

## Appendix F

# Aboriginal Heritage Specialist Reports

NRE No. 1 Colliery – Underground  
Expansion Project:  
Preferred Project Report – Heritage

FINAL REPORT

Prepared for Gujarat NRE Coking Coal Ltd

24 September 2013

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## Document information

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| <b>Biosis project no.:</b> | 16646                                                                                                                                                                                                          |
| <b>File name:</b>          | 16646.NRE.No.1.Coliery.Undeground.Expansion.Project.PPR.Heritage.FIN01.20130924.docx                                                                                                                           |
| <b>Citation:</b>           | Biosis (2013). NRE No. 1 Colliery – Underground Expansion Project: Preferred Project Report - Heritage. Report for Gujarat NRE Coking Coal Ltd. Author: A.Beben, Biosis Pty Ltd, Wollongong. Project no. 16646 |

## Document control

| Version          | Internal reviewer            | Date issued |
|------------------|------------------------------|-------------|
| Draft version 01 | Nathan Garvey and Asher Ford | 11/09/2013  |
| Final version 01 | Alexander Beben              | 24/09/2013  |

## Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

Gujarat NRE Coking Coal Ltd: David Clarkson, Stephen Wilson, Barry Clark

SCT Consultants: Ken Mills

The following Biosis staff were involved in this project:

Ashleigh Pritchard for mapping

Nathan Garvey and Asher Ford for review and quality assurance

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# 1. Introduction

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## 1.1 Project background

NRE No. 1 Colliery is located at Russell Vale, to the west of Bellambi, in the Illawarra region of New South Wales (NSW) (see Figure 1). NRE purchased the Colliery in December 2004, but extensive underground mining has been undertaken within the Colliery holdings dating from the late nineteenth century. However, a substantial volume of high quality coking coal resources remains along with some potential thermal coal resources.

The Colliery holding includes a number of sub leases between NRE and surrounding mine operators, including Consolidated Coal Lease (CCL) 745, Mining Purposes Lease (MPL) 271 and Mining Lease (ML) 1575, and covers a total area of approximately 6,973 hectares (ha).

Originally, NRE intended to expand its operations in two stages. Stage 1 plans were included in the Preliminary Works Part 3A project application that was approved on 13 October 2011, allowing some first workings coal extraction and surface facility upgrades. On 24 December 2012, the Preliminary Works Part 3A project was modified to allow the extraction of Longwalls 4 and 5 and the establishment of Maingate 6.

The original Stage 2 application, known as the Underground Expansion Project Part 3A, was lodged with the NSW Department of Planning and Infrastructure (DP&I) on 12 August 2009 and contained an application to extract 11 longwalls in the Wonga East area and 7 longwalls in the Wonga West area along with surface facilities upgrades to allow production up to 3 million tonnes per annum (Mtpa) for up to 20 years. Since that time it has been progressing through the Major Project approvals process and was placed on Public Exhibition on 18 February 2013. As a result of the submissions received on the application, NRE has made the decision to substantially revise the application to facilitate the approval process and allow continuity in operations. Due to the scope of the changes, the DP&I request NRE prepare a Preferred Project Report (PPR) for the revised Underground Expansion Project Part 3A.

The Preferred Project report (NRE 2013) outlines the revised Underground Expansion Project which has been reduced to a five year interim stage project, with extraction of eight longwalls in the Wonga East area and upgrading of surface facilities to manage an extraction rate of up to 3 Mtpa run of mine (ROM) coal per annum. The original Wonga West longwall extraction will be resubmitted to DP&I as a separate application.

This report provides revised impact assessments for Aboriginal cultural heritage sites (Section 3). A response to submissions received is provided in Section 4.

## 1.2 Scope of assessment

The objectives of this report are to:

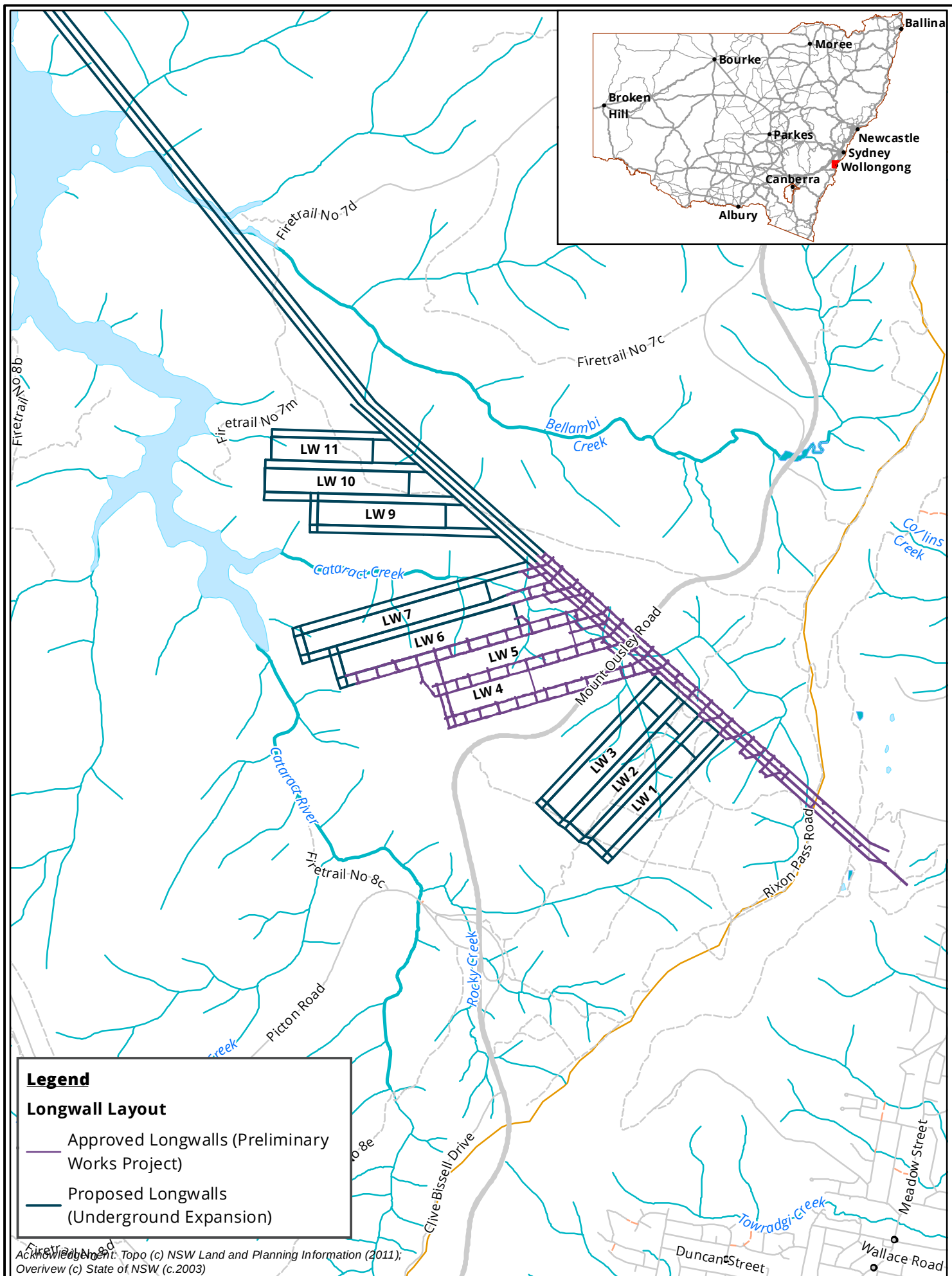
- Provide details of changes to the original project relevant to cultural heritage;
- Prepare revised impact assessments based on these changes, including revised subsidence predictions; and
- Provide a response to submission received on the original EA (ERM 2013) based on the changes outlined above.

### **1.3 Aboriginal Stakeholder Consultation**

ERM (2012) undertook Aboriginal stakeholder consultation in accordance with the OEH 2005 *Interim Community Consultation Requirements Guideline*. Consultation for the project commenced in October 2008 with five Aboriginal groups registered for the project. Section 2 and Annex U of the ERM (2012) details the Aboriginal Community Consultation undertaken.

As part of this PPR report, and to address comments received from the NSW Office of Environment and Heritage (OEH) in their submission, Biosis has continued consultation with the groups registered for the project. To facilitate an assessment of the cultural values associated with re-located and newly identified sites, Aboriginal stakeholders participated in a series of site visits conducted between 4 and 6 September 2013. These site visits were attended by representatives of the Northern Illawarra Aboriginal Collective (NIAC), Kullila Site Consultants (KSC), Peter Falk Consultancy (PFC), Illawarra Local Aboriginal Land Council (ILALC) and Wodi Wodi Elders Corporation (WVEC).

Copies of the draft this PPR report will be sent to all registered Aboriginal groups for feedback on the content, assessment and recommendations. All comments received from these groups will be appended to this report, when received.



## 2. Preferred Project Changes

After serious consideration of the community and agency submissions, NRE has decided to modify its Underground Expansion Project Part 3A application in the following manner:

1. The Wonga East longwall layout will be modified to minimise impacts to identified significant features while recovering the maximum volume of coal reserves possible.
2. The Wonga Mains driveage will not be extended northwards under the south arm of Cataract Reservoir through the known geological feature (in the Bulli Seam).
3. The Wonga West longwalls will be removed from this application and resubmitted as a separate application.
4. No change to the Pit Top from the original proposal.

A more detailed summary comparing the original proposal presented in the Environmental Assessment with the current Preferred Project is presented in Table 1 and Figure 2.

**Table 1: Detailed Summary of Project Changes**

| Project Area                    | Original Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PPR                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>Project Application Area</b> | <ul style="list-style-type: none"> <li>As per Figure 1.2 of Underground Expansion Project Environmental Assessment</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>No changes proposed</li> </ul> |
| <b>Production Limit</b>         | <ul style="list-style-type: none"> <li>3 Mtpa</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>No changes proposed</li> </ul> |
| <b>Pit Top</b>                  | <ul style="list-style-type: none"> <li>Two new stockpiles of 140,000 tonnes capacity each (SP2 &amp; SP3) with associated reclaim facilities</li> <li>New truck loading facilities</li> <li>Designated coal dispatch road</li> <li>Progressive upgrading of trucking fleet</li> <li>Continued road haulage of ROM coal to the Port Kembla Coal Terminal.</li> <li>6ML Settling Pond</li> <li>Continuing use of No.4 Shaft for mine access, bathhouse, parking and offices</li> <li>Ongoing maintenance and refurbishment of ventilation shafts, water and electrical facilities.</li> </ul> | <ul style="list-style-type: none"> <li>No changes proposed</li> </ul> |

| Project Area                                           | Original Project                                                                                                                                                                                                         | PPR                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                        | <ul style="list-style-type: none"> <li>• Ongoing geological and geotechnical investigations to determine coal quality and geotechnical conditions using drilling and related techniques.</li> </ul>                      |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Wonga East Longwalls</b>                            | <ul style="list-style-type: none"> <li>• 9 longwalls (LW) in two Areas               <ul style="list-style-type: none"> <li>– Area 1 – LW's 1-3</li> <li>– Area 2 – LW's 6-11</li> </ul> </li> </ul>                     | <ul style="list-style-type: none"> <li>• 8 longwalls in two Areas (see Figure 2).               <ul style="list-style-type: none"> <li>– Area 1 – LW's 1-3 shortened and reoriented to the southwest</li> <li>– Area 2 – LW 6 shortened</li> <li>– Area 2 – LW7 shortened and moved slightly south east</li> <li>– Area 2 – LW 8 removed</li> <li>– Area 2 – LW9-11 shortened and reoriented to the northwest</li> </ul> </li> </ul> |
| <b>Wonga Mains</b>                                     | <ul style="list-style-type: none"> <li>• Mains drivage from the end of the Preliminary Works approved drivage heading north west, beneath Cataract Reservoir to bisect the proposed Wonga West Areas 3 and 4.</li> </ul> | <ul style="list-style-type: none"> <li>• Mains drivage from the end of the Preliminary Works approved drivage heading west-northwest to what was the southern end of Wonga West Area 3.</li> </ul>                                                                                                                                                                                                                                   |
| <b>Wonga West Longwalls</b>                            | <ul style="list-style-type: none"> <li>• 7 longwalls in two Areas               <ul style="list-style-type: none"> <li>– Area 3 – LW's 1-5</li> <li>– Area 4 – LW's 6-7</li> </ul> </li> </ul>                           | <ul style="list-style-type: none"> <li>• Removed from this application. To be resubmitted as a separate application to Department of Planning and Infrastructure.</li> </ul>                                                                                                                                                                                                                                                         |
| <b>Bulli West - Bulli Seam 1<sup>st</sup> Workings</b> | <ul style="list-style-type: none"> <li>• 1st workings to the Bulli Seam to access the Bulli Seam in the western area of the Project Application Area.</li> </ul>                                                         | <ul style="list-style-type: none"> <li>• No changes proposed</li> </ul>                                                                                                                                                                                                                                                                                                                                                              |
| <b>Balgownie Seam 1<sup>st</sup> Workings</b>          | <ul style="list-style-type: none"> <li>• 1st workings in the Balgownie Seam to access the Balgownie Seam in the western area of the Project Application Area.</li> </ul>                                                 | <ul style="list-style-type: none"> <li>• No changes proposed</li> </ul>                                                                                                                                                                                                                                                                                                                                                              |

For further detail see Section 1 of the PPR report (NRE 2013).

These changes and subsequent investigations have resulted in the following changes to predicted impacts to Aboriginal cultural heritage sites in the Wonga East area:

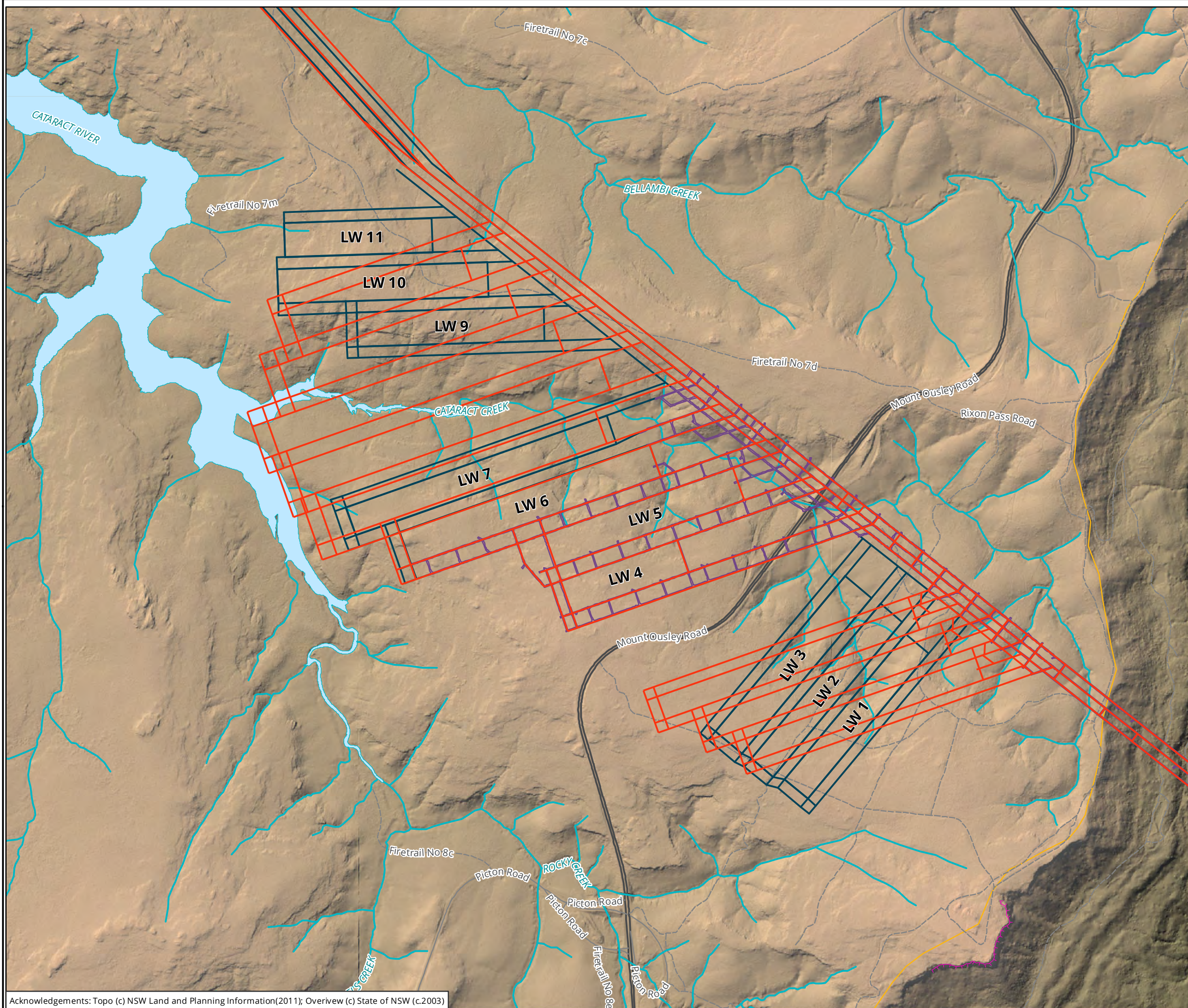
- Re-location of Aboriginal cultural heritage sites within Wonga East study area and revised locations in relation to impact footprint;
- Newly identified Aboriginal cultural heritage sites within the Wonga East study area not considered in ERM (2012) or ERM (2013);
- Changes in the location, orientation, length and width of long wall panels and reduction to the number of Aboriginal cultural heritage sites that will be undermined; and
- Changes in impacts to Aboriginal cultural heritage sites based on revised subsidence predictions.

A summary of changes relating to Aboriginal cultural heritage sites is detailed in Table 2 and Figure 3. A revised summary of Aboriginal cultural heritage sites, their significance and predicted impacts is presented in Section 3.

**Table 2: Aboriginal sites in Wonga East, showing their status (relocated or not) and previous and current location with regards to long wall layout**

| Site                                      | Status                      | Previous location in relation to Longwalls               | Current location in relation to Longwalls                |
|-------------------------------------------|-----------------------------|----------------------------------------------------------|----------------------------------------------------------|
| <b>All Aboriginal sites in Wonga West</b> | -                           | Located within Wonga West area                           | No longer part of the project                            |
| <b>52-2-0083</b>                          | Relocated (current surveys) | Located above chain pillar of LW10                       | Located outside of longwalls, but within 600m study area |
| <b>52-2-0099</b>                          | Cannot be relocated         | Located outside of longwalls, but within 600m study area | Located above LW10                                       |
| <b>52-2-0229</b>                          | Cannot be relocated         | Located outside of longwalls, but within 600m study area | Located above LW10                                       |
| <b>52-2-0233</b>                          | Cannot be relocated         | Located outside of longwalls, but within 600m study area | Located outside of longwalls, but within 600m study area |
| <b>52-2-0603</b>                          | Relocated (ERM 2012)        | Located outside of longwalls, but within 600m study area | Located outside of longwalls, but within 600m study area |
| <b>52-2-1081</b>                          | Relocated (current surveys) | Located outside of longwalls, but within 600m study area | No longer located within 600m study area                 |
| <b>52-2-1082</b>                          | Relocated (current surveys) | Located outside of longwalls, but within 600m study area | No longer located within 600m study area                 |
| <b>52-2-1095</b>                          | Relocated (current surveys) | Located outside of longwalls, but within 600m study area | No longer located within 600m study area                 |
| <b>52-2-3939</b>                          | New site (Biosis 2012)      | Located above LW10                                       | Located above LW8                                        |
| <b>52-2-3940</b>                          | New site (Biosis 2012)      | Located above LW10                                       | Located above LW8                                        |

| Site             | Status                      | Previous location in relation to Longwalls               | Current location in relation to Longwalls                |
|------------------|-----------------------------|----------------------------------------------------------|----------------------------------------------------------|
| <b>52-2-3941</b> | New site (Biosis 2012)      | Located above LW10                                       | Located above LW8                                        |
| <b>52-3-0310</b> | Relocated (ERM 2012)        | Located outside of longwalls, but within 600m study area | Located outside of longwalls, but within 600m study area |
| <b>52-3-0311</b> | Relocated (current surveys) | Located above LW9                                        | Located outside of longwalls, but within 600m study area |
| <b>52-3-0312</b> | Relocated (ERM 2012)        | Located outside of longwalls, but within 600m study area | Located outside of longwalls, but within 600m study area |
| <b>52-3-0313</b> | Relocated (ERM 2012)        | Located above LW1                                        | Located outside of longwalls, but within 600m study area |
| <b>52-3-0314</b> | Relocated (ERM 2012)        | Located outside of longwalls, but within 600m study area | Located outside of longwalls, but within 600m study area |
| <b>52-3-0317</b> | Relocated (Biosis 2012)     | Located outside of longwalls, but within 600m study area | Located outside of longwalls, but within 600m study area |
| <b>52-3-0318</b> | Relocated (Biosis 2012)     | Located outside of longwalls                             | No longer located within 600m study area                 |
| <b>52-3-0319</b> | Relocated (ERM 2012)        | Located outside of longwalls, but within 600m study area | Located outside of longwalls, but within 600m study area |
| <b>52-3-0320</b> | Cannot be relocated         | Located above chain pillar between LW4 and LW5           | No change                                                |
| <b>52-3-0322</b> | Relocated (Biosis 2012)     | Located outside of longwalls, but within 600m study area | No change                                                |
| <b>52-3-0323</b> | Relocated (current surveys) | Located above chain pillar between LW 7 and LW 8         | Located outside of longwalls, but within 600m study area |
| <b>52-3-0325</b> | Relocated (current surveys) | Located above chain pillar between LW 6 and LW 7         | Located above LW7                                        |
| <b>Wonga 4</b>   | New site (current surveys)  | -                                                        | Located outside of longwalls, but within 600m study area |
| <b>Wonga 5</b>   | New site (current surveys)  |                                                          | Located outside of longwalls, but within 600m study area |



**Legend**

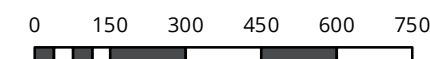
— Previous Wonga East Longwalls

**Longwall Layout**

— Approved Longwalls  
(Preliminary Works Project)

— Proposed Longwalls  
(Underground Expansion)

**Figure 2: Proposed PPR mine plan**

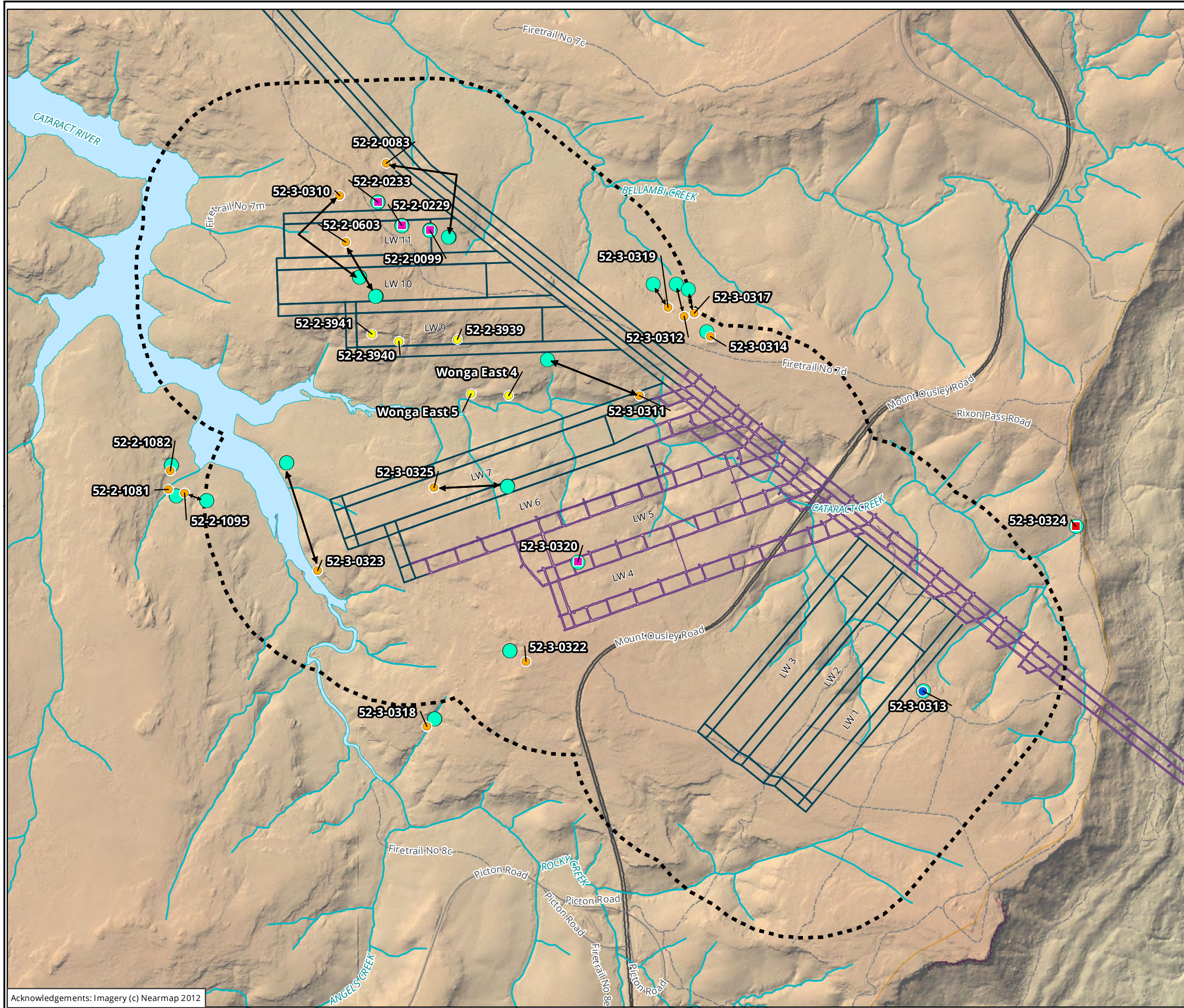


Metres  
Scale: 1:15,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



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Date: 11 September 2013  
Checked by: NMG, Drawn by: ANP, Last edited by: apritchard  
Location: P:\16600s\16646\Mapping\Report Figures\Cultural\16646 PPR\_F2\_Mine Plan



**Legend**

**Sites Located by Biosis**

- Relocated
- In Recorded Location
- New Site
- Not Relocated
- Not Surveyed

**Site Locations (ERM 2012)**

- GA Site Locations

**Longwall Layout**

- Approved Longwalls (Preliminary Works Project)
- Proposed Longwalls (Underground Expansion)
- 600m Study Area

**Figure 3: Aboriginal cultural heritage sites in Wonga East, documenting their status, previous and current location in comparison to the current impact footprint**

0 150 300 450 600 750  
Metres

Scale: 1:15,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne,  
Sydney, Wangaratta & Wollongong

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Date: 11 September 2013,  
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## 3. Revised Impact Assessments

Changes to the project from that proposed in the original Aboriginal heritage assessment (ERM 2012), project application and EA (ERM 2013) necessitate a revision of the impact and significance assessments for the project. The heritage features of the study area are described below and mapped in Figure 4.

### 3.1 Cultural Heritage Sites

The EA and Aboriginal heritage assessment (ERM 2013; ERM 2012) state that a total of twenty-three sites are located in the Wonga East study area, seventeen of which would not be impacted by mine subsidence. ERM (2012) were able to relocate a total of nine sites within Wonga East. Since this time Biosis has undertaken an extensive relocation program and relocated an additional ten sites and identified five new sites; however four sites (all grinding grooves) remain unaccounted for (Biosis 2012, Biosis *in prep*). Four sites assessed by ERM (2012) are no longer located within the study area. A summary of the twenty-one Aboriginal sites located within Wonga East study area is contained within Table 3, site locations are displayed in Figure 4.

**Table 3: Aboriginal sites within Wonga East**

Sites in bold are located within the 200 m subsidence impact footprint; all other sites are located within the 600m study area buffer.

| Site      | Name                            | Context                 | Site Type                                          |
|-----------|---------------------------------|-------------------------|----------------------------------------------------|
| 52-2-0083 | Bulli Mine Shaft Site 7         | Enclosed Shelter        | Shelter with Deposit                               |
| 52-2-0099 | <b>Bulli Mine Shaft Site 8</b>  | <b>Open Site</b>        | <b>Axe grinding grooves</b>                        |
| 52-2-0229 | <b>Bulli Mine Shaft Site 12</b> | <b>Open Site</b>        | <b>Axe grinding grooves</b>                        |
| 52-2-0233 | Bulli Mine Shaft Site 13        | Open Site               | Axe grinding grooves                               |
| 52-2-0603 | <b>Bulli Mine Shaft Site 19</b> | <b>Enclosed Shelter</b> | <b>Shelter with Art and Artefact</b>               |
| 52-2-3939 | <b>Wonga East 1</b>             | <b>Enclosed Shelter</b> | <b>Shelter with Deposit</b>                        |
| 52-2-3940 | <b>Wonga East 2</b>             | <b>Enclosed Shelter</b> | <b>Shelter with Deposit</b>                        |
| 52-2-3941 | <b>Wonga East 3</b>             | <b>Enclosed Shelter</b> | <b>Shelter with Deposit</b>                        |
| 52-3-0310 | Bulli Mine Shaft Site 18        | Enclosed Shelter        | Shelter with Art, Deposit and axe grinding grooves |
| 52-3-0311 | Bulli Mine Shaft Site 20        | Enclosed Shelter        | Shelter with Deposit                               |
| 52-3-0312 | Bulli Mine Shaft Site 23        | Enclosed Shelter        | Shelter with Deposit                               |
| 52-3-0313 | Bulli Mine Shaft Site 29        | Open Site               | Open Camp Site                                     |
| 52-3-0314 | Bulli Mine Shaft Site 21        | Enclosed Shelter        | Shelter with Art                                   |
| 52-3-0317 | Bulli Mine Shaft Site 22        | Enclosed Shelter        | Shelter with Deposit                               |
| 52-3-0319 | Bulli Mine Shaft Site 24        | Enclosed Shelter        | Shelter with Deposit                               |
| 52-3-0320 | <b>Bulli Mine Shaft Site 25</b> | <b>Open Site</b>        | <b>Axe grinding grooves</b>                        |
| 52-3-0322 | Bulli Mine Shaft Site 31        | Open Site               | Axe grinding grooves                               |
| 52-3-0323 | Bulli Mine Shaft Site 26        | Enclosed Shelter        | Shelter with Deposit                               |
| 52-3-0325 | <b>Bulli Mine Shaft Site 27</b> | <b>Enclosed Shelter</b> | <b>Shelter with Art and Deposit</b>                |
| n/a       | Wonga East 4                    | Enclosed Shelter        | Shelter with Deposit                               |

| Site | Name         | Context          | Site Type                      |
|------|--------------|------------------|--------------------------------|
| n/a  | Wonga East 5 | Enclosed Shelter | Shelter with Stone Arrangement |



## 3.2 Significance Assessment

In order to inform the revised impact assessment it is necessary to consider the significance of Aboriginal Cultural heritage sites within Wonga East. The high volume of re-identified and new sites has necessitated the re-assessment of scientific significance. The assessment of scientific significance for Aboriginal sites in the Study Area has used a different methodology from the ERM Aboriginal Heritage Assessment (2012) and, as a result, the scientific significance for all sites has been reassessed.

The two main values addressed when assessing the significance of Aboriginal sites are cultural values to the Aboriginal community and archaeological (scientific) values. This report will assess scientific values while the Aboriginal Cultural Heritage Assessment Report will detail the cultural values of Aboriginal sites in the Project Area.

## 3.3 Introduction to the Assessment Process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 1999). This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. These values are provided as background and include:

**Historical significance** (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.

**Aesthetic significance** (Scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.

**Social significance** (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities.

**Scientific significance** (Archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

The cultural and archaeological significance of Aboriginal and historic sites and places is assessed on the basis of the significance values outlined above. As well as the ICOMOS Burra Charter significance values guidelines, various government agencies have developed formal criteria and guidelines that have application when assessing the significance of heritage places within NSW. Of primary interest are guidelines prepared by the

Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), the OEH and the Heritage Branch, NSW Department of Planning. The relevant sections of these guidelines are presented below.

