HLA

HLA-Envirosciences Pty Limited

ABN 34 060 204 702

14th March 2002

U909

18 MAR 2002

Mr Matthew Andrews
Planning NSW
PO Box 3927
SYDNEY NSW 2001

Ashton Coal Project - Response to DLWC

Dear Matthew

Please find attached a copy of our response provided to the Department of Land and Water Conservation. This response addresses issues, which were raised in our meeting on the 4th of March 2002, and correspondence to your Department from DLWC, dated the 6th March 2002.

Yours faithfully

HLA-ENVIROSCIENCES PTY LIMITED

Renae Gifford
Project Manager

Enclosures

U909 Planning NSW Let 14.03.02a

Newcastle Office: 18 Warabrook Boulevarde Warabrook NSW 2304
All Mail Should Be Addressed To: PO Box 73 HRMC NSW 2310 **Ph: (+61 2) 4968 0044** Fax: (+61 2) 4968 0005
Email: mail@hla-enviro.com.au

HLA-Envirosciences Pty Limited
ABN 34 060 204 702

14th March 2002

U909

Fergus Hancock
Natural Resource Project Officer
Department of Land and Water Conservation
PO Box 297
MUSWELLBROOK NSW 2333

Proposed Ashton Coal Project

Dear Fergus

As discussed in our meeting and subsequent correspondence on Monday 4th March 2002 and detailed in the fax from the Department of Land and Water Conservation on the 6th of March 2002, it was requested that further clarification be provided on a number of issues. Please find detailed below our response to each of these issues.

1.0 Compliance with current department groundwater policies

The following demonstrates how the Ashton Project will comply with the three groundwater policies listed on the agenda of the meeting of the 4th March 2002.

1.1 Groundwater Quality Management Policy

The most sensitive beneficial use of the alluvial groundwater resource in the alluvium is either maintenance of groundwater dependent ecosystems or stockwater supply. The water quality is marginal for domestic use and there is insufficient yield for irrigation or industrial use.

It is noted that the main groundwater dependent ecosystem is probably the aquatic fauna and flora in the channel of Bowmans Creek and perhaps some of the deeper rooting vegetation along the banks of the creek and on the floodplain. The predicted impact of mining on the groundwater quality in the alluvium in the long term is to raise the salinity from the average value of about 1100 uS/cm EC to about 1700 uS/cm EC or from about 750mg/L to about 1100 mg/L TDS (Appendix J section 8.1.2) in areas where there may be some vertical fracture interconnection between the underground mine and the alluvium, such as at the northern end of longwall panels 4 and 5. This is well within the natural range of salinity of Bowmans Creek within the Ashton Project (ie 1500 uS/cm to 2200uS/cm under low flow; **Appendix O**, Figure 10). It is also well within the salinity criteria for stock watering (< 5500 uS/cm EC, or < 3500 mg/L TDS). Therefore, the Ashton project is not expected to adversely change the beneficial use of the alluvial groundwater.

No town water supplies will be affected by any impacts on the water quality in the alluvium of Bowmans Creek. The project is not expected to cause any significant risk to the water quality of Glennies Creek or the adjoining alluvial groundwater.

Newcastle Office: 18 Warabrook Boulevarde Warabrook NSW 2304
All Mail Should Be Addressed To: PO Box 73 HRMC NSW 2310 **Ph: (+61 2) 4968 0044** Fax: (+61 2) 4968 0005
Email: mail@hla-enviro.com.au

Mine planning includes measures that will be taken to prevent groundwater pollution. Water storages near alluvium will be designed and constructed to minimize seepage losses of mine water. Mine water stored in the opencut void is expected to be of similar quality to the groundwater in the surrounding coal measures and therefore, is unlikely to cause any additional impacts on water quality in connected surface water bodies or adjoining alluvium.

It is believed that there has been sufficient amount of detail in the groundwater investigations to assess the impacts of the project on the groundwater quality, which was commensurate with the moderately high level of risk (at the northern, shallow end of the longwall panels) and the relatively low commercial and environmental value of the Bowmans Creek alluvial groundwater (**Appendix J**, section 9.0) compared with the unaffected Hunter River alluvial groundwater.

