



WHITEHAVEN COAL

Narrabri Coal Operations Pty Ltd

ABN: 15 129 850 139



Narrabri Coal Mine Stage 2 Longwall Project Aboriginal Heritage Assessment

Prepared by:
Archaeological Surveys & Reports Pty Ltd

November 2009

**Specialist Consultant Studies Compendium
Volume 2, Part 5**

Narrabri Coal Operations Pty Ltd

ABN: 15 129 850 139

Narrabri Coal Mine Stage 2 Longwall Project Aboriginal Heritage Assessment

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EXECUTIVE SUMMARY

This investigation was performed for R.W. Corkery & Co. Pty Limited (RWC) on behalf of Narrabri Coal Operations Pty Ltd (NCOPL). NCOPL has contracted R.W. Corkery & Co. Pty Limited (RWC) to prepare an Environmental Assessment to support its application for project approval for Narrabri Coal Mine Stage 2 Longwall Project (the “Longwall Project”) as a Major Project under Part 3A “Major Projects” of the *Environmental Planning & Assessment Act 1979* (EP& A Act). NCOPL is a joint venture between Narrabri Coal Pty Ltd, Upper Horn Investments (Australia) Pty Ltd, J-Power, Daewoo and Kores. Narrabri Coal Pty Ltd is a 100% subsidiary Company of Whitehaven Coal Limited, which is a publicly listed Company.

Following a previous archaeological investigation of the Pit Top Area by Australian Archaeological Survey Consultants Pty Ltd (AASC, 2007), completed to accompany an Environmental Assessment for Stage 1 of the Narrabri Coal Mine, Project Approval (PA) 05_0102 was granted by the Minister for Planning on 13 November 2008 in accordance with Part 3A of the EP&A Act.

The Narrabri Coal Mine is located approximately 30km south-southeast of Narrabri and 10km north-northwest of Baan Baa, on the north-western slopes of the Northern Tablelands in New South Wales. In this report, the Mine Site corresponds with ML 1609 and the Mining Area corresponds with the total area overlying and corresponding with the proposed 26 longwall panels to be mined over the projected life of 30 years of the mine.

RWC engaged Archaeological Surveys & Reports Pty Ltd (ASR) to undertake an archaeological investigation within the Mine Site and a water pipeline corridor to the Mine Site to identify sites and/or places of Aboriginal cultural significance and to provide recommendations, in consultation with Aboriginal stakeholders, to manage all archaeological sites identified. A total of four surveys were undertaken across areas proposed to be disturbed throughout the longwall Project.

1. A detailed survey of an area above the underground footprint of Longwall Panels 1 to 7 (referred to as “Panels 1 to 7 Survey Area”).
2. A reconnaissance survey of an area above the underground footprint of Longwall Panels 8 to 26 (referred to as “Panels 8 to 26 Survey Area”).
3. A detailed survey across the footprint for the brine storage ponds (referred to as the “Brine Storage Pond Survey Area”).
4. A detailed survey along the route of the proposed water pipeline route between the mine site and the Namoi River (referred to as the “Water Pipeline Survey Area”).

Consultation

The scope of works was for ASR to consult with Aboriginal stakeholders in accordance with “Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation” (DECC 2004), and to undertake an investigation of the survey areas with the assistance of representative/s of the Aboriginal stakeholders, to identify any Aboriginal sites and relics that might be present within the Survey Areas. The results of the investigation were to be presented in a report, which was to include an assessment of the significance of any cultural relics or places identified, an appraisal of the options and opportunities arising from the discoveries, and clear recommendations for the management of those cultural resources.

Panels 1 to 7 Survey

Consultation with registered Aboriginal stakeholders was undertaken in accordance with the “Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation” (DECC 2004). Subsequently the field investigation of the Panels 1 to 7 Survey Area was undertaken with the assistance of

- Kristie Toomey, Sites Officer, Narrabri Local Aboriginal Land Council (LALC);
- Mick Trindall, Sites Officer, Narrabri Gomeroi Traditional Owner Group (Gomeroi).

Forty-three sites were recorded during the survey within the Panels 1 to 7 Survey Area. Of those, there was one scarred tree, and one fireplace. There were 12 sites containing isolated artefacts and 19 sites in which there were five artefacts or less, and nine sites that contained more than five artefacts. Of these, only seven sites contained 10 or more artefacts, and only one was believed to contain more than 100 artefacts.

Whilst many of the sites were of low density, and individually of very low cultural and scientific significance, several of the sites, and one in particular, Site 39, an extended open artefact scatter of over 200 artefacts was assessed to be both cultural and scientific significant. From the variety of materials present, and from the low cortex percentages for those artefacts, it appears that Site 39 was used as camp site along a route along Pine Creek 2. The sites were probably visited on many occasions and represent an aggregation of sites, or sites where people regularly camped on their way through the Panels 1 to 7 Survey Area.

Site Recording Forms will be lodged with DECCW to list the sites on the AHIMS Site Register.

While ASR recognises that having received project approval under Part 3A of the EP&A Act for the proposed extension to its existing coal mining operations, that Narrabri Coal is not required by legislation to redesign its proposed development plans to avoid impacting upon the sites, it is recommended that NCOPL, subject to the constraints imposed by mine safety considerations, should, wherever possible, consider directing activities from ground-surface mine development to avoid the archaeological sites.

It is further recommended that in the event that they can be avoided, that sites 10, 19, 38 and 39 should be fenced off with fluorescent para-webbing to protect them from inadvertent or accidental damage from vehicular traffic, until such time as surface activities in the vicinity of those sites have been completed. At that time, the fencing should be removed to allow the cattle to continue to crop the site areas, and thereby provide a measure of weed control and potential grass-fire hazard reduction that would otherwise not occur if the fencing was to remain.

The fenced-off areas around Sites 10, 19, 38 and 39 should be described as ‘Environmental Protection Zones’ to avoid damage to the sites that might otherwise occur if they were described as Indigenous or Culturally Sensitive Areas.

With regard to other sites not specifically referred to above, it is recommended that they should be avoided wherever possible, but where it is not possible, that the archaeological material in the affected sites should be salvaged by the archaeologist assisted by Sites Officers representing Narrabri LALC and Narrabri Gomeroi Traditional Owner Group.

Panels 8 to 26 Reconnaissance Survey

A reconnaissance survey was undertaken of the area above Panels 8 to 26 to substantiate the representativeness of the results of the investigation of the Panels 1 to 7 Survey Area for the whole of the Mining Area; and to provide a larger basis on which to assess the cumulative impact of salvaging some of the sites in the Panels 1 to 7 Survey Area containing fewer than ten artefacts per site. The survey of the Panels 8 to 26 Survey Area was targeted at those environments that were similar to those in Panels 1 to 7 Survey Area in which the majority of sites had been recorded.

The investigation was undertaken over seven days, from 6th to 14th July, with Matt Trindall and Tahnesha Trindall - on different days (of Narrabri LALC) and Mick Trindall and Patrick Sevil (of Gomerioi).

As a result of the reconnaissance survey an additional 69 sites were recorded. An analysis of the results established that, as occurred in the Panels 1 to 7 Survey Area, approximately 80% of all sites contained five or fewer artefacts. Similarly, only one location contained a number of sites in which there were more than 20 artefacts per site, and that occurred at the confluence of two tributaries of Kurrajong Creek at the southern end of Panel 23.

The representativeness of these results is borne out by the analysis of the collective results for the surveys of Panels 8 to 26, the Brine Storage Area, and the Water Pipeline Route, which show that of 121 sites, 97 (81.51%) contained 1 to 5 artefacts, 13 (10.92%) contained 6 to 10 artefacts, 5 (4.20%) contain 11 to 20 artefacts, and four sites (3.37%) contained in excess of 20 artefacts. In simple terms four in every five sites will contain five artefacts or less, and only four in 121 sites will contain more than 20 artefacts.

Site Recording Forms will be lodged with DECCW to list the sites on the AHIMS Site Register.

Brine Storage Area Survey

An additional archaeological investigation was required for the Brine Storage Area, and Matt Trindall (of Narrabri LALC) and Mick Trindall and Patrick Sevil (of Gomerioi) assisted in the survey which took place on 29th July 2009.