These guidelines state that an area may contain evidence and associations which demonstrate one or any combination of the ICOMOS Burra Charter significance values outlined above in reference to Aboriginal heritage. Reference to each of the values should be made when evaluating archaeological and cultural significance for Aboriginal sites and places.

In addition to the previously outlined heritage values, the OEH Guidelines (DECC 2006) also specify the importance of considering cultural landscapes when determining and assessing Aboriginal heritage values. The principle behind a cultural landscape is that 'the significance of individual features is derived from their inter-relatedness within the cultural landscape'. This means that sites or places cannot be 'assessed in isolation' but must be considered as parts of the wider cultural landscape. Hence the site or place will possibly have values derived from its association with other sites and places. By investigating the associations between sites, places, and (for example) natural resources in the cultural landscape the stories behind the features can be told. The context of the cultural landscape can unlock 'better understanding of the cultural meaning and importance' of sites and places.

Although other values may be considered – such as educational or tourism values – the two principal values that are likely to be addressed in a consideration of Aboriginal sites and places are the cultural/social significance to Aboriginal people and their archaeological or scientific significance to archaeologists. The determinations of archaeological and cultural significance for sites and places should then be expressed as statements of significance that preface a concise discussion of the contributing factors to Aboriginal cultural heritage significance.

### **3.4 Archaeological (Scientific Significance) Values**

Archaeological significance (also called scientific significance, as per the ICOMOS Burra Charter) refers to the value of archaeological objects or sites as they relate to research questions that are of importance to the archaeological community, including indigenous communities, heritage managers and academic archaeologists. Generally the value of this type of significance is determined on the basis of the potential for sites and objects to provide information regarding the past life-ways of people (Burke and Smith 2004: 249, NPWS 1998). For this reason, the NPWS (part of DECC) summarises the situation as 'while various criteria for archaeological significance assessment have been advanced over the years, most of them fall under the heading of archaeological research potential' (NPWS 1998: 26). The NPWS criteria for archaeological significance assessment are based largely on the ICOMOS Burra Charter.

#### **3.4.1 Research Potential**

Research potential is assessed by examining site content and site condition. Site content refers to all cultural materials and organic remains associated with human activity at a site. Site content also refers to the site structure – the size of the site, the patterning of cultural materials within the site, the presence of any stratified deposits and the rarity of particular artefact types. As the site contents criterion is not applicable to scarred trees, the assessment of scarred trees is outlined separately below. Site condition refers to the degree of disturbance to the contents of a site at the time it was recorded.

The site contents ratings used for archaeological sites are:

- 0 No cultural material remaining.
- 1 Site contains a small number (e.g. 0–10 artefacts) or limited range of cultural materials with no evident stratification. Art is in poor condition and a small number of motifs are present.

- 2 Site contains a larger number, but limited range of cultural materials and/or motifs; and/or some intact stratified deposit remains; and/or are or unusual example(s) of a particular artefact, material, art technique or motif type.
- 3 Site contains a large number and diverse range of cultural materials and/or art techniques and motifs; and/or largely intact stratified deposit; and/or surface spatial patterning of cultural materials that still reflect the way in which the cultural materials were deposited.

The site condition ratings used for archaeological sites are:

- 0 Site destroyed.
- 1 Site in a deteriorated condition with a high degree of disturbance; lack of stratified deposits; some cultural materials remaining.
- 2 Site in a fair to good condition, but with some disturbance.
- 3 Site in an excellent condition with little or no disturbance. For surface artefact scatters this may mean that the spatial patterning of cultural materials still reflects the way in which the cultural materials were laid down.

Pearson and Sullivan note that Aboriginal archaeological sites are generally of high research potential because 'they are the major source of information about Aboriginal prehistory' (1995: 149). Indeed, the often great time depth of Aboriginal archaeological sites gives them research value from a global perspective, as they are an important record of humanity's history. Research potential can also refer to specific local circumstances in space and time – a site may have particular characteristics (well preserved samples for absolute dating, or a series of refitting artefacts, for example) that mean it can provide information about certain aspects of Aboriginal life in the past that other less or alternatively valuable sites may not (Burke and Smith 2004: 247-8). When determining research potential value particular emphasis has been placed on the potential for absolute dating of sites.

The following sections provide statements of significance for the Aboriginal archaeological sites recorded during the assessment. The significance of each site follows the assessment process outlined above. This includes a statement of significance based on the categories defined in the Burra Charter. These categories include social, historic, scientific, aesthetic and cultural (in this case archaeological) landscape values. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category is also proposed. Where suitable the determination of cultural (archaeological) landscape value is applied to both individual sites and places (to explore their associations) and also, to the Study Area as a whole. The nomination levels for the archaeological significance of each site are summarised below.

### **3.4.2 Representativeness**

Representativeness refers to the regional distribution of a particular site type. Representativeness is assessed by whether the site is common, occasional, or rare in a given region. Assessments of representativeness are subjectively biased by current knowledge of the distribution and number of archaeological sites in a region. This varies from place to place depending on the extent of archaeological research. Consequently, a site that is assigned low significance values for contents and condition, but a high significance value for representativeness, can only be regarded as significant in terms of knowledge of the regional archaeology. Any such site should be subject to re-assessment as more archaeological research is undertaken.

Assessment of representativeness also takes into account the contents and condition of a site. For example, in any region there may only be a limited number of sites of any type that have suffered minimal disturbance.

Such sites would therefore be given a high significance rating for representativeness, although they may occur commonly within the region.

The representativeness ratings used for considers the site type and its contents in regards to other archaeological sites in the region and is considered as follows:

- 1 common occurrence
- 2 occasional occurrence
- 3 rare occurrence

Overall scientific significance ratings for sites, based on a cumulative score for site contents, site integrity and representativeness are:

- 1-3 low scientific significance
- 4-6 moderate scientific significance
- 7-9 high scientific significance

Each site is given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score. This scoring procedure has been applied to the Aboriginal archaeological sites identified during the sub-surface testing. The results are presented in Table 4.

### **3.5 Statements of Scientific Significance**

The following scientific (archaeological) significance assessment is based on Requirement 11 of the *Code of practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010). Using the assessment criteria detailed in Section 3.4, an assessment of significance was determined and a rating for each site was determined. The results of the archaeological significance assessment are given in Table 4 below.

**Table 4: Scientific significance assessment of archaeological sites recorded within the Study Area.**

| Site             | Site Type                     | Site Content | Site Condition | Represent ativeness | Scientific Significance | Statement of Significance                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|-------------------------------|--------------|----------------|---------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>52-2-0083</b> | Shelter with Deposit          | 2            | 2              | 1                   | 5 - Moderate            | 52-2-0083 is a shelter with deposit site. Five artefacts were identified including chert, silcrete and quartz flakes. A yellowish sandy deposit with a depth of 30cm has accumulated in a 1 x 2m area of the shelter. The site is a typical example of a common site type in the region and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                               |
| <b>52-2-0099</b> | Axe grinding grooves          | 1            | 1              | 1                   | 3 - Low                 | 52-2-0099 is a grinding groove site. Three grinding grooves were located on a sandstone outcrop measuring 8m x 4m. The site is an example of a common site type in the region with poorly preserved features and is of low scientific significance.                                                                                                                                                                                                                               |
| <b>52-2-0229</b> | Axe grinding grooves          | 1            | 1              | 1                   | 3 - Low                 | 52-3-0229 is a grinding groove site. The site was recorded as a single grinding groove located within a sandstone outcrop measuring 18 x 2m. The site is recorded as being in reasonable condition. The site is an example of a common site type in the region with poorly preserved features and is of low scientific significance.                                                                                                                                              |
| <b>52-2-0233</b> | Axe grinding grooves          | 1            | 1              | 1                   | 3 - Low                 | 52-3-0233 is a grinding groove site. The site was recorded as two grinding grooves located within a sandstone outcrop measuring approximately 18 x 4m. The site is recorded as being in reasonable condition. The site is an example of a common site type in the region with poorly preserved features and is of low scientific significance.                                                                                                                                    |
| <b>52-2-0603</b> | Shelter with Art and Artefact | 1            | 1              | 1                   | 3 - Low                 | 52-2-0603 is a shelter with art, no identified deposit and a single artefact. The art is located on two panels on the rear wall and consists of a single red ochre hand stencil and a separate indeterminate charcoal motif. A single silcrete core has previously been identified within the shelter. The art is faded and in a poor condition. The site is an example of a common site type in the region with poorly preserved features and is of low scientific significance. |

| Site             | Site Type                                          | Site Content | Site Condition | Representativeness | Scientific Significance | Statement of Significance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------|----------------------------------------------------|--------------|----------------|--------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>52-2-3939</b> | Shelter with Deposit                               | 2            | 2              | 1                  | 5 - Moderate            | 52-2-3939 is a shelter with deposit. Five surface artefacts consisting of quartz, chert and silcrete flakes have been recorded in the drip line at this site. A deposit of yellowish grey sand is present and is in an intact and fair condition. The site is a typical example of a common site type in the region, and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>52-2-3940</b> | Shelter with Deposit                               | 2            | 2              | 1                  | 5 - Moderate            | 52-2-3940 is a shelter with deposit. Six surface artefacts consisting of silcrete flakes and quartz angular fragments have been recorded in the drip line at this site. A deposit of yellowish grey sand is present and is in an intact and fair condition. The site is a typical example of a common site type in the region, and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>52-2-3941</b> | Shelter with Deposit                               | 2            | 2              | 1                  | 5 - Moderate            | 52-2-3941 is a shelter with deposit. Four surface artefacts consisting of quartz and silcrete flakes have been recorded in the drip line at this site. A deposit of yellowish grey sand is present and is in an intact and fair condition. The site is a typical example of a common site type in the region, and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>52-3-0310</b> | Shelter with Art, Deposit and axe grinding grooves | 4            | 2              | 2                  | 8 - High                | 52-2-0310 is a shelter site that has art, grinding grooves and an archaeological deposit. The deposit consists of over 100 stone artefacts on the shelter floor, suggesting a high potential for further material in the grey-brown sandy loam deposit, which has been partially disturbed through animal burrowing. The art assemblage contains 12 recognisable motifs including charcoal outline and infill anthropomorphic figures, macropods, fish and geometric lines and dots. The art is in good condition and is still easily recognisable. Three grinding grooves are located in the southern end of the shelter. The relatively large assemblage of big motifs, with multiple techniques affords rarity value, and the site is generally representative of charcoal and ochre motif art for the study area and region. This site is |

| Site             | Site Type            | Site Content | Site Condition | Representativeness | Scientific Significance | Statement of Significance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------|----------------------|--------------|----------------|--------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                      |              |                |                    |                         | of high scientific significance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>52-3-0311</b> | Shelter with Deposit | 2            | 1              | 1                  | 4 - Moderate            | 52-3-0311 is a shelter site with deposit. The deposit consists of yellowish-brown sand with quartz, silcrete and chert flakes. The deposit has been disturbed to some extent through wombat burrowing. The site is a typical example of a common site type in the region and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                                                                                |
| <b>52-3-0312</b> | Shelter with Deposit | 2            | 2              | 1                  | 5 - Moderate            | 52-3-0312 is a shelter site with deposit. The deposit consists of a yellowish-brown sand with high densities of artefacts located at two points in the drip line. The deposit is relatively undisturbed. The site is a typical example of a common site type in the region and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                                                                              |
| <b>52-3-0313</b> | Open Camp Site       | 1            | 1              | 1                  | 3 - Low                 | 52-3-0313 is an open camp site. The site was recorded as containing nine stone artefacts with a range of raw material types including silcrete, chert and fossilized wood. The site has a shallow white sand overlaying a yellow clay, this has been extensively disturbed by erosion of the topsoil through flooding and fire train upgrades. The site is an example of a common site type in the region with poorly preserved features and is of low scientific significance.                                     |
| <b>52-3-0314</b> | Shelter with Art     | 4            | 2              | 1                  | 7 - High                | 52-3-0314 is a shelter with art and deposit. The shelter contains two art panels. The first panel contains 2 charcoal outline motifs of a lizard and indeterminate drawing. Nearby the second art panel contains a series of charcoal lines. The art is in good condition and is still easily recognisable. The small but unique motifs affords rarity value, and the site is generally representative of charcoal and ochre motif art for the study area and region. This site is of high scientific significance. |

| Site             | Site Type            | Site Content | Site Condition | Representativeness | Scientific Significance | Statement of Significance                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------|----------------------|--------------|----------------|--------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>52-3-0317</b> | Shelter with Deposit | 2            | 1              | 1                  | 4 - Moderate            | 52-3-0317 is a shelter site with deposit. The deposit consists of a yellowish-brown sand with a single artefact identified. The deposit has been disturbed to some extent. The site is a typical example of a common site type in the region and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                                |
| <b>52-3-0319</b> | Shelter with Deposit | 2            | 1              | 1                  | 4 - Moderate            | 52-3-0319 is a shelter site with deposit. The deposit consists of a yellowish-clay loam with two artefacts consisting of a fossilized wood flake and a quartz flake identified. The deposit is in reasonable condition. The site is a typical example of a common site type in the region and is of moderate scientific significance due to its preservation and lack of disturbance.                                                   |
| <b>52-3-0320</b> | Axe grinding grooves | 1            | 1              | 1                  | 3 - Low                 | 52-3-0320 is a grinding groove site. The site was recorded as a single grinding groove located within a sandstone outcrop measuring 22 x 2.5m. The site is recorded as being in reasonable condition. The site is an example of a common site type in the region with poorly preserved features and is of low scientific significance.                                                                                                  |
| <b>52-3-0322</b> | Axe grinding grooves | 1            | 1              | 1                  | 3 - Low                 | 52-3-0322 is a grinding groove site. The site was recorded as two grinding grooves located within a sandstone outcrop measuring approximately 11 x 20m. The site is recorded as being in reasonable condition. The site is an example of a common site type in the region with poorly preserved features and is of low scientific significance.                                                                                         |
| <b>52-3-0323</b> | Shelter with Deposit | 2            | 2              | 1                  | 5 - Moderate            | 52-3-0323 is a shelter with deposit. Three surface artefacts consisting of silcrete, chert and quartz flakes have been recorded in the drip line at this site. A deposit of yellowish grey sand is present with a depth of 20 cm and is in an intact and fair condition. The site is a typical example of a common site type in the region, and is of moderate scientific significance due to its preservation and lack of disturbance. |

| Site                | Site Type                      | Site Content | Site Condition | Representativeness | Scientific Significance | Statement of Significance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------|--------------------------------|--------------|----------------|--------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>52-3-0325</b>    | Shelter with Art and Deposit   | 2            | 1              | 1                  | 4 - Moderate            | 52-3-0325 is a shelter with Art and deposit. Five surface artefacts consisting of silcrete, fossilized wood and quartz flakes and a quartz core have been recorded. A deposit of yellowish clayey sand is present but has been subject to wombat burrowing. A single art panel consisting of sprayed red ochre is present on the rear wall. The art is in poor condition and indiscernible. The site is a typical example of a common site type in the region, and is of moderate scientific significance due to the range of features present. |
| <b>Wonga East 4</b> | Shelter with Deposit           | 2            | 2              | 1                  | 5 - Moderate            | Wonga East 4 is a shelter with deposit. Four surface artefacts consisting of quartz and silcrete flakes have been recorded in the drip line at this site. A deposit of yellowish grey sand is present and is in an intact and fair condition. The site is a typical example of a common site type in the region, and is of moderate scientific significance due to its preservation and lack of disturbance.                                                                                                                                    |
| <b>Wonga East 5</b> | Shelter with Stone Arrangement | 1            | 1              | 1                  | 3 - Low                 | Wonga East 5 is a shelter with stone arrangement. The shelter is low with two piles of stones in the entrance. The lichen growing on the stones indicates that they were placed some time ago. The shelter does not contain a deposit, art or artefacts. Although this may have been a historical feature, consultation with Aboriginal stakeholders indicates that the site may have cultural significance. Given the condition of the site, limited range of site features the site is of low scientific significance.                        |

### 3.6 Potential Impacts to Aboriginal Heritage

During and following the extraction of coal via longwall mining methods, overlying rock strata are subject to varying degrees of subsidence, tilt and strain (SCT 2013). At the surface, the ground subsides vertically and also moves horizontally towards the centre of the mined ground. These movements can cause slumping of soils on poorly consolidated landform elements such as talus slopes and cracking of rigid areas such as sandstone platforms, ledges and cliffs. These ground surface changes can potentially impact on cultural heritage sites.

It is difficult to make precise statements of impact due to subsidence effects to Aboriginal shelter sites, and subsidence impact prediction modeling for Aboriginal shelter sites is still developing. Following on from Sefton's (2000) review of subsidence impacts in the Southern Coalfield, the majority of subsequent subsidence impact prediction modeling has been based on the identification of characteristics associated with the potential for subsidence effects to occur. To date, no single characteristic has been identified as the sole contributor to subsidence effects and risk assessments consider a combination of shelter, longwall and subsidence characteristics and parameters. In order to determine the level of risk of impacts to Aboriginal shelter sites from subsidence impacts in the Project Area, ratings and criteria have been developed considering the following, which are discussed in greater detail below:

- Potential of subsidence effects to impact on Aboriginal shelter sites;
- A review of the results of Aboriginal shelter subsidence monitoring in the wider Southern Coalfield; and,
- A review of the results of Aboriginal shelter subsidence monitoring in the Dendrobium and Delta (Elouera) Collieries which share similar geological characteristics with the Study Area.

#### 3.6.1 Subsidence Impacts

The 2008 *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield Strategic Review* defines subsidence effects as "the deformation of the ground mass surrounding a mine due to mining activity" (DoP 2008: vii). Subsidence impacts are the changes to the ground that subsequently occur as a result of subsidence effects. Subsidence impacts are not always recognisable within Aboriginal shelters or are difficult to separate from normal background effects. Any change of Aboriginal shelter site condition observed during subsidence is managed under the assumption that it could be the result of a subsidence impact.

Changes to Aboriginal shelter site conditions resulting from subsidence impacts associated with longwall mining were first recorded by Lambert and Rosenfield in the mid to late 1980's (Sefton 2000: 23-24). To date, changes in shelter conditions have been recorded at 14 shelter sites in the Southern Coalfield. Of these changes, nine are directly attributed to subsidence impacts and two are possibly related to subsidence impacts. In the case of changes in conditions at two sites, 52-2-1619 Browns Road 4 and PAD 3, Sefton (2000) noted that block fall in these shelters occurred along pre-existing cracks and there were no clear indicators if it was a result of subsidence impacts or a natural block fall event.

Changes to shelter conditions attributed to subsidence impacts include small movements along joints, tension cracking of strata, cliff collapse or block fall and increased water seepage of shelter sandstone surfaces. While subsidence impacts do not always have direct heritage values impacts, i.e. impacts to art panels, they can cause a change in shelter conditions that can then lead to a heritage values impact, such as altering water seepage patterns that subsequently adversely affects art panels. Thus the heritage values at a

given Aboriginal shelter site, such as the presence or absence of art panels, will influence the occurrence risk of a heritage values impact due to subsidence impacts.

Changes to site conditions of axe grinding grooves and engraving sites due to subsidence effects could include cracking of sandstone platforms, tree fall and change in drainage patterns. It is possible that these changes in site conditions could result in impacts to axe grinding grooves and engravings if cracks directly impact grooves or engravings, tree fall obscures grooves or engravings and/or changes in drainage patterns alters the natural setting context of axe grinding grooves.

To date, 14 axe grinding grooves and engravings on sandstone rock platforms/outcrops have been monitored for changes in site conditions as a result of mine related subsidence effects. Changes in site conditions have been recorded at one site, 52-2-0258 Flat Rock Creek 57, an axe grinding groove and engraving site at the Metropolitan Colliery (Sefton 2003). A 25 m crack running east to west was observed on the northwest section of the rock outcrop on which the site was located, however no impacts were observed to either the axe grinding grooves or the engraving (ibid: 12-13). For a site to incur a total loss of cultural heritage value; the complete destruction of axe grinding grooves or engravings in their entirety would have to occur. Subsidence monitoring to date indicates that this is highly unlikely to occur and changes in site conditions from subsidence effects are at most only likely to result in partial loss of cultural heritage values.

To date, no impacts to other Aboriginal sites, including open camp sites and artefact scatters have been recorded.

### **3.6.2 Review of Aboriginal Site Monitoring Results in the Southern Coalfield**

Subsidence monitoring data has been collected for 104 shelter sites in the Southern Coal Fields by Sefton, Biosis and Niche Environment and Heritage. Eleven of these sites have had a change in condition due to subsidence impacts, or 10.6% of all sites monitored. A combination of large overhang size and presence of bedding planes with water seepage remains the most common shared characteristics in shelters to have a change in shelter conditions. Of the 11 sites where change has been recorded, eight have water seepage and only one site has a shelter volume of less than 50 cubic metres. All shelters which showed impacts as a result of subsidence had a maximum predicted subsidence movement of greater than 300 mm; however predicted tilt, tensile and compressive strains varied greatly across sites. Other contributing characteristics distinguishable in the data as possibly contributing to the risk of impact resulting from subsidence impacts included maximum predicted subsidence movement and landform.

There are 22 sites in the dataset (21%) that were recorded during baseline recording as having a combination of water seepage and a shelter volume of more than 50 cubic metres. Of these large wet sites, eight (36%) have had changes in shelter conditions. In comparison, of the 31 large dry shelters only two (6.5%) have been subject to subsidence impacts. These trends are relatively consistent with Sefton's (2000) review in which four of the nine large shelter sites with water seepage suffered subsidence impacts (44%), in comparison to only one of the 14 large dry shelter sites (7.14%).

Landform also seems to play a role with lower valley slopes (14.3%), ridge/plateau tops (25%) and valley bottoms (15.4%) having a higher rate of impacts than the main landform in which shelters are located, which is upper ridge/valley slopes (6.1% of sites impacted). However, rates of subsidence impact associated with landforms may also be coincidental with other factors such as water seepage, which have higher chances of occurring in some landforms. For example the vast majority of sites with water seepage are located in lower valley slopes (39.3% of all sites have water seepage) and valley bases (30.7% of all sites have water seepage).

Of the shelter sites impacted by subsidence, there is only one shelter site with a volume of less than 50 cubic metres, 52-2-0277 Sandy Creek Road 25. This site is unusual in that it is a relatively small shelter created by cavernous weathering and is part of a larger rock platform. Subsidence impacts at the site included minor cracking and the separation of a vertical joint on the rear wall of the shelter. It is possible that these impacts

are related to a combination of the presence of joints and the size of the larger rock platform in which it is located.

A preliminary Discriminant Analysis (DA) of Southern Coalfield Aboriginal site subsidence monitoring data has been undertaken by Symbolix on behalf of Biosis. The DA aimed to discriminate between sites that experienced subsidence effects and those that did not. While the results are only preliminary at this stage, preliminary trends indicate that larger wet sites on ridge tops or valley bottoms are the features that best group into those that experience changes versus those that do not (Symbolix 2012). These findings are consistent with Sefton's 2000 findings and the simple analysis provided above.

### 3.6.3 Aboriginal Site Monitoring in the Dendrobium and Delta (Elouera) Collieries

Subsidence monitoring data has been collected for 17 shelter sites within the Dendrobium and Delta (Elouera) Colliery areas. These colliery areas share similar geological characteristics to the current Study Area, such as depth of coal seams being mined, and are of direct relevance in assessing the risk of impact from subsidence impacts. Of these sites, two sites have had impacts due to subsidence effects, 52-2-2252 and 52-5-0277, accounting for 17.5% of sites monitored. Site 52-2-2252 is a large dry shelter and 52-5-0277 is a small wet shelter.

Subsidence predictions for 52-2-2252 and 52-5-0277 had maximum predicted vertical movements of between 900mm to 1540mm and maximum predicted tensile strains of between 2.5mm/m and 7.4mm/m. Only one other site had similar subsidence predictions, 52-5-0278, but was not subject to subsidence impacts.

The frequency of subsidence impacts observed at Aboriginal shelter sites in the Dendrobium and Delta Collieries is higher than observed across the Southern Coalfield in general. However the dataset is still small and the difference in trends between the Southern Coalfield and Dendrobium/Delta datasets should be treated with caution.

### 3.6.4 Risk of Impact Ratings and Criteria

The development of an impact prediction methodology has attempted to provide reasonably accurate subsidence impact predictions to shelter sites, which, in combination with a cultural heritage significance assessment, is then used to provide appropriate avoidance and mitigation recommendations (generally subsidence monitoring). The risk of impact criteria adopted for the purposes of this assessment are shelter size (volume), the presence of water seepage, maximum predicted subsidence movement and the presence/absence of art. Risk categories are from moderate to negligible and reflect subsidence effect occurrence and actual impacts to heritage values from subsidence effects monitored to date.

A description of risk categories and criteria is provided in Table 5.

**Table 5: Subsidence Effect Risk Categories and Criteria**

| Category        | Description                                                                                                | Criteria                                                                                                                                                                                                                           |
|-----------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Moderate</b> | There is a moderate chance of subsidence effects occurring which may result in impacts to heritage values. | The shelter has an art panel present; and<br>The shelter has a volume larger than 50 cubic metres;<br>The shelter has joints or bedding plans subject to water seepage; and<br>Maximum predicted subsidence is greater than 300mm. |
| <b>Low</b>      | There is a low chance of subsidence effects occurring which may result in impacts to heritage values.      | The shelter has a volume larger than 50 cubic metres; and<br>Maximum predicted subsidence is greater than                                                                                                                          |

| Category          | Description                                                                                                                                                                                                     | Criteria                                                                                                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                                                                                                                                                                                                 | 300mm                                                                                                                                                                                                                    |
| <b>Very Low</b>   | There is a very low chance of subsidence effects occurring which may result in impacts to heritage values.                                                                                                      | The shelter has a volume less than 50 cubic metres and maximum predicted subsidence is greater than 300mm; or<br>The shelter has a volume more than 50 cubic metres and maximum predicted subsidence is less than 300mm. |
| <b>Negligible</b> | Impacts to heritage values are unlikely and if they did occur would normally be indistinguishable from natural environmental effects; or<br>The site is located outside of the predicted subsidence impact zone | The shelter has a volume less than 50 cubic metres;<br>Maximum predicted subsidence is less than 300mm, tensile strain predictions are <0.5mm/m and compressive strain estimates are <0.01mm/m.                          |

### 3.6.5 Subsidence Impact Predictions

The subsidence impact assessment for Aboriginal sites in the Study Area is presented below in Table 6. This assessment was made using the parameters in Sefton's PCA and in conjunction with the subsidence predictions provided by SCT (SCT 2013), detailed in Table 7. The assessment of risk was made using the criteria outlined in Section 3.6.4

**Table 6: Summary of the predicted risk of impact to Aboriginal Sites in Study Area**

Sites in bold are located within the 200 mm subsidence impact footprint; all other sites are located within the 600m study area buffer.

| Site Number | Site Name                       | Site Type                                          | Scientific Significance | Cultural Significance | Risk of Impact  |
|-------------|---------------------------------|----------------------------------------------------|-------------------------|-----------------------|-----------------|
| 52-2-0083   | Bulli Mine Shaft Site 7         | Shelter with Deposit                               | Moderate                | High                  | Negligible      |
| 52-2-0099   | <b>Bulli Mine Shaft Site 8</b>  | <b>Axe grinding grooves</b>                        | <b>Low</b>              | <b>High</b>           | <b>Very Low</b> |
| 52-2-0229   | <b>Bulli Mine Shaft Site 12</b> | <b>Axe grinding grooves</b>                        | <b>Low</b>              | <b>High</b>           | <b>Very Low</b> |
| 52-2-0233   | Bulli Mine Shaft Site 13        | Axe grinding grooves                               | Low                     | High                  | Negligible      |
| 52-2-0603   | <b>Bulli Mine Shaft Site 19</b> | <b>Shelter with Art and Artefact</b>               | <b>Low</b>              | <b>High</b>           | <b>Moderate</b> |
| 52-2-3939   | <b>Wonga East 1</b>             | <b>Shelter with Deposit</b>                        | <b>Moderate</b>         | <b>High</b>           | <b>Low</b>      |
| 52-2-3940   | <b>Wonga East 2</b>             | <b>Shelter with Deposit</b>                        | <b>Moderate</b>         | <b>High</b>           | <b>Low</b>      |
| 52-2-3941   | <b>Wonga East 3</b>             | <b>Shelter with Deposit</b>                        | <b>Moderate</b>         | <b>High</b>           | <b>Very Low</b> |
| 52-3-0310   | Bulli Mine Shaft Site 18        | Shelter with Art, Deposit and axe grinding grooves | High                    | High                  | Negligible      |
| 52-3-0311   | Bulli Mine Shaft Site 20        | Shelter with Deposit                               | Moderate                | High                  | Negligible      |
| 52-3-0312   | Bulli Mine Shaft Site           | Shelter with Deposit                               | Moderate                | High                  | Negligible      |

| Site Number      | Site Name                       | Site Type                           | Scientific Significance | Cultural Significance | Risk of Impact    |
|------------------|---------------------------------|-------------------------------------|-------------------------|-----------------------|-------------------|
|                  | 23                              |                                     |                         |                       |                   |
| <b>52-3-0313</b> | Bulli Mine Shaft Site 29        | Open Camp Site                      | Low                     | High                  | Negligible        |
| <b>52-3-0314</b> | Bulli Mine Shaft Site 21        | Shelter with Art                    | High                    | High                  | Negligible        |
| <b>52-3-0317</b> | Bulli Mine Shaft Site 22        | Shelter with Deposit                | Moderate                | High                  | Negligible        |
| <b>52-3-0319</b> | Bulli Mine Shaft Site 24        | Shelter with Deposit                | Moderate                | High                  | Negligible        |
| <b>52-3-0320</b> | <b>Bulli Mine Shaft Site 25</b> | <b>Axe grinding grooves</b>         | <b>Low</b>              | <b>High</b>           | <b>Very Low</b>   |
| <b>52-3-0322</b> | Bulli Mine Shaft Site 31        | Axe grinding grooves                | Low                     | High                  | Negligible        |
| <b>52-3-0323</b> | Bulli Mine Shaft Site 26        | Shelter with Deposit                | Moderate                | High                  | Negligible        |
| <b>52-3-0325</b> | <b>Bulli Mine Shaft Site 27</b> | <b>Shelter with Art and Deposit</b> | <b>Moderate</b>         | <b>High</b>           | <b>Negligible</b> |
| <b>n/a</b>       | Wonga East 4                    | Shelter with Deposit                | Moderate                | High                  | Negligible        |
| <b>n/a</b>       | Wonga East 5                    | Shelter with Stone Arrangement      | Low                     | High                  | Negligible        |