White Mining is prepared to accept responsibility for restoring any environmental damage caused by pumping the groundwater resources and has developed a water management plan to prevent discharge and minimize damage to the environment.

Measures have been considered in project planning to mitigate impacts on groundwater dependent ecosystems (**Appendix O**, section 6.2, and response 1.0 above).

No cumulative impacts on the groundwater quality in the Bowmans Creek alluvium are expected because the diversion of Bowmans Creek will isolate the alluvium from existing and proposed poorer quality mine water discharges into Bowmans Creek from mines upstream.

While no significant adverse impacts on alluvial groundwater quality are anticipated, various measures have been proposed to restore any deterioration. These may include controlled releases of good quality water down the chain of ponds during high flows in Bowmans Creek. The subsidence ponding will improve this recharge and recovery by concentrating rainfall overland flows and ponding flows in the stream channel. The extent of this ponding is shown in Figures PBP 9 and 10 in the package provided on the 28th February, 2002.

A more detailed groundwater management plan can be developed in conjunction with DLWC to ensure that the alluvial groundwater resource is adequately protected and restored if necessary.

1.2 Groundwater Quantity Management Policy

The Ashton Project is unlikely to cause any irreversible damage to the Bowmans Creek alluvial groundwater resources for the reasons outlined below under headings 2.0, 3.0 and 4.0. In fact, the available yield from the portion of aquifer between the highway and the existing gauging station may be increased due to the increase in saturated thickness caused by subsidence. Therefore, there is unlikely to be any reduction in the long term sustainable yield to meet the needs of future generations (eg stockwater), or the dependent ecological processes.

Groundwater dependent ecosystems have been identified and will be protected by the proposed mitigation measures.

While there is a moderately high risk of impacts on a small area of the Bowmans Creek alluvial groundwater at the northern end of longwall panels 4 and 5, the impact should be localized and temporary, and levels should be restored in a relatively short time after mining ceases. This could be accelerated by the release of water from the diversion into the abandoned channel post mining.

Predicted leakage from the Glennies Creek and Hunter River alluvium due to reduction of pressure heads in the underlying coal measures are expected to be temporary and restored soon after mining ceases by rainfall and river recharge.

It is expected that there is sufficient sustainable yield to maintain the dependent ecological systems and meet current or future stock watering requirements for the property.

White Mining propose to obtain the necessary licenses and approvals for groundwater extraction and interference activities. Estimates of the expected volumes of groundwater extraction either by pumping or by aquifer interference have been provided in the EIS.

1.3 Groundwater Dependent Ecosystem Policy

The groundwater dependent ecosystems within the Ashton project have been broadly identified by fauna and flora surveys (Appendices J and K). It is understood that these ecosystems within the project area are not unique, have been severely impacted by agricultural activities and do not contain threatened species or habitat, and therefore do not have a high environmental value.

It is anticipated that except perhaps for some localized areas at the northern end of longwall panels 4 and 5, the mining will have little if any impacts on the ecological processes and the biodiversity. Mitigation measures have been proposed to minimize any impacts should they occur (section 6.0, **Appendix O**).

