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7.0 MEASURES PROPOSED TO MITIGATE ADVERSE IMPACTS ON THE ENVIRONMENT

Key points

- Rehabilitation of both the No. 1 and No. 2 Open Cuts will be undertaken so as to enhance the connectivity of vegetation and habitat between Bells Mountain and Skeletar Ridge;
- Land use effects have been mitigated by the use of existing infrastructure. Experience to date has shown no significant loss of agricultural capacity over the long term, which should continue under this proposal;
- Modelling of MCC's water management system predicts that under most conditions the mine will remain a nil discharge site in terms of the HRSTS. The comprehensive water monitoring program already in place will continue to ensure compliance with all applicable standards, and early warning of any emerging problems;
- Traffic impacts will be unaffected as there is no planned increase in employment or coal production;
- Dust control measures such as watering haul roads, early land rehabilitation and early attention to any issues highlighted by monitoring are being employed;
- The proposal is integrated in MCC's Spontaneous Combustion Management Plan which will utilise inert capping material from the No. 1 Open Cut Extension for the effective treatment of spontaneous combustion on the entire site;
- The four Indigenous and occupation sites that were located during an archaeological survey are of low archaeological significance and are not recommended for preservation;
- Two scarred trees of moderate archaeological significance were located. Further investigations into potential relocation or preservation are recommended;
- Noise impacts will be mitigated by ongoing compliance with the applicable environmental standards;
- Risk management systems are already well-established;
- The proposed No. 1 Open Cut Extension provides an assured means of eliminating the existing hazards associated with 'pothole' subsidence and resultant spontaneous combustion; and
- Community consultation, the operation of the MCCCCC and complaint hotline will continue and the current monitoring systems will be enhanced, if required.

7.1 Flora and Fauna

The Flora and Fauna Investigation shown in **Appendix F** recommended the following mitigation measures be incorporated and implemented into the relevant management plans prepared for the proposed development:

- Minimum time period between vegetation removal and rehabilitation;
- Restricted vegetation clearing throughout areas to the north of Bimbadeen homestead to periods outside the breeding cycle for the Grey-crowned Babbler and Eastern False Pipistrelle;
- Collect and stockpile vegetation, soil, ground and arboreal habitat features for use in creation of compensatory habitat and rehabilitation activities;
- Establish ecologically functional compensatory habitat for sensitive species prior to the clearing event within areas adjacent to the study area to promote the retention and preservation of local flora and fauna populations;
- Prior to clearing, inspect fauna habitat for species with poor dispersal capabilities with a view to relocate species to suitable alternative habitat;
- Implement appropriate rehabilitation activities;
- Collect local seed providence from the majority of flora species identified within the area to be cleared;
- Implement exotic flora and fauna control programs targeting in particular the European Fox and Feral Cat, European Rabbit and Feral Goat and invasive exotic plants;
- Minimise the edge to area ratio and improve alternative short term vegetation connectivity by undertaking supplementary planting and rehabilitation activities throughout land adjacent to the study area prior to and during mining;
- Monitor the progression of site rehabilitation; and
- Asses the status of the Eastern Grey Kangaroo and potential grazing pressure exerted on the study area.

7.2 Soils and Land Use

The soils in the area to be affected by open cut mining have been mapped and assessed for their suitability as topdressing material to be used in mine site rehabilitation. The transfer of suitable topsoil will, ideally, be undertaken as a single operation in order to maximise the preservation of soil structure and the microflora and fauna contained within the soil. The topsoil will be respread on rehabilitation sites with low erosion potential. Care will be taken to avoid mixing topsoil with the A2 horizon below. Rehabilitation practices currently employed at MCC have proven to be successful in establishing a stable, erosion-resistant landform vegetated with a mixture of grasses, trees and understorey vegetation. These rehabilitation practices will be continued.

The proposed No. 1 Open Cut Extension will have a temporary impact on the current land use. Post mining the No. 1 Open Cut Extension area will be returned to an agricultural suitability that can support cattle grazing. The increase in area of trees and native understorey species will improve the habitat values of the post-mining landscape for native fauna.

One potential consideration for final use of the Extension A final void is as a MSC waste management facility. Other uses of the void would be considered if they came forward but at the stage of writing this EIS no alternative proposals were under active consideration. In the absence of a clear alternative, the voids will be made safe for abandonment according to the DMR requirements and guidelines.

7.3 Spontaneous Combustion

Spontaneous combustion can cause problems for people and the environment. Over $800 000 has been spent to date to ameliorate both spontaneous combustion and subsidence. The No. 1 Open Cut Extension presents a permanent solution to the problem of spontaneous combustion and subsidence. As discussed in **Sections 4.6.8**, **5.4.3** and **5.5.3** several strategies are available to MCC to manage spontaneous combustion during mining.