**Table 7: Subsidence Effect Risk Assessment**

| Site Number | L (m) | W (m) | H (m) | Volm <sup>3</sup> | Aspect | Faces aspect | Art | Location | Wet / Dry | Location End LW | Location in LW | DIR   | SUBS | Tensile Strain | Comp Strain | Tilt | Previously Undermined | Previously Subsided |
|-------------|-------|-------|-------|-------------------|--------|--------------|-----|----------|-----------|-----------------|----------------|-------|------|----------------|-------------|------|-----------------------|---------------------|
| 52-2-0083   | 2.5   | 1.5   | 1.5   | 5.625             | NE     | CW           | N   | LVS      | D         | N               | O              | E-W   | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | No                  |
| 52-2-0099   | 8     | 4     | N/A   | N/A               | N      | SP           | N   | UVS      | W         | Y               | O              | E-W   | 0.5  | 4.2            | 8           | 14   | Yes                   | No                  |
| 52-2-0229   | 18    | 2     | N/A   | N/A               | N      | SP           | N   | RT       | W         | Y               | O              | E-W   | 0.9  | 4.1            | 8           | 14   | Yes                   | Yes                 |
| 52-2-0233   | 18    | 4     | N/A   | N/A               | N      | SP           | N   | RT       | W         | N               | O              | E-W   | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-2-0603   | 7     | 3     | 3     | 63.00             | W      | CW           | Y   | RT       | W         | Y               | E              | E-W   | 0.3  | 0.6            | 2.4         | 4.7  | Yes                   | Yes                 |
| 52-2-3939   | 8     | 8     | 1.5   | 96.00             | W      | BF           | N   | UVS      | D         | Y               | E              | E-W   | 0.2  | 6.2            | 6.2         | 10   | Yes                   | Yes                 |
| 52-2-3940   | 25    | 4     | 4     | 400.00            | S      | BF           | N   | UVS      | D         | Y               | E              | E-W   | 0.1  | 3.1            | 6.2         | 10   | Yes                   | No                  |
| 52-2-3941   | 8     | 2     | 1     | 16.00             | S      | BF           | N   | UVS      | D         | Y               | M              | E-W   | 0.2  | 3.0            | 5.9         | 10   | Yes                   | Yes                 |
| 52-3-0310   | 9.6   | 8.5   | 1.6   | 130.56            | W      | CW           | Y   | RT       | D         | N               | O              | E-W   | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | No                  |
| 52-3-0311   | 7.5   | 6.9   | 1.2   | 62.10             | SW     | CW           | N   | UVS      | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-3-0312   | 20    | 4.5   | 3.3   | 297.00            | N      | CW           | N   | UVS      | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-3-0313   | 5     | 25    | N/A   | N/A               | N/A    | SP           | N   | UVS      | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-3-0314   | 6.3   | 3.4   | 2.5   | 53.55             | NE     | CW           | Y   | RT       | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-3-0317   | 20    | 4     | 4     | 320.00            | NW     | BF           | N   | UVS      | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-3-0319   | 67    | 4.5   | 3     | 904.50            | NE     | CW           | N   | UVS      | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-3-0320   | 22    | 2.5   | N/A   | N/A               | N/A    | SP           | N   | RT       | W         | N               | CP             | SE-NW | 1.8  | 14.1           | 28          | 47   | Yes                   | Yes                 |
| 52-3-0322   | 11    | 20    | N/A   | N/A               | S      | SP           | N   | UVS      | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | Yes                 |
| 52-3-0323   | 6     | 3.5   | 3     | 63.00             | SW     | BF           | N   | LVS      | W         | N               | O              | SE-NW | <0.1 | <0.5           | <1.0        | <2.0 | No                    | No                  |

| Site Number         | L (m) | W (m) | H (m) | Volm <sup>3</sup> | Aspect | Faces aspect | Art | Location | Wet / Dry | Location End LW | Location in LW | DIR   | SUBS | Tensile Strain | Comp Strain | Tilt | Previously Undermined | Previously Subsidised |
|---------------------|-------|-------|-------|-------------------|--------|--------------|-----|----------|-----------|-----------------|----------------|-------|------|----------------|-------------|------|-----------------------|-----------------------|
| <b>52-3-0325</b>    | 3     | 2.5   | 1.2   | 9.00              | NW     | CW           | Y   | LVS      | W         | Y               | M              | SE-NW | 1.4  | 8.6            | 17          | 29   | Yes                   | Yes                   |
| <b>Wonga East 4</b> | 10    | 4     | 10    | 24.00             | S      | CW           | N   | UVS      | D         | N               | O              | E-W   | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | No                    |
| <b>Wonga East 5</b> | 6     | 4     | 1     | 24.00             | S      | CW           | N   | UVS      | W         | N               | O              | E-W   | <0.1 | <0.5           | <1.0        | <2.0 | Yes                   | No                    |

#### Abbreviations

|                       |                                                                                                                                                                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L                     | overhang / sandstone platform length (metres)                                                                                                                                                                                               |
| W                     | overhang / sandstone platform width (metres)                                                                                                                                                                                                |
| H                     | overhang height                                                                                                                                                                                                                             |
| Volm <sup>3</sup>     | Volume in metres cubed                                                                                                                                                                                                                      |
| Aspect                | direction shelter faces                                                                                                                                                                                                                     |
| Faces aspect          | main apparent formation process either block fall (BF) or cavernous weather (CW) or sandstone platform (SP)                                                                                                                                 |
| Art                   | Art present (Y = present, N = absent)                                                                                                                                                                                                       |
| Location              | Topographic location (RT = ridgetop, UVS = upper valley slope, LVS = lower valley slope, VB = valley bottom)                                                                                                                                |
| Wet / dry             | D = surfaces mainly not affected by water seepage, W = surface mainly affected by water seepage                                                                                                                                             |
| Location End LW       | Y = located within 100m of the end of a longwall, wither inside or outside the longwall, N = not located within 100m of the end of a longwall, wither inside or outside the longwall                                                        |
| Location In LW        | O = located outside the longwall and chain pillar, CP = located under the longwall and chain pillar, E = located closer to the edge of the longwall than the middle (centre), M = located closer to the centre of the longwall than the end |
| DIR                   | Direction of the nearest longwall                                                                                                                                                                                                           |
| SUBS                  | Maximum predicted subsidence                                                                                                                                                                                                                |
| Tensile Strain        | Maximum predicted tensile strain                                                                                                                                                                                                            |
| Comp Strain           | Maximum compressive strain                                                                                                                                                                                                                  |
| Tilt                  | Maximum tilt                                                                                                                                                                                                                                |
| Previously undermined | Has the site previously been undermined by extraction of the Bulli or Balgownie seams (Y = yes, N = no)                                                                                                                                     |
| Previously subsidised | Has the site previously been subsidised by extraction of the Bulli or Balgownie seams (Y = yes, N = no)                                                                                                                                     |

### 3.6.6 Specific Site Impact Assessments

Based on the information in Tables 4, 5 and 6, the following impact assessment has been described in terms of 'risk of impact' for Aboriginal sites within the Study Area.

| 52-2-0083                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Bulli Mine Shaft Site 7  | Shelter with Deposit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------|
| <p>The site is located along a 1-2m high cliff formation which is relatively short in length and has a predicted horizontal compression of less than 20mm/m. The site has been previously undermined as part of the Bulli Seam extraction works, but does not appear to have been subject to previous subsidence.</p> <p>Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 250m north of Longwall 11. The site has a small volume, less than 50 m<sup>3</sup> and no water seepage is present.</p> <p><b>Location: Outside long wall panels but within 600m study area buffer</b></p> <p><b>Impact Assessment: Negligible</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |                      |
| 52-2-0099                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Bulli Mine Shaft Site 8  | Axe grinding grooves |
| <p>The site is mapped as occurring within a sandstone platform on the upper valley slope; however this site could not be relocated. Based on the mapped location, the site has been previously undermined as part of the Bulli Seam extraction works, but does not appear to have been subject to previous subsidence.</p> <p>Based on subsidence predictions for the preferred project and the mapped location, the site has maximum predicted systematic tensile strains of 4.2m, an overall subsidence movement of 500mm/m and is located within Longwall 11. Whilst the site is predicted to be subject to movement, as an open site it will not be subject to rock falls caused by horizontal compression along cliffs (predicted at 150mm per 20m section). There is a 20-30% potential for impacted through cracking of the sandstone platforms within which the site is located. As this site has not been located it is difficult to accurately determine precise impacts based upon the landform context and subsidence modelling. The current impact assessment is based upon the assumption that the site is located in its recorded location but has been obscured by vegetation cover which has significantly increased since the original recording (post-bush fire).</p> <p><b>Location: Centre of LW11</b></p> <p><b>Impact Assessment: Very Low</b></p> |                          |                      |
| 52-2-0229                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Bulli Mine Shaft Site 12 | Axe grinding grooves |
| <p>The site is mapped as occurring within a sandstone platform on the upper valley slope; however this site could not be relocated. The site has been previously undermined as part of the Bulli Seam extraction works, but does not appear to have been subject to previous subsidence.</p> <p>Based on subsidence predictions for the preferred project and the mapped location, the site has maximum predicted systematic tensile strains of 4.1m, an overall subsidence movement of 900mm/m and is located within Longwall 11. Whilst the site is predicted to be subject to movement, as an open site it will not be subject to rock falls caused by horizontal compression along cliffs (predicted at 150mm per 20m section). There is a 20-30% potential for impacted through cracking of the sandstone platforms within which the site is located. As this site has not been located it is difficult to accurately determine precise impacts based upon the landform context and subsidence modelling. The current impact assessment is based upon the assumption that the site is located in its recorded location but has been obscured by vegetation cover which has significantly increased since the original recording (post-bush fire).</p> <p><b>Location: Centre of LW11</b></p> <p><b>Impact Assessment: Very Low</b></p>                               |                          |                      |
| 52-2-0233                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Bulli Mine Shaft Site 13 | Axe grinding grooves |
| <p>The site is mapped as occurring within a sandstone platform on the upper valley slope; however this site could not be relocated. The site has been previously undermined as part of the Bulli Seam extraction works, but does not appear to have been subject to previous subsidence.</p> <p>Based on subsidence predictions for the preferred project and the mapped location, the site has maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 100mm and is located 50m north of Longwall 11. Whilst the site is predicted to be subject to movement, as an open site it will not</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |                      |

be subject to rock falls caused by horizontal compression along cliffs (predicted at 150mm per 20m section). There is a limited potential for impacted through cracking of the sandstone platforms the site is located within due to its location outside of the longwall. As this site has not been located it is difficult to accurately determine precise impacts based upon the landform context and subsidence modelling. The current impact assessment is based upon the assumption that the site is located in its recorded location but has been obscured by vegetation cover which has significantly increased since the original recording (post-bush fire).

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

|                  |                                 |                                       |
|------------------|---------------------------------|---------------------------------------|
| <b>52-2-0603</b> | <b>Bulli Mine Shaft Site 19</b> | <b>Shelter with Art and Artefacts</b> |
|------------------|---------------------------------|---------------------------------------|

The site is located on a ridge top and forms part of a north to south aligned 90m cliffline ranging from 2 to 4m in height. The site has been previously undermined by the Bulli seam extraction works and has been subject to a maximum of subsidence of 0.3m and horizontal movement of 0.1m. There is no evidence of rock fall within the shelter and it is possible the sites location near the top of the ridgeline has reduced the horizontal compression exerted as a part of previous mining.

Based on subsidence predictions for the preferred project, the site is located at the centre of Longwall 11 and has maximum predicted horizontal compression of 250mm and an overall subsidence movement of 1.5m. The horizontal compression is likely to cause perceptible cracking in the vicinity of the site, with a 5-10% probability of rock fall along the cliff line associated with the site. The site has a small volume of 63 m<sup>3</sup> and water seepage is present.

**Location: Centre of LW11**

**Impact Assessment: Moderate**

|                  |                     |                             |
|------------------|---------------------|-----------------------------|
| <b>52-2-3939</b> | <b>Wonga East 1</b> | <b>Shelter with Deposit</b> |
|------------------|---------------------|-----------------------------|

The site is located in an upper valley slope and is part of a 3-5m high sandstone cliff which protrudes from a general line of cliffs with a 6m overhang. The site has been previously undermined by the Bulli seam extraction which has resulted in approximately 0.2m of subsidence and tensile strains of 9mm.

Based on subsidence predictions for the preferred project, the site is located at the edge of Longwall 9 with a predicted maximum subsidence of 0.8m, horizontal compression of 350mm and tensile strains of 9mm/m. The site is relatively short in length and is located away from the general cliff line which limits the potential for impacts. The horizontal compression is likely to cause perceptible cracking in the vicinity of the site (predicted at 30%), with a 2% probability of rock fall along the cliff line associated with the site. The site has a small volume of 96 m<sup>3</sup> and no water seepage is present.

**Location: Edge of LW9**

**Impact Assessment: Low**

|                  |                     |                             |
|------------------|---------------------|-----------------------------|
| <b>52-2-3940</b> | <b>Wonga East 2</b> | <b>Shelter with Deposit</b> |
|------------------|---------------------|-----------------------------|

The site is located in an upper valley slope and is part of an extended 100m long, 4-6m high sandstone cliff which runs east to west. The site appears to have been subject to rock fall either naturally or as part of the previous Bulli seam extraction. The Bulli seam extraction has resulted in approximately 0.1m of subsidence and horizontal compression of 0.1m.

Based on subsidence predictions for the preferred project, the site is located at the edge of Longwall 9 with a predicted maximum subsidence of 0.6m, horizontal compression of 250mm and tensile strains of 7mm/m. The site is considered vulnerable to further rock falls due to the long line of cliffs, some of which have been subject to collapse. The horizontal compression is likely to cause perceptible cracking in the vicinity of the site (predicted at 30%), with a 5% probability of rock fall along the cliff line associated with the site. The site has a large volume of 400 m<sup>3</sup> and no water seepage is present.

**Location: Edge of LW9**

**Impact Assessment: Low**

|                  |                     |                             |
|------------------|---------------------|-----------------------------|
| <b>52-2-3941</b> | <b>Wonga East 3</b> | <b>Shelter with Deposit</b> |
|------------------|---------------------|-----------------------------|

The site is located in an upper valley slope and is part of a 3-4m high sandstone cliff; the site is formed through block fall which has separated the site from neighbouring cliff line. The site has been previously undermined by the Bulli seam extraction which has resulted in approximately 0.2m of subsidence and horizontal compression of 0.1m.

Based on subsidence predictions for the preferred project, the site is located at the edge of Longwall 9 with a predicted maximum subsidence of 1.2m, horizontal compression of 250mm and tensile strains of 7mm/m. The site is not considered vulnerable to further rock fall as it is detached from the cliff line and with a volume of 16 m<sup>3</sup> is not large enough to experience significant lateral compression. No water seepage is present.

**Location: Centre of LW9**

**Impact Assessment: Very Low**

|                  |                                 |                                                           |
|------------------|---------------------------------|-----------------------------------------------------------|
| <b>52-3-0310</b> | <b>Bulli Mine Shaft Site 18</b> | <b>Shelter with Art, Deposit and axe grinding grooves</b> |
|------------------|---------------------------------|-----------------------------------------------------------|

The site is located on an upper valley slope as part of an extended 400m long, 1-3m high cliff formation which has a predicted horizontal compression of less than 20mm/m. The site has been previously undermined as part of the Bulli Seam extraction works, but does not appear to have been subject to previous subsidence.

Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 70m north of Longwall 11. The site has a volume greater than 50 m<sup>3</sup>, art panels but no identifiable water seepage is present. Despite the minimal impacts predicted, the shelters size and content elevates its impact assessment from negligible.

**Location: Centre of LW11**

**Impact Assessment: Very Low**

|                  |                                 |                             |
|------------------|---------------------------------|-----------------------------|
| <b>52-3-0311</b> | <b>Bulli Mine Shaft Site 20</b> | <b>Shelter with Deposit</b> |
|------------------|---------------------------------|-----------------------------|

The site is located on an upper valley slope as part of an extended, 1-6m high cliff formation which has a predicted horizontal compression of less than 20mm/m. The site has been previously undermined as part of the Bulli and Balgownie seam extraction works, and has been subject to previous subsidence as part of the Balgownie seam extraction works.

Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 175m north-east of Longwall 7. The site has a volume greater than 50 m<sup>3</sup> and water seepage is present, however as the site is located outside of the long wall panels a negligible impact to heritage values is predicted..

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

|                  |                                 |                             |
|------------------|---------------------------------|-----------------------------|
| <b>52-3-0312</b> | <b>Bulli Mine Shaft Site 23</b> | <b>Shelter with Deposit</b> |
|------------------|---------------------------------|-----------------------------|

The site is located on an upper valley slope as part of an extended 500m long, 1-6m high cliff formation which has a predicted horizontal compression of less than 20mm/m. The site has been previously undermined as part of the Bulli seam extraction works and has been subject to previous subsidence.

Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 535m north-east of Longwall 7. The site has a volume greater than 50 m<sup>3</sup> and water seepage is present, however as the site is located outside of the long wall panels a negligible impact to heritage values is predicted.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

|                  |                                 |                       |
|------------------|---------------------------------|-----------------------|
| <b>52-3-0313</b> | <b>Bulli Mine Shaft Site 29</b> | <b>Open Camp Site</b> |
|------------------|---------------------------------|-----------------------|

The site is located on an upper valley slope within a sandy deposit which has been subject to extensive erosion. The site has been previously undermined as part of the Bulli and Balgownie seam extraction works and has been subject to previous subsidence as a result of these actions.

Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 100m east of Longwall 1. Whilst the site is predicted to be subject to movement, as an open site it will not be subject to rock falls caused by horizontal compression along cliffs. There is a limited potential for the movement of deposits which may impacted upon the in-situ preservation of the site.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

|                  |                                 |                         |
|------------------|---------------------------------|-------------------------|
| <b>52-3-0314</b> | <b>Bulli Mine Shaft Site 21</b> | <b>Shelter with Art</b> |
|------------------|---------------------------------|-------------------------|

The site is located on a ridge top associated with an extended 60m long, 1-4m high cliff formation which has a predicted horizontal compression of less than 20mm/m. The site has been previously undermined as part of the Bulli seam extraction works and has been subject to previous subsidence. Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 560m north-east of Longwall 7. The site has a volume greater than 50 m<sup>3</sup> and water seepage is present, however as the site is located outside of the long wall panels a negligible impact to heritage values is predicted.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

| 52-3-0317 | Bulli Mine Shaft Site 22 | Shelter with Deposit |
|-----------|--------------------------|----------------------|
|-----------|--------------------------|----------------------|

The site is located on an upper valley slope as part of an extended 500m long, 1-6m high cliff formation which has a predicted horizontal compression of less than 20mm/m. The site has been previously undermined as part of the Bulli seam extraction works and has been subject to previous subsidence. Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 545m north-east of Longwall 7. The site has a volume greater than 50 m<sup>3</sup> and water seepage is present, however as the site is located outside of the long wall panels a negligible impact to heritage values is predicted.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

| 52-3-0319 | Bulli Mine Shaft Site 24 | Shelter with Deposit |
|-----------|--------------------------|----------------------|
|-----------|--------------------------|----------------------|

The site is located on an upper valley slope as part of an extended 500m long, 1-6m high cliff formation and has a predicted horizontal compression of less than 20mm/m. The site has been previously undermined as part of the Bulli seam extraction works and has been subject to previous subsidence. Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 550m north-east of Longwall 7. The site has a volume greater than 50 m<sup>3</sup> and water seepage is present, however as the site is located outside of the long wall panels a negligible impact to heritage values is predicted.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

| 52-3-0320 | Bulli Mine Shaft Site 25 | Axe grinding grooves |
|-----------|--------------------------|----------------------|
|-----------|--------------------------|----------------------|

The site is mapped as occurring on the upper valley slope; however this site could not be relocated. Based on the mapped location, the site has been previously undermined as part of the Bulli Seam and Balgownie extraction works and does appear to have been subject to previous subsidence. Based on subsidence predictions for the preferred project and the mapped location, the site has maximum predicted systematic tensile strains of 14.1m, an overall subsidence movement of 1.4m and is located within the chain pillar associated with Longwall 5. Whilst the site is predicted to be subject to movement, as an open site it will not be subject to rock falls caused by horizontal compression along cliffs (predicted at 450mm/m per 20m section). The sites recorded location places it over the goaf but within a detached boulder, this location if correct reduces the potential for impacts. As this site has not been located it is difficult to accurately determine precise impacts based upon the landform context and subsidence modelling. The current impact assessment is based upon the assumption that the site is located in its recorded location but has been obscured by vegetation cover which has significantly increased since the original recording (post-bush fire).

**Location: Chain pillar associated with LW5**

**Impact Assessment: Very Low**

| 52-3-0322 | Bulli Mine Shaft Site 31 | Axe grinding grooves |
|-----------|--------------------------|----------------------|
|-----------|--------------------------|----------------------|

The site is located within a sandstone platform on the upper valley slope. The site has been previously undermined as part of the Bulli seam extraction works and does appear to have been subject to previous subsidence. Based on subsidence predictions for the preferred project and the mapped location, the site has maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 100mm and is located 170m south-west of Longwall 4. The site is predicted to be subject to minimal movement, as an open site it

will not be subject to rock falls caused by horizontal compression along cliffs (predicted at 150mm per 20m section). There is a limited potential for impacted through cracking of the sandstone platforms the site is located within due to its location outside of the longwall.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

| 52-3-0323 | Bulli Mine Shaft Site 26 | Shelter with Deposit |
|-----------|--------------------------|----------------------|
|-----------|--------------------------|----------------------|

The site is located on a lower valley slope along an extended 600m long, 2-6m high cliff formation which has a predicted horizontal compression of less than 20mm/m. The site has not been previously undermined or to have been subject to previous subsidence.

Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 230m southwest of Longwall 7. The site has a volume greater volume than 50 m<sup>3</sup> and water seepage is present. Despite the minimal impacts predicted, the shelters size elevates its impact assessment.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Very Low**

| 52-3-0325 | Bulli Mine Shaft Site 27 | Shelter with Art and Deposit |
|-----------|--------------------------|------------------------------|
|-----------|--------------------------|------------------------------|

The site is located on a lower valley slope; the shelter has been formed through block fall and is detached from the main cliff line, which is located 60m upslope. The site has been previously undermined as part of the Bulli seam extraction works and has been subject to previous subsidence.

Based on subsidence predictions for the preferred project, the site is located within Long wall 7 with a predicted maximum subsidence of 1.4m, compressive strains of 86mm/m and tensile strains of 170mm/m. The site is detached from the cliff line and is unlikely to be subject to rock falls or perceptible cracking. The site has a small volume which is less than 50 m<sup>3</sup> and water seepage is present. Despite the sites small volume its impact assessment is elevated by the presence of art and water seepage within the shelter.

**Location: Chain pillar associated with LW8**

**Impact Assessment: Very Low**

| n/a | Wonga East 4 | Shelter with Deposit |
|-----|--------------|----------------------|
|-----|--------------|----------------------|

The site is located on the upper valley slopes associated with an extended, 1-6m high cliff line which has a predicted horizontal compression of less than 20mm per 20 metres. The site has been previously undermined as part of the Bulli and Balgownie seam extraction works, but does not seem to have been subject to previous subsidence as part of these extractive works.

Based on subsidence predictions for the preferred project, the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 225m south of Longwall 9. The site has a small volume, less than 50 m<sup>3</sup> and no water seepage is present.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

| n/a | Wonga East 5 | Shelter with Stone Arrangement |
|-----|--------------|--------------------------------|
|-----|--------------|--------------------------------|

The site is located on the upper valley slopes associated with an extended, 1-6m high cliff line which has a predicted horizontal compression of less than 20mm per 20 metres. The site has been previously undermined as part of the Bulli and Balgownie seam extraction works, but does not seem to have been subject to previous subsidence as part of these extractive works.

Based on subsidence predictions for the preferred project. the site has very low maximum predicted systematic tensile strains of less than 500mm, an overall subsidence movement of less than 300 mm and is located 210 south of Longwall 9. The site has a small volume, less than 50 m<sup>3</sup> and water seepage is present.

**Location: Outside long wall panels but within 600m study area buffer**

**Impact Assessment: Negligible**

## 4. Response to Submissions

This section provides a response to submissions received on the Underground Expansion Project EA based on changes outlined in Section 2. Responses are provided to submission received from the general public (Section 4.1) and from government agencies (Section 4.2).

### 4.1 Public submissions

No public submissions were received for Aboriginal cultural heritage.

### 4.2 Agency submissions

Submissions relevant to Aboriginal Cultural Heritage were received from the following agencies:

- Office of Environment and Heritage (OEH); and
- Wollongong City Council (WCC).

Submissions related to several key issues, including the relocation of sites and ongoing consultation with the Aboriginal community.

#### 4.2.1 Office of Environment and Heritage

The NSW Office of Environment and Heritage provided comments on the original EA (ERM 2013). OEH raised the following concerns and recommendations:

| Submissions                                                                                                | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Failure to relocate a number of sites – additional survey required</b>                                  | <p>Biosis has now undertaken comprehensive survey for Aboriginal heritage sites in Wonga East. Survey was targeted to cliffs providing potential shelter sites using LiDAR mapping of cliffs. This resulted in the relocation of all shelter sites previously recorded, as well as the recording of two new shelter sites.</p> <p>Due to dense vegetation in comparison to when initial surveys were undertaken, only one axe grinding groove (52-3-0322) has been relocated. Extensive survey was undertaken for all sites; however the remaining sites could not be relocated.</p> <p>Given additional surveys undertaken by Biosis have relocated all shelter sites and recorded five new sites we consider the current survey effort to be comprehensive.</p> |
| <b>Potential for additional sites to occur within the Project area – additional survey effort required</b> | <p>Additional survey effort was undertaken using the above methodology. This has resulted in the recording of five new Aboriginal sites in the Wonga East area.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Submissions                                                                                                                  | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Further assessment of impacts based on revised subsidence predictions should be undertaken</b>                            | Given the relocation and recording of several new sites a revised impact assessment, based upon SCT Consulting's (2013) subsidence modeling, has been undertaken for all sites within the Wonga East study area. This revised impact assessment includes an amended significance assessment and site specific impact predictions.                                                                                                                                                                                                                                                                                                                                  |
| <b>Recommendation to avoid impacts to Aboriginal sites, particularly the identified women's site 52-2-1183 in Wonga West</b> | Wonga West has been removed from the current project application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Requirement for archaeological monitoring of all known sites within the subsidence impact zones</b>                       | Following Project Approval NRE will review and revise the current Heritage Management Plan (HMP) for Wonga East. This revised HMP will include monitoring of all Aboriginal sites located within the subsidence impact zone.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Ongoing consultation with the Aboriginal community throughout the life of the mine</b>                                    | <p>NRE has undertaken additional consultation with the Aboriginal community following relocation of a number of additional sites by Biosis, including a visit to all relocated sites not previously visited and allowing for comments from the Aboriginal community on the significance of relocated sites.</p> <p>NRE commits to ongoing consultation with the Aboriginal community throughout the life of the mine. This will include discussion with the Aboriginal community on the management of Aboriginal sites, and a commitment to involve the Aboriginal community in proposed mitigation should sites be impacted as a result of mining activities.</p> |

#### 4.2.2 Wollongong City Council

Wollongong City Council provided comments on the original EA (ERM 2013). Wollongong City Council raised the following concerns and recommendations:

| Submissions                                                                                                                            | Response                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reduction in subsidence impacts to Aboriginal sites in Wonga East and West.</b>                                                     | <p>Wonga West has been removed from this application. In Wonga East the configuration of long walls has resulted in avoidance of impacts to 52-3-0311 and 52-3-0322.</p> <p>Impacts to other Aboriginal cultural heritage sites cannot be mitigated without compromising the viability of the project.</p> |
| <b>The EA should address Aboriginal cultural heritage issues in accordance with the departments EA requirements given the proposed</b> | The ERM (2013) EA includes an assessment which complies with the Director Generals Requirements for the project. The assessment contains a detailed                                                                                                                                                        |

| Submissions                                                                                                                                                                                                                                      | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>impacts to Aboriginal cultural heritage.</b></p>                                                                                                                                                                                           | <p>summary of background and ethnographic research and aboriginal community consultation in accordance with contemporary guidelines. Weaknesses in the identification of Aboriginal cultural heritage within the study area have been addressed within this report and a revised significance and impact assessment has been presented.</p>                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>It is recommended that proper consultation should take place with representatives from Council, the Illawarra Local Aboriginal Land Council and other local Aboriginal groups as well as any registered Native Title claimants(s).</b></p> | <p>NRE has undertaken additional consultation with the Aboriginal community throughout the project. Additional consultation with registered Aboriginal parties has been undertaken following relocation of a number of additional sites by Biosis, allowing for comments from the Aboriginal community on the significance of relocated sites.</p> <p>NRE commits to ongoing consultation with the Aboriginal community throughout the life of the mine. This will include discussion with the Aboriginal community on the management of Aboriginal sites, and a commitment to involve the Aboriginal community in proposed mitigation should sites be impacted as a result of mining activities.</p> |

## 5. Conclusions

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Changes to the project, as outlined in Section 2 have resulted in a significant reduction in predicted impacts to Aboriginal cultural heritage sites. A summary of the reduced impact predictions is provided below:

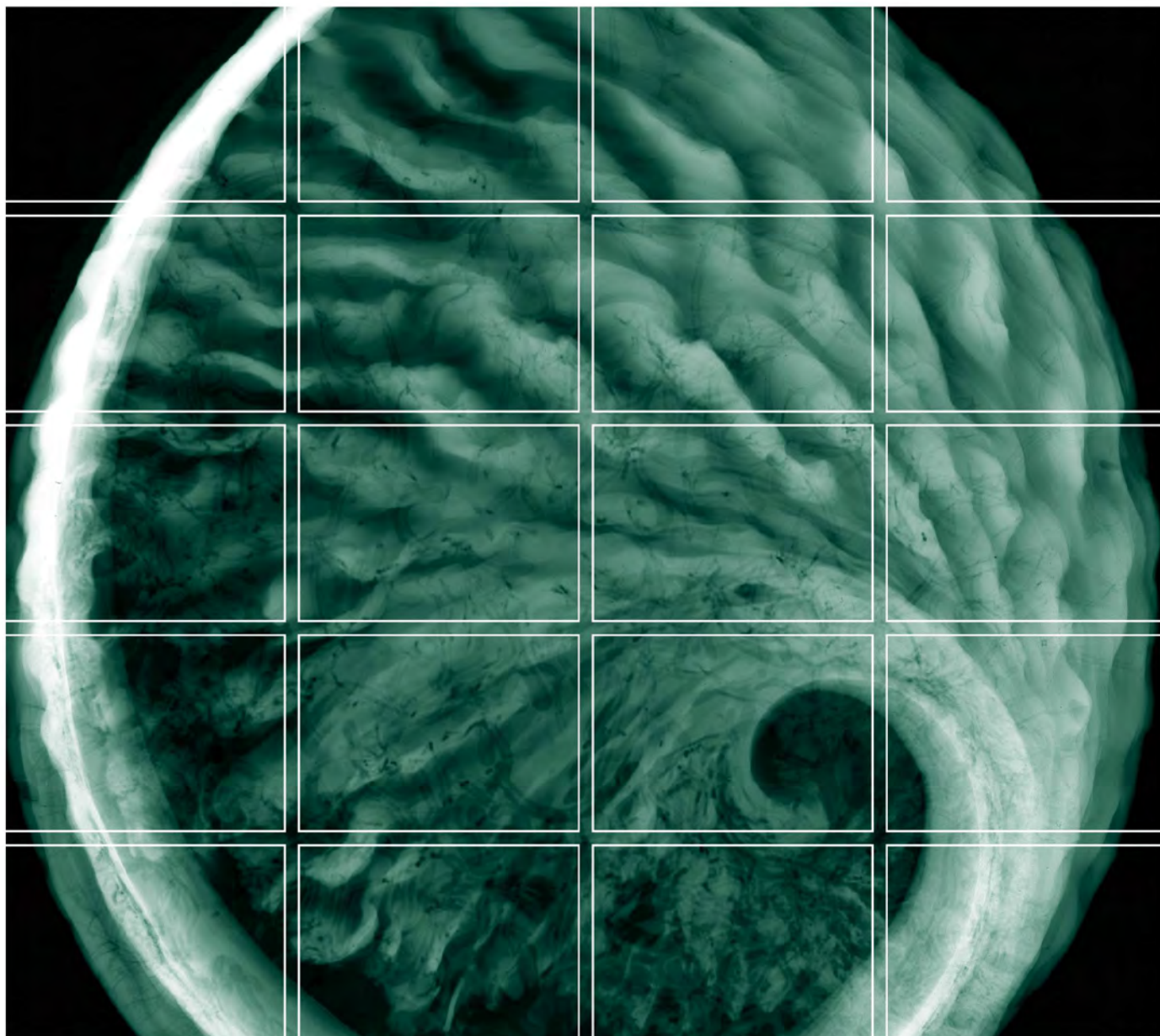
- Removal of Wonga West from the program has resulted in reduced impacts to Aboriginal cultural heritage sites.
- The revision of the mine plan has resulted in site 52-03-0311 and 52-03-0313 no longer being undermined;
- Revised scientific and cultural significance assessments for all newly re-located and identified Aboriginal cultural heritage sites, this has confirmed the level of scientific and cultural significance attributed to sites which were not relocated by ERM (2012; 2013);
- Re-location of sites 52-2-0083 and 52-3-0310 which has lead to these sites being identified as outside of the proposed mine plan and being subject to a lower level of predicted impact to these sites;
- Revised subsidence impacts for sites 52-03-0320, 52-02-3939, 52-02-3940 and 52-03-3941; and
- The relocation of 52-2-0229 has resulted in the site being located within the mine plan and revised subsidence predictions have resulted in an increase in risk to this site.

In summary, site 52-2-0603 is considered to be at a moderate risk of impact. All other Aboriginal heritage sites in the study area are considered to be at low, very low or negligible risk of impact.