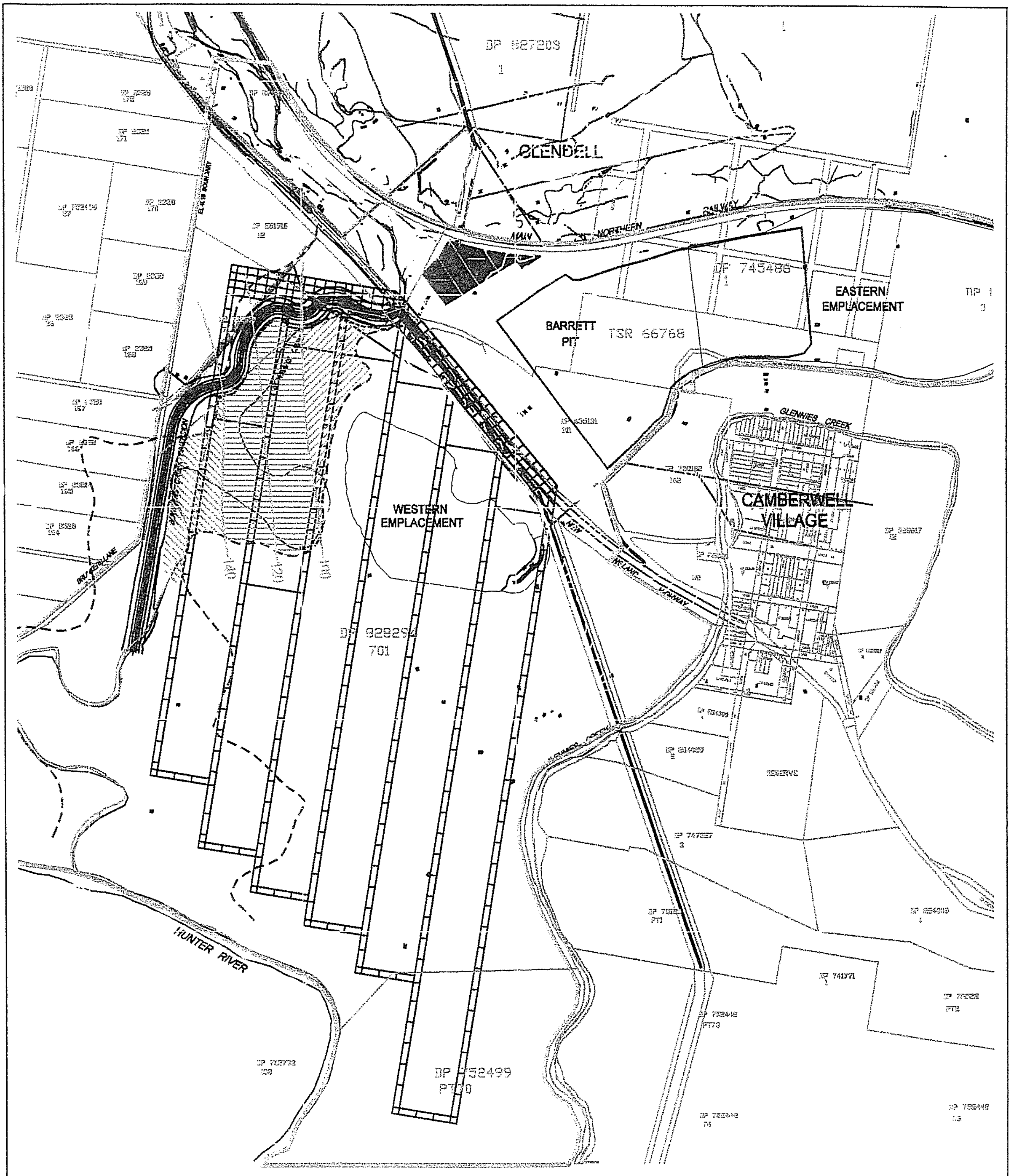
It is anticipated that the natural function of the alluvial groundwater in sustaining ponds, and ecosystems in the channel of Bowmans Creek during droughts, will continue, apart possibly from a temporary disruption in a short section of alluvium, between the highway and the existing gauging station.

There is considered to be sufficient available information and sufficient understanding of the hydrogeology of the Bowmans Creek alluvium and the impacts of longwall mining subsidence on overlying groundwater systems in similar hydrogeological environments, to adequately predict the impacts of the Ashton proposal on the Bowmans Creek alluvial groundwater resource and the dependent ecosystems. An adaptive management strategy involving periodic releases of water into the chain of ponds, monitoring actual impacts on groundwater levels and quality, and mitigation measures which will be implemented to provide an adequate level of protection for the Bowmans Creek alluvial groundwater resource commensurate with its demonstrated relatively low commercial and environmental value.