Nine sites were recorded, all sites containing five or fewer artefacts. The maximum number of artefacts in any one site was five, and if all nine sites are to be salvaged only 23 artefacts would be removed, however it is probable that only six of the sites – containing 15 artefacts, would occur within the impact footprint of the Brine Storage Area and require salvaging.

Site Recording Forms will be lodged with DECC to list the sites on the AHIMS Site Register.

Water Pipeline Survey Area

A further archaeological investigation was required for a proposed water pipeline route between the Mine Site and the Namoi River. Mick Trindall and Patrick Sevil (of Gomerioi) assisted in the survey which took place on 30th July 2009.

No sites of Indigenous cultural significance were recorded within the Water Pipeline Survey Area.

As in all projects, NCOPL is reminded that while project approval under Part 3A of the EP&A Act negates the provisions and constraints that might otherwise apply under existing legislation that it should be cognisant of the provisions of the National Parks & Wildlife Act 1974 (as amended) with regard to skeletal remains.

The owners, and their employees, earthmoving contractors, subcontractors, machine operators and their representatives, whether working in the survey areas or elsewhere, should be instructed that in the event of any bone being unearthed during earthmoving, work should cease immediately in the area of the find.

In the event that any bone cannot be clearly identified by a qualified archaeologist as being of animal remains the police are to be informed of its discovery, and officials and/or their representatives of the Narrabri Local Aboriginal Land Council, and the Narrabri Gomeroi Traditional Owner Group, advised that the bone is subject to police investigation.

Work should not recommence in the area of the find, until both the police (if bone has been found) and those officials or representatives have given their permission to do so. Those failing to report a discovery and those responsible for the damage or destruction occasioned by unauthorised removal or alteration to a site or to archaeological material may be prosecuted under the National Parks and Wildlife Act 1974, as amended.

1 INTRODUCTION

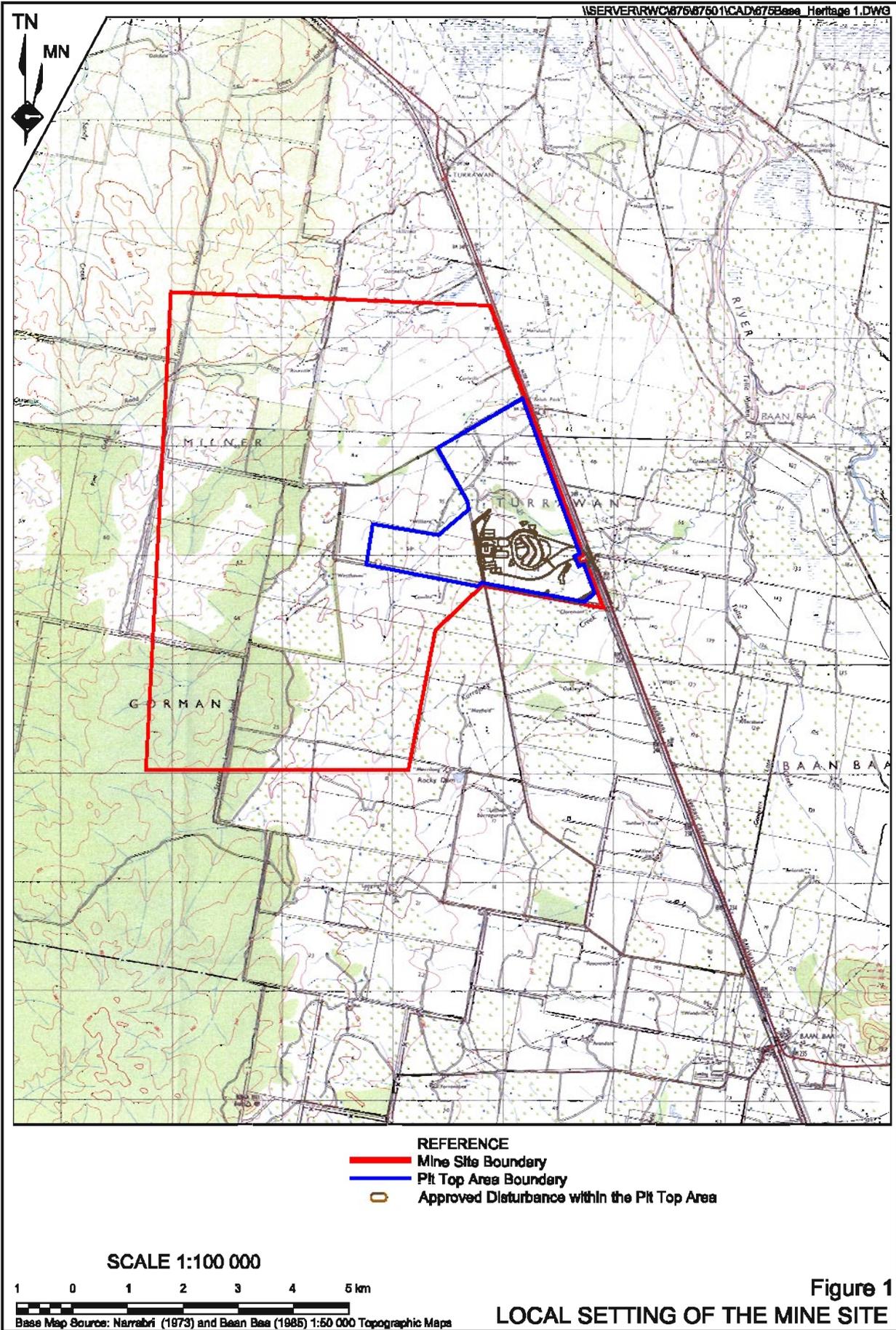
This investigation was performed for R.W. Corkery & Co. Pty Limited (RWC) on behalf of Narrabri Coal Operations Pty Ltd (NCOPL). NCOPL has contracted R.W. Corkery & Co. Pty Limited (RWC) to prepare an *Environmental Assessment* to support its application for project approval for the Narrabri Coal Mine Stage 2 Longwall Project (the “Longwall Project”) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). NCOPL is a joint venture between Narrabri Coal Pty Ltd (77.5%), Upper Horn Investments (Australia) Pty Ltd (7.5%), J-Power (7.5%), Daewoo (5%) and Kores (2.5%). Narrabri Coal Pty Ltd is a 100% subsidiary Company of Whitehaven Coal Limited, which is a publicly listed Company. The Narrabri Coal Mine is approximately 30km south-southeast of Narrabri and 10km north-northwest of Baan Baa, on the north-western slopes of the Northern Tablelands in New South Wales. **Figure 1** displays the local setting of the Mine Site.

Following a previous archaeological investigation of the Pit Top Area by Australian Archaeological Survey Consultants Pty Ltd (AASC, 2007), completed to accompany an Environmental Assessment for Stage 1 of the Narrabri Coal Mine, Project Approval (PA) 05_0102 was granted by the Minister for Planning on 13 November 2008. PA 05_0102 approves the mining (by continuous miner) and rail transport of up to 2.5 million tonnes of ROM coal per year for a period of 21 years from the granting of a mining lease. The Pit Top Area (of 757ha) encompasses all surface infrastructures except for the Ventilation Shaft Areas and disturbance associated with mine ventilation and gas drainage. The Pit Top Area includes the site access road, the rail loop, the ROM and product coal pads, coal handling and preparation facilities (including a coal preparation plant), reject emplacement area, brine storage ponds, box cut and drift portals, and all surface building and service infrastructure.

1.1 Background and Scope

NCOPL proposes to convert the approved Stage 1 Narrabri Coal Mine from a continuous miner operation (with an approved annual production rate of 2.5Mtpa) to a longwall mining operation with a maximum annual production rate of 8Mtpa. **Figure 2** identifies the critical surface and underground components of the proposed longwall mining operation and differentiates between those activities or infrastructure already approved for the Stage 1 operations and those proposed for the Stage 2, longwall operations. **Figure 2** displays the location of the area to be mined by longwall mining methods, referred throughout this report on the “Mining Area”. The Mining Area has been divided into 26 panels referred to as Longwall Panels 1 to Panel 26. Detailed planning has focussed on the first seven longwall panels (Panels 1 to 7) with indicative planning for the remaining panels (Panels 8 to 26). Detailed mine planning for Panels 8 to 13 would be undertaken towards the end of mining in Panels 1 to 7. Similarly, detailed mine planning would be prepared for Panels 19 to 26. In all cases, the operational experience gained during the previous mining period will be reflected in the mine plans for the subsequent panels.