## References

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- Australia ICOMOS. 1999. *The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance* (The Burra Charter), *Guidelines to the Burra Charter: Cultural Significance and Conservation Policy*. Pamphlet, Australia ICOMOS (Inc).
- Burke, H and Smith, C. 2001. *The Archaeologists Field Handbook*. Allen and Unwin.
- Biosis 2012. *Baseline Recording of Aboriginal Archaeological Sites in Wonga East Long Walls 4-5*. Report for Gujarat NRE Coking Coal Ltd. Author: A. Jakoviljevic.
- Biosis *in prep*. *Baseline Recording of Aboriginal Archaeological Sites in Wonga East Long Walls 6-7*. Report for Gujarat NRE Coking Coal Ltd. Author: A. Jakoviljevic.
- DECC NSW 2004. *National Parks and Wildlife Act 1974: Part 6 Approvals – Interim Community Consultation Requirements for Applicants*. NSW Department of Environment and Climate Change, Sydney NSW.
- DECC NSW 2005. *Draft Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation*. NSW Department of Environment and Climate Change, Sydney NSW.
- DECC NSW n.d. *Guidelines for Aboriginal Heritage Impact Assessment (Draft)*. Prepared by the NSW National Parks and Wildlife Service with additional text by Krystal Buckley, Context Pty Ltd.
- DECCW. 2010. *Code of practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. NSW Department of Environment Climate Change and Water, Sydney NSW.
- ERM 2012. *NRE No. 1 Colliery Aboriginal Heritage Assessment*. Report to Gujarat NRE Coking Coal Ltd. ERM Australia Pty Ltd.
- ERM 2013. *NRE No. 1 Colliery Project Application (09-0013) Environmental Assessment*. Report to Gujarat NRE Coking Coal Ltd. ERM Australia Pty Ltd.
- National Parks and Wildlife Service. 1997. *Aboriginal Cultural Heritage Standards and Guidelines Kit*
- NRE 2013. *Underground expansion project: Preferred project report*. Gujarat NRE Coking Coal Ltd.
- Pearson, M & Sullivan, S. 1995. *Looking after heritage places: The basics of heritage planning for managers, landowners and administrators*. Melbourne University Press.
- Sefton, C. 2000. *Overview of the Monitoring of Sandstone Overhangs for the effects of Mining Subsidence on Illawarra Coal Measures*, for Collieries Division, BHP Coal.
- Sefton, C. (2003). *Monitoring of Sandstone Overhangs and Engraving Sites on Longwalls 4-7 Metropolitan Colliery*. An unpublished report for Illawarra Coal BHP Minerals.
- SCT Operations 2013. *Subsidence Assessment for Gujarat NRE Preferred Project Russell Vale No 1 Colliery*. Report for Gujarat NRE Coking Coal Ltd. SCT Operations Pty Ltd.



## NRE No.1 Colliery

*Aboriginal Heritage Assessment*

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Gujarat NRE Coking Coal Pty Ltd

November 2012

0079383 Aboriginal Heritage - FINAL

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## EXECUTIVE SUMMARY

*Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Gujarat NRE Coking Coal Pty Ltd (NRE), to prepare an Aboriginal Heritage Assessment for the consolidation and continuation of mining operations at NRE No.1 Colliery.*

*The Study Area for this assessment focuses on areas with the potential for surface disturbance resulting from mine related subsidence. The Study Area is divided into two geographically separate areas. The eastern Study Area, referred to as the 'Wonga East Study Area', encompasses the proposed Wonga East mining area and adjacent land. The western Study Area, referred to as the 'Wonga West Study Area', encompasses the Wonga West and V Mains mining areas and adjacent land, as shown in Figure 1.2. A search of AHIMs database revealed 50 recorded Aboriginal sites within the Study Areas. Fifteen of these sites are within the potential subsidence footprint.*

*The iterative mine planning process involved consideration of longwall options in light of archaeological constraints, in order to avoid impact to areas of high conservation value. The proposed mine plans have avoided or modified longwall extraction directly under third and fourth order creeks (Seedsman Geotechnics 2012), with the exception of Central Creek in Wonga West and within proximity to Cataract Dam. This approach has enabled a large number of significant Aboriginal sites to be avoided, particularly those sites located adjacent to Cataract Dam. The avoidance strategy has ensured that thirty five sites within the Study Area are not within the potential subsidence footprint.*

*The Study Area was surveyed on foot by the study team and Aboriginal representatives. Owing to the difficult terrain and low ground surface visibility in much of the Study Area, the survey targeted the location of the previously recorded archaeological site and creek lines.*

*A total of 56 sites have been identified within the study area, of these six new sites were identified through field survey within the potential subsidence footprint. Fifteen AHIMS registered sites were relocated including 13 rock shelters, one grinding groove site and one artefact scatter.*

*All sites within the potential subsidence footprint were assessed for significance and potential risk and given an impact assessment score. Four sites are of high archaeological significance and five sites are of moderate archaeological significance. Where high or moderately significant sites are at moderate or high impact risk they will be actively managed. There are five site types present within the potential subsidence footprint. These are axe grinding grooves, artefact scatters, scarred trees, water holes and rock shelters. These will be managed in different ways as the subsidence may impact these sites in different ways. The enclosed sites may collapse, while the open sites may crack or be impacted by tilt. Monitoring and archival recording will be undertaken at these sites. There are four sites with moderate significance and moderate risk including one shelter with art and three shelters with deposits. These sites will be relocated where possible and there AHIMs cards updated.*

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Gujarat NRE Coking Coal Pty Ltd (NRE), to prepare an Aboriginal Heritage Assessment for the consolidation and continuation of mining operations at NRE No.1 Colliery in the Southern Coalfields (the 'Project'). The Project Application Area (PAA) comprises Consolidated Coal Lease (CCL) 745, Mining Purposes Lease (MPL) 271 and Mining Lease (ML) 1575. A locality map showing the PAA and the extent of the relevant lease areas is presented as *Figure 1.1*.

Extensive underground mining has been undertaken within the PAA, dating from the early twentieth century; however a substantial volume of high quality coking coal resource remains, along with some thermal coal.

The proposal is a Major Project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and relevant Director General's Requirements (DGRs) were issued on 18 August 2009. Supplementary to the DGRs, the Office of Environment and Heritage (OEH), (formerly Department of Environment, Climate Change and Water (DECCW)) provided specific requirements for the Project on 1 September 2009.

In regards to Aboriginal Heritage the DGRs include the assessment of:

*Heritage – including the potential Aboriginal and non-Aboriginal heritage impacts of the project, both within the surface infrastructure areas and proposed mining area;*

ERM's approach to the preparation of the detailed site assessment was based on the following requirements and current best practice guidelines:

- the DGRs;
- OEH correspondence and subsequent discussions with OEH to clarify requirements;
- National Parks and Wildlife Service (NPWS) Aboriginal Cultural Heritage: Standards and Guidelines Kit (draft 1997);
- Department of the Environment and Climate Change (DECC) Interim Community Consultation Requirements for Applicants (2005);
- DECC Guide to Determining and Issuing Aboriginal Heritage Impact Permits (2009);
- DECC Operational Policy: Protecting Aboriginal Cultural Heritage (2009); and
- the Australia ICOMOS Burra Charter 1999 (Burra Charter).

## 1.1 NRE No.1 STUDY AREA

The Study Area for this assessment focuses on areas with the potential for surface disturbance resulting from mine related subsidence. In accordance with the Southern Coalfields Inquiry, land within 600 m of the underground extraction area and associated potential subsidence footprint have been included in the Study Area. The Study Area is divided into two geographically separate areas. The eastern Study Area, referred to as the 'Wonga East Study Area', encompasses the proposed Wonga East mining area and adjacent land. The western Study Area, referred to as the 'Wonga West Study Area', encompasses the Wonga West and V Mains mining areas and adjacent land, as shown in *Figure 1.2*.

The Russell Vale Site contains the coal handling facilities. An Aboriginal Heritage assessment of this site has also been prepared. This is presented in *Annex A*.

## 1.2 AUTHORSHIP

Dr. Tim Owen (ERM archaeologists) prepared the environmental and archaeological background reviews (Chapters 3 and 4). Dr. Luke Kirkwood (ERM archaeologist) undertook the Aboriginal heritage field survey and prepared Chapters 5. Dr. Diana Neuweiger (ERM Heritage Consultant) undertook fieldwork and authored Chapters 6 to 8.

## 1.3 REPORT STRUCTURE

This report is structured in the following way:

*Chapter 2* Aboriginal community consultation;

*Chapter 3* Environmental background relating to the Study Area;

*Chapter 4* Archaeological context, including known and potential heritage sites within and near the Study Area;

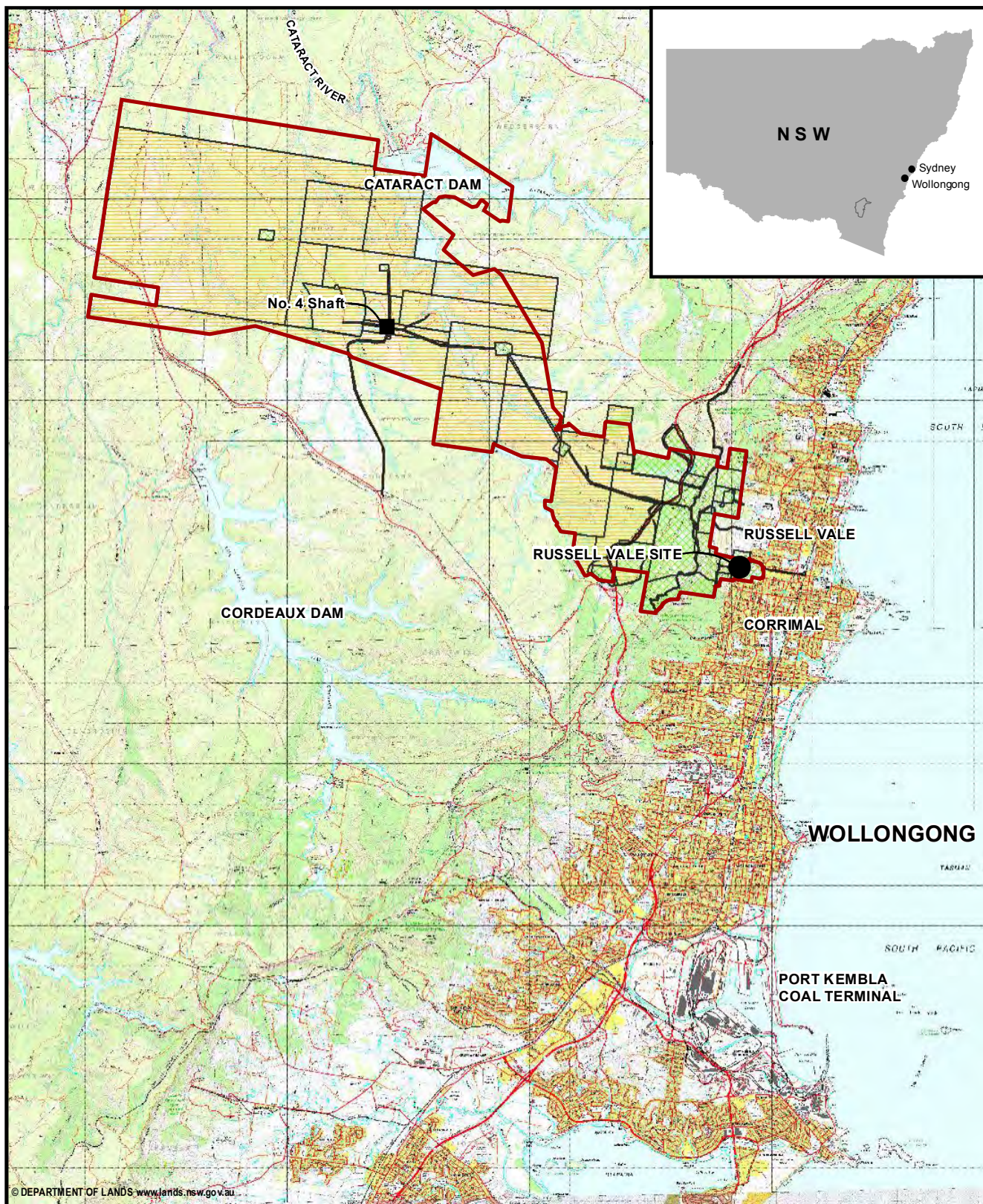
*Chapter 5* Survey methodology, results of the field survey and significance assessment of heritage sites located within the Study Area;

*Chapter 6* The impact assessment;

*Chapter 7* NSW legislative framework and statutory requirements; and

*Chapter 8* Heritage management and impact mitigation recommendations.

- Annex A* Russell Vale Site Aboriginal Heritage Assessment; and
- Annex B* Log of the stakeholder consultation undertaken for the project.
- Annex C* Legislation



#### Legend

- Project Application Area
- Surface Lease
- Underground Lease

Client: Gujarat NRE Coking Coal Limited  
 Project: NRE No. 1 Colliery EAR Post Adequacy 2012  
 Aboriginal Heritage Assessment

Drawing No: 0079383s\_AHA\_GIS009\_R0.mxd

Date: 26/03/2010 Drawing size: A4

Drawn by: JF Reviewed by: MK

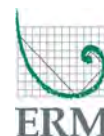
Scale: Refer to Scale Bar



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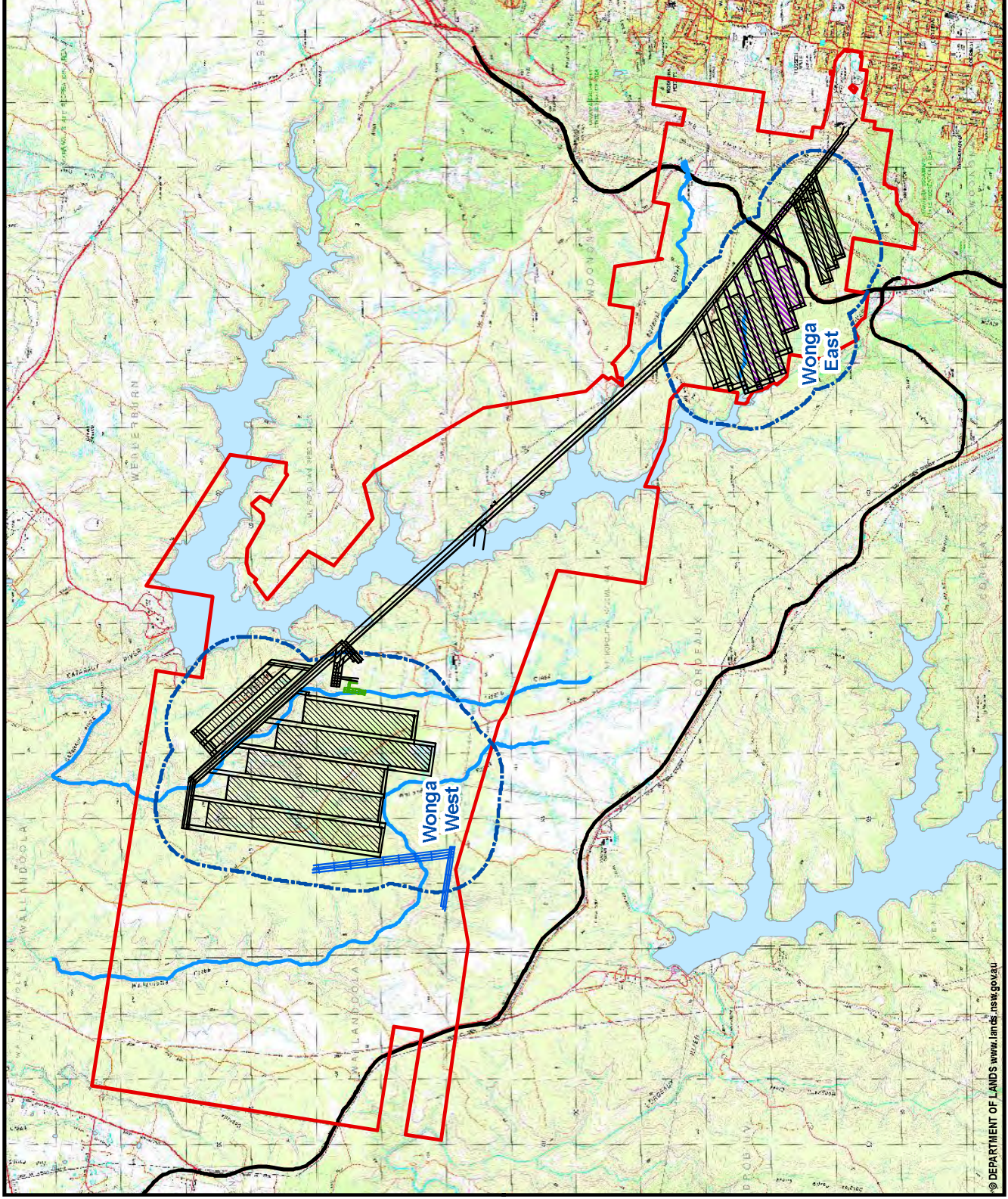
**Figure 1.1**  
**Locality Map**

Environmental Resources Management ANZ  
 Auckland, Brisbane, Canberra, Christchurch,  
 Hunter Valley, Melbourne, Perth, Port Macquarie,



# Legend

- Project Application Area
- Study Areas
- Proposed Longwalls
- Subject to separate application (MP 10\_0046\_MOD 1)
- Proposed Bulli Seam first workings
- Proposed Balgownie Seam first workings
- Major Road
- Creek/River



**Figure 1.2**

## Study Areas

|              |                                                                             |
|--------------|-----------------------------------------------------------------------------|
| Client:      | Gujarat NRE Coking Coal Limited                                             |
| Project:     | NRE No. 1 Colliery EAR Post Adequacy 2012<br>Aboriginal Heritage Assessment |
| Drawing No:  | 0079383s_AHA_GIS007_R2.mxd                                                  |
| Date:        | 12/09/2012                                                                  |
| Drawn by:    | SQW                                                                         |
| Reviewed by: | MK                                                                          |
| Scale:       | Refer to Scale Bar                                                          |



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Environmental Resources Management ANZ  
Auckland, Brisbane, Canberra, Christchurch,  
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



This chapter contains details of Aboriginal community consultation with regard to ERM's heritage assessment of the project.

Aboriginal consultation is required for any assessment of Aboriginal heritage. The OEHL requires consultation to be undertaken in accordance with the 'Interim Community Consultation Requirements Guideline' (2005).

The interim guideline sets out a process for inviting Aboriginal groups to register interest as a party to consultation (including the placing of local press advertisements), seeking responses on the proposed assessment methodology and seeking comment on proposed assessments and mitigation measures. The interim guidelines require proponents to allow ten working days for Aboriginal groups to respond to invitations to register, and then 21 days for registered Aboriginal parties to respond to a proposed assessment methodology. Additional time should be allowed for groups to review a draft report and comment on the results and management recommendations.

The Aboriginal community consultation for this project has been carried out in accordance with the OEHL guideline. The complete log of all communications between ERM and local Aboriginal stakeholders is presented in *Annex B*.

## 2.1

### CONSULTATION FOR FIELD SURVEY

Letters requesting advice on Aboriginal organisations to consult, and any known heritage issues to be taken into consideration in the area, were emailed on 3 October 2008 to:

- OEHL;
- Registrar, *Aboriginal Land Rights Act 1983* (NSW);
- Illawarra Local Aboriginal Land Council (ILALC); and
- Wollongong City Council.

A local press advertisement requesting local Aboriginal stakeholders interested in being consulted, was run in the Illawarra Mercury newspaper on 10 October 2008. Responses to the advertisement and advice on consultation suggested that five Aboriginal groups were interested in the assessment process.

These five groups were:

- Illawarra Local Aboriginal Land Council (ILALC);
- D'harawal Knowledge Holders (DKH);
- Northern Illawarra Aboriginal Collective (NIAC);

- Wodi Wodi Elders Corporation; and
- Kullila Welfare and Housing Aboriginal Corporation.

Each group was provided with a written survey methodology, by post and email, between 6 and 11 November 2008. Comments and fieldwork registration were received from the ILALC, DKH and NIAC. All other stakeholders agreed to the proposed methodology, but did not provide the requested information and insurances.

ILALC provided a letter to ERM stating that NIAC are not recognised as representing the Illawarra Aboriginal community, and that NIAC therefore cannot speak on behalf of 'country' and do not represent the views of the local Aboriginal community. The letter is provided in *Annex B*.

NRE representative Dr Chris Harvey was provided with a list of Aboriginal stakeholders and information forwarded by the community groups. Aboriginal group selection and engagement was undertaken by NRE.

Further details of the Aboriginal consultation are provided in *Annex B*.

The field survey aimed to target areas of Aboriginal archaeological potential based upon the initial desktop assessment, particularly within 100 m of any drainage lines and previously recorded sites.

During the surveys, ERM archaeologists discussed the local Aboriginal heritage values and patterning with the community representatives. This provided an understanding of the local perspective for Aboriginal habitation and subsistence patterns; as well as understanding some local intangible values. When Aboriginal sites were identified, all participants were involved in recording the site, determining its extent and archaeological potential. At the completion of the survey an open discussion was held regarding the sites, the archaeological potential and required investigations in the future. The outcomes of the discussions were agreed upon by all present. The outcomes of this consultation underwrite this heritage assessment.

## 2.2

### ***FUTURE ABORIGINAL CONSULTATION***

Copies of the draft report will be sent to all registered Aboriginal groups and Wollondilly Council's Indigenous Heritage Officer and committee for comment and feedback on the content, assessment and recommendations. All comments received from these groups will be appended to this report when received (the appended report will be titled Final 2). Any future work relating to the Aboriginal archaeological mitigation should include consultation with the relevant Aboriginal stakeholders.

The purpose of this chapter is to provide the environmental context that was used in developing a predictive model of potential Aboriginal site locations. Interactions between people and their surroundings are of integral importance in both the initial formation and the subsequent preservation of the archaeological record. The nature and availability of resources including water, flora and fauna and suitable raw materials for the manufacture of stone tools and other items had (and continues to have) a significant influence over the way in which people use the landscape.

Alterations to the natural environment also impact upon the preservation and integrity of any cultural materials that may have been deposited, whilst current vegetation and erosional regimes affect the visibility and detectability of Aboriginal sites and objects. For these reasons, it is essential to consider the environmental context as a component of any heritage assessment.

### 3.1 ENVIRONMENTAL CONTEXT

#### 3.1.1 *Physical Description and Geology*

The Study Area is located within the Southern Coalfield of the Sydney basin. The stratigraphical series in the area is formed by a near-horizontal to gently folded succession of sandstones, shales, claystones and coal, of Permian to Triassic age. The north westerly plunging South Bulli Syncline is the dominant geological structure at NRE No. 1 Colliery. Major faults are characteristic of the Southern Coalfield.

East of the Illawarra Escarpment, the geology of the PAA comprises Permian age Illawarra Coal Measures, underlain by units of the Shoalhaven Group. Typically the rock types which make up the Illawarra Coal Measures are lithic sandstone, shale, siltstone, tuffs and associated carbonaceous sediments (Geological Survey NSW 1966). The coal seams comprise the Bulli, Balgownie, Cape Horn, Hargraves and Wongawilli seams, in descending stratigraphical order. The Cape Horn and Hargraves seams are too thin to be of economic interest for mining.

West of the escarpment, the Permian deposits are overlain by units of the Triassic Narrabeen Group, comprising sandstone, siltstone, claystone, shale and tuffaceous claystone. Further west and extending across the majority of the PAA, these deposits are overlain by Hawkesbury Sandstone, characterised by quartz sandstone with some shale. There are some relatively small areas where the Hawkesbury Sandstone is overlain by the Liverpool sub group which comprises predominantly shale with some sandstone beds (Geological Survey NSW 1966).

### 3.1.2 *Landforms*

The PAA extends from the coastal slopes near Russell Vale, west across the Illawarra escarpment and the Woronora plateau. The land above the proposed mining area ranges in elevation from 260 to 400 m above the Australian Height Datum (AHD). The area contains north-western sloping drainage depressions and uplands swamps, plateau surfaces, narrow to gently undulating crests and ridges, and rugged steep slopes and sandstone gorges incised by the deep valleys of the Cataract River and its tributaries (Hazelton and Tille 1990). The PAA is typical of lands flanking the Illawarra Escarpment in the Wollongong region (Land Information Centre 2000).

The major landforms in the south west of the Study Area consist of gentle slopes rising to the south from the various open depressions created by Wallandoola Creek and its tributaries. On the western side of the Study Area, the land slopes more rapidly down to Lizard Creek in the north.

### 3.1.3 *Soils*

The Russell Vale site is on the Illawarra Escarpment soil landscape, while the majority of the PAA occur west of the escarpment on the Lucas Heights and Maddens Plains soil landscapes (Hazelton and Tille 1990). A small area of the Gynea soil landscape occurs along the north eastern edge of Cataract Dam. The Bundeena soil landscape is present along Bellambi Creek (west from the escarpment).

The diversity of soil landscapes and landforms in the Study Area means that the soil has variable properties. Soil types within the Study Area include podzolic soils (yellow, red, lateritic and gleyed podzolic soils), lithosols, yellow soloths, yellow earths, brown earths, earthy sands, siliceous sands and leached sands (Hazelton and Tille, 1990). Acid peats are present in swamps and areas of poor drainage (Hazelton and Tille, 1990). Soils of the PAA commonly developed from Hawkesbury Sandstone and are typically infertile and acidic with a high erosion hazard (DoP, 2008). Mass movement and rock fall hazards are characteristic of the Illawarra Escarpment, Warragamba and Hawkesbury landscapes.

The NSW Soil and Land Information System was accessed to determine whether any soil technical reports existed for the Study Area. No reports were available within the Study Area. However, two reports were available for the area, within two km of the southern boundary. A summary of the data contained within these reports is shown in *Table 3.1*.

**Table 3.1** *Soil Technical Reports Relevant to the Study Area*

| Sample Location<br># | 1                                      | 2                                                                                 |
|----------------------|----------------------------------------|-----------------------------------------------------------------------------------|
| Survey/Profile       | Wollongong II NHT, Profile No: 17      | Soil Landscapes of the Wollongong-Port Hacking 1:100 000 Sheet Survey, Profile 93 |
| Site morphology      | Flat on summit surface                 | Shallow valley floor                                                              |
| Elevation            | 363 m                                  | Not stated                                                                        |
| Lithology            | Shale, Sandstone-quartz                | Sandstone-quartz                                                                  |
| Vegetation           | Dry sclerophyll forest                 | Native vegetation also swamp complex                                              |
| Layer 1 (m)          | A1 0-0.30 - fine light sandy clay loam | 0-0.35 - silty loam                                                               |
| Layer 2 (m)          | B2 0.3-0.5 - fine sandy loam           | 0.35-0.62 - sandy loam                                                            |
| Layer 3 (m)          |                                        | 0.62-1.1 - loamy sand                                                             |

Soil profiles in the area suggest that the upper soil horizons could be relatively deep, especially in lower areas (e.g. adjacent to Lizard Creek). The thick vegetation cover in much of the area is likely to have helped prevent erosion, which if it occurred could cause disturbance to Aboriginal archaeological sites in the upper horizons.

### 3.1.4 *Hydrology*

The availability of water has significant implications for the range of resources available and the suitability of the area for human occupation. The Study Area is adjacent to the Cataract River, which even prior to damming would have been the major reliable water source for the immediate area. Watercourses of third order and above (according to the Strahler classification scheme) over the proposed underground mining areas include the old Cataract River and Bellambi, Lizard and Wallandoola Creeks. Two additional unnamed third-order drainage lines occur within Wonga West and feed into Lizard Creek.

Near the headwaters, the streams are generally shallow with poorly defined channels, a low bed gradient and upland swamps are present. Downstream, bed gradients increase, elongated pools are present and creeks flow over exposed sandstone bed rock and rock shelves. Deeply incised sandstone gorges flank the creeks at some points, this is most noticeable at Lizard Creek and these conditions have led to the formation of a number of sandstone overhangs. Cataract, Bellambi, Lizard and Wallandoola Creeks have been undermined by past coal mining, within and/ or upstream of the PAA. Land east of the Illawarra Escarpment, including the Russell Vale site, drains to Bellambi Gully which flows through the Russell Vale site and the suburb of Bellambi before discharging into the South Pacific Ocean at Bellambi Beach.

Upland swamps occur along the drainage lines, in flat sections and can form sediment deposition behind choke points in the stream. Swamps have a major role in regulating the flow and water quality of perennial streams.

Upland swamps in this region are diverse and are key habitats for a wide variety of fauna that are unique to swamps. Swamps were a key resource zone for Aboriginal peoples, providing a wide variety of edible plants and fauna species.

### 3.1.5 *Flora and Fauna*

The Study Area is on the Illawarra plateau elevated 400 m above the coastal plain, foothills and the lower and upper slopes of the escarpment. The plateau is incised with deep valleys and covered with dense native vegetation. The plateau consists predominantly of Hawkesbury sandstone some of which has eroded to reveal the underlying Narrabeen sandstone.

Fertile pockets of clay and shale have allowed rainforests to develop; other vegetation communities include dry and wet sclerophyll forest and upland swamps. The upland swamps are able to support moorland species such as sedges, melaleuca and banksia.

Some of the animal species present across the plateau include: large brown hawk sugar gliders, quail, brown snake, red wallaby, echidna, brush bronze wing, pheasant coucal, platypus, currawong, red bellied black snake, dove, death adder, crow, magpie lark, white throated swift, heath monitor, white cockatoo and pied currawong (after DEC Undated B: 80-104).

Plant species included: maiden's blush, three-veined myrtle, dog wood, water gum, mopoke, silvertop ash, blackbutt, smooth-barked apple, Sydney golden wattle, blackwood, Port Jackson pine, white maple, prickly current bush, rough tree fern, soft tree-fern, prickly tree-fern, giant lily, Gynea lily, blueberry ash, messmate, native cherry, native geranium, native mulberry, red devil, mountain devil, paper bark, bracelet honey-myrtle, broad leaved and narrow leaved geebung, five corners, waratah, grass tree (after DEC Undated B: 80-104).

It has been recorded that local Aboriginal peoples used these plants and animals as part of their economy. The DEC (Undated B) also provides the seasonal availability, part of the plant used and possible uses, i.e. medicine, food, indicators of insects or animals etc.

The environmental assessment of the site indicates that the underlying geology presents a context that was favourable for the creation of Aboriginal sites. Outcrops of sandstone on hill slopes can form overhangs that were favourable camping locations and used as art sites, the aspect of which, often presented views of water resources. The horizontal outcrops of sandstone revealed by water erosion caused by the creeks and tributaries would have provided useful locations to sharpen stone axes and thus lead to the formation of grinding grooves over time.

The numerous water resources in the area, including Wallandoola and Lizard Creeks and their associated swamplands, would have provided habitat for numerous species of fauna and flora which would have been exploited by Aboriginal peoples for food, medicines and implement making.

Within the majority of the PAA (outside of surface lease areas), soils in the area are likely to be relatively deep and undisturbed and only minor disturbance has occurred in relation to the construction of access roads, mining infrastructure and bushfires. As a result, any archaeological sites are likely to be well preserved.

## 4.1 ARCHAEOLOGICAL BACKGROUND

### 4.1.1 *Regional Ethno-History*

Archaeological studies have confirmed that Aboriginal people have occupied the Australian sub-continent for at least 40,000 years (c.f. Allen and O'Connell 2003). This date is frequently challenged however, with tentative indications that occupation may extend back into the early Pleistocene.

However, such early dates for the Sydney basin and surrounds have not been established. The earliest proven occupation dates in the Illawarra area are around 20,000 BP. Scientifically verified dates have been obtained from rock shelters near the Nepean River (14,700 BP; cited in Attenbrow 2002 and Flood 1999); from sites along the current Shellharbour coast (17,000 BP; cited in Attenbrow 2002 and Flood 1999); a rock shelter on Burrill Lake (20,760 BP; Lampert 1971 cited in Flood 1999), and a date of 17,000 BP has been returned from a shell midden site at Bass Point (Steele 2006).

Late Pleistocene dates, obtained from Holocene 'coastal' locations, represent Aboriginal Pleistocene occupation of hinterland locations (sea levels during the Pleistocene were lower than today, with the sea positioned around 16 km further east).