2.0 Demonstration that EIS predictions are based on 'worst case' scenarios with regard to fracture development in the underground workings

In section 6.0 **Appendix J** of the EIS, the inflows to the mine, or water loss from the alluvium was estimated assuming a worst case scenario that "open fractures will connect the underground mine to surface fracturing in Bowmans Creek alluvium which could drain the shallow groundwater in the alluvium". This assumption was based on:

i) An initial assessment (pre-EIS) of the risk of inflows from the surface based on the height of subsidence induced fracturing and the minimum thickness of coal measures cover to provide a protective barrier between the underground mine and Bowmans Creek and the adjoining alluvial aquifer. This assessment used methods described in Singh and Kendowski (1983), which are based on the following empirically derived relationship for predicting the height of fracturing ($h = 56 \times t^{0.5}$) developed from back analysis of inflows at many mines in the northern hemisphere. The minimum



LEGEND

EDGE OF ALLUVIUM

CONTOURS OF THICKNESS OF COAL MEASURES COVER

MODERATE TO HIGH RISK OF INFLOWS

MODERATE RISK OF INFLOWS

MODERATE TO LOW RISK OF INFLOWS

0 500 1000
metres

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble, NSW 2073
61 2 9988 4422

RISK OF INFLOWS FROM ALLUVIUM
White Mining Limited
Ashton Coal Project - Groundwater Hydrology
Camberwell, New South Wales

FIGURE **1**

DRAWN	PROJECT-FILE NUMBER	APPROVED	DATE	REVISED DATE
LJE	U909-001		March 2002	

Predicted leakage from the Glennies Creek and Hunter River alluvium due to reduction of pressure heads in the underlying coal measures are expected to be temporary and restored soon after mining ceases by rainfall and river recharge.

It is expected that there is sufficient sustainable yield to maintain the dependent ecological systems and meet current or future stock watering requirements for the property.

White Mining propose to obtain the necessary licenses and approvals for groundwater extraction and interference activities. Estimates of the expected volumes of groundwater extraction either by pumping or by aquifer interference have been provided in the EIS.

1.3 Groundwater Dependent Ecosystem Policy

The groundwater dependent ecosystems within the Ashton project have been broadly identified by fauna and flora surveys (Appendices J and K). It is understood that these ecosystems within the project area are not unique, have been severely impacted by agricultural activities and do not contain threatened species or habitat, and therefore do not have a high environmental value.

It is anticipated that except perhaps for some localized areas at the northern end of longwall panels 4 and 5, the mining will have little if any impacts on the ecological processes and the biodiversity. Mitigation measures have been proposed to minimize any impacts should they occur (section 6.0, **Appendix O**).

It is anticipated that the natural function of the alluvial groundwater in sustaining ponds, and ecosystems in the channel of Bowmans Creek during droughts, will continue, apart possibly from a temporary disruption in a short section of alluvium, between the highway and the existing gauging station.

There is considered to be sufficient available information and sufficient understanding of the hydrogeology of the Bowmans Creek alluvium and the impacts of longwall mining subsidence on overlying groundwater systems in similar hydrogeological environments, to adequately predict the impacts of the Ashton proposal on the Bowmans Creek alluvial groundwater resource and the dependent ecosystems. An adaptive management strategy involving periodic releases of water into the chain of ponds, monitoring actual impacts on groundwater levels and quality, and mitigation measures which will be implemented to provide an adequate level of protection for the Bowmans Creek alluvial groundwater resource commensurate with its demonstrated relatively low commercial and environmental value.