MCC has developed a Spontaneous Combustion Management Plan which deals with operational issues but does not provide a definitive long term solution for the whole site. A revised Spontaneous Combustion Management Plan is currently being developed to cover all mine closure issues. When completed, this plan will be submitted to relevant Government departments such as the DMR and EPA. For the reasons indicated in **Section 5.4.3** the plan is expected to be completed by the end of 2002.

Until the revised plan is available, the existing Spontaneous Combustion Management Plan will be utilised to mitigate the affects of spontaneous combustion. The main element of this plan is that when areas of spontaneous combustion are encountered, the affected material will be dumped low in the spoil dump area and initially covered with 5 m of inert material.

7.4 Noise and Vibration

The Noise and Vibration Assessment shown in **Appendix H** recommended mitigation measures be incorporated and implemented into the relevant management plans prepared for the proposed development.

In Year 1 of the proposal (the worst-case year for nearby Muswellbrook residences) noise levels will satisfy the EPA noise criteria, with the exception of potential minor (1-2 dB(A)) exceedance under adverse night-time atmospheric conditions at Locations 12 (Madden) and 13 (McMaster).

The predicted exceedances are due almost entirely to excavators at ground level working the far western extent of the expansion area. It must be noted here that when the noise measurements were taken, the excavator was handling material with several very large (i.e., greater than 1 m across) rocks and dumping these onto the haul trucks, with maximum noise levels up to 128 dB(A). This contributed to the resulting Leq noise level of 119 dB(A), which was at least 3 dB(A) higher than had previously been measured for a similarly sized excavator.

If such large rocks are not encountered during surface excavations at the western end of the expansion area, the Leq level of an excavator will be a more typical 116 dB(A), and noise goal exceedances are unlikely to occur.

Even allowing for the rocky material and a sound power level of 119 dB(A) as used in the modelling, initial workings at the surface may be conducted during daytime hours only, when air temperatures are higher than at night, relative humidity is lower and the atmosphere exhibits a temperature lapse of 1-1.5 ^{0}C/100 m altitude. These factors will lower received noise levels by approximately 4-6 dB(A) relative to the predicted night-time levels.

It is recommended that a noise monitoring program be carried out at the commencement of operations in the extension area to determine the degree of noise impact. If the measured noise levels are above the noise goals and are also unacceptable to residents, excavation works at ground level should be limited to daytime hours only while the relevant noise-enhancing atmospheric conditions persist, or an engineering solution to reduce noise levels should be sought.

The above recommendation also holds for Year 5, when residences to the south on Muscle Creek Road may experience a similar degree of impact.

As a minimum, it is recommended that residences 10, 13, 14, 15, 17 and 20 should be included in the monitoring program.

Sleep Arousal

The only predicted exceedances of the sleep arousal criterion occurs at Location 20 (Gordon). The level of exceedances is only 1 dB(A) and is caused by rock impacts during excavation works at ground level producing a sound power level of 128 dB(A). These impact noises are predicted to be only 1-2 dB(A) under the criterion at Location 14 (Madden).

While the likelihood of sleep disturbance is small, excavator/shovel operators should take particular care when loading large rocks onto the back of dump trucks. The noise monitoring program should include measurement of Lmax levels, as well as the Leq levels required to determine compliance with operational noise goals.

Worst-case impact noise levels will reduce by at least 5 dB(A) when the excavator (or shovel) had dug down 1 bench height, as the source will be immediately behind a wall of earth at least 10 m high.

Blasting

The predicted results in **Table 6.7** suggest that overpressure and vibration limits will be easily met by typical blasts with a MIC of 200-400 kg. Charge weights should not exceed 600 kg to ensure compliance with the overpressure limit of 115 dB(A) at the closest residence (Collins).

7.4.1 Mining Methods

As part of the strategies to minimise noise the following mining methods will be adopted;

Equipment Type and Loading Methods

As previously mentioned, MCC will not use a dragline. The excavator in backhoe configuration will have a lower noise affect by being able to carefully place material and larger rocks. MCC undertakes to develop procedures and train vehicle operators in working methods which minimise noise impacts. The use of hydraulic excavators will enable overburden to be "placed" rather than "dumped" into haul trucks as is the case with electric shovels. Overburden dumping with be "in-pit" and noise from this operation will be shielded from North Muswellbrook by the walls of the pit and the existing spoil emplacement to the west of the existing No. 1 Open Cut void.

Equipment Modifications

MCC will undertake economically feasible measures to reduce noise from its mining equipment. To this end acoustical testing of its fleet of 11 Komatsu 730E (190 t capacity) dump trucks has been undertaken by Komatsu. MCC are waiting on the recommendations from Komatsu in respect of potential modifications to the mufflers and are prepared to implement those recommendations.