These early dates confirm a long history of Aboriginal occupation across the Illawarra region. Aboriginal occupation in the region has created an enduring and rich archaeological record; see the discussion relating to the archaeological record below. However, historical records relating to Aboriginal culture, at the time of European colonisation, are limited. Individuals, such as Tench (1793) and Matthews (1901) recorded facets of Aboriginal culture and language; albeit often as a secondary component to their primary research or objectives. Others, such as Tindale (1940; 1974), whilst aiming to record Aboriginal culture, could unfortunately, only record a social system which had been greatly altered during the preceding 150 years. Coupled with the inherent biases of western culture and society, the historical accounts are sometimes incorrect and/or lacking in detail.

However, coupling the available written documents with the archaeological record and oral histories (from descendents of the original inhabitants); allows a picture of Aboriginal society, demography and economy to be developed. The consequential account can be used to assist with interpreting and deciphering Aboriginal sites and their ancient landscape context.

### 4.1.2 *Local Ethno-History*

The regional social organisation of the Illawarra Aboriginal groups has been understood from oral histories, early historical accounts and linguistic studies. The tribal group in the Illawarra area, prior to European occupation, was the

Wodi Wodi (DEC Undated B; 2005 and Tindale 1974) who spoke a variant of the Dharawal language (*Tharawal* across the current Study Area [Mathews 1901:127]). The Dharawal name derives from traditional stories, which tell of the people's arrival in the mouth of Lake Illawarra bringing the Cabbage Tree Palm (Dharawal) with them from the north (DEC Undated B: 5).

Groups of Dharawal inhabiting the Illawarra were probably composed of small units (also referred to in the literature as bands/tribes/clans or named groups), comprising individuals who spoke a similar language. A group may have been composed of one or two adult males and their 'wives' and dependants (McDonald 1992). The groups of people undertook localised social interaction between themselves (such as marriage); whilst numerous groups formed larger units (bands or clans) that gathered resources, traded and held regional gatherings (Attenbrow 2002).

Local Aboriginal population density prior to European settlement is not clearly understood (as for most of Australia) and it is believed that Illawarra local groups were decimated early in European history from introduced diseases (Organ 1997). Official European settlement in the Illawarra began in 1816 once a government land survey had been conducted (DEC 2005). DEC states that 'Dr. Charles Throsby moved cattle into the area in 1815 via the Bulli Pass with the assistance of stockman Joseph Wild and two Aboriginal guides (possibly Bundle and Broughton). The first five land grants for the Illawarra were issued in late December 1817' (2005:14).

Settlement in the Illawarra by Europeans had a profound effect on Aboriginal society and economy. Land grants adjacent to the larger fresh water resources, clearance of forests and the commencement of agriculture would have restricted Aboriginal access to food and land. The introduction of exotic plants and animals resulted in a significant alteration to (and prevention of) traditional land care practices (such as bush burning). This impacted the social, political and cultural balance which existed between the Aboriginal groups. The result was enmities between the Illawarra Dharawal speakers and the Bong Bong, Broughton Creek, Kiama and Shoalhaven Dharawal speakers (DEC 2005:16).

The pattern of pre-European Aboriginal society and economy across the Illawarra is far different from that recorded during the nineteenth century. Aboriginal economy across the Illawarra was split with people referring to themselves as 'fresh water' or 'salt water' people; depending on whether they occupied the coastal or plateaus and inland river valleys (DEC Undated B: 5). The Study Area is located within a landscape defined as plateau. Environmental conditions on the plateau are described on the following pages.

Water, stone, clay, plant and animal resources were the raw materials utilised, collected and mined by the Illawarra Dharawal people. These materials (such as ochre, silcrete and basalt), were traded with neighbouring groups. Water was a key resource, and whilst plentiful within the flatter landscape adjacent

to the coast, could be scarce on the higher plateau. To allow habitation within the inland areas, the Dharawal incised sandstone platforms with channels to drain water into carved wells (DEC Undated B: 11).

Resource gathering and patterns of habitation were influenced by the season. Knowledge of food resources influenced the timing for journeys, gatherings and festivals. An intricate knowledge of edible plants, their medicinal uses and practical applications was held by the Dharawal. Artefacts such as spears, shields and canoes were made from timbers, gums and resins. Nuts, feathers, teeth, ochres, animal skins and plant fibres were used to create decorative clothing, cloaks and ornamentation (DEC Undated B: 12).

Extensive use of resources created a visible symbology across a group's landscape (some of which may still remain today). For instance, the Dharawal identified distinct landforms from a distance by the colouring and form of trees (which were sometimes assigned uses by gender); ceremonial areas were defined spatially through carved trees; burials were also marked in such a way. During gatherings, trees were marked to designate camping areas for visiting groups (who may stay for weeks or months) (DEC Undated B: 13). Many uses of natural materials will not have resulted in an archaeological signature, e.g. smoke from leaves was used for communication over long distances; or annual indicators observed in plants or animals told people when they were in season or available. These cultural aspects would have resulted in use of resources, or actions of people, for which there may be a physical record (such as the resulting sites).

#### **4.1.3**      *Local Archaeological Context*

A literature review of the OEH library (and additional reports held by ERM) was undertaken to understand the broader region's archaeological patterning. This review was targeted to those reports relevant to the Study Area. Key word searches were used to find reports for the locality in AHIMS.

The majority of South Coast, Illawarra based, heritage studies have concentrated on the coastal and estuarine zones (discussed in Navin Officer 2006). These studies have either been compiled as heritage or impact studies for the development sector or as local studies by an interest group.

Previous archaeological research in the Illawarra area suggests that Aboriginal sites are very common along the coastal plain. More recent research, triggered principally by mining environmental assessments, has started to identify and record Aboriginal sites across the Illawarra's hinterland. Aboriginal sites in this landscape context have been associated with resources, such as food and fresh water.

Archaeological models for Aboriginal Holocene occupation in the Illawarra region have been developed by a number of researchers. Most models suggested ridgelines were used as they provide access routes through the difficult hinterland terrain. Flat areas and saddles were favoured for repeat

visits and would have been a focus for occupation activities, possibly resulting in an archaeological signature in these areas.

A brief overview of Aboriginal sites types (from the wider recorded pattern in the OEH's AHIMS) suggests that most Aboriginal sites are lithic sites, rock shelters with art and deposits and grinding grooves. A general connection appears to exist with shallow shelves of sandstone located on the upper reaches of ridgelines, which create small overhangs that were attractive locations to Holocene Aboriginal people.

Of direct relevance to the current assessment (in terms of archaeological content and proximity) are two academic studies (Sefton 1998; McDonald 1994) and five consultants' studies (Saunders 1997, 1998; Biosis 2005, 2007a, 2008a). A further two studies define the observed impacts on Aboriginal heritage sites resulting from long-wall mining (Biosis 2007b, 2008b). A review of these reports is provided in *Table 4.1*.

**Table 4.1** *Previous Studies within the immediate region*

| Author         | Type of archaeological work    | Locality                | Details of sites recorded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------|--------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sefton (1988)  | Masters thesis (Unpublished)   | Illawarra Escarpment    | Focused on data collected by the Illawarra Prehistory Group, who between 1970 and 1988 recorded hundreds of Aboriginal shelter sites. Sefton's study area comprised 351 km <sup>2</sup> from the Illawarra escarpment (east) to the Woronora River (north), Cataract Catchment (south) and Wallandoola River (west). The outcomes of the work were a high incident of recorded grinding grooves in the Georges River Basin than the Cataract River Basin; suggesting a higher population density in the former. It was noted that rock engravings were found in the same locations as grinding grooves, although a higher incident of engravings were noted in coastal locations. |
| Sefton (1993a) | Aboriginal Heritage Assessment | North of Mount Keira Rd | The study area consisted of 600 hectares on the northern side Mt Keira Road. Four sites were noted as occurring in the area: two axe grinding grooves, a shelter with deposit and axe grinding groove, and a shelter with art and axe grinding groove.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Sefton (1993b) | Aboriginal Heritage Assessment | Cordeaux Colliery       | The study area consisted of 500 hectares mainly on the northern side of Mt Keira Road (with a small part on the southern). Sixteen sites were recorded: seven axe grinding grooves, six shelters with art, two shelters with deposit and one shelter with art and deposit.                                                                                                                                                                                                                                                                                                                                                                                                        |

| Author                | Type of archaeological work    | Locality                                                   | Details of sites recorded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|--------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| McDonald (1994)       | PhD Thesis (Published)         | The Hawkesbury sandstone formation within the Sydney Basin | PhD thesis focusing on prehistoric rock art across the Sydney region. A number of points relevant to the current study area were drawn including: only 7% shelters with art contained deposits; 28% of shelter sites with deposits also contained grinding grooves; the majority of the art is depictive (66%), stencilled (33%) and only two of the sites (from 181) contained rock engravings; around half (41%) of motifs were unidentifiable (because of rock preservation); of the identifiable motifs, 49% were hand stencils or variants therein, 9% were macropods, 7% anthropomorphs, 6% other land animals. The majority of art was created by charcoal (or other dry pigment) stencilling, a few were painted; barely any used both techniques. The overall findings suggested that there was a major variation between the rock art techniques and motif types between the Woronora plateau and the central and northern areas of the Sydney basin. |
| Navin Officer (1995)  | Aboriginal Heritage Assessment | Lake Cataract                                              | The survey area consisted of three subsidence lines on the eastern and western sides of Lake Cataract: 42% of Line 1 was surveyed, as was 88% of Line 2 and 51% of Line 3. No sites were recorded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Navin Officer (1999a) | Aboriginal Heritage Assessment | Lake Cataract                                              | The survey area consisted of land on the eastern and western sides of Lake Cataract, with attention focussed on rock exposures along watercourses, and mature trees. Particularly focus was on landform features most at risk of subsidence (sandstone rock shelters, overhangs and platforms). One previously recorded site (a shelter with art) was relocated during the survey. No additional sites were found.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Navin Officer (1999b) | Aboriginal Heritage Assessment | Cordeaux Colliery                                          | Survey of 366 ha on the northern and southern sides of Mount Keira Road, and further south east for a pipeline and borehole. Five previously recorded sites existed in this area (three axe grinding grooves, a shelter with art and an isolated find). Five additional sites were found: three shelters with art and two axe grinding grooves.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Navin Officer (2000)  | Aboriginal Heritage Assessment | Cordeaux Colliery                                          | The survey area consisted of land on the western side of Lake Cataract, with attention focussed on rock exposures along watercourses, and mature trees. Twelve recorded sites existed in this area: seven shelters with art; four shelters with art and deposit; and one axe grinding groove site. Two additional sites were recorded: a shelter with art and deposit, and a shelter with art.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Author                | Type of archaeological work                                       | Locality          | Details of sites recorded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sefton C. 2000        | Monitoring study of effects of subsidence to archaeological sites | Woronora plateau  | 51 overhangs were monitored to determine effects of underground mining. Five showed changes. Four showed evidence of movement (crack or opening) as well as flaking, block fall and cracking of associated surfaces. One had water damage to the rear wall of the cave. There was no indication of deposits being affected by subsidence. It was noted that the main threat to panels containing the art was the effects of cracking or flaking.                                                                                                                                                                                              |
| Navin Officer (2001a) | Aboriginal Heritage Assessment                                    | Wallandoola Creek | The survey area consisted of land north and east of Wallandoola Creek, with attention focused on rock exposures along watercourses, and mature trees. Particular focus was on landform features most at risk of subsidence (sandstone rock shelters, overhangs and platforms). Four previously recorded sites were within the survey area (two shelters with art, one axe grinding groove site and one shelter with art and deposit and axe grinding grooves). Five additional sites were found (two shelters with art, one shelter with art and deposit, one axe grinding groove site and one isolated find). Ten PADs were also identified. |
| Navin Officer (2001b) | Aboriginal Heritage Assessment                                    | Cordeaux Colliery | The survey area consisted of land on the western side of Lake Cataract, with attention focused on rock exposures along watercourses, and mature trees. Particularly focus was on landform features most at risk of subsidence (sandstone rock shelters, overhangs and platforms). Two shelters with PADs and one shelter with art were found.                                                                                                                                                                                                                                                                                                 |
| Dallas, M. 2002       | Archaeological Test Excavation                                    | Stuart Park       | 116 stone artefacts recovered from three pits. The site was small and was therefore of low significance as it did not hold the potential to contain a statistically strong sample to gain new information.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Navin Officer (2003)  | Aboriginal Heritage Assessment                                    | Cordeaux Colliery | No sites were recorded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Navin Officer 2006    | Aboriginal Heritage Assessment                                    | Mt Ousley         | No Aboriginal sites were located during survey. Recommended that Aboriginal groups be invited to monitor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Steele D. 2006        | Aboriginal Heritage Assessment                                    | Wollongong        | No new sites identified during survey.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Roberts. A 2007       | Aboriginal & European Heritage Assessment                         | Darkes Forest     | Two Aboriginal sites identified a scarred tree and an ochre/gypsum quarry with associated artefact scatter and PAD. Minimisation of impact to sites recommended, no disturbance of the PAD and monitoring of the excavation works of the development.                                                                                                                                                                                                                                                                                                                                                                                         |

| Author     | Type of archaeological work    | Locality                    | Details of sites recorded                                                                                                                                                                                                                                                                                                                                                      |
|------------|--------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ERM (2009) | Aboriginal Heritage Assessment | V Mains – NRE No.1 Colliery | <p>Four Aboriginal heritage sites were identified through a OEH) search of the AHIMS) . Two of these sites were able to be relocated during archaeological survey.</p> <p>One site, Wollondoola 2 lies within the subsidence impact zone of the V Mains. This is a rock shelter with grinding grooves and artefacts, considered to have moderate archaeological potential.</p> |

#### 4.1.4

#### *Recent Mining Subsidence Impact Assessments*

Of direct relevance to the current study are the potential impacts from longwall mining subsidence. A number of key reports, by consultants and the NSW Government, have recently been written on the subject. The following review provides a discussion of long wall mining subsidence. This review will be used to underpin the impact assessment portions of this assessment.

##### *Sefton (2000)*

Sefton (2000) prepared a ten year monitoring program assessing the impacts of longwall coal mining in the Southern Coal Fields on sandstone overhang Aboriginal archaeological sites. Sefton inspected and monitored a total of 52 sites, prior to, during and after long wall mining (2000:15). The results of the assessment program (and a principle component analysis using 16 variables) were:

- five of the 52 sites had evidence of impacts resulting from mining (2000: 17-18);
- the impacts from longwall mining could be grouped into four categories: cracking, movement along existing joints/bedding planes, block falls and change to the pattern of water seepage through the rock;
- the components associated with most change were: overhang size (especially length); wetness of the overhang; location near the valley bottom; location above the goaf [that part of a mine from which the mineral has been partially or wholly removed]; and block-fall type shelters;
- no monitored overhang collapsed during the study;
- no monitored shelter with an area of less than 50 m<sup>3</sup> has suffered subsidence impacts (irrespective of other risks);
- not all shelters larger than 50 m<sup>3</sup> suffer impacts (only five of the 23 large shelters [>50 m<sup>3</sup>]suffered an impact);

- the 'over-riding factor which appears to be significant is overhang size where large overhangs are at greater risk' (2000:38); and
- the impacts caused by subsidence were not observed until at least three months post mining.

*Biosis (2007b)*

Biosis (2007b) reviewed the potential impacts to cultural heritage sites in the Dendrobium Area 2 Subsidence Management Plan (SMP) area. A single Aboriginal site (a sandstone shelter with art, AHIMS# 52-2-2252) was located, which had moderate significance and was to be subject to a number of subsidence related movement impacts. Site 2252 was located two km south of the current Study Area. The aim of the study was to 'assess the impacts of predicted subsidence on identified heritage sites and recommend management and mitigation measures' (2007b:3).

An assessment of potential impacts to Site 2252 was made. The site was judged to be at some risk because of its large size (>50 m<sup>3</sup>), the block fall shelter formation, bedding and jointing planes present, dampness and location directly over a longwall goaf. It was predicted that the site was at some risk from potential impact, because of the compressive and tensile strains were enough to deform the rock and the cliff formation containing the site was in an advanced stage of natural erosion (2007b:32).

Biosis (2008b) provides the results from the assessment, post long wall mining subsidence on Aboriginal Site 2252 undertaken six months post mining.

The results of the assessment showed that the site had suffered some damage attributable to subsidence movement. This damage included: the opening of a pre-existing crack at the base of the back wall; and the down slope slumping of talus and boulders adjacent to the site. Twenty monitoring points were observed; only one of which had changed. The observed change was minor additional opening of a pre-existing crack to a width of 10 mm. Soil cracking and displacement of boulders was observed in the front of the shelter (2008b:7).

*Southern Coalfields Inquiry Report*

In 2008 an independent inquiry (Southern Coalfields Inquiry (SCI) Report) was established because of concerns held by the Government over both past and potential future impacts of mine subsidence on significant natural features in the Southern Coalfield (NSW 2008). The objectives of the report were threefold:

1. to undertake a strategic review of the impacts of underground mining in the Southern Coalfield on significant natural features (ie rivers and significant streams, swamps and cliff lines), with particular emphasis on risks to water flows, water quality and aquatic ecosystems;

2. to provide advice on best practice in regard to:
  - a) assessment of subsidence impacts;
  - b) avoiding and/or minimising adverse impacts on significant natural features; and
  - c) management, monitoring and remediation of subsidence and subsidence-related impacts; and
3. to report on the social and economic significance to the region and the State of the coal resources in the Southern Coalfield.

This report is of importance to Aboriginal heritage as it provides a basic assessment of potential environmental consequences resulting from subsidence impacts on Aboriginal heritage sites.

The summary of the report stated that:

*“Aboriginal heritage sites are most at risk of subsidence impacts where they are located in cliff lines and/or rock overhangs. The Panel was not made aware of any significant impacts having occurred on Aboriginal heritage features in the Southern Coalfield since the 1980s (2008: 2).”*

Chapter 4 of the report (*Subsidence impacts on natural features*) includes a review of the type of impacts that can be expected from mining related subsidence. Several types of subsidence impacts were judged to be relevant to archaeological sites:

- rock falls and cliff collapses;
- surface cracking and exfoliation; and
- water table and/or seepage changes (2008: 77).

It was reported that Aboriginal rock shelter and painted art sites in valleys and on cliff lines had the potential to be damaged by cliff falls or rock falls. Axe grinding grooves and engraved art sites were likely to be exposed to cracking of bedrock or creek side strata.

The Inquiry (2008: 84) determined that the *“prediction of the impacts on features of Aboriginal heritage significance is determined, first, by adequate surveys to determine the existence and significance of archaeological or cultural significance... the archaeological sites which are most susceptible to subsidence-induced damage are rock shelters in caves or overhangs, generally associated with cliff lines.”*

The impacts on cliff lines (watercourses and valleys) were viewed primarily as being associated with ‘non-conventional’ subsidence (2008: 82). Therefore the measures of predicting valley closure and upsidence were judged to be the most valuable when determining impacts on these landforms.

The Inquiry determined that predicted valley closure was the most useful subsidence parameter [2008: 83]. It should be noted that current scientific understanding of nonconventional surface subsidence effects (far-field horizontal movements, valley closure, upsidence and other topographical effects) are not as advanced as effects resulting from conventional subsidence [an opinion reflected in NSW 2009].)

Management of impacts to Aboriginal sites arising from subsidence was discussed with OEH (2008: 109). The outcomes of this discussion were a proposed risk based decision model that was 'outcome-based and designed to avoid overly-prescriptive requirements' (2008: 109):

*"DECC has instead proposed an ecological risk-based standard that addresses threatened species, Aboriginal heritage, upland swamps and other features, in addition to rivers and streams. This model is based on both risk management and risk avoidance. High risks are to be avoided; lesser risks are to be managed. DECC considers that clear and objective criteria with defined 'acceptable limits of change' are needed.*

*It proposes that this be made operational via a decision model that identifies limits of risk acceptability for identified ecological features and potential subsidence outcomes. The model is based on an ecological risk assessment approach that identifies risk values of 'High', 'Medium' and 'Low' and stipulates management measures of 'Prevent', 'Minimise' and 'Proceed with Caution'. In essence, the model establishes qualitative risk standards by ensuring impacts do not exceed a qualitative impact rating. DECC argues that mining companies would then have the flexibility to determine solutions to comply with the required outcomes. DECC stresses that its model is still in infancy and remains 'conceptual' until it can be trialled with mining companies and stakeholders."*

At the time of writing, OEH had not published the risk based decision making tool.

The Inquiry recommended that Risk Management Zones (RMZs) should be identified to focus assessment and management of potential impacts on natural features. In particular they should be identified for all significant environmental features which are sensitive to non-conventional subsidence effects.

The Metropolitan Planning Assessment Commission Report 2009 (MPAC) (NSW 2009) report was prepared for the Metropolitan Coal Project, which was the first mining proposal in the Southern Coalfield to be assessed under Part 3A since the release of the SCI report (NSW 2008). The Aboriginal Cultural Heritage Assessment (prepared for the Part 3A project application) identified 188 Aboriginal heritage sites within the Project Area, of which 142 sites were sandstone overhangs; the remainder were open sites.

The summary presented in NSW 2009 noted that:

*“the subsidence assessments for the [Aboriginal] sites presented in the EA are based on conventional subsidence. There is no analysis of the non-conventional subsidence effects, albeit that some open sites are located in or close to drainage lines and a number of sites are associated with watercourses. The Panel considers that this does not constitute an adequate degree of assessment for an EA.*

*It appears likely that some sites of Aboriginal heritage and cultural significance will be impacted by the Project and approval conditions will therefore need to incorporate provisions for monitoring all highly significant sites for the purpose of comparing predictions of effects and impacts against measured effects and impacts and implementing mitigation and remediation measures where practical. (NSW 2009:v)*

*Monitoring of predicted versus measured effects, impacts and consequences of both conventional and non-conventional subsidence on a range of significant features including watercourses, groundwater, upland swamps, Aboriginal heritage sites and cliff lines (2009: vi).”*

A detailed review of the Aboriginal Cultural Heritage Assessment (ACHA) report is presented in NSW 2009: Chapter 11. The review included a discussion relating to scientific archaeological versus Aboriginal cultural significance assessment and conventional versus non-convention subsidence impacts on Aboriginal heritage sites.

The review found the impact assessment to be insufficient, and recommended the following be implemented for the future studies (after NSW 2009: 99-101):

- a high level of quantification of Aboriginal sites, with detailed descriptions of a site’s shape, dimensions, structure and composition, especially those of higher significance;
- a site specific assessment of high significance sites, having regard to assessment criteria recently adopted in another mining approval (Biosis 2007a,);

- an analysis of conventional and non-conventional subsidence effects, impacts and consequences on Aboriginal sites (subsidence prediction should use the prediction of effects to then predict what impact these effects will have on features of interest [NSW 2008: 78]), using terms that are quantified (not terms such as negligible, very low or low risk); and
- a quantitative link between subsidence impacts and consequences to Aboriginal sites and to the 'back analysis' of actual versus predicted effects and impacts on recorded Aboriginal sites (i.e. the possible inclusion of a monitoring program for all sites of high significance; for the purpose of comparing predictions of effects and impacts against measured effects and impacts and implementing mitigation and remediation measures where practical).

#### 4.1.5 Study Area AHIMS Data

A search of the DECC AIHMS database for an area 12 km by 12 km, with the proposed NRE No.1 longwalls at the centre of the search, was undertaken on 17 October 2008. The search identified 254 recorded Aboriginal sites, the substantial majority of which were shelter sites containing a combination of art, archaeological deposits and grinding grooves. This search was refined focussing on the Wonga East and Wonga West Study Areas. Fifty recorded Aboriginal sites are located within the Study Areas with 21 of these sites within the potential subsidence footprint (*Table 4.2*). The potential subsidence footprint is defined as the area where subsidence is predicted to be greater than 20 mm. *Table 4.3* and *Figure 4.1* identify the locations of AHIMS listed sites.

**Table 4.2** *Number of Aboriginal sites within the Study Area*

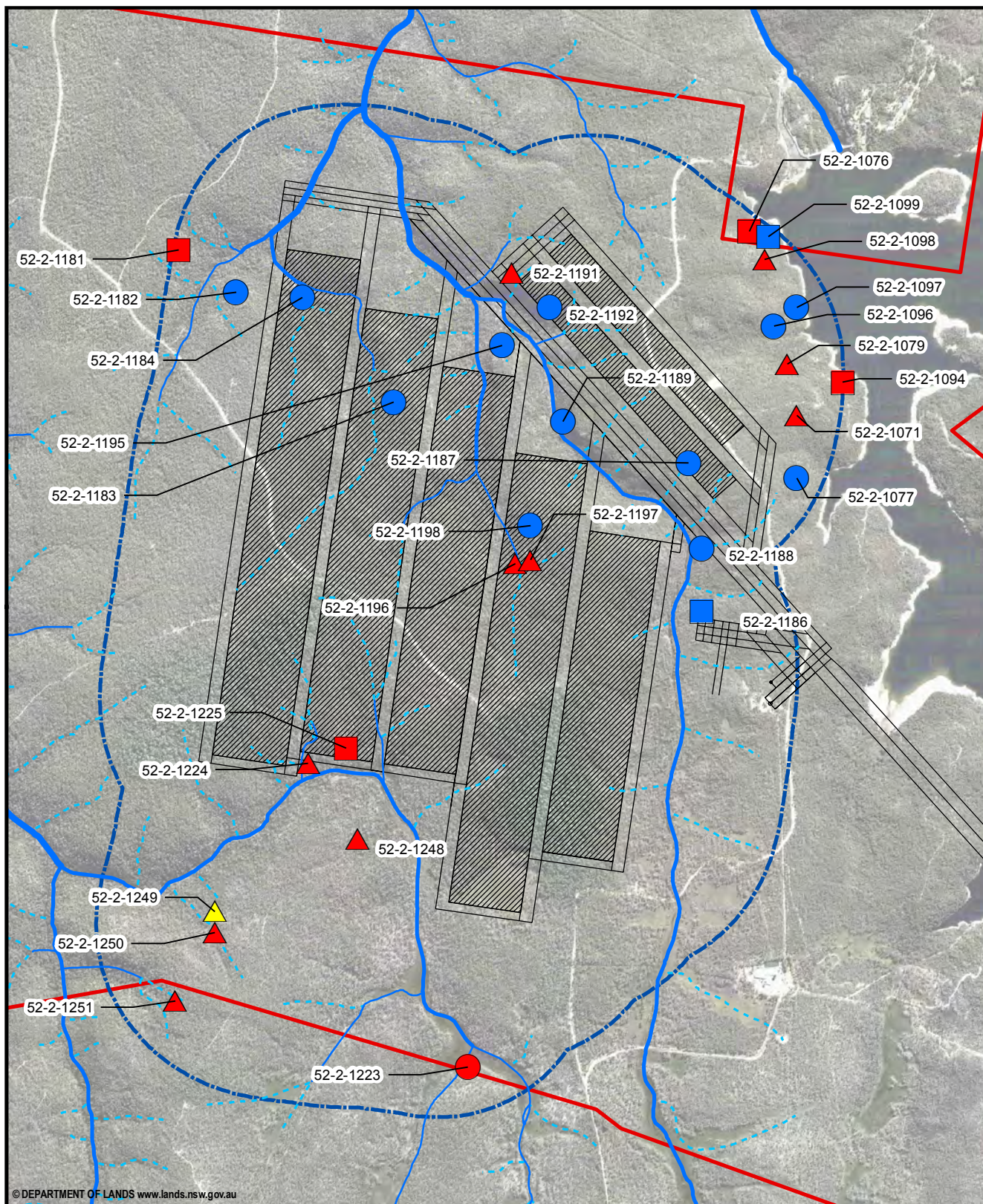
| Site Type                                           | Count     | Frequency   |
|-----------------------------------------------------|-----------|-------------|
| Artefact Scatter                                    | 1         | 2%          |
| Axe Grinding Groove                                 | 14        | 28%         |
| Shelter with Art and/or Artefacts, Grinding Grooves | 35        | 70%         |
| <b>Total</b>                                        | <b>50</b> | <b>100%</b> |

**Table 4.3** *AIHMS registered sites within the Study Area*

| AHIMS Site Id <sup>1</sup> | AHIMS Site Name  | Context          | Site Type                    |
|----------------------------|------------------|------------------|------------------------------|
| <b>Wonga West</b>          |                  |                  |                              |
| 52-2-1071                  | Gillbird Site 47 | Open site        | Axe grinding grooves         |
| 52-2-1076                  | Gillbird Site 56 | Enclosed Shelter | Shelter with Art and Deposit |
| 52-2-1077                  | Gillbird Site 48 | Enclosed Shelter | Shelter with Art             |
| 52-2-1079                  | Gillbird Site 51 | Open site        | Axe grinding groove          |
| 52-2-1094                  | Gillbird Site 50 | Enclosed Shelter | Shelter with Art and Deposit |
| 52-2-1096                  | Gillbird Site 52 | Enclosed Shelter | Shelter with Art             |
| 52-2-1097                  | Gillbird Site 53 | Enclosed Shelter | Shelter with Art             |

| <b>AHIMS</b>               |                          |                  |                                                                               |
|----------------------------|--------------------------|------------------|-------------------------------------------------------------------------------|
| <b>Site Id<sup>1</sup></b> | <b>AHIMS Site Name</b>   | <b>Context</b>   | <b>Site Type</b>                                                              |
| 52-2-1098                  | Gillbird Site 54         | Open site        | Axe grinding groove                                                           |
| 52-2-1099                  | Gillbird Site 55         | Enclosed Shelter | Shelter with Deposit                                                          |
| 52-2-1181                  | Lizard Creek Site 17     | Enclosed Shelter | Shelter with Art and Deposit                                                  |
| 52-2-1182                  | Lizard Creek Site 16     | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1183                  | Lizard Creek Site 14     | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1184                  | Lizard Creek Site 15     | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1186                  | Lizard Creek Site 1      | Enclosed Shelter | Shelter with Deposit                                                          |
| 52-2-1187                  | Lizard Creek Site 3      | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1188                  | Lizard Creek Site 2      | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1189                  | Lizard Creek Site 4      | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1191                  | Lizard Creek Site 6      | Open Site        | Axe grinding grooves                                                          |
| 52-2-1192                  | Lizard Creek Site 5      | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1195                  | Lizard Creek Site 10     | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1196                  | Lizard Creek Site 11     | Open Site        | Axe grinding grooves                                                          |
| 52-2-1197                  | Lizard Creek Site 12     | Open Site        | Axe grinding grooves                                                          |
| 52-2-1198                  | Lizard Creek Site 13     | Enclosed Shelter | Shelter with Art<br>Shelter with Deposit, and Axe grinding grooves            |
| 52-2-1223                  | Wallandoola Site 2       | Enclosed Shelter | Axe grinding grooves                                                          |
| 52-2-1224                  | Wallandoola Site 4       | Open Site        | Axe grinding grooves                                                          |
| 52-2-1225                  | Wallandoola Site 3       | Enclosed Shelter | Shelter with Art and Deposit                                                  |
| 52-2-1248                  | Wallandoola Site 12      | Open Site        | Axe grinding grooves<br>Shelter with Art, and Axe grinding grooves            |
| 52-2-1249                  | Wallandoola Site 13      | Enclosed Shelter | grooves                                                                       |
| 52-2-1250                  | Wallandoola Site 14      | Open Site        | Axe grinding grooves                                                          |
| 52-2-1251                  | Wallandoola Site 15      | Open Site        | Axe grinding grooves                                                          |
| <b>Wonga East</b>          |                          |                  |                                                                               |
| 52-2-0083                  | Bulli Mine Shaft Site 7  | Enclosed Shelter | Shelter with Deposit<br>Shelter with Art and Deposit and axe grinding grooves |
| 52-2-0099                  | Bulli Mine Shaft Site 8  | Enclosed Shelter | Axe grinding grooves                                                          |
| 52-2-0229                  | Bulli Mine Shaft Site 12 | Open site        | Axe grinding grooves                                                          |
| 52-2-0233                  | Bulli Mine Shaft Site 13 | Open site        | Axe grinding grooves                                                          |
| 52-2-0603                  | Bulli Mine Shaft Site 19 | Enclosed Shelter | Shelter with Art<br>Shelter with Art and Deposit and axe grinding grooves     |
| 52-2-1081                  | Gillbird Site 2          | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1082                  | Gillbird Site 3          | Enclosed Shelter | Shelter with Art                                                              |
| 52-2-1095                  | Gillbird Site 1          | Enclosed Shelter | Shelter with Art<br>Shelter with Art and Deposit and axe grinding grooves     |
| 52-3-0310                  | Bulli Mine Shaft Site 18 | Enclosed Shelter | Shelter with Deposit                                                          |
| 52-3-0311                  | Bulli Mine Shaft Site 20 | Enclosed Shelter | Shelter with Deposit                                                          |
| 52-3-0312                  | Bulli Mine Shaft Site 23 | Enclosed Shelter | Artefact Scatter                                                              |
| 52-3-0313                  | Bulli Mine Shaft Site 29 | Open Site        | Shelter with Art                                                              |
| 52-3-0314                  | Bulli Mine Shaft Site 21 | Enclosed Shelter | Shelter with Deposit                                                          |
| 52-3-0317                  | Bulli Mine Shaft Site 22 | Enclosed Shelter | Shelter with Art                                                              |
| 52-3-0318                  | Bulli Mine Shaft Site 30 | Enclosed Shelter | Shelter with Deposit                                                          |
| 52-3-0319                  | Bulli Mine Shaft Site 24 | Open Site        | Axe grinding grooves                                                          |
| 52-3-0320                  | Bulli Mine Shaft Site 25 | Open Site        | Axe grinding grooves                                                          |
| 52-3-0322                  | Bulli Mine Shaft Site 31 | Enclosed Shelter | Shelter with Deposit                                                          |
| 52-3-0323                  | Bulli Mine Shaft Site 26 | Enclosed Shelter | Shelter with Art                                                              |
| 52-3-0325                  | Bulli Mine Shaft Site 27 | Enclosed Shelter |                                                                               |

1. Co-ordinates for sites were estimated off topographical maps by the Illawarra Prehistory Group in the early 1980s. When sites are re-recorded with modern GPS equipment, errors in the original co-ordinates of up to 400 m are not uncommon.