2.0 Demonstration that EIS predictions are based on 'worst case' scenarios with regard to fracture development in the underground workings

In section 6.0 **Appendix J** of the EIS, the inflows to the mine, or water loss from the alluvium was estimated assuming a worst case scenario that "open fractures will connect the underground mine to surface fracturing in Bowmans Creek alluvium which could drain the shallow groundwater in the alluvium". This assumption was based on:

i) An initial assessment (pre-EIS) of the risk of inflows from the surface based on the height of subsidence induced fracturing and the minimum thickness of coal measures cover to provide a protective barrier between the underground mine and Bowmans Creek and the adjoining alluvial aquifer. This assessment used methods described in Singh and Kendowski (1983), which are based on the following empirically derived relationship for predicting the height of fracturing ($h = 56 \times t^{0.5}$) developed from back analysis of inflows at many mines in the northern hemisphere. The minimum total thickness of cover, or protective barrier for a 2.1m extraction in the Pikes Gully Seam at Ashton, ranges from about 110m to about 125m, allowing for about 80m fracture height, 15m depth of surface fracturing and between 15 and 30m of aquiclude. . The attached drawing of the thickness of coal measures cover under the Bowmans Creek alluvium indicates, there is a moderate to high risk of inflows from the alluvium and stream channel (ie cover thickness to base of alluvium < 110m), at the northern end of longwall panels 4 and 5. Panel 6 has a moderate to low risk of inflows due to the greater thickness of coal measures cover (>140m).

ii) Subsequent advice from Graham Holt, subsidence specialist, based on experience with longwall mining in the Hunter Valley, particularly at the nearby Cumnock Mine, indicated that "Ground cracking is likely to occur from mining two seams, and it is likely that water will enter the workings. If one seam were to be mined beneath the creek the depth of cover to even the uppermost seam (Pikes Gully Seam) is sufficient to prevent inundation-type water flows into the mine." (section 6.0 **Appendix P**, EIS)

Because of the moderate to high risk of inflows via connected fractures, and the likelihood of some increase in the risk of inflows due the cumulative effects of superimposed, multiple seam extraction, the diversion of Bowmans Creek was considered necessary for mine safety reasons and to minimize the volumes of saline water produced from dewatering the underground mine that would need to be handled by the mine water management system.

Evidence from longwall extraction of 2.1m of coal from the Pikes Gully Seam at depths of about 85m to 90m at the nearby Cumnock Mine, suggests that the empirical equations used overseas, over-estimate the required thickness of protective cover for single seam mining in the Hunter Valley. Comparison of pre and post mining, stream channel morphology surveys along Davies Creek above longwall panels in the Pikes Gully Seam at Cumnock Mine, indicated that while cracking occurs at the surface, it did not drain farm dams nor ponds in the stream channel, even in areas where rock was exposed in the stream channel (HLA, 2000). Some temporary drainage may have occurred but ponding was quickly restored and there was no significant inflows reported in the longwall panels.

At the Wambo Mine, substantial inflows (about 200L/s) occurred from South Wambo Creek down open cracks parallel to the rib when about 3.0m of coal was extracted at a depth of about 70m. The estimated height of fractured zone was about 97m using the overseas equations, and hence, there was a high risk of connection with surface cracks, which extend to about 15m depth, based on overseas experience (Singh & Kendowski, 1983).

Back analysis of the Cumnock and Wambo experience suggests that the overseas relationship used to estimate the height of fracturing (56 x $t^{0.5}$) should be modified to about 40 x $t^{0.5}$ for the Hunter Valley. Applying this to Ashton using, reduces the minimum cover thickness from 110m to 125m down to 80m to 105m, which suggests a lower risk of inflows, except for portions of the northern end of panel 4 and 5.

The tensile strain is estimated to be < 7.5mm/m under the alluvium at the shallowest northern end of the Aston project panels 4, 5 and 6 (calculated using the Newcastle Coalfield Subsidence Handbook, see EIS **Appendix P**, section). This is much lower than the recommended maximum surface tensile strain for the mining under stored water in the Bowen Basin mines (< 7.5mm/m) and for sub-sea mining in the United Kingdom (< 10 mm/m, Singh, 1986).