Mining Operations Nearest to North Muswellbrook

In respect of noise impacts on North Muswellbrook in the early years of the proposal the following operational undertakings by MCC are just as important, if not more important, than acoustical modification of equipment in reducing noise levels:

- Working only during daytime hours for the first two years;
- Always conducting mining operations below a 10 m working face in the north western "tongue" of the No. 1 Open Cut Extension;
- No blasting operations in the north-western tongue; and
- All overburden dumping to be in-pit, behind and to the east of the existing spoil pile of the current No. 1 Open Cut void.

Blasting Methods

Blasting generates noise by overpressure and this can be reduced by the following:

- Careful calculation of maximum instantaneous charge to reduce blasting effect;
- Ensuring sufficient stemming and good stemming material in blast holes;
- Having sufficient blanket of softer material over the top of the blast to reduce noise and other environmental problems;
- Blasting during certain times of the day when most people are not at home; and,
- Being able to have sufficient blasted material for ongoing production within the pit so that blasting is not required during periods of adverse weather conditions such as wind direction toward sensitive receivers, low cloud cover or inversion layers.

Emplacement Locations

There will be no out-of-pit overburden emplacements constructed. Bunding will also be used, if required, to further reduce the affects of mine noise, by providing a physical barrier to the passage of noise.

7.5 Transport and Traffic

There will be minimal impact of the proposal in terms of traffic generation on public roads during the No. 1 Open Cut Extension proposal. The existing on-site access and haul roads are of a high standard, and are upgraded and maintained as required.

Detailed analysis of the transport route from MCC operations to the RCT were conducted by Hallam and Associates for a proposed maximum coal production rate of 2.2 Mtpa. The No. 1 Open Cut Extension proposes an average production rate of 1.5 Mtpa with assessment of up to 2.0 Mtpa to allow for fluctuations in the tonnage of coal produced in an individual year and the potential for up to 0.5 Mpta of production from the Sandy Creek Colliery.

A review of Hallam and Associates report by TPK was based on the facts that:

- New England Highway traffic growth is stable;
- The Hallam Report modelled all scenarios and disclosed high levels of service;
- The current proposal will generate less traffic; and
- Additional rail facilities in the surrounding areas (Mt Arthur Coal) have reduced coal road transport demand.

It is reasonable to assume that the analysis and conclusions of the Hallam Report are appropriate to include as relevant documentation for the consideration of the No. 1 Open Cut Extension.

The Hallam and Associates report concluded that:

- Coal truck movements from MCC were within the range of daily variation in heavy vehicle movements on the New England Highway;
- The intersection of Muscle Creek Road and the New England Highway was operating at a high level of service, which would remain even when traffic from the proposed rural subdivision on Muscle Creek Road is also added;
- No intersection improvement works would be required; and
- The proposed mine expansion would be expected to have an acceptable traffic impact.

As the No. 1 Open Cut Extension will not lead to the expansion of coal road transport to the levels considered by Hallam and Associates, the conclusions reached by Hallam and Associates are conservative and represent an extreme worst case. Accordingly, it is considered that there are no new specific recommendations to be made in terms of traffic impacts. Existing arrangements for road inspection and maintenance should continue and driver education of coal truck drivers in termes of specific road safety and courtesy should also continue.

7.6 Visual and Night Lighting

Overburden emplacement will be contained within the void of the No. 1 Open Cut Extension, with the exception of the transport of inert capping material transported to the No. 2 Open Cut for use in the control of spontaneous combustion. Most mining operations will be conducted away from the view of residential locations or the travelling public.

Night lighting requirements will be very similar to those of the current No. 2 Open Cut. Most overburden will be transported within the pit and will therefore be below natural ground level. This will shield the headlights of dump trucks from direct impact upon surrounding lands. There will be a contribution to general light glow in the night sky which, due the proximity of the mine to Muswellbrook, will be visible from the town. Care should be exercised in the location of lighting plant, especially if located on the edge of highwalls, so that direction of the illumination is away from residences or residential areas.

7.7 Water Management

7.7.1 Surface Water

The mine will operate essentially as a zero discharge operation (discharge limited by the current EPL which is capped at 1 ML/day during Flood Flow in the Hunter River in accordance with the HRSTS) and therefore will not impact surrounding streams. The mine design will include provisions to ensure that any accidental discharge of saline and dirty water is contained by strategically located bunds and pits, and by installation of pressure-loss-activated switches on pumps.

Overburden emplacements will be rehabilitated progressively to minimise the volumes of dirty water runoff and restore the water flow and quality of these catchments. It is anticipated that approximately 80% of the disturbed catchments can be restored, with the rest of the catchments remaining as open cut base or hardstand areas. On completion of mining all disturbed areas will be revegetated to restore the runoff and water quality characteristics of the area.