#### Legend

- Project Application Area
- Study Area - Wonga West
- Proposed Longwalls
- 1st order stream
- 2nd order stream
- 3rd order stream
- 4th order and above stream

#### AHIMS Site Type

- ▲ Axe Grinding Groove
- ▲ Axe Grinding Groove, Shelter with Art
- Axe Grinding Groove, Shelter with Deposit
- Shelter with Art
- Shelter with Art, Shelter with Deposit
- Shelter with Deposit

Client: Gujarat NRE Coking Coal Limited  
 Project: NRE No. 1 Colliery EAR Post Adequacy 2012  
 Aboriginal Heritage Assessment

Drawing No: 0079383s\_AHA\_GIS001\_R2.mxd

Date: 18/10/2012 Drawing size: A4

Drawn by: SQW Reviewed by: NB

Scale: Refer to Scale Bar



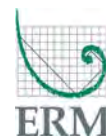
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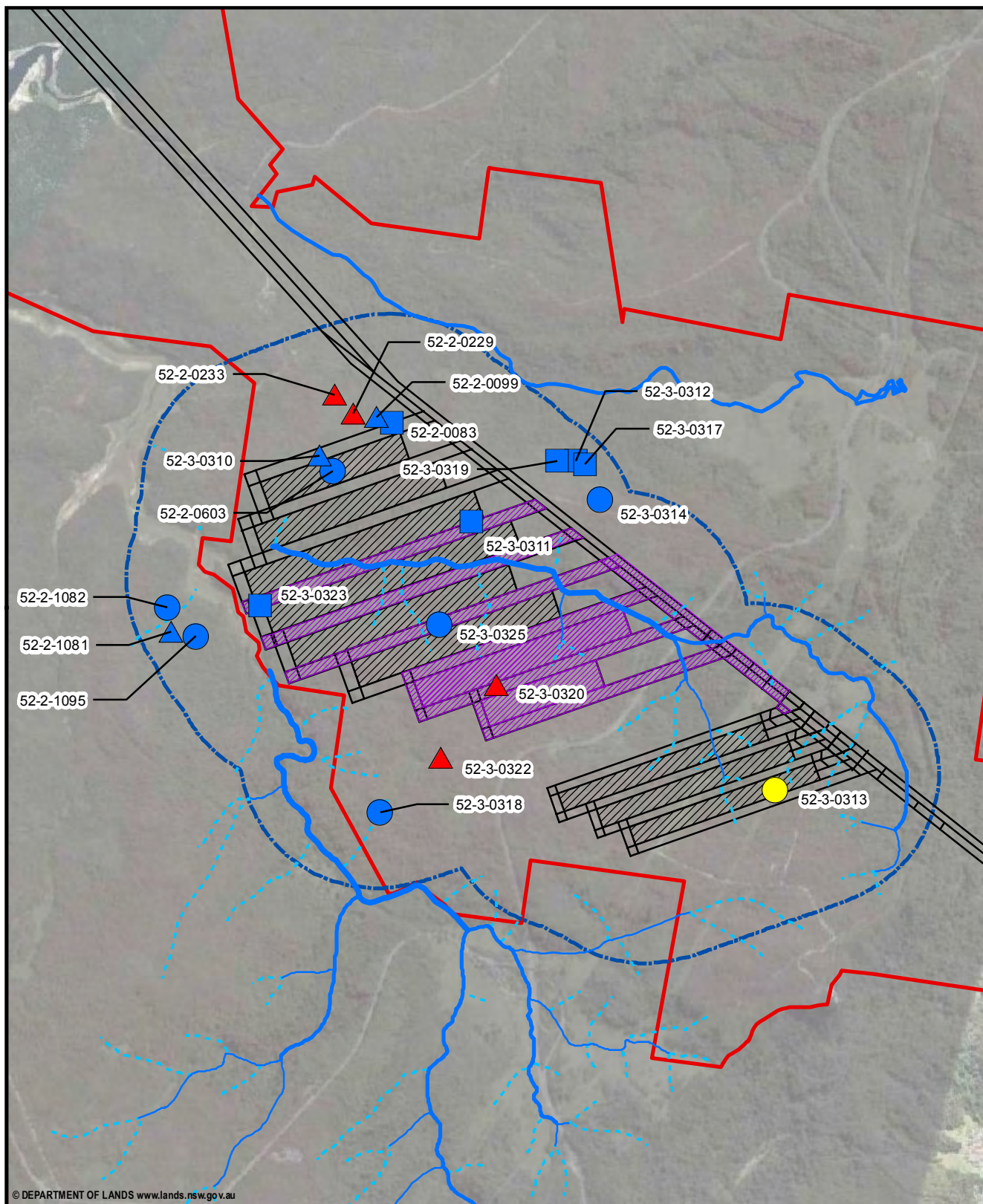
**Figure 4.1**

#### AHIMS Sites within the Wonga West Study Area

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch,  
 Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney





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#### Legend

- |                                                                                                                                                                                                                     |                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <span style="border: 2px solid red; padding: 2px;"> </span> Project Application Area                                                                                                                                | <b>AHIMS Site Type</b>                                                                          |
| <span style="border: 2px dashed blue; padding: 2px;"> </span> Study Area - Wonga East                                                                                                                               | <span style="color: red;">▲</span> Axe Grinding Groove                                          |
| <span style="background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black; padding: 2px;"> </span> Proposed Longwalls                                  | <span style="color: blue;">▲</span> Axe Grinding Groove, Shelter with Art, Shelter with Deposit |
| <span style="background: repeating-linear-gradient(-45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black; padding: 2px;"> </span> Subject to separate application (MP 10_0046_MOD 1) | <span style="color: yellow;">●</span> Open Camp Site                                            |
| <span style="color: blue;">---</span> 1st order stream                                                                                                                                                              | <span style="color: blue;">●</span> Shelter with Art                                            |
| <span style="color: blue;">---</span> 2nd order stream                                                                                                                                                              | <span style="color: blue;">■</span> Shelter with Deposit                                        |
| <span style="color: blue;">---</span> 3rd order stream                                                                                                                                                              |                                                                                                 |
| <span style="color: blue;">---</span> 4th order and above stream                                                                                                                                                    |                                                                                                 |

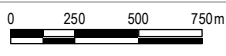
Client: Gujarat NRE Coking Coal Limited  
Project: NRE No. 1 Colliery EAR Post Adequacy 2012 Aboriginal Heritage Assessment

Drawing No: 0079383s\_AHA\_GIS011\_R1.mxd

Date: 09/11/2012 Drawing size: A4

Drawn by: SQW Reviewed by: MK

Scale: Refer to Scale Bar



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**Figure 4.2**

#### AHIMS Sites within the Wonga East Study Area

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch,  
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

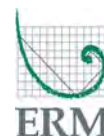


Table 4.4 provides an overview of the most likely site types which could be found within the Study Area.

**Table 4.4** *Aboriginal sites commonly found in the local area*

| Site types                   | Definitions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stone artefact concentration | <p>Stone artefact concentrations are collections of stone, frequently brought from other areas, which demonstrate evidence for Aboriginal working, use and/or discard of the stone at a single location. Stone artefact concentrations may be associated with any of the site types listed in the table.</p> <p>Where such sites are buried by sediment they may not be noticeable unless exposed by erosion or disturbed by modern activities.</p> <p>These sites may be found in any landform, but are most likely to be associated with waterways, flat landforms and ridgeline. It is expected that some stone artefact concentrations will be present.</p> |
| Isolated finds               | <p>Sites consisting of only one identified stone artefact, isolated from any other artefacts or archaeological evidence (and defined by an arbitrary separation distance of 50 m). They are generally indicative of sporadic past Aboriginal use of a location.</p> <p>A distinction should be drawn between isolated finds which are a component of the background distribution and objects such as axes, hammer stones, grinding dishes etc. which would have been used repeatedly.</p> <p>These sites could be recorded anywhere within the Study Area.</p>                                                                                                  |
| Background distribution      | <p>Represents the low density of Aboriginal objects that have been discarded but cannot be associated with concentrations of objects. The background distribution is a record of Aboriginal occupation of an area. The density that defines the background scatter needs to be defined through local comparisons.</p> <p>It is recognised that regionally there is a low density count of background objects recorded across the escarpment.</p>                                                                                                                                                                                                                |
| Shelter sites                | <p>Sandstone shelters and overhangs were used by Aboriginal people to provide habitation areas sheltered from the rain and sun. The deposits in such sites are commonly very important because they often contain clearly stratified material in a good state of preservation.</p> <p>These sites are expected to be located within the Study Area.</p>                                                                                                                                                                                                                                                                                                         |
| Grinding grooves             | <p>Grooves resulting from the grinding of stone axes or other implements are found on flat areas of suitable sandstone. They are often located near waterholes or creek beds as water is necessary in the sharpening process. In areas where suitable outcrops of rock were not available, transportable pieces of sandstone were used.</p> <p>These sites are expected to be located within the Study Area.</p>                                                                                                                                                                                                                                                |
| Quarries                     | <p>These are areas where stone was obtained for flaked artefacts or ground-edge artefacts, or where ochre was obtained for rock paintings, body decoration or decorating wooden artefacts.</p> <p>These sites have a low chance of being located within the Study Area, due to the sandstone geology.</p>                                                                                                                                                                                                                                                                                                                                                       |

| Site types                                              | Definitions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Art sites                                               | <p>Aboriginal paintings, drawings and stencils are commonly to be found where suitable surfaces occur in sandstone shelters and overhangs. These sites are often referred to as rock shelters with painted art. Rock engravings, carvings or peckings are also to be found on sandstone surfaces both in the open and in shelters. These are referred to as rock engraving sites.</p> <p>These sites are expected to be located within the Study Area.</p>                                                                                                                                                                                                                                                                                                                                                                         |
| Scarred trees                                           | <p>Scarred trees bear the marks of bark and wood removal for utilisation as canoes, shields, boomerangs or containers. It is commonly very difficult to confidently distinguish between Aboriginal scars and natural scars or those made by Europeans. Scars may also originate as 'foot-marks', small pockets cut into the bark of a tree enabling the tree to be climbed.</p> <p>These sites have a moderate chance of being recorded within the Study Area, but only in areas with old growth trees.</p>                                                                                                                                                                                                                                                                                                                        |
| Burial sites                                            | <p>Burials may be of isolated individuals, or they may form complex burial grounds. Often associated with other site types such as middens, or mounds.</p> <p>These sites are not expected to be located within the Study Area.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Stone arrangements, carved trees and ceremonial grounds | <p>These site types are often interrelated. Stone arrangements vary from simple cairns or piles of rocks to more elaborate arrangements; patterns of stone laid out to form circles and other designs, or standing slabs of rock held upright by stones around the base.</p> <p>Carved trees may have intricate geometric or linear patterns or representations of animals carved into their trunks. Ceremonial grounds and graves were often marked by such trees.</p> <p>Bora grounds are a common type of ceremonial site and they are generally associated with initiation ceremonies. They comprise two circles, generally edged with low banks of earth but sometimes of stone, a short distance apart and connected by a path.</p> <p>It cannot be predicted whether these sites will be located within the Study Area.</p> |
| Resource areas                                          | <p>Resource gathering areas represent landforms that contain a high number of fauna and flora species, which were known Aboriginal resources. Resource areas are frequently associated with permanent water resources, often swamps or marshes, and frequently have recorded sites such as middens nearby. Landforms associated with these sites are often flats with a favourable outlook.</p> <p>These sites are not expected to be located within the Study Area.</p>                                                                                                                                                                                                                                                                                                                                                           |
|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## 5.1

## FIELD SURVEY METHODOLOGY

The Study Area was surveyed in two field trips. The initial survey was held on 9-10 February 2009 and involved ERM Heritage consultant Dr Diana Neuweger and ERM Archaeologist James Shepherd. ILALC representative Peter Henry and Veronica Falk of DKH also participated in the survey. A second survey was conducted on 9-19 November 2009 (exclusive of weekends). The second survey team included ERM Archaeologist Luke Kirkwood and ERM Environmental Consultant Melissa Karam with the ILALC represented by Michael Pixton, Allan Walker, Craig Tungai and Richard Campbell and DKH being represented by Peter Falk.

The survey methodology was prepared in light of the archaeological background undertaken for this study, the guidelines provided by NPWS and by the DGRs.

The surveys took the form of a pedestrian survey. Owing to the difficult nature of the terrain and low ground surface visibility in much of the Study Area, conventional survey transects were not able to be walked. The survey targeted locations of previously recorded archaeological sites, ridgelines, areas associated with sandstone overhangs, large sandstone platforms associated with water and creeklines, where unregistered sites may have been present. Ground surface visibility was variable; however it was generally low, ranging between 0% to 10%. Survey transects are shown on *Figure 5.1*.

Previously recorded sites were targeted to determine their current condition. Sites that were relocated were assessed against the original detail on the site cards to determine any changes.

The co-ordinates for previously recorded sites documented by the Illawarra Prehistory Group in the mid-1980s were at the time estimated from topographic maps. This created difficulties in accurately relocating sites in extremely difficult terrain with dense vegetation hindering visibility. A multi-step methodology for relocating these sites was developed and involved:

1. surveying a 100 m radius around a given co-ordinate in an effort to identify the archaeological site and/or features described in the site card relocation instructions;
2. identifying key landform features mentioned in site card relocation instructions and possible candidate areas for further inspection; and
3. surveying natural features such as sandstone overhang ridgelines and sandstone platforms.

This methodology helped to increase the chances of relocating sites, and enabled targeted survey of potential culturally sensitive landforms (overhangs etc) in a systematic fashion.

When heritage sites were identified, they were recorded by the survey team for content, GPS location and digitally photographed.

## 5.2

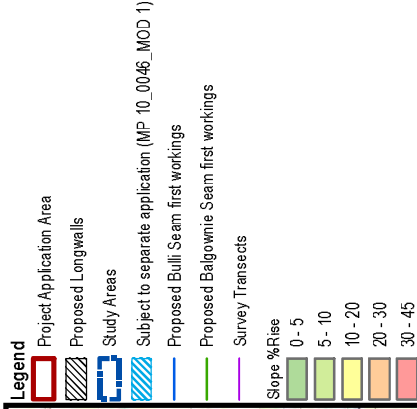
### *FIELDWORK CONSTRAINTS AND LIMITATIONS*

The survey was limited by a number of factors including restricted access to the survey area following wet weather; imprecise co-ordinates for previously recorded archaeological sites; dense vegetation cover coupled with low ground surface visibility and weather conditions.

A large part of the PAA is designated as a Schedule 1 Restricted Access Area (Metropolitan Special Area) under the *Sydney Water Catchment Management Act 1998*. It is managed by the Sydney Catchment Authority (SCA) and access into and through the area is restricted following wet weather.

The archaeological sites previously recorded in the Study Area were recorded by the Illawarra Prehistory Group during voluntary surveys in the mid to late 1980s. The co-ordinates of the sites were estimated using topographic map series available at the time. The inaccuracy of recorded co-ordinates coupled with the dense vegetation and low visibility, made locating previously recorded sites difficult. In some cases, sites were over 350 m from their recorded position. As a result, a methodology of multiple relocation techniques was adopted, although not all sites were able to be relocated.

The Study Area contains few fire access trails and large areas of bushland over dissected plateau terrain, much of which has not been burnt for some years. The density of vegetation restricts movement and poses a health and safety risk, especially in terms of concealing cliffs, drops and dangerous wildlife. Hot weather conditions during the time of the field survey also presented additional risks to surveying in remote bushland. While all precautions were taken, excessive heat, bushfire risk and the potential for electrical storms during the field survey limited the distances that could be safely surveyed. The survey team therefore only accessed areas which did not pose a high level of risk to safety and could easily be evacuated in the event of an emergency.



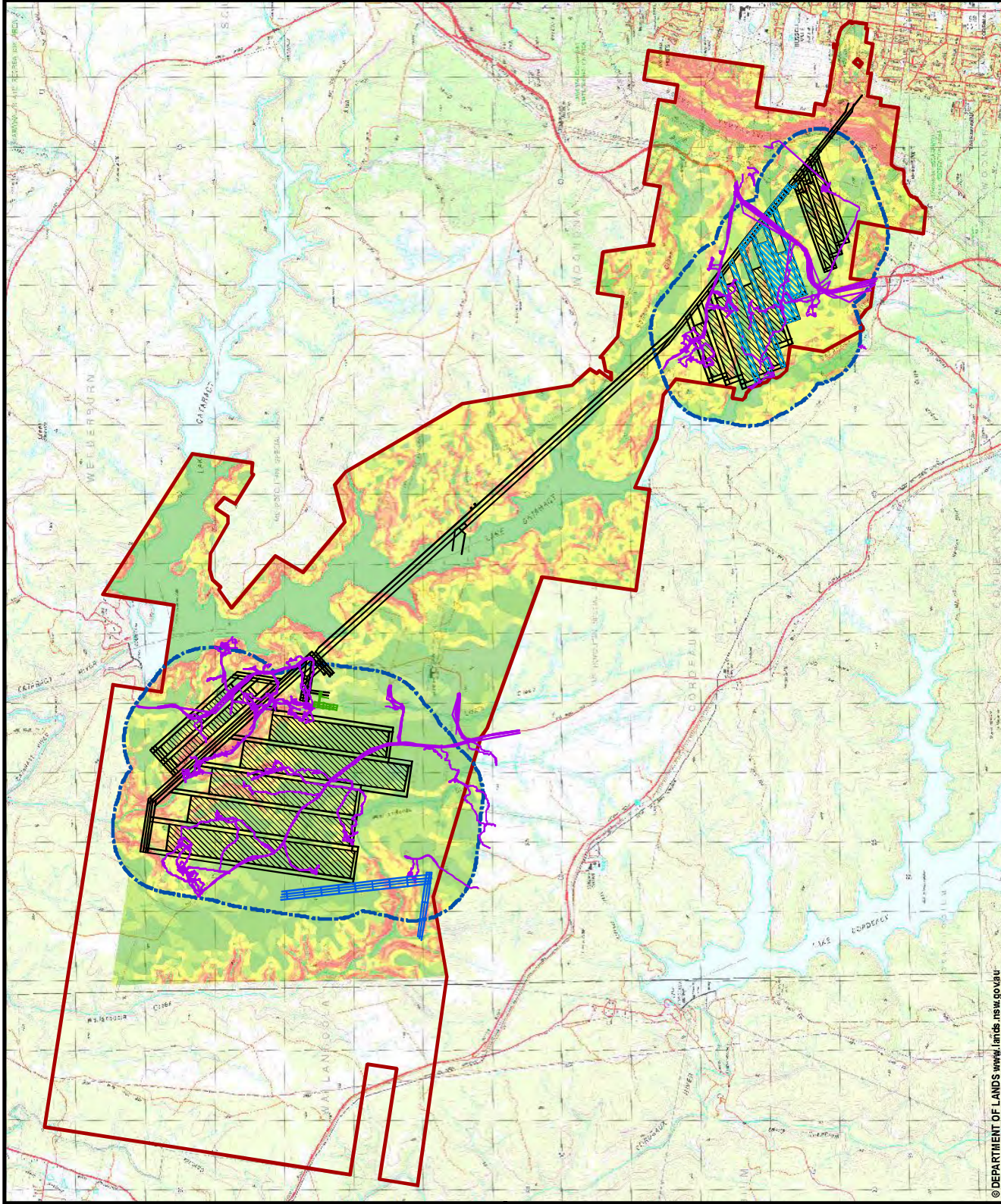
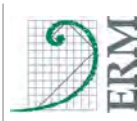
**Figure 5.1**  
**Survey Data**

|             |                                                                             |
|-------------|-----------------------------------------------------------------------------|
| Client:     | Gujarat NRE Coking Coal Limited                                             |
| Project:    | NRE No. 1 Colliery EAR Post Adequacy 2012<br>Aboriginal Heritage Assessment |
| Drawing No: | 0079383s_AHA_GS008_R2.mxd                                                   |
| Date:       | 18/10/2012      Drawing size: A4                                            |
| Drawn by:   | SQW      Reviewed by: MK                                                    |
| Scale:      | Refer to Scale Bar                                                          |



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Three new sites were identified during fieldwork, all within the potential subsidence footprint.

Fifteen AHIMS registered sites were relocated including thirteen rock shelters, one grinding groove site and one artefact scatter.

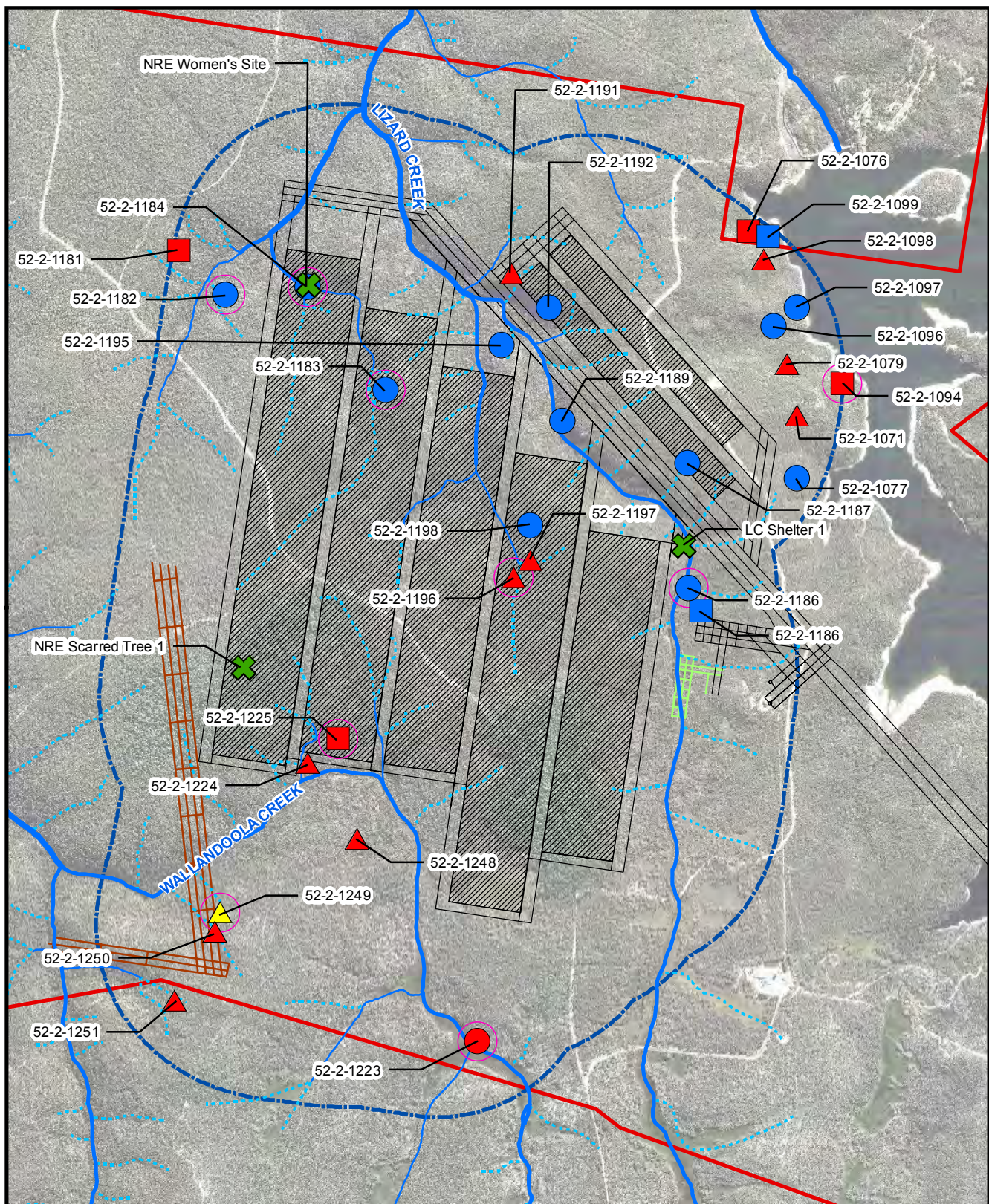
Three additional sites referred to as Wonga East 1, 2 and 3 were also identified by Biosis while undertaking fieldwork associated with a separate application to modify the Preliminary Work Project (MP 10\_0046). These sites were not visited by ERM. Details of these new sites were provided to ERM by Biosis to ensure consistency in reporting.

A summary of the survey results is provided in *Table 5.1*, the location of the sites is shown in *Figure 5.2* and *Figure 5.3*.

The re-located sites are discussed in the following pages.

**Table 5.1** *Aboriginal sites new and relocated*

| AHIMS<br>Site Number | AHIMS<br>Site Name       | AHIMS<br>Site Type                                    |
|----------------------|--------------------------|-------------------------------------------------------|
| <b>Wonga West</b>    |                          |                                                       |
| 52-2-1223            | Wallandoola Site 2       | Shelter with Deposit and Axe grinding groove          |
| 52-2-1094            | Gillbird Site 50         | Shelter with Art and Deposit                          |
| 52-2-1182            | Lizard Creek Site 16     | Shelter with Art                                      |
| 52-2-1183            | Lizard Creek Site 14     | Shelter with Art                                      |
| 52-2-1184            | Lizard Creek Site 15     | Shelter with Art                                      |
| 52-2-1188            | Lizard Creek Site 2      | Shelter with Art                                      |
| 52-2-1196            | Lizard Creek Site 11     | Axe Grinding Grooves                                  |
| 52-2-1225            | Wallandoola Site 3       | Shelter with Art and Deposit                          |
| 52-2-1249            | Wallandoola Site 13      | Shelter with Art and axe grinding grooves             |
| New NRE Womens Site  | NRE Women's Site         | Water Hole with Aboriginal Ceremony & Dreaming        |
| New NRE Scarred Tree | NRE Scarred Tree 1       | Scarred Tree                                          |
| New LC Shelter 1     | Lizard Creek Shelter 1   | Shelter with Art                                      |
| <b>Wonga East</b>    |                          |                                                       |
| 52-2-0312            | Bulli Mine Shaft Site 23 | Shelter with Deposit                                  |
| 52-2-0314            | Bulli Mine Shaft Site 21 | Shelter with Art                                      |
| 52-2-0319            | Bulli Mine Shaft Site 24 | Shelter with Deposit                                  |
| 52-2-0603            | Bulli Mine Shaft Site 19 | Shelter with Art                                      |
| 52-3-0310            | Bulli Mine Shaft Site 18 | Shelter with Art and Deposit and Axe grinding Grooves |
| 52-3-0313            | Bulli Mine Shaft Site 29 | Artefact scatter                                      |
| Biosis               | Wonga East 1             | Shelter with Deposit                                  |
| Biosis               | Wonga East 2             | Shelter with Deposit                                  |
| Biosis               | Wonga East 3             | Shelter with Deposit                                  |



#### Legend

- Project Application Area
- Study Area - Wonga West
- Proposed Longwalls
- Proposed Bulli Seam first workings
- Proposed Balgownie Seam first workings
- 1st order stream
- 2nd order stream
- 3rd order stream
- 4th order and above stream
- ✕ Identified Heritage Site (ERM 2009)
- Relocated AHIMS Site (ERM 2009)
- AHIMS Site Type**
- ▲ Axe Grinding Groove
- ▲ Axe Grinding Groove, Shelter with Art
- Axe Grinding Groove, Shelter with Deposit
- Shelter with Art
- Shelter with Art, Shelter with Deposit
- Shelter with Deposit

Client: Gujarat NRE Coking Coal Limited  
 Project: NRE No. 1 Colliery EAR Post Adequacy 2012  
 Aboriginal Heritage Assessment

Drawing No: 0079383s\_AHA\_GIS014\_R1.mxd

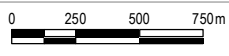
Date: 13/09/2012

Drawing size: A4

Drawn by: SQW

Reviewed by: MK

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**Figure 5.2**

**Archaeological sites relocated and identified in the Wonga West study area**

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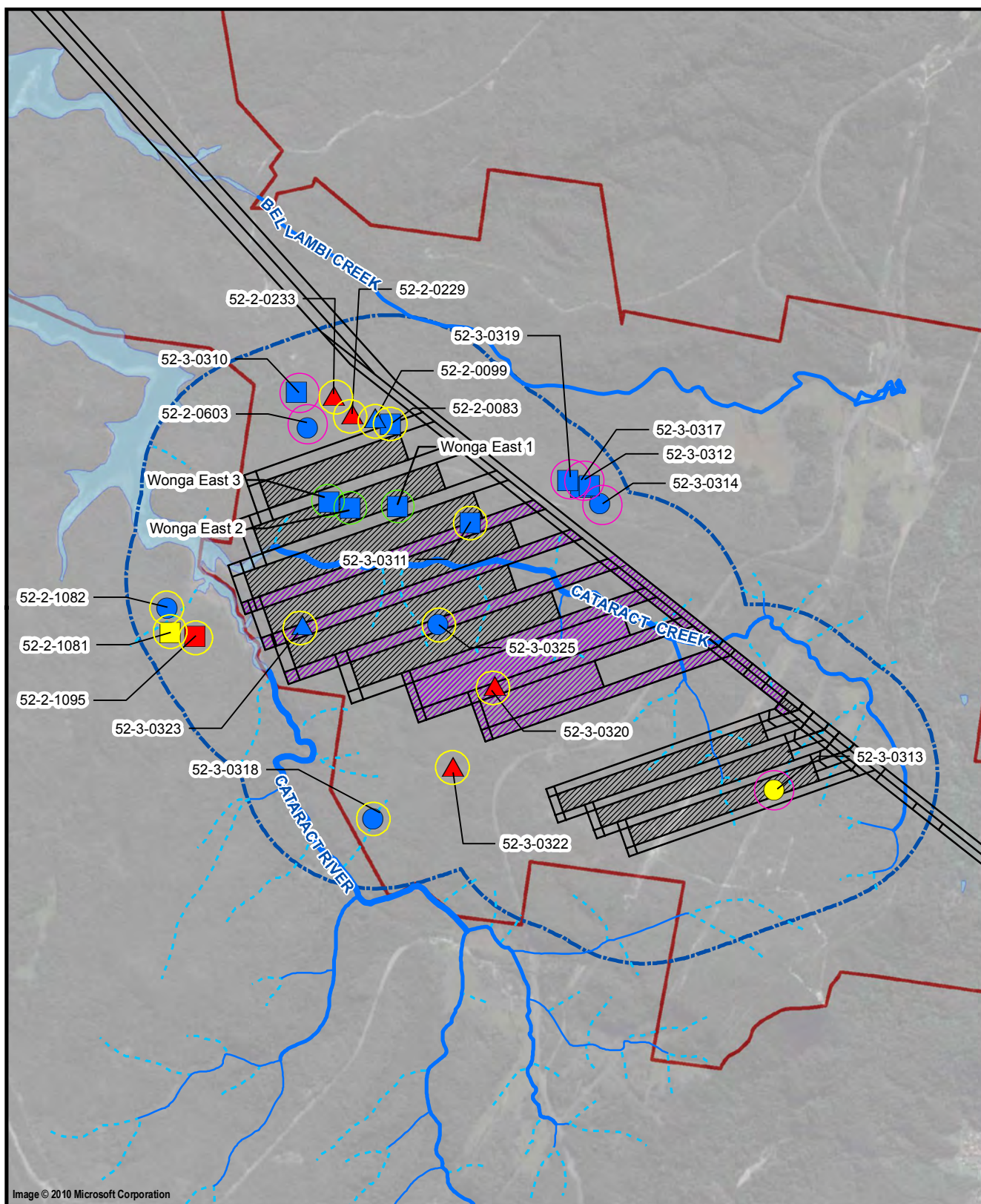


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#### Legend

- |                                                                                                                                                                                                                     |                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <span style="border: 2px solid red; padding: 2px;"> </span> Project Application Area                                                                                                                                | <span style="color: red;">▲</span> AHIMS Site Type                                              |
| <span style="border: 2px dashed blue; padding: 2px;"> </span> Study Area - Wonga East                                                                                                                               | <span style="color: blue;">▲</span> Axe Grinding Groove, Shelter with Art, Shelter with Deposit |
| <span style="background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black; padding: 2px;"> </span> Proposed Longwalls                                  | <span style="color: yellow;">●</span> Open Camp Site                                            |
| <span style="background: repeating-linear-gradient(-45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black; padding: 2px;"> </span> Subject to separate application (MP 10_0046_MOD 1) | <span style="color: blue;">●</span> Shelter with Art                                            |
| <span style="color: blue;">---</span> 1st order stream                                                                                                                                                              | <span style="color: blue;">■</span> Shelter with Deposit                                        |
| <span style="color: blue;">—</span> 2nd order stream                                                                                                                                                                | <span style="color: yellow;">○</span> Relocated AHIMS Site (Biosis 2012)                        |
| <span style="color: blue;">—</span> 3rd order stream                                                                                                                                                                | <span style="color: pink;">○</span> Relocated AHIMS Site (ERM 2009)                             |
| <span style="color: blue;">—</span> 4th order and above stream                                                                                                                                                      | <span style="color: green;">○</span> New AHIMS Site (Biosis 2012)                               |

Client: Gujarat NRE Coking Coal Limited

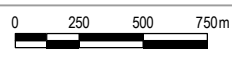
Project: NRE No.1 Colliery Aboriginal Heritage Assessment

Drawing No: 0079383s\_AHA\_GIS015\_R1.mxd

Date: 09/11/2012 Drawing size: A4

Drawn by: KB Reviewed by: MK

Scale: Refer to Scale Bar



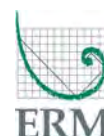
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**Figure 5.3**

**Archaeological sites relocated and identified in the Wonga East study area**

Environmental Resources Management Australia Pty Ltd

Brisbane, Canberra, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



## 5.4 WONGA WEST

### 5.4.1 Relocated Archaeological Sites

#### 52-2-1223 Wallandoola Site 2

Wallandoola Site 2 is a rock shelter facing west over a tributary of Wallandoola Creek. A tree has grown up in front of the shelter and the tree trunk rest against the rock overhang. There were reportedly 19 grinding grooves associated with shelter and a deposit of greater than 30 cm depth consisting of grey loamy sand. One red jasper flake and one grey quartzite flake were also recorded at the site. No art was recorded in the shelter.