The Mine Site corresponds with Mining Lease (ML) 1609 and covers an area of 5,210ha. It is noted that with the exception of the brine storage ponds, all of the additional Pit Top Area disturbance identified on **Figure 2**, along with the initial Ventilation Shaft Area, occurs within an area surveyed and assessed by AASC (2007). An Aboriginal Cultural Heritage Management Plan (ACHMP) has subsequently been prepared to manage the impacts of activities within the Pit Top Area on Aboriginal heritage.



Note: A colour version of this figure is available on the Project CD

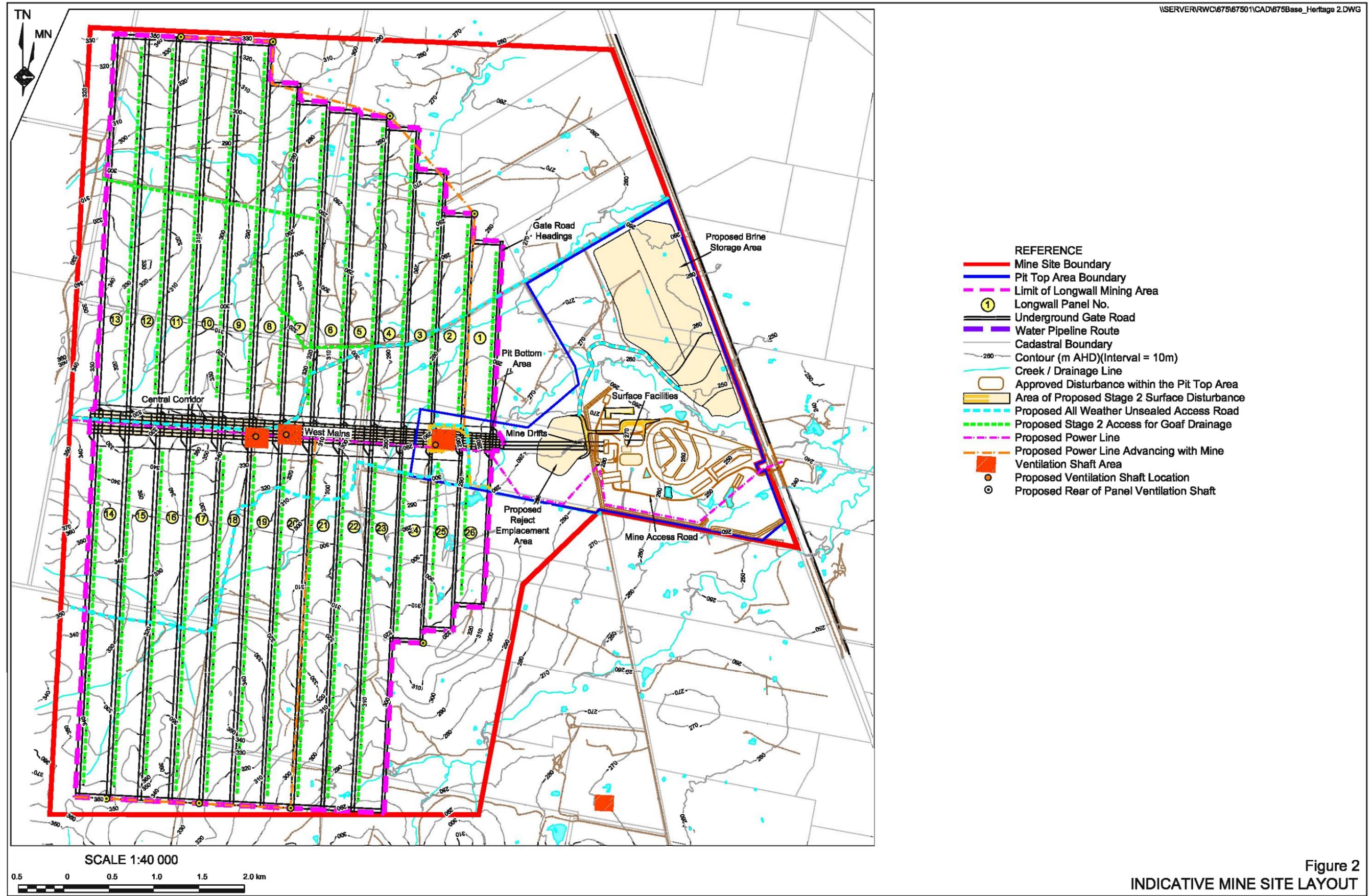


Figure 2
INDICATIVE MINE SITE LAYOUT

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The Longwall Project requires additional surface disturbance beyond the areas surveyed by AASC (2007). These areas, which are identified on **Figure 3**, include the following.

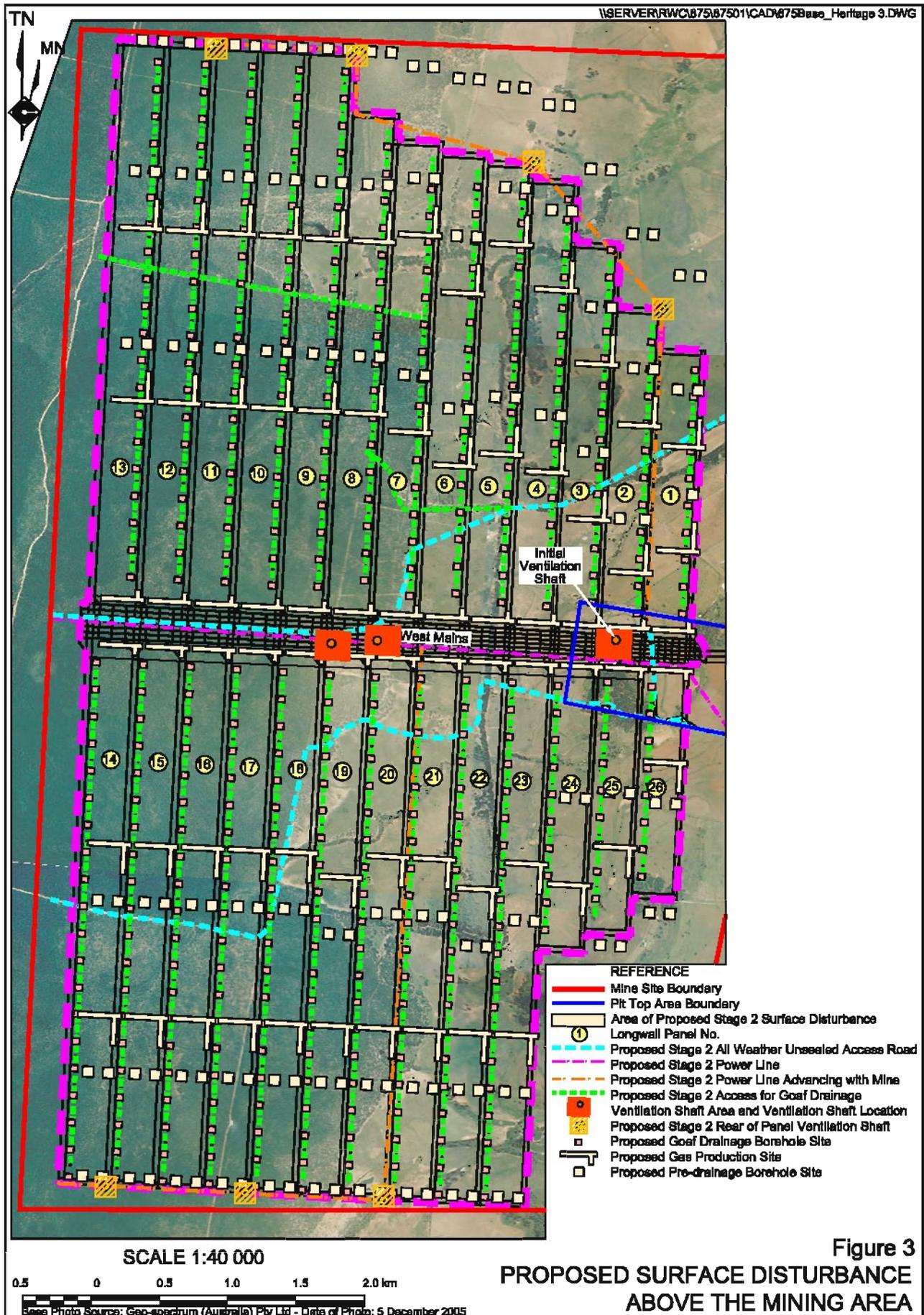
- **Ventilation Shaft Areas.** Sites for the construction and operation of ventilation fans. The current mine design has provided for up to four intake or exhaust fan sites above the West Mains of the underground mine and rear of panel exhaust sites every three to four longwall panels. Each Ventilation Shaft Area would cover an area of up to approximately 5ha.
- **Gas Pre-drainage Sites.** Sites from where medium radius drill holes are bored from surface into and along the coal seam and intersected by a gas pumping well to drain the gas contained within the coal seam prior to mining. The combined area of disturbance associated with each pre-drainage site would be approximately 3.5ha and there would be either two or three pre-drainage sites over each longwall panel (depending on the length of the panel).
- **Goaf Gas Drainage Sites.** Gas concentrating in the goaf of the underground workings would be removed via a vacuum pump attached to the top of a cased 250mm internal diameter borehole. The boreholes would be drilled from surface, at roughly 200m intervals and would therefore require the creation of a drill pad of approximately 50m x 50m dimensions.
- **Access Roads and Service Corridors.** A road and service corridor of approximately 10m in width would be constructed along the tailgate side of each longwall panel along the alignment of the goaf gas drainage sites.
- **Power Line Corridor.** A corridor of approximately 30m wide would be required for the construction of powerlines to service the ventilation fans.