7.7.2 Groundwater

The No. 1 Open Cut Extension should create a better environment for ground water recovery and improvement in ground water quality. Therefore no mitigation measures are required for groundwater impacts from the proposed No. 1 Open Cut Extension.

7.7.3 Mine Water Storage

In dry and median conditions the proposed No. 1 Open Cut Extension will require water. The following sources contain sufficient amounts of water:

- The No. 1 Open Cut;
- The No. 2 Open Cut; and
- The holding dams of the eliminated Q_{c3} catchment.

As a last resort the appropriate licences would be applied for to obtain water from other sources.

In wet conditions the proposed No. 1 Open Cut Extension will require an additional storage of approximately 360 ML prior to availability of the No. 2 Open Cut (assuming the availability is at the beginning of Year 3). The following methods are available to MCC for water storage and use to eliminate excess water:

- The construction of a dam with the capacity of up to 400 ML which was approved for the Sandy Creek Colliery EIS (HLA 1988), and only would be constructed upon the development of the Sandy Creek Colliery;

- A variation in the discharge licence of up to 175ML/day in flood conditions; and,

- A water evaporation operation using specialist evaporative equipment, such as a set of large sprinklers.

The following two additional processes will consume water, or eliminate water production, however they have not been incorporated into the budget calculations:

- Evaporation from the No. 1 Open Cut pond; and,

- Elimination of a part of the surface water make from Catchment Q_{C5} - The area of Catchment Q_{C5} will be gradually reduced by up to 50%.

7.7.4 Monitoring Objectives

Monitoring should be carried out to confirm that the water management system is effective, and that the impacts of mining are consistent with the predictions made in this study and the various licence conditions.

In Year 1, water pumping volumes should be reviewed on a weekly basis to track the change in storage at the mine, and to determine the appropriate mitigation measure or measures which may be required for mine water storage, if wet conditions occur.

The monitoring data will be reviewed annually and it is recommended that more thorough reviews be carried out at the beginning of Year 2, when the lower levels of Lewis Seam underground workings are intersected in the highwalls, and when the development of the alternative entry to the Sandy Creek Colliery may be commenced.

7.7.5 Water Management System Monitoring

It is recommended that flow meters be installed at key points in the water management system to monitor water flows (if they are not already installed). Recommended locations include:

- Pipelines to the No. 2 Underground storage;
- Pipelines to the Workshop Dam;
- Pipelines to and from the No. 2 Open Cut Pit;
- Pipelines to and from the No. 1 Open Cut Pit; and,
- Pipelines to any offsite discharge points.

Water levels in the main water management dams should also be monitored regularly to assist with water balance calculations and to ensure sufficient freeboard is always available to contain the run-off from design storms specified in consent conditions, or by statutory authorities.

Water quality monitoring at the current monitoring locations should be continued.

7.7.6 Groundwater Levels and Quality

The two bores that measure water in the No. 2 Underground and the St Heliers Colliery are sufficient for groundwater monitoring. A groundwater monitoring program will be put in place. Data from the monitoring program will then be used as a control on the mine water management system.

It is recommended that water quality in the workings be analysed on an annual basis throughout the life of the project.

7.7.7 Mine Water Levels in Old Spoil-Filled Open Cut Pits

Water levels in the tracts of spoil-filled open cut pits (the old southwest extensions of the No. 2 Open Cut) that will be intersected by the proposed extension in Years 4 to 9 should be determined prior to mining. It is recommended that at least one borehole be drilled into the deepest part of these filled areas (with drilling conducted to the base of the spoil), and water levels obtained. If water is present, the volume of stored water can be estimated, and appropriate mitigation measures formulated.

7.7.8 Licensing and Regulatory Considerations

Various licences are required under the *Water Act 1912*, especially for construction and use of water management works or water bores. The main licences which may be required for the proposed development are those that are covered under Section 10 of the *Water Act 1912*. This section deals with licences "to construct and use a work, and to take and use water, if any, conserved, or obtained by the work, and to dispose of the water for the use of occupiers of land".

The following is a list of activities that may require licensing:

- Construction of drains and settling dams in, and taking water from, ephemeral water courses associated with the works area;

- Construction of an open cut mine (No. 1 Open Cut Extensions A and B) and taking and using surface water and groundwater entering the mine; and

- Construction of dams with a total storage capacity in excess of the (MHRDC).

It is possible that further licences may be required once mine designs are finalised or when parts of the system are modified. These will be applied for at the time.

Licences would also be required under Section 116 of the *Water Act 1912* to commence, enlarge, deepen or alter a bore for dewatering purposes.