A follow up condition assessment was undertaken by Caryll Sefton (year of assessment not provided). This identified two wombat burrows, fresh fungal growth and chemical weathering. Sefton also speculated that the presence of a 'stone wall' hinted at recent European occupation.



**Photograph 5.1** 52-2-1223 Wallandoola Site 2 - Sandstone overhang.



**Photograph 5.2** 52-2-1223 Wallandoola Site 2 - Grinding grooves within the overhang.

#### 52-2-1094 Gillbird Site 50

Gillbird Site 50 is a rock shelter with art and potential archaeological deposit. The Illawarra Prehistory Group noted in their 1984 survey that this site represents one of the largest and best rock art sites within the Cataract catchment area. This site is accessible via a small access track off Fire Road No. 8H and is located on the first major sandstone ridge up from Lake Cataract, 80 m from the current water's edge. Estimates of the original Cataract River's course situate the rock art site approximately 300-500 m from the nearest permanent water source at that time. The sandstone overhang is 17 m in length, 5.7 m wide and 6 m high with an easterly aspect. The living area, measures 8 m by 3 m and was formed through block fall and cavernous weathering. The archaeological deposit is an orangey to cream sand of varying depth with no visible surface artefacts.

The bulk of the art is located in the extreme left of the shelter which is also protected from the elements by large sandstone boulders. The original recording identified thirty six motifs which included: 18 macropods; 3 snakes;

3 birds; 2 echidnas; 1 bat; 3 fish; 3 frontal human figures; 3 profile human figures; 70 indeterminates; and 18 abstract outlines in red ochre (probably bird tracks). The current survey identified many of these motifs including what may be a fishing scene involving a number of previously recorded motifs. However, this rock art panel has suffered extensive weathering and some vandalism, and not all of the motifs previously recorded could be confirmed.

Water from the roof has seeped down the back wall leaving a white mineralized deposit. In some areas, spalling has occurred with the largest area impacted being approximately 30 by 25 cm. It is unclear whether the spalling is natural or the result of vandalism, however in places where spalling has occurred, there is evidence of further mineralization. Vandalism has also occurred to this rock panel in the form of arrows, dates and letters which are presumably initials (16/9/83, FN, RA etc). Most of the vandalism is superimposed on the rock art using either charcoal or having been scratched into the rock. A 20 cm long charcoal 'pencil' made from a small tree branch was found at the base of one of the rock art panels that had suffered vandalism. While it is possible that attempts have been made to add motifs to the rock art, the majority of motifs are thought to be authentic and are typical of the style found in the surrounding area.



**Photograph 5.3 52-2-1094 Gillbird Site 50 – Left section of extensive rock art panel**

Depicted here are several motifs including a possible depiction of at least two people fishing (top centre), a stylized watercourse, macropods, several types of fish and turtle and a large emu motif (far left). Note spalling (centre) and mineralization (white patches) caused through water seepage from the roof. There is also evidence of vandalism across the panel in the form of arrows, dates and letters presumably initials.

*52-2-1182 Lizard Creek Site 16*

Lizard Creek Site 16 is a small rock shelter with art and potential archaeological deposits overlooking an ephemeral tributary of Lizard Creek. The sandstone overhang is approximately 6 m in length by 2.7 m wide and 1.5 m in height. The living area of the shelter is 3 m by 2 m and the aspect is north-west. The deposit in the shelter is grey sandy loam up to 20 cm deep, although no surface artefacts were observed. Two outline charcoal motifs have been recorded for this shelter by the Illawarra Prehistory Group in 1984. The first smaller motif is that of a lizard, while the second much larger motif has been interpreted as being also a lizard however not complete. Both motifs occur on small flat panels on the roof of the rock shelter. A reinspection of the site in 1991 did not identify any new motifs but noted the site as being disturbed.



**Photograph 5.4** 52-2-1182 Lizard Creek Site 16 – Facing north east highlighting the sandstone overhang.



**Photograph 5.5** 52-2-1182 Lizard Creek Site 16 – Charcoal outline of the large incomplete 'lizard' motif present on roof of rock shelter.

*52-2-1183 Lizard Creek Site 14*

Lizard Creek Site 14 is a rock shelter with art, artefacts and potential archaeological deposit on an ephemeral tributary of Lizard Creek. The overhang is 8 m in length by 3.3 m in width and 3.0 m in height. The living area of the shelter is 5 m by 2 m and the aspect of the shelter is north-west. The deposit in the shelter is creamy grey sandy loam up to 30 cm deep. Over 50 artefacts were originally recorded by the Illawarra Prehistory Group including chert, quartz, silcrete and fossilized wood. The current survey was able to record 19 stone artefacts without disturbing the archaeological deposit. This assemblage represented both flakes and cores of the variety of raw material previously recorded. The art in the shelter is a white-painted stencil of a child's left hand, one white-painted adult hand stencil on the right of the shelter and one faded red-painted adult right hand stencil on the roof of the left of the shelter. The shelter is disturbed by wombat burrows and the art is generally faded. The site has been investigated by the Illawarra Prehistory Group in 1984, and subsequently re-examined in 1991.



**Photograph 5.6** 52-2-1183 Lizard Creek Site 14 – Facing south east highlighting the sandstone overhang and rock fall in front of shelter.



**Photograph 5.7** 52-2-1183 Lizard Creek Site 14 – Selection of stone artefacts recovered from the floor of the shelter.

#### 52-2-1184 Lizard Creek Site 15

Lizard Creek Site 15 is a rock shelter with art and deposit at the confluence of two small ephemeral tributaries of Lizard Creek. The site was originally recorded by the Illawarra Prehistory Group in 1984 and reinspected in 1991. The sandstone overhang is 4 m in length, and only 1 metre in width and 1 metre in height and the living area inside the shelter is 4 m by 1 m. The aspect of the shelter is north-west. The floor of the shelter is yellow sandy loam with a potential depth of 40 cm deep. The art includes a charcoal outline of a macropod with some portions of it faded and three undetermined outline charcoal motifs.



**Photograph 5.8** 52-2-1184 Lizard Creek Site 15 – Facing south east showing the sandstone overhang.



**Photograph 5.9** 52-2-1184 Lizard Creek Site 15 – Charcoal outline of an indeterminate motif present on back wall of rock shelter.

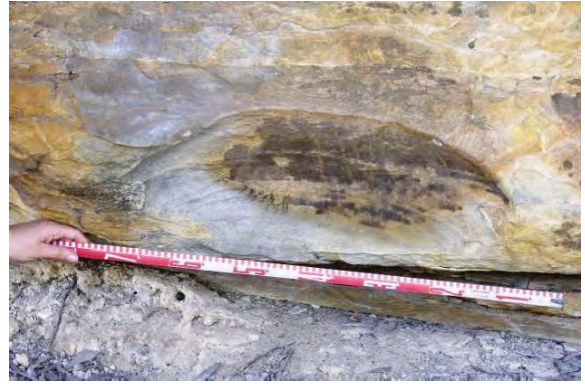
#### 52-2-1188 Lizard Creek Site 2

Lizard Creek Site 2 is a rock shelter with art and a potential archaeological deposit overlooking Lizard Creek approximately 300 m north of a large waterfall. The sandstone overhang is 4 m in length, 2.2 m in width and 1.6 m in height. The living area is 4 m long and 0.5 m deep and faces to the west.

The deposit is cream sandy loam and is approximately 40 cm deep. The art in the shelter is one indeterminate charcoal outline drawing on a small concave panel in the centre of the back wall. The art is in poor condition having the lower portion of it rubbed away, most likely by sheltering animals, as evidenced by recent scats deposited in the shelter.



*Photograph 5.10 52-2-1188 Lizard Creek Site 2 – Facing east highlighting the sandstone overhang.*



*Photograph 5.11 52-2-1188 Lizard Creek Site 2 – Very faint weathered charcoal outline (bottom left) present on small concave at base of rock shelter.*

#### *52-2-1196 Lizard Creek Site 11*

Lizard Creek Site 11 is composed of three grinding grooves cut into a 24 m by 6m sandstone exposure approximately 20 m from a small waterfall. The largest grinding groove measures 380 mm long, 80 mm wide and 10 mm deep. Originally recorded by the Illawarra Prehistory Group in 1985 the site was revisited again in 1991 and was recorded as being in good condition.



*Photograph 5.12 52-2-1196 Lizard Creek Site 11 – Rock platform and rock pools where grinding grooves are located. Facing south.*



*Photograph 5.13 52-2-1196 Lizard Creek Site 11 – Three grinding grooves.*

#### *52-2-1225 Wallandoola Site 3*

Wallandoola Site 3 is a rock shelter with art and limited potential for archaeological deposits. Located approximately 150 m north of a waterfall and natural waterhole on Wallandoola Creek, the overhang and living space is 8 m in length, 6 m wide and 1.5 m high.

Very faint weathered rock art exists on the roof (charcoal outlines) and on the wall (white adult hand stencils) of the shelter. However at some point between the 1950s and the present, the shelter was re-occupied by campers who extensively modified the shelter through removing any potential archaeological deposits, creating a stone platform at the back of the shelter and creating walls out of rock falls. No stone artefacts were observed. A number of pieces of wooden furniture, tin plates and glass bottles with dates of manufacture remain within the shelter, enabling the reoccupation to be dated to at least the 1950s.



*Photograph 5.14 52-2-1225 Wallandoola Site 3 – Mid 20<sup>th</sup> century artefacts (table, plates, bottles) indicating habitation of rock shelter within the last 60 years.*



*Photograph 5.15 52-2-1225 Wallandoola Site 3 – The very faint weathered outline of a charcoal motif (right) present on roof of rock shelter.*

#### *52-2-1249 Wallandoola Site 13*

Wallandoola Site 13 is a rock overhang formed by a block fall and cavernous weathering. A number of painted images were recorded on the wall of the shelter. The art includes two charcoal outline and infill macropods (one with a joey), 1 profile human figure, 1 charcoal front human figure, three red stencils and three indeterminate charcoal drawings.

Field inspection on February 2009 noted the same features as recorded in the site card. The rock art and condition of the rock shelter are identical to the description and photographs in the site card. The grinding groove was still obvious and the shelter contains a loose sandy deposit that has the potential to be of some depth and to contain archaeological artefacts and indicators of occupation.



*Photograph 5.16 52-2-1249 Wallandoola Site 13 – Sandstone overhang.*



*Photograph 5.17 52-2-1249 Wallandoola Site 13 – Charcoal outline of macropod and joey.*

#### 5.4.2 *New Sites*

##### *New Site Lizard Creek Rock Shelter (LC Shelter 1)*

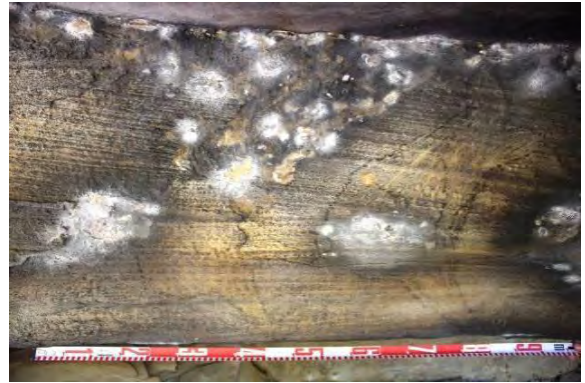
The new Lizard Creek Site (LC Shelter 1) is a previously unrecorded rock shelter with art and deposit located on the western bend of Lizard Creek immediately opposite a gully on the eastern side of the creek. The sandstone overhang is 27 m in length, and 2 m in width and 1.5 m in height and is composed of two distinct sandstone layers differing in their hardness, with the harder more robust layer forming the overhang and sitting on top of a softer, more easily weathered layer. The living area inside the shelter is 10 m by 2 m. The aspect of the shelter is east north east and it is located 100 m from Lizard Creek on a moderate slope. The vegetation immediately outside the shelter is composed of banksias and bloodwoods. The floor of the shelter is yellow/white sandy loam with a potential depth of 50 cm. No surface artefacts were identified.

The rock art within the shelter is divided into two panels with three charcoal outline motifs present in total. The first panel is 8.8 m from the left edge of the shelter and is composed of two charcoal outline drawings of fish. The inside of the two motifs has been scratched in a top to bottom fashion and with one of the fish partly superimposed on the other. Soot is present on the walls and roof of the shelter and there is peeling as the result of mineralized accretions which are roughly 3 cm across. The motifs of the fish are similar in shape and design and both measure 37 cm wide and 23 cm high.

The second motif is an unidentifiable charcoal outline with some infill also of charcoal. The figure possibly represents a macropod or lizard. The motif is in a concave cavity immediately to the right of the first motif. Some peeling has occurred in the extreme right of the motif and some possible rubbing weathering from animals has occurred along the top of the motif. There is no obvious cracking and apart from some minor mineralization, both motifs are in good condition.



**Photograph 5.18** *New Lizard Creek Site XX – Facing south west highlighting the sandstone overhang.*



**Photograph 5.19** *New Lizard Creek Site XX – Rock Art panel showing charcoal outline of two fish and white mineralization.*

#### *NRE Women's Site*

The NRE Women's Site was identified by Veronica Falk of DKH is located within a tributary of Lizard Creek and is made up of naturally formed holes in the sandstone creek bed. The sandstone platform is a natural creek bed and the holes in the sandstone are permanently filled with water. The local Aboriginal knowledge suggests that these holes in the sandstone were used for birthing.

This site contains three birthing holes and is located within 750 m of a rock shelter site (52-2-1183) that contains hand stencils of children.



**Photograph 5.20** *New NRE Women's Site – Creek bed of Lizard Creek looking up stream.*



**Photograph 5.21** *New NRE Women's Site – Example of one of the water holes present within the creek bed.*

### *NRE Scarred Tree 1*

The NRE Scarred Tree 1 is located adjacent to a track leading of the western side of the No.8 Fire Trail, in dense bushland. The hardwood tree contains a four metre long and two meter wide scar. The scar is an oval shape and may be for small shield. The scar is located above head height.



*Photograph 5.22 NRE Scarred Tree 1.*

### **5.4.3** *Non-Relocated Sites*

Although every effort was made to relocate all sites, this was not possible. Incorrect site co-ordinates, vague site descriptions and difficult terrain have meant that some sites were unable to be relocated. Descriptions of AHIMS archaeological sites that were unable to be relocated have been summarized from their site card descriptions.

#### *52-2-1071 Gillbird Site 47*

Gillbird Site 47 is recorded as being a grinding groove site. The nature and extent of the site is not recorded on the site card. The condition of site is considered to be reasonable and it is noted that it is located in a small gully close to a creek. The site was originally recorded in 1984 by Illawarra Prehistory Group.

#### *52-2-1076 Gillbird Site 56*

Gillbird Site 56 is a rock shelter with grinding grooves, art and artefacts. The art is faint and in fairly poor condition due to fretting on the sandstone surface. The site card is incomplete and does not provide the number and location of grinding grooves. The art is described to include three macropods and two pieces of indeterminate art. There is also an adult right hand stencil under one of the macropods. All of the motifs are in charcoal and there is some evidence of ochre spray and white clay drawings in patches. Seven artefacts were recorded at the site including silcrete, chert and quartzite flakes. The aspect of the shelter is north north east. The site was originally recorded in 1984 by Illawarra Prehistory Group.

#### *52-2-1077 Gillbird Site 48*

Gillbird Site 48 is a rock shelter with grinding grooves and art. The art is faint due to fretting on the sandstone surface. The site card is incomplete and does not include full details of the rock art or number and location of grinding grooves. The attached drawings of the rock art show at least three macropods, one human (male) figure and three pieces of indeterminate art. All of the motifs are in charcoal and there is some evidence of ochre spray in patches. The aspect of the shelter is east. The site was originally recorded in 1984 by Illawarra Prehistory Group.

#### *52-2-1079 Gillbird Site 51*

Gillbird Site 51 is an extensive grinding groove site. There are 54 grinding grooves recorded on two large sandstone outcrops measuring approximately 13 m by 10 m and 22 by 10 m. The site is located near a small creek and was originally recorded by the Illawarra Prehistory Group in 1984.

#### *52-2-1096 Gillbird Site 52*

Gillbird Site 52 is a rock shelter with art, grinding grooves and an archaeological deposit. The sandstone overhang is approximately 6 m in length, 2.1 m wide and 1.6 m high. The living area measures 6 m by 2 m. The shelter has a south east aspect. Deposit in the rock shelter is a light grey sandy loam approximately 45 cm deep. The recorded art is of a charcoal outlined echidna and five indeterminate figures. The art is recorded as being of good condition. Originally recorded by the Illawarra Prehistory Group in 1984.

#### *52-2-1097 Gillbird Site 53*

Gillbird Site 53 is a rock shelter with art and an archaeological deposit. The sandstone overhang is approximately 17 m in length, 2.1 m wide, and 2.3 m in height. The living area of shelter measures 6 m by 1.5 m. The aspect of the shelter is east. Deposit within the shelter yellow clayey loam up to 25 cm in depth. The art consist of two charcoal human figures in profile with spear in hand and a third human frontal view and three indeterminate charcoal drawings. Recorded by the Illawarra Prehistory Group 1984.

*52-2-1098 Gillbird Site 54*

Gillbird Site 54 is a series of 19 grinding grooves located near a small creek. The sandstone exposure measures 18 m long by 2.5 m wide. The largest groove is recorded as being 340 by 85 by 16 millimetres. Some of these grooves are hard to distinguish. Recorded by the Illawarra Prehistory Group 1984.

*52-2-1099 Gillbird Site 55*

Gillbird Site 55 is a rock shelter with grinding grooves and artefacts. The site card is incomplete and does not provide the number and location of grinding grooves. The shelter walls are unsuitable for art and some erosion of the deposit was observed. The shelter aspect is north east and four artefacts were recorded. The site was originally recorded in 1984 by Illawarra Prehistory Group.

*52-2-1181 Lizard Creek Site 17*

Lizard Creek Site 17 is a rock shelter with art, grinding grooves and an archaeological deposit. The sandstone overhang is 16 m in length, 1.9 m in width, 2.8 m in height. The living area of the shelter is 14 m by 2m and the aspect of the shelter is north east. The deposit in the shelter is grey sandy loam approximately 25 cm deep. The art in the shelter is 17 hand stencils, 14 indeterminate charcoal and ochre drawings and 1 outlined macropod ~1.5 m long. Most of the art in is poor condition. Some stone artefacts were also recorded including 3 dark chert chips and 5 quartz flakes. Recorded by the Illawarra Prehistory Group in 1984.

*52-2-1186 Lizard Creek Site 1*

Lizard Creek Site 1 is a rock shelter with an archaeological deposit. The shelter is disturbed by wombat burrows. The site was originally recorded by the Illawarra Prehistory Group. The second page of site card is missing.

*52-2-1187 Lizard Creek Site 3*

Lizard Creek Site 3 is a rock shelter with art and an archaeological deposit. The sandstone overhang is 6 m in length, 2.6 m in width and 1.3 m in height. The living area measures 4 m by 2 m and the aspect of shelter is south-west. The deposit is yellow clayey loam approximately 20 cm deep. The art includes a charcoal frontal outline of a human and 1 charcoal indeterminate. The art is in poor condition but the deposit is undisturbed. The site was originally recorded by the Illawarra Prehistory Group in 1984 and re-examined in 1991 which stated that the condition was disturbed.

*52-2-1189 Lizard Creek Site 4*

Lizard Creek Site 4 is a rock shelter with art. The sandstone overhang is 6.5 m in length, 2.5 m in width and 2.2 m in height. The shelter has no living area and has a westerly aspect. The only art in the shelter is one indeterminate charcoal drawing on the centre of the back wall. The art is recorded as very poor condition. Originally recorded by the Illawarra Prehistory Group in 1985 the site was revisited in 1991 and recorded as disturbed.

*52-2-1191 Lizard Creek Site 6*

Lizard Creek Site 6 is one grinding groove located near a pothole in the nearby creek. The creek is a metre wide and the groove is in the flow of water. Originally recorded by the Illawarra Prehistory Group in 1985 the site was revisited in 1991 and recorded as being in good condition.

*52-2-1192 Lizard Creek Site 5*

Lizard Creek Site 5 is a rock shelter with art. The sandstone overhang is 7 m in length, 2.2 m in width and 1.2 m in height. The living area of the shelter is 4 by 1.5 m and the aspect of the shelter is west-southwest. The deposit in the shelter is grey sandy loam approximately 10 cm in depth. The art in the shelter is 2 indeterminate charcoal drawings. The art is in poor condition and water staining had impacted most of the drawings in the shelter. Originally recorded by the Illawarra Prehistory Group in 1985, the site was revisited in 1991 and recorded as being very disturbed.

*52-2-1195 Lizard Creek Site 10*

Lizard Creek Site 10 is a rock shelter with art and deposit. The sandstone overhang is 12 m in length, 3 m in width, 1.5 m in height. The living area of the shelter is 2 m by 2 m and the aspect of the shelter is east-northeast. The deposit in the shelter is brown yellow sandy loam approximately 15 cm in depth. The art in the shelter consists of two figures and three indeterminate charcoal drawings. The art is in poor condition. Originally recorded by the Illawarra Prehistory Group in 1985, the site was revisited in 1991 and recorded as being disturbed.

*52-2-1197 Lizard Creek Site 12*

Lizard Creek Site 12 is a series of 23 grinding groove located on a 7 m by 2 m surface of sandstone along a creek bed. There are 10 grooves at the bottom edge of a small pothole and with the remainder located near the edge of 1.5 m drop. Originally recorded by the Illawarra Prehistory Group in 1985, the site was revisited in 1991 and recorded as being in good condition.

*52-2-1198 Lizard Creek Site 13*

Lizard Creek Site 13 is a rock shelter with art, grinding groove and an archaeological deposit. The sandstone overhang is 2 m in length, 3.3 m wide and 2.3 m in height. The aspect of the shelter is south west and the living area is 12 m by 2 m. The deposit is brown-grey sandy loam approximately 15 cm in depth. At least 25 stone artefacts of chert, silcrete, jasper and quartz are located on the dripline. There are two indeterminate charcoal drawings. Recorded by the Illawarra Prehistory Group in 1987.

*52-2-1224 Wallandoola Site 4*

Wallandoola Site 4 is recorded as being a grinding groove site. The details of second page of the site card are illegible, although the site is recorded as in reasonable condition. Originally recorded by the Illawarra Prehistory Group in 1985.

*52-2-1248 Wallandoola Site 12*

Wallandoola Site 12 is a series of eight grinding grooves located on a sandstone outcrop that runs east to west and has an area of 4 by 1.5 m. Six of the grooves are found in one area of the sandstone outcrop with the two largest grooves found immediately east of them. The site is recorded as in reasonable condition. Originally recorded by the Illawarra Prehistory Group in 1985.

*52-2-1250 Wallandoola Site 14*

Wallandoola Site 14 is a series of 10 grinding grooves. 5 grooves are located 30 cm back from the ledge in water flow in an area measuring approximately 20 m x 3 m. The largest groove measures 360 cm x 70 cm x 10 cm. Another groove is located upstream on edge of water flow, 3 grooves are located a further 12 m upstream, with another 1 found 10 m up from that the final groove located other 36 m further up. The overall area is estimated to be 50 m x 40 m. The whole area is below a small swamp.

*52-2-1251 Wallandoola Site 15*

Wallandoola Site 15 is recorded as being an extensive collection of 52 grinding grooves. The axe groove site is upstream from the edge of a 2.5 m high waterfall. 5 grooves are located on the lower edge of the first pothole 1.5 m from the edge; 12 on the lower edge of the second pothole with one other 20 cm west of them. The area is on the creek bed and measures 10 m x 8 m, 3 m upstream another 4 grooves below a pothole with 3 others above at top of the 7 m upstream on an area 10 x 9 m just above another small drop. 13 grooves around a small pothole with a water channel 2 m long x 40 mm wide x 5 mm deep leading from above the pothole with the 13 grooves near the top of this is a short parallel water channel. 10 m south west is an area of sandstone 16 m x 4 m, 8 m from the top of the area are 3 grooves, 4 m lower down are 8 more grooves, 2 m southwest of this unit are 3 more.

## 5.5 WONGA EAST

### 5.5.1 Relocated Archaeological Sites

#### 52-2-0312 Bulli Mine Shaft Site 23

Rock shelter Bulli Mine Shaft 23 is in the same condition as described on the site card. There was evidence on the floor of the shelter of long term disturbance, broken glass bottles of the 1920s and 1930s present.

The living area of the rock shelter shows no structural damage to the sandstone faces. There were lichens and mosses growing on the rock shelter walls and ferns growing out of the cracks and crevices.



**Photograph 5.23** 52-2-0312 Bulli Mine Shaft Site 23 –showing the sandstone overhang.



**Photograph 5.24** 52-2-0312 Bulli Mine Shaft Site 23 – Glass bottle found in shelter.

#### 52-2-0314 Bulli Mine Shaft Site 21

Bulli Mine shaft Site 21 is a sandstone overhang that contains art. The ceiling of the rock shelter has fallen, and this is likely to have collapse long ago. The description given by the site card indicates that the living area is still the same as recorded in the 1980s. The art is of a lizard and shows two figures overlapping. The rock shelter still contains a sandy deposit.



**Photograph 5.25** 52-2-0314 Bulli Mine Shaft Site 21 –showing the sandstone overhang.



**Photograph 5.26** 52-2-0314 Bulli Mine Shaft Site 21– Charcoal outline of a lizard present on ceiling of rock shelter.

*52-2-0319 Bulli Mine Shaft Site 24*

This site was found to be in the same condition as it was when recorded in the 1980s. There are ferns growing in the cracks and crevices of the rock shelter. The shelter contains a sandy deposit.



***Photograph 5.27 52-2-0319 Bulli Mine Shaft Site 24 –showing the sandstone overhang.***



***Photograph 5.28 52-2-0319 Bulli Mine Shaft Site 24 – Evidence of deposit.***

*52-2-0603 Bulli Mine Shaft 19*

Bulli Mine Shaft 19 is a sandstone overhang with art and an artefact. The shelter is approximately 7 m long, 3 m wide and 3 m in height, while the living space is 4 by 3 m. The shelter faces west towards the Cataract River which is approximately 800 m away. A single silcrete core artefact has been recorded for this site. In the shelter, there is a weathered red hand stencil and faint charcoal outline drawing on the back wall. Despite the large size of the living space, the shelter is quite exposed and shows evidence of block fall and weathering. The site was originally recorded in 1983 by the Illawarra Prehistory Group and its position recorded using topographic maps. The current survey relocated the site approximately 280 m to the northwest of its recorded position putting it outside of the potential subsidence footprint.



***Photograph 5.29 52-2-0603 Bulli Mine Shaft 19 – Facing East Highlighting The Sandstone Overhang.***



***Photograph 5.30 52-2-0603 Bulli Mine Shaft 19 – Very Faint Weathered Charcoal Outline (Centre) Present On Wall Of Rock Shelter.***

*52-3-0310 Bulli Mine Shaft 18*

Bulli Mine Shaft 18 is a large rock shelter with art, grinding grooves, artefacts and deposit. Located on the south side of Fire Trail 7D, the shelter is between the Cataract River in the west and a large swamp associated with a tributary of the Cataract in the east. The sandstone overhang and living space is 9.6 m in length, 8.5 m in width, 1.6 m in height. The aspect of the shelter is west. The deposit in the shelter is a fine brown dust to medium grey ashy sand over 45 cm deep. Over 100 artefacts have been recorded within the shelter, which includes flakes of silcrete, quartz, jasper, chert, fossilized wood, a broken blade, fabricators, cores and blades. Three grinding grooves are found at the south end of the shelter. The art includes twelve identified motifs including a human figure, macropods, fish and geometric lines and dots. Originally recorded by the Illawarra Prehistory Group in 1985, the site was revisited in 1991 and recorded as having deposits disturbed by animal movement.



**Photograph 5.31** *52-3-0310 Bulli Mine Shaft 18 – Facing east highlighting the sandstone overhang.*



**Photograph 5.32** *52-3-0310 Bulli Mine Shaft 18 – Selection of stone artefacts recovered from the floor of the rock shelter.*

*52-3-0313 Bulli Mine Shaft 29*

Bulli Mine Shaft 29 is an open artefact scatter measuring approximately 25 by 5m with the deposit being shallow white sand over yellow clay. The site is located in open eucalypt forest and is 100m back from a sharp drop leading down to a rainforest ecotone. The site is recorded as being composed of 9 stone artefacts made of materials such as silcrete, chert and fossilized wood. Originally recorded by the Illawarra Prehistory Group in 1984, the exposed areas today suffer from extensive erosion of the topsoil through water movement and fire trail upgrades. While the location of the site was able to be accurately relocated, no stone artefacts were observed.