It is noted that the worst case scenario adopted in the EIS assumed that the shallow groundwater in the basal sandy gravel aquifer extended the full width and length of the panel and there was good hydraulic connection through the basal aquifer. However, in practice, the basal sandy gravel aquifer does not extend under more than 10% of panel 4, and more than 40% of panels 5 and 6. The

This addresses the issues raised in item 4, first bullet point, of the agenda of the meeting of 4th March 2002. Points raised were:

- It is unlikely that vertically interconnected, subsidence induced, fracturing would completely and permanently drain the alluvium, or any residual ponds in the abandoned channel of Bowmans Creek, except perhaps under the northern end of panels 4 and 5, where there is a moderately high risk of interconnection, as discussed in item 2.0 of this response.

- Further, it was noted that basal silty sand or gravel layer, which contains the better quality groundwater is not present in much of the alluvium under the longwall panels south of the large meander.

- It was also noted that although the existing channel of Bowmans Creek almost completely penetrates the basal silty, sandy gravel aquifer, the water quality data suggests there is limited hydraulic connection between the aquifer and stream channel. Otherwise the aquifer would be expected to have similar water quality to the baseflow in Bowmans Creek, whereas the salinity (EC) of the latter (about 2000uS/cm) is almost double the former (1000 uS/cm).

- Mitigation measures proposed in the EIS (**Appendix O**, section 6.2) for protecting the groundwater dependent ecosystems in the abandoned channel of Bowmans creek, included periodically discharging of some good quality water (ie under high flows) to maintain the ponds. Therefore the salt mass loading and the water balance in the abandoned channel and the adjoining alluvium will depend on the frequency and quality of these discharges, and could be regulated by a condition on the licence to maintain the water quality in the ponds within a similar range to the natural salinity range in this reach of Bowmans Creek.

4.3 Drainage levels and impacts on current alluvium of Bowmans Creek from abandoning current creek alignment

This addresses the issues raised in item 4, second bullet point of the agenda of meeting of 4th March 2002. The point is largely addressed above by the discussion in item 4.3.. However, it was noted that the lower surface of the alluvium will subside about the same amount as the land surface, ie about 5m near the centre-line of the longwall panels. Therefore , there will be a gradient from the abandoned channel towards the alluvium, encouraging recharge from any residual ponds or flows in the abandoned channel. It is also noted that bottom of the basal sands and gravels returns to its natural elevation downstream of the existing gauging station, so underflow will continue to rejoin the surface channel at this point and prevent any significant rise in the groundwater levels. It is also expected that there will be uninterrupted groundwater seepage (underflow) in the basal sands and gravels under the lower flood protection bund.

5.0 Timeframes for rehabilitation of the Creek system, alluvial groundwaters and groundwater dependent ecosystems within the framework of the mine lease

This responds to the issues raised in item 4, third bullet point of the agenda of the meeting on 4th March 2002. It was noted that it was expected that the groundwater levels in the alluvium would recover to close to the pre-mining levels within about 10 - 15years after mining assuming the groundwater levels are significantly lowered by subsidence effects during mining (**Appendix J**, section 8.1.2). Experience upstream at the Liddell Mine was that groundwater levels in the alluvium which appear to have been affected by longwall mining, recovered within about 5 years (Liddell Colliery Extension EIS, 2001, **Appendix 6**, section 3.4.5). Artificially, discharging water down the chain of ponds during high flows (ie about the 1 in 1 year to 1 in 5year ARI floods) would accelerate southern end of each of these panels are underlain by either coal measures in case of panels 4 and 5, or clayey, silty alluvium (all three panels). Therefore, it is unlikely that the estimated high flows from the alluvium would be sustained particularly as the aquifer underflow is small (<0.01ML/day) and Bowmans Creek will be diverted to the west away from the area of the alluvium with the greatest risk of subsidence induced fracture drainage.

In conclusion, the scenario assumed in the EIS is the worst case and it is expected that the actual height of vertically connected fracturing and the associated water losses from the alluvium and abandoned channel will be less than presented in the EIS. It is proposed to monitor subsidence impacts on the alluvial groundwater levels and on ponds in the abandoned channel and implement mitigation measures where appropriate as described in section 6.0, **Appendix J** of the EIS.