When the *Water Management Act 2000* becomes operative, applicable licences will be required under the following sections:

- Section 90 Water management work approvals to construct and use water supply works, drainage works, and flood works; and

- Section 91 Activity approvals to carry out a controlled activity (that is, removal or deposition of material that affects the quantity or flow of water in a water source) or to carry out an aquifer interference activity.

A Farm Dams Property Assessment should be conducted, in the context of the proposed development, for any new dams that are to be built. Existing mine water system dams should be included. MCC has made application to the DLWC for existing mine water system dams to be registered.

7.8 Air Quality

The Air Quality Impact Assessment conducted by Holmes Air Sciences Pty Limited shown in **Appendix E** concluded that no properties would be expected to experience concentrations of either PM_{10}, TSP or dust deposition above the appropriate goal or standard as a result of the proposal.

The review of recent air quality and meteorological data for the area determined that annual deposition rates and ambient air quality in the nearby residential areas is within the NSW EPA's ambient air quality criteria. These conclusions indicate that dust emissions in the area are currently being managed satisfactorily.

Measures to be taken by MCC to minimise the generation of dust include:

Equipment Method and Selection of Work

MCC will not use draglines in its operations. The equipment selected for the removal of coal and overburden addresses potential safety issues and environmental factors. Materials can be very selectively mined and placed with the minimum dust generation.

Low Surface Disturbance During Blasting.

MCC have a blasting protocol in place that is designed to minimise overpressure, ground vibration and dust impacts.

Using Water Infusion During Blasting.

In areas with high propensity for dust generation the use of water infusion will be used. This involves pumping water from underground storage areas and then allowing water to gravity feed though blastholes that have intersected underground workings or areas of high heat. The water percolates through the affected strata and back to the same underground storage area.

Overburden Dumping

Overburden which has a high fines component and therefore, higher levels of dust generation will be placed at lower levels within the inpit dump. Materials that are still hot will also be placed low down in the pit area and capped with inert material.

Spray Usage

Water carts equipped will be used to reduce dust during loading and unloading of trucks and to damp down haul roads to reduce dust generated by trucks hauling coal or overburden.

Delayed Mining for High Dust Make Areas

When areas are identified as having a high dust potential mining can be suspended until more suitable conditions exist. Suitable conditions can consist of meteorological conditions such as during rain or favourable wind conditions.

Dust Generation During Mining of Coal

The use of wetting agents developed specifically developed for coal will be trialed in the suppression of dust.

Dust Suppression at Crushing and Stockpile Areas

Water sprays will be fitted to the ROM receival hopper, crusher and stackout facilities and will run while coal is being crushed or conveyed. Stockpiles storage time will be monitored as not to exceed the incubation period for coal to be effected by spontaneous combustion.

Off-site Transport of Coal

All trucks transporting coal from MCC have covers placed over the load to prevent coal dust being generated during transport of coal to local power stations or the RCT.

7.9 Indigenous and Non- Indigenous Heritage

7.9.1 Indigenous Heritage

The management recommendations outlined below are aimed at mitigating development impact on the archaeological resources of the study area. These recommendations outline recommended procedure for the known sites within the development area, and the correct procedure if development works uncovers additional archaeological resources.

An important feature of the following recommendations for the management of Indigenous archaeological resources is the ongoing involvement with the relevant Aboriginal communities – the Upper Hunter Wonnarua Council, the Wonnarua Tribal Council, the Lower Hunter Wonnarua Council, the Wanaruah Local Aboriginal Land Council and the Wonnaruah Nation Aboriginal Corporation. This should be maintained throughout the development process and copies of all heritage assessments and recommendations should be made available to each community group. This form of community involvement is a standard requirement of the NSW National Parks and Wildlife Service in approving permits and applications, and is also a vital component of obtaining consent for proposed development works.

The management recommendations outlined below are aimed at mitigating adverse development impact on the archaeological resources of the study area. These recommendations outline the preferred management for all known sites during the development, and the correct management of procedure if additional archaeological resources are uncovered during construction.

Additionally, an Archaeological Management Plan (AMP) has been recommended for the proposed MCC development, and this discussed in reference to both known and potential archaeology of the study area.

Known Archaeological Sites

Site 37-2-0104, the scarred tree registered with NPWS, has been destroyed at some prior date and is not considered in the below recommendations.

1) No site within the MCC proposed extension limits can be disturbed without approval from the NSW National Parks and Wildlife Service.

   If the site in question cannot be avoided in development planning, it is recommended that a "Consent to Destroy" permit be applied for from the NSW National Parks and Wildlife Service. These permits are granted under Section 90 of the *National Parks and Wildlife Act (1974)*. Archaeological and Aboriginal Cultural Heritage assessments are essential in obtaining such permits, with concurrence from both the archaeologist and Aboriginal communities. The form must be lodged by a qualified archaeologist and have the signatures of both the owner and applicant of the development. Planning time must be allocated for this permit application as processing time for these permits are officially up to 8 weeks, but frequently take longer.