1.2 Scope, Objectives and Report Format

1.2.1 Scope

The scope of works was for ASR to consult with Aboriginal stakeholders in accordance with “Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation” (DECC 2004), and to undertake an investigation of the Survey Areas with the assistance of representative/s of the Aboriginal stakeholders, to identify any Aboriginal sites and relics that might be present within the Survey Areas. The results of the investigation were to be presented in a report, which was to include an assessment of the significance of any cultural relics or places identified, an appraisal of the options and opportunities arising from the discoveries, and clear recommendations for the management of those cultural resources.

Given that the location of the proposed additional areas of surface disturbance associated with the Longwall Project may be varied over the life of the mine depending on the underground conditions experienced, which in turn would influence gas generation and ventilation requirements, an initial detailed survey of the Mine Site considered the areas above Panels 1 to 7 of the underground mine workings to be disturbed by activities associated with the Longwall Project to identify sites and/or places of Aboriginal cultural significance. This area is hereafter referred to as the Panels 1 to 7 Survey Area.



Whilst it was recognised there is less certainty about the long term layout for Panels 8 to 26, it was considered appropriate to undertake sufficient investigations to accurately predict the impacts of the overall project. Rather than undertaking a detailed survey across Panels 8 to 26, it was determined to commence with a desktop assessment for Panels 8 to 26 reflecting the information gained from the detailed survey of the Panels 1 to 7 Survey Area (hereafter referred to the “Panels 8 to 26 Survey Area”). The objective of the desktop survey was to compile a predictive model of Aboriginal site occurrence over the Panels 8 to 26 Survey Area which would be used to develop a field survey methodology for this larger survey area. Following discussion regarding the appropriate approach to the field survey, the reconnaissance survey of those areas of the Panels 8 to 26 Survey Area with a higher probability for Aboriginal site identification was undertaken.

Following a review of the dewatering requirements of the Longwall Project, NCOPL advised that a Brine Storage Area of up to 160ha in area could be required to store the waste water (brine) produced by the reverse osmosis treatment of this water. In addition, a pipeline would be required to transfer and discharge the surplus fresh water (raffinate) produced by the reverse osmosis treatment of this water. The scope of the archaeological investigations was subsequently extended to include a detailed archaeological investigation of the designated Brine Storage Area and proposed water pipeline route between the Mine Site and the Namoi River.

1.2.2 Report Objectives

The objectives of this report are to describe the consultation process and the archaeological investigation of the Survey Areas and to record the archaeological relics and sites that were identified. Further, the report documents the participation of the Aboriginal stakeholders, and their recommendations as to the future management of the sites identified during the investigation. In addition, the report includes a discussion of the results of the investigation in the context of other known sites in the area. Finally, the report includes a statement as to the recommendations for the future development of Narrabri Coal Mine.

1.2.3 Report Format

The report is presented in the following format:

- i Executive summary
- ii Contents
1. Introduction
2. Aboriginal Consultation
3. The Environmental Context
4. The Archaeological Record
5. Models for Site Location
6. The Surveys
7. The Results
8. Discussion
9. Significance Assessment
10. Recommendations.

1.3 The Mine Site, Mining Area and Survey Areas

The Narrabri Coal Mine is located approximately 30km south-southeast of Narrabri and 10km north-northwest of Baan Baa, on the north-western slopes of the Northern Tablelands in New South Wales. In this report the Mine Site corresponds with ML 1609, the Mining Area corresponds with the total area overlying and corresponding with the proposed 26 longwall panels to be mined over the projected 27 year life of the mine, and the Survey Areas subject of this report corresponds with the underground footprint of Panels 1 to 7 (Panels 1 to 7 Survey Area), the areas of higher probability for site identification over the remainder of the Mining Area (Panels 8 to 26 Survey Area), the Brine Storage Area and the water pipeline route between the Mine Site and the Namoi River.

The Mining Area occurs over a number of properties, the majority of which are owned by NCOPL. With the exception of a small portion of the "Newhaven" property owned by K. and J. Scott, the Panels 1 to 7 Survey Area occurs entirely on land owned by NCOPL. **Figure 4** shows the survey areas of Panels 1 to 7, Panels 8 to 26 and the Brine Storage Area relative to the Mining Area and superimposed on the topographic mapping of the Mine Site. **Figure 5** shows the three survey areas superimposed over an aerial photograph of the Mine Site. The survey area of the Water Pipeline Route, which included all relevant road easements and the nominated alignment of the pipeline route on the "Broadwater" property, is not presented.

1.4 Potential Impacts of the Longwall Project

Two sources of potential impact to the archaeological and cultural record have been identified as being associated with the proposed Longwall Project, namely:

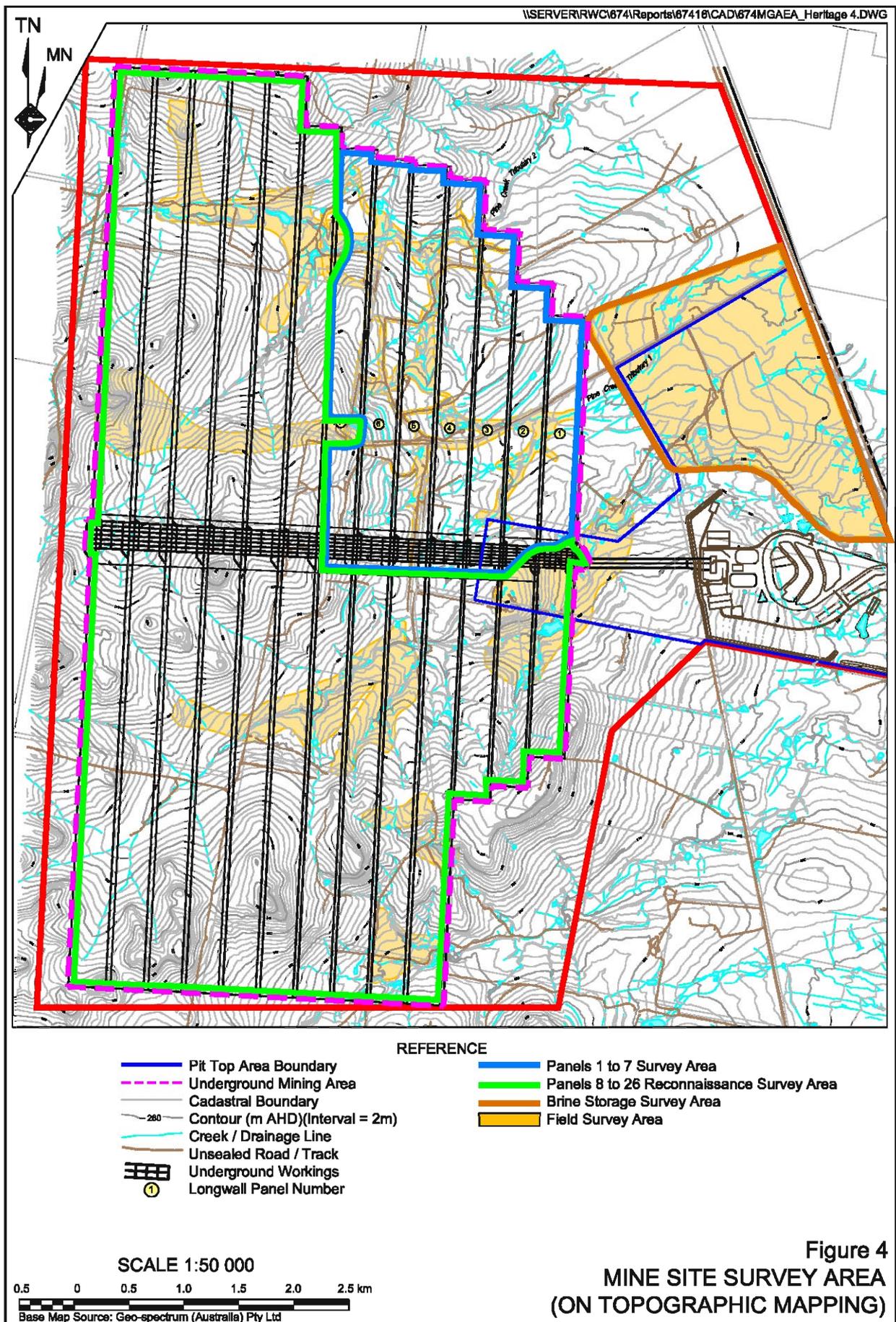
- clearing associated with drilling and operation of ventilation, pre-drainage and goaf gas drainage sites (and associated access and power line corridor construction); and
- surface subsidence resultant from the longwall mining method.