3. Confirm that the Glennies Creek alluvium is outside the limit of subsidence.

The predicted Zero Subsidence Limit is based on the lowest seam mined. This means it is the predicted limit of subsidence shown in **Figure 5.5, Volume 3** of the EIS – Cumulative Subsidence Contours. This demonstrates it is some 70m or so from Glennies Creek at the point of closest approach. Predictions are based on a worst-case subsidence situation.

The closest approach point is where Glennies Creek cuts into the steep hill on its western side and we understand there are no alluvials associated with the creek at this location.

It is relevant to note that mining of the upper three seams will result in a predicted Zero Subsidence Limit that is further west from the creek.

We note that in **Section 8.2.1, Appendix H** it is stated that no part of Glennies Creek is undermined by mining operations. It was not specifically stated in the subsidence impact report (**Appendix P**) that Glennies Creek (and of course its associated alluvials) would not be affected as it was considered self evident from the subsidence prediction contours.

4.0 Explaining the level of interchange between the diversion and alluvium

4.1 Diversion and alluvium

The diversion will be designed and constructed so there is minimal interchange of water seeping into or out of the diversion to and from the alluvium. Some seepage losses may occur through the base and walls of the diversion channel in the first 500 to 1000m of the channel where it crosses the alluvium. The base of the channel is expected to be well above the base of the alluvium so the channel will not interrupt natural underflow through the basal gravels from upstream. From chainage 1100 to 1700 the diversion is cut in coal measures and for the most of the remaining length south of chainage 1700 the diversion is cut into a thin alluvium underlain by coal measures at about 5m depth. Therefore, there will be little or no interaction between the diversion and the alluvium in the southern half of its channel.

In order to mitigate impacts on the ecosystem in the abandoned channel of Bowmans Creek it is proposed to install a large diameter pipe with gate valve so that a portion of high flows (greater than 1 in 1year to 1 in 5year ARI) can be released into the chain of ponds proposed for the abandoned channel. Some of this water may recharge the alluvial aquifer, particularly after the first subsidence occurs, as is discussed below.

4.2 Abandoned channel and alluvium

Mine planning includes measures that will be taken to prevent groundwater pollution. Water storages near alluvium will be designed and constructed to minimize seepage losses of mine water. Mine water stored in the opencut void is expected to be of similar quality to the groundwater in the surrounding coal measures and therefore, is unlikely to cause any additional impacts on water quality in connected surface water bodies or adjoining alluvium.

It is believed that there has been sufficient amount of detail in the groundwater investigations to assess the impacts of the project on the groundwater quality, which was commensurate with the moderately high level of risk (at the northern, shallow end of the longwall panels) and the relatively low commercial and environmental value of the Bowmans Creek alluvial groundwater (**Appendix J**, section 9.0) compared with the unaffected Hunter River alluvial groundwater.

White Mining is prepared to accept responsibility for restoring any environmental damage caused by pumping the groundwater resources and has developed a water management plan to prevent discharge and minimize damage to the environment.

Measures have been considered in project planning to mitigate impacts on groundwater dependent ecosystems (**Appendix O**, section 6.2, and response 1.0 above).

No cumulative impacts on the groundwater quality in the Bowmans Creek alluvium are expected because the diversion of Bowmans Creek will isolate the alluvium from existing and proposed poorer quality mine water discharges into Bowmans Creek from mines upstream.

While no significant adverse impacts on alluvial groundwater quality are anticipated, various measures have been proposed to restore any deterioration. These may include controlled releases of good quality water down the chain of ponds during high flows in Bowmans Creek. The subsidence ponding will improve this recharge and recovery by concentrating rainfall overland flows and ponding flows in the stream channel. The extent of this ponding is shown in Figures PBP 9 and 10 in the package provided on the 28th February, 2002.

A more detailed groundwater management plan can be developed in conjunction with DLWC to ensure that the alluvial groundwater resource is adequately protected and restored if necessary.