2) The following sites within the study area have been determined as of low archaeological (scientific) significance. No further archaeological assessment is recommended for these sites prior to the commencement of works. It is therefore recommended that Consents to Destroy be applied for and the artefacts be collected from:

   a) M-2,
   b) M-3, and
   c) M-4.

3) Although site M1 (an occupation site) was also assessed to be of low archaeological (scientific) significance, this assessment identified the potential for subsurface archaeological materials at site. Consequently, additional archaeological research is recommended to clarify the archaeological resources of this site prior to the commencement of works.

   This should consist of subsurface archaeological testing at the site, conducted by a qualified archaeologist in conjunction with representatives of the local Aboriginal community groups. This form of excavation will require the consent of the NSW National Parks and Wildlife Service, through the submission of a Consent to Destroy permit for site M1 as the excavation will destroy the known site. The permit application will need to include a research design prepared by a qualified archaeologist and outlining the proposed methodology for the excavation of the site. Additionally, the surface materials of the site should be recorded in detail prior to excavation.

4) Site M-6 (a scarred tree) has been assessed to be of moderate archaeological significance. The tree is located on the existing boundary of the MCC proposed development area, being positioned on the northern boundary of Extension A. Due to its' positioning, it is considered possible that the tree may be retained in its current position during the development.

   It is strongly recommended that the tree be retained in situ.

   If the tree is to be retained in its current position, its' the proximity to the proposed development may result in indirect impacts from the construction works, such as from the movement of

vehicles close to the site. To minimise any such indirect impacts, the following management recommendations are made:

a) The tree should be appropriately fenced prior to the commencement of works to clearly identify the site to construction workers.

b) The area defined by the fencing should be approximately 5m by 5m around the base of the tree.

c) This should be done with star pickets and iridescent para webbing for maximum visibility.

However, if direct disturbance to the tree is the only feasible option, the relocation of the tree may be required so that it can survive and maintain part of its heritage significance. The successful relocation of a mature tree is difficult, and it is primarily recommended that an arboreal specialist conduct an inspection of the tree to determine its health and status, and the probability of it surviving excavation and relocation.

5) Site M-5 (a scarred tree) has been assessed to be of moderate archaeological significance. Although its retention in situ is the preferred management strategy for the site, its central positioning within Extension A may require that it be relocated so that it can survive and maintain part of its heritage significance.

As above, the successful relocation of a mature tree is difficult, and it is primarily recommended that an arboreal specialist conduct an inspection of the tree to determine its health and status, and the probability of it surviving excavation and relocation.

If it is concluded that the tree has any chance of surviving relocation, the following recommendations are made:

a) The relocation of the tree will require approval from the NSW National Parks and Wildlife Service, as its removal from its *in situ* position with destroy the location significance of the tree and may also result in its complete destruction. This will require the submission of a Consent to Destroy permit with a attached research design outlining the proposed methodology of the tree's relocation and its final position.

b) A professional mature tree transplanting company should be employed to conduct the excavation and relocation. The likelihood of the tree surviving its initial excavation will rely on a number of factors, such as sufficiently large equipment to collect the maximum amount of root material, which will require specialist assessment and execution.

c) The tree should be relocated within an environment similar to its original position, in regards to soils and landscape. Its final location should be retained as close to its original position as possible, which should be determined through discussions with an arboreal specialist, MCC staff, a qualified archaeologist, the local Aboriginal community groups and the NSW National Parks and Wildlife Service.

If the initial arboreal inspection indicates that the tree will have no chance of successfully surviving relocation, the tree's removal will be necessary to partially retain its heritage significance. In this scenario, the following recommendations are made:

a) The removal of the tree will require approval from the NSW National Parks and Wildlife Service, as this will result in the destruction of this site. This will require the submission of a Consent to Destroy permit (Section 90).

b) That during the removal of the tree, the section of the trunk containing the scar be separated from the remaining tree and removed for its protection.

c) The removal of the tree should be conducted by an arboreal specialist, and monitored by a qualified archaeologist and the local Aboriginal community groups involved. This monitoring will be required to ensure that the scar itself is not damaged during the works.

d) The final location for the storage and/or display of the removed section of the tree should be determined through discussions between MCC staff, the local Aboriginal community groups involved and the NSW National Parks and Wildlife Service.

e) Further, advice from a materials conservator specialist regarding the storage and/or display of the tree section should be acquired for the successful preservation of the scar.

f) The submission of the Consent to Destroy permit to the NSW National Parks and Wildlife Service will require the submission of a research design outlining the proposed methodology to remove the tree, the archaeological monitoring of the tree's removal, and its management following removal. This will need to be prepared and submitted by a qualified archaeologist.