Both effects are complex and technical but for the purposes of this review they have been reduced to simple issues.

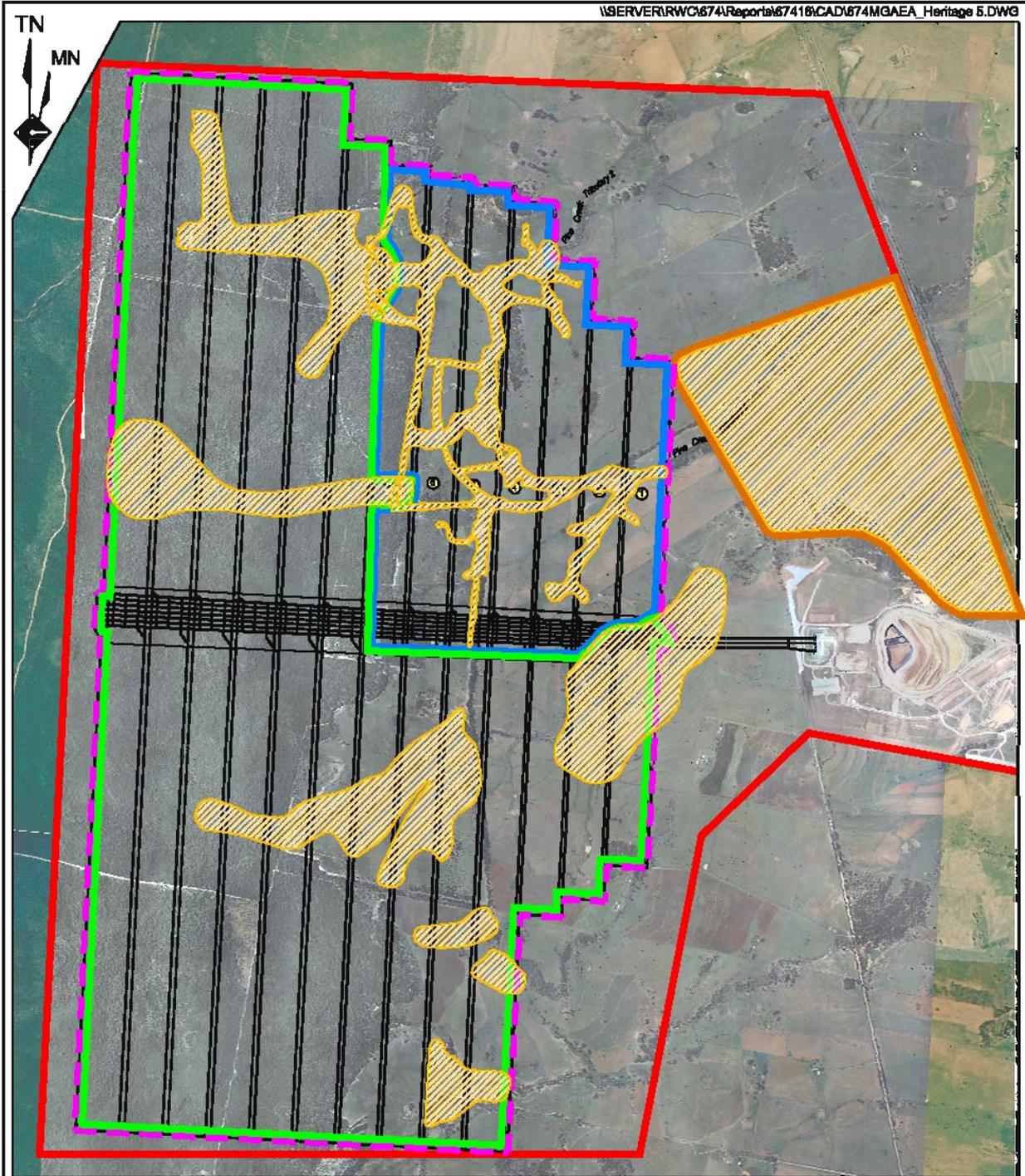
Construction and Operation of Gas Drainage Sites and Ventilation Shaft Areas

Tests conducted by GeoGas Pty Ltd established that gas composition within the mine varies considerably (RWC, 2009). As a consequence, it will be necessary to install a comprehensive mine ventilation system to manage seam gas generated within the mine and to provide a safe working environment for the mine's workforce. To achieve this outcome, gas within the coal seam will have to be pre-drained, gas accumulating within the collapsed goaf of each completed longwall panel removed and the mine ventilated.

Gas pre-drainage would require a number of medium radius diameter Surface to In-seam (SIS) boreholes to be drilled (across the width of each longwall panel) into and then along the length of the coal seam. An area of approximately 80m x 80m would be required for each SIS Borehole Drill Site (0.64ha), however, as with other surface drilling sites, mature trees and other vegetation would be retained where practicable within each site. At the extremity of each set of SIS boreholes, a medium radius vertical pump well would be constructed to intersect each SIS borehole. The current pre-drainage arrangement provides for seven pump wells at each Gas Production Site, requiring an area of approximately 2.9ha. On the basis that three Pre-Drainage Sites would be required for Longwall Panels LW3 to LW24, and two would be required for LW1, LW2, LW25 and LW26, the total area of disturbance would be up to 259ha (66.5ha of which would be incurred within the Panels 1 to 7 Survey Area).



\\SERVER\RW\674\Reports\67416\CAD\674MGAEA_Heritage 5.DWG



- | | |
|--|---|
| <ul style="list-style-type: none"> Pit Top Area Boundary Underground Mining Area Longwall Panel Number | <p>REFERENCE</p> <ul style="list-style-type: none"> Panels 1 to 7 Survey Area Panels 8 to 26 Reconnaissance Survey Area Brine Storage Survey Area Field Survey Area |
|--|---|

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

Base Map Source: Geo-spectrum (Australia) Pty Ltd

Figure 5
 MINE SITE SURVEY AREA
 (ON AERIAL PHOTOGRAPH)

A conceptual goaf drainage design has 250mm internal diameter cased boreholes located about 30m off the tailgate corner of the active goaf at approximately 200m intervals. To provide access for the drilling rigs and vehicles, as well as pipelines and other services, a corridor of 10m would be required between each goaf gas drainage hole. Up to 400 goaf gas drainage sites would be required over the Mining Area, requiring surface disturbance of up to 100ha.