1.2 Groundwater Quantity Management Policy

The Ashton Project is unlikely to cause any irreversible damage to the Bowmans Creek alluvial groundwater resources for the reasons outlined below under headings 2.0, 3.0 and 4.0. In fact, the available yield from the portion of aquifer between the highway and the existing gauging station may be increased due to the increase in saturated thickness caused by subsidence. Therefore, there is unlikely to be any reduction in the long term sustainable yield to meet the needs of future generations (eg stockwater), or the dependent ecological processes.

Groundwater dependent ecosystems have been identified and will be protected by the proposed mitigation measures.

While there is a moderately high risk of impacts on a small area of the Bowmans Creek alluvial groundwater at the northern end of longwall panels 4 and 5, the impact should be localized and temporary, and levels should be restored in a relatively short time after mining ceases. This could be accelerated by the release of water from the diversion into the abandoned channel post mining.

HLA-Envirosciences Pty Limited
ABN 34 060 204 702

14th March 2002

U909

Fergus Hancock
Natural Resource Project Officer
Department of Land and Water Conservation
PO Box 297
MUSWELLBROOK NSW 2333

Proposed Ashton Coal Project

Dear Fergus

As discussed in our meeting and subsequent correspondence on Monday 4th March 2002 and detailed in the fax from the Department of Land and Water Conservation on the 6th of March 2002, it was requested that further clarification be provided on a number of issues. Please find detailed below our response to each of these issues.

1.0 Compliance with current department groundwater policies

The following demonstrates how the Ashton Project will comply with the three groundwater policies listed on the agenda of the meeting of the 4th March 2002.

1.1 Groundwater Quality Management Policy

The most sensitive beneficial use of the alluvial groundwater resource in the alluvium is either maintenance of groundwater dependent ecosystems or stockwater supply. The water quality is marginal for domestic use and there is insufficient yield for irrigation or industrial use.

It is noted that the main groundwater dependent ecosystem is probably the aquatic fauna and flora in the channel of Bowmans Creek and perhaps some of the deeper rooting vegetation along the banks of the creek and on the floodplain. The predicted impact of mining on the groundwater quality in the alluvium in the long term is to raise the salinity from the average value of about 1100 uS/cm EC to about 1700 uS/cm EC or from about 750mg/L to about 1100 mg/L TDS (Appendix J section 8.1.2) in areas where there may be some vertical fracture interconnection between the underground mine and the alluvium, such as at the northern end of longwall panels 4 and 5. This is well within the natural range of salinity of Bowmans Creek within the Ashton Project (ie 1500 uS/cm to 2200uS/cm under low flow; **Appendix O**, Figure 10). It is also well within the salinity criteria for stock watering (< 5500 uS/cm EC, or < 3500 mg/L TDS). Therefore, the Ashton project is not expected to adversely change the beneficial use of the alluvial groundwater.

No town water supplies will be affected by any impacts on the water quality in the alluvium of Bowmans Creek. The project is not expected to cause any significant risk to the water quality of Glennies Creek or the adjoining alluvial groundwater.

Newcastle Office: 18 Warabrook Boulevarde Warabrook NSW 2304
All Mail Should Be Addressed To: PO Box 73 HRMC NSW 2310 **Ph: (+61 2) 4968 0044** Fax: (+61 2) 4968 0005
Email: mail@hla-enviro.com.au

HLA-Envirosciences Pty Limited
ABN 34 060 204 702

14th March 2002

U909

18 MAR 2002

Mr Matthew Andrews
Planning NSW
PO Box 3927
SYDNEY NSW 2001

Ashton Coal Project - Response to DLWC

Dear Matthew

Please find attached a copy of our response provided to the Department of Land and Water Conservation. This response addresses issues, which were raised in our meeting on the 4th of March 2002, and correspondence to your Department from DLWC, dated the 6th March 2002.

Yours faithfully

HLA-ENVIROSCIENCES PTY LIMITED

Renae Gifford
Project Manager

Enclosures

U909 Planning NSW Let 14.03.02a