Additional Archaeological Materials

If any additional archaeological materials are be uncovered during construction, the following management procedure is recommended:

1) Work must cease immediately to enable archaeological assessment.

2) The NSW National Parks and Wildlife Service should be notified, as a "Consent to Destroy" permit can only be obtained through this agency.

3) An archaeological and cultural assessment will need to be undertaken as part of this permit application process. Typically, this will require an archaeologist and representative of the relevant Local Aboriginal Land Councils to attend the site, make an assessment and lodge the appropriate documents.

Archaeological Management Plan

It is recommended that an Archaeological Management Plan (AMP) be developed for the management of the known and potential archaeological resources within the proposed MCC extension area. This AMP would need to outline the management of the sites and areas identified by this report, being:

- Sites M-1 to M6, and

- The subsurface potential of Site M-1,

The management recommendations presented for the above sites in this report could be utilised as the basis of the AMP policies regarding the sites.

Two additional issues have also been identified by this assessment, and will need to be addressed in the AMP. These are:

- The low visibility within Extension A of the proposed development, and
- The subsurface potential for archaeological materials within the study area.

This report identified a number of constraints affecting the effective assessment of the study area, specifically the low visibility conditions within Extension A at the time of survey. This low level of visibility significantly restricted the *effective coverage* of the archaeological survey within Extension A, which limited the assessment of the study area. As much of this area has been assessed to be of moderate archaeological sensitivity, based on the archaeological patterning of the region and landscape analysis, it is considered likely that additional archaeological materials will be found within this area. This conclusion was reinforced when four additional sites - two occupation sites and two scarred trees - were identified within Extension A.

To rectify this imbalance in effective survey coverage, it is recommended that Extension A is subject to re-survey after clearance. This survey should maintain the landform unit divisions delineated by this assessment, and aim to cover a proportionate area of each landform unit.

Discussions with MCC staff have indicated that the clearance of the proposed extension area will be conducted in stages over a five-year period, as the development progresses. The archaeological re-survey of Extension A could therefore be conducted in two alternate ways:

1) *Re-survey to be conducted in stages as the work progresses.*
   As each area is cleared prior to development, the archaeological survey could have access to the entire cleared area. However, it should be noted that if additional materials are found they will need to be assessed and managed during the construction phase, which could slow the timing of MCC works.

2) *Re-survey to be conducted prior to development, through clearance of sample transects.*
   Prior to the commencement of works, a number of transects are cleared across Extension A through slashing (low impact clearance). These transects could be assessed for archaeological materials, and could be utilized as basis for assessing the archaeological potential of the remaining Extension A.

Details of the timing and methodology of the survey will need to be clarified as part of the AMP, and if any additional archaeological materials are identified as a result of these surveys, management

recommendations will need to be formulated for their management during development and incorporated into the AMP.

The subsurface potential for archaeological materials within the study area was also identified by this assessment as a heritage issue. As stated, this assessment defined much of the study area is of moderate archaeological sensitivity, based on the archaeological patterning of the region and landscape analysis. Although no specific PADs were identified by the assessment, it is considered possible that subsurface archaeological materials will be found within the study area. This was also indicated within one known site – M-1 – where archaeological materials were exposed through previous subsurface disturbance.

A subsurface testing program is therefore recommended for the study area, and this should be incorporated into the AMP. At present, subsurface testing is only recommended for one locality:

- Site M-1;

due to the potential archaeological deposit (PAD) identified at the site. This form of excavation will require the consent of the NSW National Parks and Wildlife Service (Consent to Destroy permit) for Site M1 as the excavation will destroy the site. The permit application will need to include a research design prepared by a qualified archaeologist and outlining the proposed methodology for the excavation of the site. This subsurface testing work should be conducted by a qualified archaeologist in conjunction with representatives of the local Aboriginal community groups.

In addition, the results of the additional survey of Extension A may lead to the extension of this archaeological subsurface testing program. If further research prior to development is recommended following the additional landscape survey, the sampling of the study area through archaeological subsurface testing may be recommended. This would consist of the sampling of the study area, through testing of all the landscape units defined by this assessment. These will include:

a) LFU 1: Ridge Crests,
b) LFU 2: Hillslopes,
c) LFU 3: Steep Hillslopes, and
d) LFU 4: Lower Order Streams.

If this form of subsurface testing is recommended, it will require the consent of the NSW National Parks and Wildlife Service, through the submission of a Preliminary Research Permit. As above, a research design will need to be submitted to the NPWS as part of this permit application, prepared by a qualified archaeologist and outlining the proposed methodology of the excavations. The subsequent subsurface testing work should be conducted by a qualified archaeologist in conjunction with representatives of the local Aboriginal community groups.

