Observed Impacts Associated with Longwall 34

Ecological Values	Predicted Impact*	Observed Impact	Within Prediction (yes/no)
Endangered Ecological Communities (and other vegetation)	Unlikely to have a significant impact as physical and chemical changes to the 'habitat' are unlikely to lead to material change in the vegetation community composition. Potential for gas emissions within creeks systems to lead to minor	None	Yes

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Ecological Values	Predicted Impact*	Observed Impact	Within Prediction (yes/no)
	vegetation die back		
Threatened Flora	No predicted impact	None	Yes
Threatened Fauna	Potential redirection of surface flows in the some sections of the Georges River or creeks. Drainage of some pools within the creeks. Unlikely to result in a significant impact to threatened fauna	Minor cracking in the Georges River not apparently resulting in loss of surface flows. Some pools in Mallaty Creek have lost standing water. No observed impact to threatened species	Yes

*as defined by Biosis Research 2007.

Conclusion

This report considers the observed impacts of subsidence associated with the extraction of Longwall 34 at West Cliff Colliery against the impacts predicted prior to extraction. This assessment is based on a combination of observations of terrestrial ecological values from a site visit specifically designed to consider the impacts of subsidence on these values as well as a review of other monitoring observations and measurements.

Minor impacts, including bed rock fracturing within the Georges River and loss of standing water from some pools within the ephemeral Mallaty Creek which have occurred within the limit of subsidence for Longwall 34 are within the parameters of the predicted impacts outlined in the terrestrial ecological assessment for Longwalls 34 to 36 (Biosis Research 2007).

It is the conclusion of this report that the impacts observed as a result of the extraction of Longwall 34 are localised and have been confined to marginal habitat for terrestrial ecological values. It is not likely that the extraction of Longwall 34 has lead to a significant impact on any terrestrial ecological values.

Recommendations

Given the nature of the impacts observed within the limit of subsidence of Longwall 34 on terrestrial ecological values and the fact that these impacts are all within predicted levels no further monitoring is recommended.

References

BHPBIC 2011_Nov West Cliff Area 5 Longwall 34 Impact Report.

Biosis Research 2007 West Cliff Area 5- Longwalls 34-36, Impacts of Subsidence on Terrestrial Flora and Fauna. Report for BHP Billiton Illawarra Coal.

Biosis Research 2010 Flora and Fauna Assessment: West Cliff Area 5 Longwall 33 End of Panel Report. An unpublished report for BHP Billiton Illawarra Coal.

EcoEngineers 2011, Document Reference: 2008/07A - End of Panel Assessment on Water Flow and Quality Effects West Cliff Colliery Longwall 34.

MSEC510_Revision 02: End of Panel Subsidence Monitoring Report. BHP Billiton Illawarra Coal, West Cliff Colliery - Longwall 34.