Ventilation shafts of up to 6m in diameter would be constructed to provide for air intake to or ventilation from the underground workings. The preferred construction technique is as blind bores, ie. bored from the surface into the underground workings to depths of between approximately 170m and 320m below surface. The technique involves the drilling of the shaft to the coal seam prior to the development of the roadways in the coal with these roadways intersection the shafts after their final completion. The construction area for each Ventilation Shaft Area would be of maximum dimensions 200m x 250m (5.0ha). The location and number of surface ventilation locations is based on a conservative assessment of ventilation requirements and is therefore likely to provide for more ventilation capacity than may be required, ie. the number of surface ventilation points, and therefore area of surface disturbance is unlikely to exceed that illustrated on **Figure 2**. **Figure 2** provides for ventilation from the West Mains from Maingates 2, 7 and 8, and rear of panels LW2, LW5, LW9, LW12, LW14, LW19 and LW21. Therefore, on the basis that each ventilation shaft area would disturb up to 5.0ha, up to 55.0ha of the Mine Site would be disturbed to accommodate the ventilation requirements of the Longwall Project over the life of the mine.

It is worthy of note that the estimated areas of disturbance provided for represents a maximum area of disturbance. NCOPL would reduce, or consolidate areas of disturbance associated with other activities (eg. access roads).

There is a potential for any archaeological contexts occurring within the footprint of any of the impacts described above, to be severely impacted upon.

Subsidence

NCOPL engaged Ditton Geotechnical Services Pty Ltd (DGS, 2009) to predict and report on the potential impacts from subsidence from longwall mining. In summary, DGS (2009) predicts that while subsidence would occur to varying degrees across the Mine Site the maximum predicted subsidence of 1.6m would occur towards the eastern section of the Mining Area, and up to 2.4m would occur in the western section (DGS, 2009).

The impacts from subsidence are likely to be two-fold: firstly there is the likelihood of differential lowering of the ground surface over large areas; and secondly there is the likelihood that cracking may occur both along the margins of the subsidence, above the line of longwall panels, and within the area of subsidence from differing degrees of subsidence. As a subsequent result of the cracking, further impacts may be caused if material is required to be transported to the location of the cracking to fill and repair the cracks.

The vertical displacement of an archaeological site from subsidence is unlikely to result in damage or alteration to most archaeological sites, however, any lateral displacement caused by variable subsidence across a site containing many artefacts might have significant impact on the integrity of the site and cause displacement of artefacts within the assemblage. Any lateral movement or migration of drainage lines and creek resulting from variable subsidence also has the potential to impact on any scarred or carved trees along the creek banks that might be undermined by a change in channel profile.

In addition, there is the possibility that subsidence could cause fracturing or breakage of any sandstone platforms on which grinding grooves occur.

Naturally, all efforts to try to avoid impacting on Aboriginal sites wherever and whenever possible would be undertaken by NCOPL, however, in some circumstances total avoidance is not possible, and all that can be practically achieved is to minimise the impact or to mitigate the effects of the impact.

In this instance, the frequency and location of gas drainage and ventilation infrastructure is dictated by a requirement to maintain the safety of the underground mine, ie. the coal seam gas poses an extremely high risk to the safety of mine personnel if not removed, and to effectively remove the gas and ventilate the mine requires the specific placement of boreholes for gas drainage or ventilation purposes. As a consequence it may not be possible to avoid impacting upon some of the Aboriginal sites, in which case it will be necessary to salvage the artefacts from those particular sites and to remove them to a secure place agreed to by Narrabri LALC, Gomeroi, and the Department of Environment and Climate Change (DECC).

Additional Note

Under Part 3A of the EP&A Act, a “Project Approval” overrides or negates any protection or conditions that might otherwise have applied, such as under Section 90 of the *National Parks and Wildlife Act 1974* (as amended) (NPW Act), if approval had not been sought under Part 3A of the EP&A Act. Hence, a Section 90 Consent under the NPW Act is not required to enable the development of or disturbance to an archaeological site once a project approval has been issued. However, before the Department of Environment, Climate Change and Water (DECCW) will notify the consent authority (the Minister for Planning) of its satisfaction with the proposed actions, DECCW generally requires that a Management Strategy is developed to manage the archaeological record. This Management Strategy would provide information on the proposed management of identified sites (or sites identified in the future), whether it is to avoid sites, or to mitigate the damage to sites, or to minimise the potential impact to a site, or to record the details, salvage the artefacts, and provide for the safe custody of the salvaged material.

As a consequence of this survey, it is unlikely that the same area will ever be surveyed again, thus from an archaeological perspective, this was an opportunity to observe and record any sites that might be present, and to propose a strategy for the management of any known or potential archaeological and/or cultural material in the future development of the area.

2 ABORIGINAL CONSULTATION

In accordance with the “Guidelines For Aboriginal Cultural Heritage Impact Assessment and Community Consultation” (DECC 2004), an advertisement was placed in the *Narrabri Courier* on 26th August 2008 inviting all Aboriginal stakeholders with an interest in the project to register their interest. A copy of the advertisement as it appeared in the newspaper is included as **Appendix i**. The only responses to the advertisement were from Lyn Trindall, CEO, Narrabri Local Aboriginal Land Council (LALC) – included as **Appendix ii**, and Brad Trindall on behalf of Narrabri Gomeroi Traditional Owner Group (Gomeroi) – included as **Appendix iii**.

ASR then contacted Narrabri LALC to arrange a date for the field investigation of the Panels 1 to 7 Survey Area, and then tried to contact Mr Brad Trindall to confirm that the date was also convenient for Gomeroi. However, Mr Brad Trindall could not be contacted, and Lyn Trindall advised ASR to contact Mr Craig Trindall who had taken over as the Gomeroi representative.

Craig Trindall informed ASR that Gomerai had signed a *Deed of Agreement* with NCOPL, and that before Gomerai would agree to the investigation it would need to consider the proposed survey methodology. Subsequently, ASR forwarded a copy of the “*Proposed Investigative Strategy for the Archaeological Investigation of the Project Site*” to both Narrabri LALC and Gomerai, a copy of which is included as **Appendix iv**.

Eventually, and after a protracted period of consultation involving NCOPL, Gomerai, Narrabri LALC and ASR, it was agreed that the field investigation could commence in accordance with the proposed survey strategy. Accordingly, Narrabri LALC arranged for several members to attend a site induction at the mine, Gomerai having previously had several members inducted for the 2007 investigation for the Pit Top Area. Subsequently, Kristie Toomey, Sites Officer, Narrabri LALC, and Mick Trindall, Sites Officer, Gomerai assisted Appleton (ASR) in the survey which commenced on 30th March 2009.

The investigation was undertaken over five days, from 30th March to 1st April, and on the 7th and 8th April. Both Kristie Toomey and Mick Trindall were present during all stages of the five day investigation. Craig Trindall accompanied the group on the morning of 30th March, and assisted in the identification and recording of the first two sites.

Both prior to and during the survey, Kristie Toomey, Mick Trindall and the archaeologist John Appleton discussed the potential for particular site types to be present, and the particular environments in which they might occur. The survey strategy and results were considered and discussed throughout the survey and at the completion of each survey unit. At the conclusion of the survey, the results were discussed as were the possible outcomes in view of the potential impacts from the proposed goaf boreholes and access roads.

Following the completion of the field investigation of the Panels 1 to 7 Survey Area, ASR contacted Ms Lyn Trindall of Narrabri LALC and Mr Craig Trindall of Gomerai regarding the completion of a further survey over the remaining areas of the Mining Area where the probability of site occurrence and identification is higher (based on the archaeological record of the Panels 1 to 7 Survey Area and predictive modelling). It was subsequently agreed that the field investigation over the “Panels 8 to 26 Survey Area” could commence in accordance with a survey strategy proposed by ASR.

The investigation was undertaken over seven days, from 6th to 14th July, with Matt Trindall and Tahnesha Trindall - on different days (of Narrabri LALC) and Mick Trindall and Patrick Sevil (of Gomerai) present during all stages of the seven day investigation. Both prior to and during the survey, discussions were held regarding the potential for particular site types to be present, and the particular environments in which they might occur. The survey strategy and results were considered and discussed throughout the survey and at the completion of each survey unit. At the conclusion of the survey, the results were discussed as were the possible outcomes in view of the potential impacts from the Longwall Project.