An important feature of the development of the AMP will be consultation between all of the following groups:

- NSW National Parks and Wildlife Service,
- Upper Hunter Wonnarua Council,
- Wanaruah Local Aboriginal Land Council;
- Wonnarua Tribal Council,
- Wonnaruah Nation Aboriginal Corporation,
- Lower Hunter Wonnarua Council,
- Muswellbrook Coal Company, and
- A qualified archaeologist.

This form of consultation will be required to determine the timing of works, the methodology of works and the role of each group in the works. This will need to be established in the preliminary stages of the AMP.

7.9.2 Non-Indigenous Heritage

The management recommendations outlined below are aimed at mitigating development impacts to the known and potential non-Indigenous heritage of the study area.

Known Heritage Items

Only one non-Indigenous heritage item was identified by this assessment as potentially impacted by the proposed development – the Muswellbrook Brickworks. Although not located within the study area, the item may be indirectly impacted from the adjacent development through dust, vibration and noise.

The Muswellbrook Brickworks have been identified as an item of local heritage significance on the Hunter Valley Regional Environmental Heritage Schedule and on the Muswellbrook Shire Heritage Register. It cannot therefore be disturbed in any way without the consent of the Muswellbrook Shire Council.
However, the impact from the proposed development on the Brickworks has been assessed by be minimal, with the Brickworks substantially removed from the proposed works.

As such, no specific management recommendations are presented for the Brickworks during development. However, the proximity of the Brickworks to the development has been identified as a heritage issue and if any alterations are made to the existing development plans, the development impact on the Muswellbrook Brickworks will require reassessment.

Additional Heritage Items

As, under Section 139 of the *Heritage Act* (1977 as amended 1998), no relic can be disturbed in any way without the approval of the NSW Heritage Office, the following management recommendations are made in the event of the discovery of additional non-Indigenous heritage items:

1) Upon discovery of the relic, work must cease immediately while the proper authority is contacted (the NSW Heritage Office) and a permit determination is made.

2) Relics can only be disturbed with an approved Excavation Permit (Section 140) as issued from the NSW Heritage Office.

3) Archaeological assessments are essential in obtaining such permits, and will require an archaeologist to make an on-site assessment and lodge the appropriate documents.

7.10 Hazards

The activities to be conducted within the No. 1 Open Cut Extension generally carry the same level of risks as that of existing operations at the mine. The extensive freehold land holdings of MCC surrounding the No. 1 Open Cut Extension help to remove the public from the risks associated with mining which would occur if there were uncontrolled access to features such as the mining highwalls or the subsidence zone.

The proposed No. 1 Open Cut Extension provides a means to eliminate the hazard caused by subsidence 'potholing' to the north of Coal Road. In its current from the risk of 'potholing' is reduced by measures such as the construction of a security fence around the subsidence zone and actions taken to fill potholes with inert material. However, the area affected by potholing, whilst able to be predicted, is not known with certainty. Potholes that have formed outside of the security fence indicate that there is a risk for potholing to occur in places and at times not able to be predicted with certainty.

The No. 1 Open Cut Extension will mine through the area of potholing and remove this potential hazard. The rehabilitated landform that will be constructed following mining will be stable and in a form that is safe to the public and wildlife.

7.11 Social and Economic

The No. 1 Open Cut Extension proposal, if approved, will maintain the existing social and economic benefits that are derived from the provision of employment and demand for services. These benefits are significant to the Upper Hunter Region, and the towns and surrounding districts of Muswellbrook, Singleton, Scone and Aberdeen.

As there is assessed to be no significant adverse social or economic impact from the continuation of operations and employment at MCC. No measures are proposed in relation to mitigation of adverse impacts.

7.12 Community Relations

An environmental officer is employed by the mine whose role includes the receipt and response to environmental complaints and the provision of information to the community and regulatory agencies. An environmental officer will continue to be employed by MCC. As outlined in **Section 4.9** MCC also

has a 24 hour hotline for the public to contact MCC. MSC also has an environmental hotline for public enquiries about any of the mines that operate within the Shire.

A Complaints Register is currently used by MCC to record information in respect to any incident hazard or risk related to health, safety or the environment. This facility will be extended to include the operations of the proposed No. 1 Open Cut Extension.

The MCCCCC will continue and be extended to cover the operations of the proposed No. 1 Open Cut Extension. This Committee will provide a direct line of communication for representatives of the local community. It is anticipated that this Committee will provide an effective means of feedback to MCC on measures undertaken to mitigate adverse effects on the environment and suggestions in terms of potential improvements in environmental performance and community relations.