Subsequently, a listing of all 112 sites recorded during both investigations, together with a conversion of their map references (from GDA66 to AGD96), were forwarded to both Narrabri LALC and Gomerai, to provide them with the information on which they could base any recommendations they might have as to the future management of the identified cultural record. A copy of correspondence providing the Land Council’s recommendations is included as **Appendix v**, and the response from Gomerai is included as **Appendix vi**.

Following the investigation of the “Panels 8 to 26 Survey Area” NCOPL engaged ASR to undertake an investigation of the Brine Storage Area. Both Narrabri LALC and Gomerai were consulted over the proposed survey strategy with both stakeholder groups agreeing to the proposed survey strategy and both confirming the attendance of a sites monitor for the survey.

3 THE ENVIRONMENTAL CONTEXT

Any discussion of the likely presence of Aboriginal cultural remains or of the basis why such remains might be discovered must be within the context of the environment and the resources that would have been available to any Aboriginal occupants of the area.

3.1 General Geology and Topography

The Mine Site is located within the Permo-Triassic Gunnedah Basin, which forms the central part of the north-south elongate Sydney-Gunnedah-Bowen Basin System. The Mining Area is located near to the northern and western boundaries of the Gunnedah Basin and the eastern margin of the Surat Basin, a sub-basin of the larger Great Artesian Basin (RWC, 2009).

The rocks of the Mine Site generally strike north-south and dip gently to the west. Minor variations to the north-south strike may be the result of variable thickness and compaction of the sedimentary units being draped over the faulted and uneven surface on the underlying Boggabri Volcanics. Undifferentiated Quaternary alluvial gravel, sand, silt and clay overly the Jurassic and Triassic sediments (RWC, 2009) associated with the Namoi River.

The two formations of most relevance to the current archaeological investigation are the Pilliga Sandstone and the Purlawaugh Formation. The Pilliga Sandstone outcrops over the western half of the Mining Area. It consists of medium bedded, cross-bedded, well sorted fine to coarse grained quartz sandstone. The Purlawaugh Formation outcrops over the majority of the eastern half of the Mining Area, and consists of thinly bedded, generally fine grained, silty lithic sandstone, siltstone and minor claystone (RWC, 2009).

Panels 1 to 7 Survey Area

For the purposes of provenancing descriptions to locations on the two creek systems that drain from west to east through the Panels 1 to 7 Survey Area, both of which are tributaries of Pine Creek, these are made with reference to Pine Creek Tributary 2 (in the north)¹, and Pine Creek Tributary 1 (in the south)¹.

It was observed during the investigation that surface deposits throughout the Panels 1 to 7 Survey Area were dominated by loamy, fine grained soils derived from weathered fine-grained sandstone. Large areas of degrading gravelly lag deposits were also observed in erosion gullies at isolated sections of both Pine Creeks 1 and 2 (and their tributaries).

A “tessellated” metamorphosed sedimentary bedrock platform was exposed in the creek bed at a track crossing of a tributary of Pine Creek 2, and decomposing sedimentary bedrock was exposed in the creek bed in a minor tributary of Pine Creek 1. Ironstone (or indurated sandstone) gravels were observed in exposures in the southern creek bank in the upper reaches of Pine Creek 2, and in an isolated section of Pine Creek 1.

Of significant archaeological interest was an intermittently visible sandstone “reef” running north-south above longwall panel 5, formed by floaters above strata uplift. The same formation was also visible beside a gateway 1,300m to the south, and again in the head of an erosion gully 50m further again to the south. This was the only visible evidence of any naturally

¹ It is noted that the referencing of the Pine Creek tributaries reflects the nomenclature used during the field survey but is the opposite of the referencing used in the *Environmental Assessment*, ie. Pine Creek Tributary 1 in the Environmental Assessment is located to the north.

occurring rock in the Panels 1 to 7 Survey Area that might have been useful to the Aboriginal occupants of the area in the past.

Elevations in the Panels 1 to 7 Survey Area descend from 330m AHD in the Pilliga in the south-western corner, and 300m AHD on the rise in the north-western corner, down to 276m AHD in the creek bed of Pine Creek 2 on the western boundary and 266m AHD where Pine Creek 2 crosses the eastern boundary (of longwall panel 1). In the south-eastern corner (of longwall panel 1) Pine Creek 1 descends to 272m AHD.

Panels 8 to 26 Survey Area

For the purposes of provenancing descriptions to locations on the four creek systems that drain from west to east through the Panels 8 to 26 Survey Area, the two in the northern panels, Panels 8 to 13; both of which are tributaries of Pine Creek, are made with reference to Pine Creek Tributary 2 (in the north)², and Pine Creek Tributary 1 (in the south). And the two in the south that drain through Panels 14 to 26, are made with reference to Kurrajong Creek Tributary 1, and Kurrajong Creek further to the south.

Panels 8 to 13 occur in Pilliga Forest. Surface deposits in this area are of deep, weathered sands derived from the sandstone high-ground at the western end of the area. In several places along the western boundary the slopes rise to low sandstone ridges and knolls of weathering sandstone bedrock, the knolls consisting of “tor-like” piles of sandstone boulders resting on exposed sandstone bedrock.

Similarly, Panels 14 to 18 and parts of Panels 19 and 20 occur in Pilliga Forest. Panels 20 to 26 occur on cleared, rolling slopes bisected by ribbons of predominantly eucalypt riparian vegetation along the creek banks. For the most part deposits in these panels are of sandy soils derived from weathering sandstone but the upper slopes and crests of the rises in Panels 21 and 22 are littered with lag deposits of angular to sub-angular metasedimentary rock, while downstream in a tributary of Kurrajong Creek Tributary 1 there are extensive exposures of metasedimentary sub-angular to rounded cobbles (60-200mm), and there are exposures of indurated sandstone bedrock in the creek bed.

Elevations in the Panels 8 to 13 Survey Area descend from 346m AHD in the Pilliga on the western boundary, down to 280m AHD in the creek bed of Pine Creek.

Elevations in the Panels 14 to 26 Survey Area descend from 348m AHD on the western boundary, down to 290m AHD in the creek bed of Kurrajong Creek Tributary 1 at the eastern edge of Panel 26.

Brine Storage Area

The proposed Brine Storage Area occurs in an “amphitheatre-like” basin on the flood plain of Kurrajong Creek Tributary 1, immediately to the north of the creek between the Pit Top Area and the North Western Branch Railway Line.

Soils in the area comprise of sandy deposits derived from the sandstone slopes immediately to the north. Very little stone occurs in the survey area, however there were some minor lag deposits of rounded, water-worn cobbles in the western section.

² It is noted that the referencing of the Pine Creek tributaries reflects the nomenclature used during the field survey but is the opposite of the referencing used in the *Environmental Assessment*, ie. Pine Creek Tributary 1 in the Environmental Assessment is located to the north.

Elevations in the area descend from 252m AHD on the upper rim of the basin down to approximately 246m AHD close to the creek bank.

Water Pipeline Route

Soils in the area comprise of sandy deposits derived from the weathering of the underlying sandstone bedrock. Minor lag deposits of angular to sub-angular metasedimentary pebbles occur on the upper slopes and rises above about the 255m AHD contour, but from the evidence of roadside exposures, this gives way to angular gravelly pebbles further down slope. Similarly, the scalded surfaces of the road verges along the western end of Turrawan Road (above about the 238m AHD contour) are littered with a lag deposit of angular and sub-angular medium to large pebbles (6-60mm).

Elevations along the route descend from 260m AHD where the pipeline leaves the Pit Top Area, down to 220m AHD on the bank of the Namoi River

3.2 Vegetation

An ecological survey and assessment of the Mine Site completed by Ecotone Ecological Consultants (2009) identified four natural or predominantly natural vegetation community types and one artificial vegetation community type occur within the Study Area as follows.

Natural Communities

1. Brown Bloodwood / Pilliga Grey Box / Red Ironbark Sandstone Slopes and Ridgetop Woodland
2. Inland Grey Box / Bimble Box / Blakely's Red Gum Lower Flats and Floodplain Woodland
3. River She Oak / Belah Riparian Forest
4. Callitris Forest

Artificial Community

5. Cleared open pasture with or without scattered native trees or cultivated cropland or gardens

Community 1 (locally referred to as Pilliga Scrub) generally occupies the western part of the Mine Site, whilst Communities 2, 3 and 4 occur in the eastern part of the Mine Site. Community 5 is the largest single community in area, and makes up the balance of the eastern part of the Mine Site.

Panels 1 to 7 Survey Area

Within the Panels 1 to 7 Survey Area, with the exception of the remnant woodland on the rise at the northern end (Community 2), the natural communities consists primarily of riparian ribbon-like woodland along the Buffer Zones and upper Bank Zones of both creeks (Community 3). Vegetation in these areas comprise a mixture of River Oak (*Casuarina cunninghamiana*), White Cedar (*Melia azedarach*), Rough-barked Apple (*Angophora floribunda*), White Box (*Eucalyptus albens*) – particularly along the upper reaches of Pine Creek 1, River Red Gum (*E. Camaldulensis*), Yellow Box (*E. Melliodora*), White Ribbon Gum (*E. Viminalis*), Western Rosewood, (*Alectryon oleifolius*), and minor Kurrajong (*Brachychiton populneus*). *Acacia* sp. dominate the understorey, which includes River Bottlebrush (*Callistemon sieberi*), and Blackthorn (*Bursaria spinosa*).

Cypress pine regrowth has recolonised the cleared upper slopes below the Pilliga boundary fence, and in some cropped areas along the upper drainage depressions of both creeks.

Panels 8 to 19 Survey Area

Panels 8 to 19 occur in Pilliga Forest. Pilliga Forest typically contains Cypress Pine (*Callitris* spp.), and Casuarinas, while Eucalypts dominate the canopy throughout the forest.

Panels 20 to 26 Survey Area

Panels 19 to 26 occur on cleared pasture land all but for ribbons of riparian vegetation along the creek banks, and for stands of Cypress Pine that have colonised a high knoll in the northern ends of Panels 25 and 26.

Brine Storage Area

With the exception of a small patch of the remnant woodland on a small rise to the immediate north of Kurrajong Creek Tributary 1, the vegetation of the Brine Storage Area is cleared paddocks with occasional and isolated mature trees. Riparian ribbon-like woodland occurs along the banks of Kurrajong Creek Tributary 1 to the south of the Brine Storage Area and remnant woodland with the road easement to the east of the Brine Storage Area.

Water Pipeline Route

The vegetation along the water pipeline route varies between remnant woodland dominated by Grey Box and Cypress Pine, small patches of Weeping Myall community and cleared areas dominated by exotic pasture and weeds.

3.3 Water Resources

It should be noted that the depiction of drainage lines in blue on **Figure 4** is not indicative of the water they contain. In fact, it is reasonable to conclude that all drainage lines indicated in blue where there is not a riparian strip of woodland, are merely shallow drainage depressions, barely visible in the field other than as shallow swales.

As described in Section 3.1, the Panels 1 to 7 Survey Area is bisected by the two major tributaries of Pine Creek, referred to in this report as Pine Creek 2 and Pine Creek 1. In effect, neither creek line retains water and any surface run-off is rapidly discharged downstream. However, it was observed during the investigation that took place after recent rain, that a minor waterhole had filled upstream of the tessellated platform in the minor tributary of Pine Creek 2, and that there was a second small water hole, probably created by wild pigs, in a tributary of Pine Creek 1. Similarly, no reliable water source was observed in the investigation of the Panels 8 to 26 Survey Area.

The lack of a reliable water source may have deterred Aboriginal people from staying in the area for long in the past, however, it is possible that other water holes existed prior to them having become silted up with the loamy colluvial soils released by land clearing, cropping and grazing following the arrival of European settlers.

The Brine Storage Area occurs adjacent to Kurrajong Tributary 1, however, it is unlikely that the creek ever contained potable water except for a few hours after a heavy downpour.

The Water Pipeline Route follows road easements, none of which cross a reliable water source. The Namoi River at the eastern end of the route would have been a reliable source, although the water would have required filtering before it could be drunk.

3.4 Stone Resources

Panels 1 to 7 Survey Area

As referred to in Section 3.1, the only stone resource that might have been useful to the Aboriginal occupants of the area occurring in the Panels 1 to 7 Survey Area, were the sandstone floaters, which might have been, and were, used for sharpening stone axes. It follows therefore that any artefactual material within the Survey Area was probably sourced from elsewhere, perhaps from pebbles in the river bed downstream.

Panels 8 to 26 Survey Area

The metasedimentary lag deposits referred to previously as occurring on the crests of the rise in Panels 21 and 22 included siliceous material that could have been used for knapping into tools or weapons.

Brine Storage Area

Minor lag deposits of water-worn pebbles and cobbles were evident on the western rim of the basin, some of which had been utilised to manufacture steep-edged scrapers, while others were used as cores.

Water Pipeline Route

Minor lag deposits of angular to sub-angular metasedimentary pebbles occur on the upper slopes and rises above about the 255m AHD contour, but from the evidence of roadside exposures, this gives way to angular gravelly pebbles further down slope. Similarly, the scalded surfaces of the road verges along the western end of Turrawan Road (above about the 238m AHD contour) are littered with a lag deposit of angular and sub-angular medium to large pebbles. While some of this material might have been utilised it was generally too small to knap successfully.

3.5 Previous Impacts

Panels 1 to 7 Survey Area

As the aerial photograph in **Figure 5** shows, and as referred to in Section 3.2, the vast majority of the Survey Area has been cleared for pasture. However, the impact has not stopped there, as continuous grazing of poor grasses in an area of low rainfall has resulted in the active degradation and erosion of most if not all exposed surface deposits.

Other impacts have been caused by property tracks, dams, and active gullying in what were once only drainage depressions. Grazing along the creek banks has also caused massive gullying of the creek banks, bank-slumping, and significant wash outs, particularly along the southern bank of the upper reaches of Pine Creek 2, and a minor tributary of Pine Creek 1.

The fragility of the soils is also evident in several collapsed dam walls along Pine Creek 1 and the gulying of the drainage channel into one of the dams, and in the gulying of creek banks and extensive wash-out areas. Although a number of contour banks have been constructed across the slopes of the paddocks they have only served to channel the run-off into more concentrated and destructive drainage courses.

Panels 8 to 19 Survey Area

There have been only limited impacts in the Pilliga Forest in the Panels 8 to 19 survey area (see **Figure 5**), most of which have been caused in the construction of dams, or in clearing access tracks to the dams and to fence-lines, however, it was clear from the tree stumps and the relatively open areas, particularly in Panels 9 to 12 that there has been extensive tree-felling or logging in the past. And in the absence of tree toppings it would appear that the trees were felled for something other than fence-posts and strainer posts. Nor is it likely that the trees were felled for firewood. Similar logging has taken place in Panels 14 to 17.

The presence of the dams might suggest that the logging was to open up the forest for pasture improvement, but there was no evidence of piles of ash of partly burnt logs that there would have been if the logging was merely to remove trees.

Panels 20 to 26 Survey Area

Most of the vegetation in the Panels 20 to 26 survey area has been cleared for pasture, and in some places such as on the crest of the rise in Panels 21 and 22 the paddocks had been recently disc-ploughed to improve pasture growth (see **Figure 5**). Similarly, paddocks in Panels 23 and 24 had been disc-ploughed not quite so recently and were under new growth at the time of the survey.

Brine Storage Area

The Brine Storage Area has been cleared for pasture (see **Figure 5**). Currently impacts are occurring as scalding on the flat bottom of the basin, and bank-slumping and slope-wash around the rim. Unfortunately contour banking above the rim does not follow the natural contour, dipping slightly towards the east. As a consequence instead of the contour banking retaining the run-off to stimulate grass growth, the effect has been to channel the water to the eastern ends of the banks where the concentrated mass of water has discharged down-slope causing extensive gulying and scouring.

Water Pipeline Route

For the most part the proposed route utilises either the road easement or the railway maintenance track. The road is a metalled surface with deep side drains and as a consequence the banks to either side are artefacts of drain shaping with battered slopes of 3m to 4m wide. The railway maintenance track at the higher elevations occurs on sandy deposits which have been graded to various depths but seldom more than 5cm to 10cm deep. At lower elevations the deposits are less sandy and grading has been mostly only to level the track.

East of Turrawan the road is sealed with deep side gutters, the outer batters of which have impacted on the natural profile for up to 10m to either side of the road. From the road to the Namoi River the land has been cleared and linear features marking subsurface irrigation pipes attest to the paddocks having once been used for crops, although currently the paddocks are carrying stock.