**Photograph 5.33** 52-3-0313 Bulli Mine Shaft 29 – Access track to Brokers Nose Ridge highlighting the level of erosion along this track.



**Photograph 5.34** 52-3-0313 Bulli Mine Shaft 29 – Access track to Brokers Nose Ridge underneath the transmission lines which is the recorded location for this site.

### 5.5.2 Non-Relocated Sites

#### 52-2-0083 Bulli Mine Shaft Site 7

Bulli Mine Shaft 7 is a rock shelter with an archaeological deposit. The sandstone overhang is approximately 2.5 m in length, 1.5 m wide and 1.5 m in height. The deposit extends outside the shelter to a depth of 30 cm, with a number of artefacts being noted including chert flakes, a silcrete flake and 2 pieces of quartz. The site was originally recorded in 1984 by Illawarra Prehistory Group with the site having been revisited in 1991.

#### 52-2-0099 Bulli Mine Shaft 8

Bulli Mine Shaft 8 is a series grinding grooves located in an exposed sandstone outcrop measuring approximately 8 m by 4 m. There are 6 grinding grooves in total. The site was originally recorded in 1984 by Illawarra Prehistory Group with the site having been revisited in 1991.

#### 52-2-0229 Bulli Mine Shaft 12

Bulli Mine Shaft 12 is recorded as being 1 grinding groove in a sandstone outcrop measuring approximately 18 by 2 m wide. The site was originally recorded in 1984 by Illawarra Prehistory Group with the site having been revisited in 1991.

#### 52-2-0233 Bulli Mine Shaft 13

Bulli Mine Shaft 13 is recorded as being 2 grinding grooves in a sandstone outcrop measuring approximately 18 by 4 m wide. The site lies of the north of the road to Shaft #1. The site was originally recorded in 1984 by Illawarra Prehistory Group with the site having been revisited in 1991.

#### *52-2-1081 Gillbird Site 2*

Gillbird Site 2 is a rock shelter with art, grinding grooves and an archaeological deposit. The rock shelter is described as “the worst damaged shelter” having been vandalized by modern graffiti including names and dates. This graffiti is of a similar nature to 52-2-1094 and was possibly vandalized at the same time. The sandstone overhang is 9 m in length, 2.8 m in width and 3.3 m in height. The aspect of the shelter is north west. The deposit in the shelter is a grey brown loam approximately 20 cm deep with 3 silcrete flakes being found on shelter floor. Six grinding grooves are found within the shelter. The art includes 9 red hand stencils and a number of indeterminate figures. Originally recorded by the Illawarra Prehistory Group in 1985.

#### *52-2-1082 Gillbird Site 3*

Gillbird Site 3 is a rock shelter with art. The sandstone overhang is 3.7 m in length, 2.2 m in width and 1.4 m in height. The living area of the shelter is 3m by 1m and the aspect of the shelter is north east. The deposit in the shelter is grey sandy loam approximately 30 cm in depth. The art in the shelter are a number of indeterminate charcoal drawings on the roof. Originally recorded by the Illawarra Prehistory Group in 1985.

#### *52-2-1095 Gillbird Site 1*

Gillbird Site 1 is a rock shelter with art. The rock shelter is vandalized by modern graffiti – names, dates and animal figures. This graffiti is of a similar nature to that at 52-2-1094 and was possibly vandalized at the same time. The sandstone overhang measures approximately 6m in length, 1.8 m in width, and 2.3 m in height. The living area is 4 m x 2 m. The aspect of the shelter is north-northeast. The deposit in the shelter is a brown sandy loam approximately 15 cm in depth. The art includes a number of red hand stencils (adult and children), eleven identified motifs including macropods, echidnas, lizards, snakes, eels and fish and a number of indeterminate figures. Originally recorded by the Illawarra Prehistory Group in 1985.

#### *52-3-0311 Bulli Mine Shaft Site 20*

Bulli Mine Shaft Site 20 is a rock shelter with an archaeological deposit. The sandstone overhang is 7.5 m in length, 6.9 m in width and 1.2 m in height. The aspect of the shelter is southwest. Surface artefacts identified include 5 quartz chips, 1 red silcrete chips and black chert flake and 1 quartz pebble. The deposit in the cave has been disturbed by wombat diggings and there is also evidence on the shelter roof of burning. Originally recorded by the Illawarra Prehistory Group in 1984.

*52-3-0317 Bulli Mine Shaft Site 22*

Bulli Mine Shaft Site 22 is a rock shelter with an archaeological deposit. The sandstone overhang is 20 m in length, 4 m in width and 4 m in height. The aspect of the shelter is northwest. The floor of the shelter is mostly a stone floor with brown sandy loam at either end of the shelter. The living area of the shelter is estimated to be approximately 5 m by 2 m. The estimated deposit depth is 15 cm. Large sandstone block fill most of the shelter. One fine grained light grey split pebble has been identified. Original site card was recorded in 1984 by the Illawarra Prehistory Group.

*52-3-0318 Bulli Mine Shaft Site 30*

Bulli Mine Shaft Site 30 is a rock shelter with art. The sandstone overhang measures approximately 10 m long, 3.7 m wide and 4.5 m high. The living area is 9 m by 3 m. The site is recorded as being located in a canyon and is well protected with the shelter having a westerly aspect. One human figure, an indeterminate charcoal drawing and six other drawings are recorded for this shelter.

*52-3-0320 Bulli Mine Shaft Site 25*

Bulli Mine Shaft Site 25 is one grinding groove recorded on a sandstone outcrop measuring 22 m by 2.5 m. The site is recorded as in reasonable condition. Originally recorded by the Illawarra Prehistory Group in 1984.

*52-3-0322 Bulli Mine Shaft Site 31*

Bulli Mine Shaft Site 31 is a series of two grinding grooves recorded on a sandstone outcrop measuring approximately 11 m by 20 m. The site is recorded as being in reasonable condition. Originally recorded by the Illawarra Prehistory Group in 1985.

*52-3-0323 Bulli Mine Shaft Site 26*

Bulli Mine Shaft Site 26 is a rock shelter with an archaeological deposit. The aspect of the shelter is south west. The sandstone overhang is 6 m in length, 3.5 m in width, 3 m in height. The deposit in the shelter is sand to a depth of 20 cm. Three stone artefacts were located on the dripline of the shelter which included 1 grey chert, 1 coarse grained silcrete flake and 1 quartzite flake. Originally recorded by the Illawarra Prehistory Group in 1985.

*52-3-0325 Bulli Mine Shaft Site 27*

Bulli Mine Shaft Site 27 is a rock shelter with artefacts and deposit. The sandstone overhang is 3 m in length, 2.5 m in width and 1.2 m in height. The aspect of the shelter is north. The deposit is recorded as being approximately 45 cm in depth.

There are 5 artefacts recorded in the shelter including: one red silcrete chip, one quartz flake, one fossilised wood, one quartz chip and one quartz core. The original site card was recorded in 1984 by Illawarra Prehistory Group.

#### *Wonga East 1*

Wonga East 1 is a west facing rock shelter with artefacts and deposit, recorded by Biosis in September 2012 (Asher Ford *pers. com*). The shelter is located within open woodland on an upper ridgeline approximately 280 metres north of Cataract Creek. The sandstone overhang is 8 m in length, 8 m in width and 1.5 m in height. The shelter deposit consists of yellowish grey sand that has gone through limited surface disturbance due to animals and extensive leaf and dried wood deposit. There are 5 artefacts recorded within the shelter including: two quartz flakes, one chert flake, one chert distal fragment and one silcrete flake. A potential archaeological deposit was identified as being associated with the artefacts.

#### *Wonga East 2*

Wonga East 2 is a south to south-west facing rock shelter with artefacts and deposit, recorded by Biosis in September 2012 (Asher Ford *pers. com*). The shelter is located within open woodland on an upper ridgeline approximately 300 metres north of Cataract Creek. The sandstone overhang is 25 m in length, 4 m in width and 4 m in height. The floor area of the shelter measures 10 m by 2 m and is divided into three living areas within the shelter that are separated by rock boulders. The shelter deposit consists of yellowish grey sand that has gone through limited surface disturbance due to animals. There are 6 artefacts recorded within the shelter including: two silcrete bipolar flakes, two quartz angular fragments, one quartz bipolar flake and a sandstone hammer stone. The artefacts were located within all three living areas and a potential archaeological deposit was identified as being associated with the artefacts.

#### *Wonga East 3*

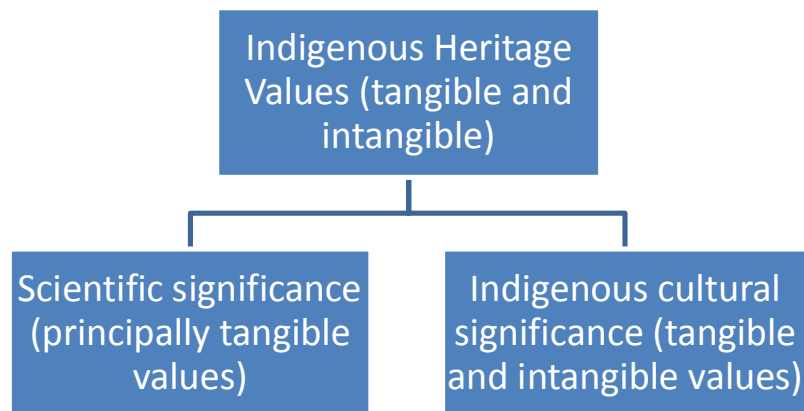
Wonga East 3 is a south facing rock shelter with artefacts and deposit, recorded by Biosis in September 2012 (Asher Ford *pers. com*). The shelter is located within open woodland on an upper ridgeline approximately 330 metres north of Cataract Creek. The sandstone overhang is 8 m in length, 2 m in width and 1 m in height. The floor area of the shelter measures 6 by 1 m and is covered in a deposit consisting of yellowish grey sand that has gone through limited surface disturbance due to animals. There are 4 artefacts recorded within the shelter including: three quartz bi-polar flakes and one silcrete flake was located at the eastern part of the shelter floor, adjacent to the boulder, approximately 60cm from the drip line. A potential archaeological deposit was identified as being associated with the artefacts.

## 6.1

## PREAMBLE

Aboriginal heritage sites, objects and places hold value for communities in many different ways. The nature of those heritage values is an important consideration when deciding how to manage a heritage site, object or place and balance competing land-use options.

ERM's approach to the Aboriginal heritage assessment is based upon identifying the key Aboriginal heritage values; values that are likely to be both tangible and intangible. This approach needs to consider the values assessment from the scientific and Aboriginal community perspectives, in accordance with Australian best practice documents.



The NPWS Aboriginal Cultural Heritage Standards and Guidelines Kit (1997) states:

*While Aboriginal sites and places may have educational, tourism, and other values to groups in society their two principal values are likely to be in terms of their cultural/social significance to Aboriginal people and their scientific significance to archaeologists. It is thus possible to identify two main streams in the overall significance assessment process: the assessment of cultural/social significance to Aboriginal people and the assessment of scientific significance to archaeologists... (1997: PDF page 92)*

This assessment focuses upon the scientific significance assessment of the sites observed and recorded during the survey, and the AHIMs sites located within the Study Area. The Aboriginal community has provided input into the survey and assessment and has been afforded the opportunity to comment on this report for a cultural and social significance assessment of the sites recorded.

### 6.1.1 *Archaeological Potential*

Archaeological site formation is a combination of scientific factors, such as bioturbation, and environmental factors, such as erosion or burial through soil movement. Once discarded on the ground surface, artefacts are often readily incorporated into the topsoil horizons through the process of bioturbation. Most commonly, dense artefact deposits exist hidden beneath the upper surface (c.f. Wandsnider and Camilli 1992; Fanning and Holdaway 2001). Most frequently, the eroded component of a larger subsurface deposit is detected and recorded as a site. Where soils are sandy, artefacts can occur at greater depths and erosion may frequently expose artefacts. Therefore it is crucial that soils, sands and geomorphology of an area are defined in an archaeological assessment and the archaeological implications defined. An understanding of these factors, linked further to the notions of site integrity and condition, yield an understanding of an area or site's archaeological potential.

It is important to note that the level of archaeological potential relates to the likelihood of discovering an Aboriginal object or site, within a location. Further description should then be made as to the potential condition and integrity of the soil matrix and potential site itself. Only after all these factors have been considered, can scientific value start to be assessed for an area with potential. Therefore, whilst scientific value and potential are linked, it must be noted that these values and potentials are not the same and can differ substantially for any single site or area with potential.

Areas with archaeological potential were identified according to the definitions in *Table 6.1*.

**Table 6.1** *Definitions of Archaeological Potential*

| Rank               | Definition                                                                                                                                                    | Example                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| No potential       | Artefacts cannot occur in-situ.                                                                                                                               | Eroded landforms, reconstructed landscapes, hazardous landscape, developed areas.                                                           |
| Low potential      | Artefacts are not normally found in comparable contexts but could occur in low densities making detection unlikely.                                           | Landforms with no specific focus for use, i.e. with no water sources or undifferentiated slopes.                                            |
| Moderate potential | Artefacts are known to occur in comparable landforms in detectable densities (~1 artefact/m <sup>2</sup> ) and there is an unknown possibility for detection. | Landforms with an environmental focus which may have seen seasonal visitation.                                                              |
| High potential     | Artefacts are consistently found in comparable landforms or similar environmental contexts and thus will certainly be found in any ground breaking works.     | Landforms with known environmental focus encouraging repeat visitation to specific locale, i.e. margins of swamp or near high order creeks. |

### 6.1.2 Scientific Significance Assessment

The primary guide to management of heritage places is the Australia ICOMOS Burra Charter 1999. The Burra Charter defines cultural significance as:

*Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.*

*Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.*

*Places may have a range of values for different individuals or groups.*

This assessment has sought to identify Aboriginal heritage objects and sites within the Study Area and obtain sufficient information to allow the values of those objects and sites to be determined. NPWS (1997:93) has stated that 'while various criteria for archaeological significance assessment have been advanced over the years, most of them fall under the heading of archaeological research potential'. As such, seven key criteria may be used to examine the scientific value/significance of a site. These are:

- **Rarity:** whether any or all aspects of a site (type, location, integrity, content and archaeological potential) can be considered common or rare within a local, regional or national context;
- **Representativeness:** the comparative rarity of the site when considered and contrasted against other similar sites conserved at the local and/or regional level;
- **Archaeological landscapes:** the study of the cultural sites relating to Aboriginal peoples within the context of their interactions in the wider social and natural environment they inhabited. Landscapes can be large or small depending upon specific contexts (i.e. local or regional conditions); they may also may be influenced by Aboriginal social and demographic factors (which may no longer be apparent);
- **Connectedness:** whether the site can be connected to other sites at the local or regional level through aspects such as type, chronology, content (i.e. materials present, manufacturing processes), spatial patterning or ethno-historical information;
- **Integrity and condition:** integrity refers to the level of modification a site has been subject to (the cultural and natural formation process) and whether the site could yield intact archaeological deposits, which could be spatially meaningful. Condition takes into account the state of the material, which is especially relevant for organic materials;
- **Complexity:** the demonstrated or potential ability of a site to yield a complex assemblage (stone, bone and/or shell) and/or features (hearths, fire pits, activity areas); and

- Archaeological potential: the potential to yield information (from sub-surface materials which retain integrity, stratigraphical or not) that will contribute to an understanding of contemporary archaeological interest, or which could be saved for future research potential.

### 6.1.3 *Aboriginal Heritage Values*

The survey was conducted according to the methodology discussed with all Aboriginal stakeholders and focused on the identification of Aboriginal heritage values relating to archaeological sites, although discussion also included intangible values and the importance of sites to the local community. Field survey methods were adopted to discover new archaeological sites, to ensure their accurate recording and to provide sufficient information to provide an assessment of cultural significance to the extent that surface survey allowed.

## 6.2 *STATEMENT OF HERITAGE SIGNIFICANCE*

Fifty AHIMS listed sites and six new Aboriginal cultural heritage sites have been identified as occurring within the Study Area. These include: one artefact scatter; 14 axe grinding grooves; 39 rock shelters with art, deposits and/or axe grinding grooves; one scared tree; and one water hole with Aboriginal Ceremony and Dreaming. Of the rock shelters 25 contain art, 18 contain archaeological deposit and 5 have associated axe grinding grooves.

A statement of heritage significance is provided for each archaeological site. *Table 6.2* provides an overview of the scientific and cultural significance assessment for all sites within the Study Area.

No significant and no moderate changes were observed to the re-located sites during the survey. All relocated sites were in generally the same condition as described on the original site card. The only apparent difference was the addition of lichen and fern growth for the shelters found in the damper areas. It has therefore been assumed that non relocated sites will be in generally the same condition as described on the original site card. The significance and impact assessment for the non-relocated sites are therefore based on the information recoded on the AHIMS site cards.

### 6.2.1 *Significance Assessment for Relocated sites in Wonga West*

#### *52-2-1223 Wallandoola 2*

Shelter sites in the Illawarra escarpment are not rare. Wallandoola 2 contains deposits and artefacts that were noted on a previous visit to the site. There has been little excavation of rock shelter deposits in the Illawarra and this makes Wallandoola 2 potentially interesting on scientific grounds. A wombat burrow was noted in the cave on the site card and therefore the integrity of the deposit is not expected to be good.

The shelter is in good condition and the grinding grooves illustrate that the rock shelter was occupied in the past. There is a moderate archaeological potential for artefacts to be present in the floor deposits.

Therefore Wallandoola site 2 is of moderate scientific significance.

*52-2-1094 Gillbird Site 50*

This site is a shelter with art, and is located on a large ridgeline within a short walking distance to the original course of the Cataract River. The large flat panel on the back wall of the shelter contains 36 easily identifiable motifs with a further 88 motifs being either indeterminate or abstract in nature. The art is in a mixed condition with varying degrees of preservation due to different levels of exposure to natural weathering processes and vandalism. While rock art is a common site type for the area, the scale and variety of motifs in this rock shelter make this site highly significant.

*52-2-1182 Lizard Creek Site 16*

This site is a shelter with two outline charcoal motif of lizards marked on the roof. The site is part of a ridgeline of eroding sandstone looking over a dry minor tributary of Lizard Creek. No stone artefacts were observed, although the floor of the shelter may possess archaeological deposits. The art is in a relatively poor condition and is difficult to discern. Rock art shelters with charcoal outline figures are a common archaeological site type for the region and coupled with the poor preservation of the motifs this site is rated as being of low scientific significance.

*52-2-1183 Lizard Creek Site 14*

This site is a shelter with three hand stencils, a number of surface artefacts and the potential for archaeological deposits. The site is on a ridgeline looking over an ephemeral minor tributary of Lizard Creek.

Nineteen stone artefacts of various raw materials and types were readily identifiable on the surface living space of the shelter, suggesting the potential for archaeological deposits. The art is in a poor condition being faded, with the red hand stencil being much harder to identify than the white stencils. Rock art is a common site type for the area, however the potential for extensive archaeological deposits and the presence of a child's hand stencil make this site high scientifically and culturally significant.

*52-2-1184 Lizard Creek Site 15*

This site is a shelter with one outline charcoal motif of a partial macropod and three indeterminate charcoal outline motifs. The site is a small sandstone overhang with a limited living space. No stone artefacts were observed, although the floor of the shelter may possess archaeological deposits. The art is in a very poor condition and is difficult to discern. Rock art shelters with charcoal outline figures are a common archaeological site type for the geographical region and coupled with the poor preservation of the motifs this site has low scientific significance.

*52-2-1188 Lizard Creek Site 2*

The site is a small rock shelter with one motif of a small indistinguishable charcoal outline at the base of the shelter. The motif has suffered extensive weathering. Rock shelter sites with art are common in the geographic region and given the size of the shelter and the poorly preserved nature of the single motif warrant a low scientific significance.

*52-2-1196 Lizard Creek Site 11*

Grinding groove sites are common within the region, especially in areas with sandstone outcrops and surface water. Lizard Creek Site 11 is not significant in terms of representativeness or rarity. The significance of this site is low.

*52-2-1225 Wallandoola Site 3*

Rock shelters with art are a common archaeological site type within the geographic region. Although the shelter contains both stencils and charcoal outlines, their weathered damaged nature caused by reoccupation of the site post 1950s and the limited nature of the archaeological deposits reduces the scientific significance (as it relates to Aboriginal cultural heritage) of this site to low.

*52-2-1249 Wallandoola 13*

The Illawarra has a large number of rock shelter sites with art that form a complex of site types that not only are scientifically significant but are also spiritually significance to Aboriginal individuals.

The shelter is in good condition and the art is faded but has survived well. There is also the moderate archaeological potential for artefacts to be present in the floor deposits.

Therefore Wallandoola site 13 is of high scientific significance as the floor deposits are not obviously disturbed by animals.

## 6.2.2 *Significance Assessment for New Sites Identified in Wonga West*

### *New Site LC Shelter 1*

LC Shelter 1 is a rock shelter with three charcoal outline motifs (two fish and one indeterminate) located just above Lizard Creek on the western bank. Apart from some mineralization, the art is in generally good condition. No stone artefacts were observed, although the floor of the shelter may possess archaeological deposits. Rock art shelters with charcoal outline figures are a common archaeological site type for the geographical region therefore this site has moderate scientific significance.

### *NRE Women's Site*

The NRE Women's Site is made up of naturally formed water holes in the sandstone creek bed which the local Aboriginal knowledge suggests were used for birthing. The site is important as it can be used to show women's sites in the area. It is also closely associated with the 52-2-1183 which is found in close proximity and has stencils of childrens' hands.

The women's site contains natural features in a sandstone creek bed. The condition of this site is good. This site contains no potential to provide scientific data. This site type is rare and is therefore of high archaeological significance. The site is of high significance to the Aboriginal community.

### *NRE Scarred Tree 1*

The NRE Scarred Tree 1 is a tree that contains a four metre long and two metre wide scar.

The condition of the tree is good. There is no potential for further scientific information to be obtained from this site. The site itself is not of a rare type. Therefore the site is of low scientific significance but contains high Aboriginal cultural significance.

## 6.2.3 *Significance Assessment for Relocated sites in Wonga East*

### *52-2-0312 Bulli Mine Shaft Site 23*

This rock shelter contains deposit and therefore has potential for artefacts to be found. There is no art on the shelter walls and the site type itself is not rare. As this site like all the other shelter sites in the Study Area are part of a greater complex showing occupation in the Study Area the significance of the site is moderate.

*52-2-0314 Bulli Mine Shaft Site 21*

This site contains shallow archaeological deposit and therefore has some potential to yield further archaeological information and artefacts. The site also contains two figures, most likely lizards in the shelters. These art motifs are not common in the area and therefore this site has high archaeological significance.

*52-2-0319 Bulli Mine Shaft Site 24*

This shelter contains potentially deep sandy deposit on the floor. There is potential to contain further archaeological information within the shelter. There is no art on the rock shelter walls. The site type is again not uncommon in the area, but as part of the complex of sites within the region it contains a moderate archaeological significance.

*52-2-0603 Bulli Mine Shaft 19*

The site is a rock shelter with two motifs: a small indistinguishable charcoal outline at the base of the shelter and a red hand stencil. The two motifs have suffered extensive weathering through exposure to the elements and are barely visible. While a single silcrete core artefact had been previously located, the shelter does not possess an extensive deposit as the floor of the shelter is predominately bedrock. Rock shelter sites with art are common in the geographic region and the poorly preserved nature of the motifs warrant a low scientific significance. This site is outside the potential subsidence footprint.

*52-3-0310 Bulli Mine Shaft 18*

This site is a large shelter with over 100 surface artefacts and 12 motifs of various designs including a human figure, macropods, fish and a number of simple non-figurative geometric designs and dots.

Comprehensive surveys on rock art in the Sydney basin by McDonald (1994) determined that non-figurative designs such as dots and other geometric designs occur relatively infrequent in rock shelter art, representing only 6% of the 14,242 surveyed sites. Although rock shelters are a relatively common site type for the region, the extent of the living space of this shelter combined with the nature of the motifs and large numbers of surface artefacts makes this shelter of high significance for further scientific investigation.

Bulli Mine Shaft 29 is an open artefact scatter recorded as being located on a heavily disturbed access track. There is the potential for this site to extend into undisturbed deposits. Although open stone artefact scatters are relatively uncommon on the Illawarra Escarpment, the number of artefacts identified coupled with the heavily disturbed nature of the site and lack of any visible cultural remains today means that this site only has low scientific value.

#### 6.2.4 *Significance Assessment for New Sites in Wonga East (Not Visited By ERM)*

##### *Wonga East 1*

This shelter contains sandy deposit on the floor. There is potential to contain further archaeological information within the shelter. There is no art on the rock shelter walls. The site card records a potential archaeological deposit as being associated with the artefacts. The site type is not uncommon in the area, but as part of the complex of sites within the region it contains a moderate archaeological significance.

##### *Wonga East 2*

This shelter contains sandy deposit on the floor. There is potential to contain further archaeological information within the shelter. There is no art on the rock shelter walls. The site card records a potential archaeological deposit as being associated with the artefacts. The site type is not uncommon in the area, but as part of the complex of sites within the region it contains a moderate archaeological significance.

##### *Wonga East 3*

This shelter contains sandy deposit on the floor. There is potential to contain further archaeological information within the shelter. There is no art on the rock shelter walls. The site card records a potential archaeological deposit as being associated with the artefacts. The site type is not uncommon in the area, but as part of the complex of sites within the region it contains a moderate archaeological significance. Significance of Non-Relocated Sites.

As no significant or moderate changes were detected at the relocated sites, the condition of non-relocated sites also is assumed to be the same as when they were originally recorded.

## 6.2.5 Summary

Table 6.2 summarises the significance of the sites within the Study Area.

**Table 6.2 Summary of Significance Assessment**

| AHIMS Site Number | Context          | Archaeological potential | Scientific significance <sup>1</sup> | Aboriginal social significance <sup>2</sup> |
|-------------------|------------------|--------------------------|--------------------------------------|---------------------------------------------|
| <b>Wong West</b>  |                  |                          |                                      |                                             |
| 52-2-1071         | Open site        | None                     | Low                                  | High                                        |
| 52-2-1076         | Enclosed Shelter | Moderate                 | High                                 | High                                        |
| 52-2-1077         | Enclosed Shelter | Moderate                 | High                                 | High                                        |
| 52-2-1079         | Open site        | None                     | Moderate                             | High                                        |
| 52-2-1094         | Enclosed Shelter | High                     | High                                 | High                                        |
| 52-2-1096         | Enclosed Shelter | High                     | High                                 | High                                        |
| 52-2-1097         | Enclosed Shelter | High                     | High                                 | High                                        |
| 52-2-1098         | Open site        | Moderate                 | Moderate                             | High                                        |
| 52-2-1099         | Enclosed Shelter | Low                      | Moderate                             | High                                        |
| 52-2-1181         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-2-1182         | Enclosed Shelter | Moderate                 | Low                                  | High                                        |
| 52-2-1183         | Enclosed Shelter | High                     | High                                 | High                                        |
| 52-2-1184         | Enclosed Shelter | Low                      | Low                                  | High                                        |
| 52-2-1186         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-2-1187         | Enclosed Shelter | Moderate                 | High                                 | High                                        |
| 52-2-1188         | Enclosed Shelter | Low                      | Low                                  | High                                        |
| 52-2-1189         | Enclosed Shelter | Low                      | Low                                  | High                                        |
| 52-2-1191         | Open Site        | Low                      | Low                                  | High                                        |
| 52-2-1192         | Enclosed Shelter | Low                      | Low                                  | High                                        |
| 52-2-1195         | Enclosed Shelter | Low                      | Low                                  | High                                        |
| 52-2-1196         | Open Site        | Low                      | Low                                  | High                                        |
| 52-2-1197         | Open Site        | None                     | Low                                  | High                                        |
| 52-2-1198         | Enclosed Shelter | High                     | High                                 | High                                        |
| 52-2-1224         | Open Site        | None                     | Low                                  | High                                        |
| 52-2-1225         | Enclosed Shelter | Low                      | Low                                  | High                                        |
| 52-2-1248         | Open Site        | None                     | Low                                  | High                                        |
| 52-2-1223         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-2-1249         | Enclosed Shelter | Moderate                 | High                                 | High                                        |
| 52-2-1250         | Open Site        | None                     | Low                                  | High                                        |
| 52-2-1251         | Open Site        | None                     | Low                                  | High                                        |
| New LC1           | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| New NRE           |                  |                          |                                      |                                             |
| Women's Site      | Open Site        | None                     | High                                 | High                                        |
| New NRE           |                  |                          |                                      |                                             |
| Scarred Tree      | Open Site        | None                     | Low                                  | High                                        |
| <b>Wonga East</b> |                  |                          |                                      |                                             |
| 52-2-0083         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-2-0099         | Enclosed Shelter | None                     | Low                                  | High                                        |
| 52-2-0229         | Open site        | None                     | Low                                  | High                                        |
| 52-2-0233         | Open site        | None                     | Low                                  | High                                        |
| 52-2-0603         | Enclosed Shelter | Low                      | Low                                  | High                                        |
| 52-2-1081         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-2-1082         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |

| AHIMS Site Number | Context          | Archaeological potential | Scientific significance <sup>1</sup> | Aboriginal social significance <sup>2</sup> |
|-------------------|------------------|--------------------------|--------------------------------------|---------------------------------------------|
| 52-2-1095         | Enclosed Shelter | High                     | High                                 | High                                        |
| 52-3-0310         | Enclosed Shelter | High                     | High                                 | High                                        |
| 52-3-0311         | Enclosed Shelter | High                     | Moderate                             | High                                        |
| 52-3-0312         | Enclosed Shelter | High                     | Moderate                             | High                                        |
| 52-3-0313         | Open Site        | Low                      | Low                                  | High                                        |
| 52-3-0314         | Enclosed Shelter | Moderate                 | High                                 | High                                        |
| 52-3-0317         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-3-0318         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-3-0319         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-3-0320         | Open Site        | None                     | Low                                  | High                                        |
| 52-3-0322         | Open Site        | None                     | Low                                  | High                                        |
| 52-3-0323         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| 52-3-0325         | Enclosed Shelter | Moderate                 | Moderate                             | High                                        |
| Wonga East 1      | Enclosed Shelter | High                     | Moderate                             | High                                        |
| Wonga East 2      | Enclosed Shelter | High                     | Moderate                             | High                                        |
| Wonga East 3      | Enclosed Shelter | High                     | Moderate                             | High                                        |

1. For non- relocated sites the scientific significance was determined from the condition described in the AHIMS site card (see *Section 6.2*).
2. Derived from discussion with local Aboriginal community representatives in relation to site types identified.

## 7 IMPACT ASSESSMENT

### 7.1 POTENTIAL SUBSIDENCE IMPACTS

#### 7.1.1 Introduction

NRE commissioned Seedsman Geotechnics Pty Ltd (Seedman) to prepare a subsidence assessment for the Project. The following impact assessment is based on the predications made by Seedsman. A copy of the full report *Gujarat NRE No.1 Colliery Management of Subsidence Risks Associated with Wongawilli Seam Extraction* (Seedsman 2012) is provided as Annex M of the Environmental Assessment Report.

#### 7.1.2 Impact Types

The method of mining to be undertaken at the Wonga East and Wonga West mining areas is longwall extraction. Longwall extraction results in the remaining unsupported strata collapsing into the resulting void which is known as a goaf.

Collapse of overlying strata into the goaf results in surface subsidence. Subsidence causes a number of different potential impacts to the surface geology. The potential impacts are described in the following sections.

##### *Subsidence*

Subsidence is the vertical displacement occurring over the goaf. There is a horizontal component of this displacement both across the width of the panel and along the panel (NSW DoP 2008). Subsidence is expressed in terms of millimetres of displacement. The level of displacement has been assessed based upon the predictions provided by Seedsman (2012) for sites within the potential subsidence footprint.

##### *Tilt*

Tilt is created when two adjacent points undergo differing amounts of vertical displacement. Tilt is expressed in terms of millimetre per metre; this is the change in vertical orientation per meter of height above ground (NSW DoP 2008). Tilt has been predicted for each Aboriginal archaeological site within the potential subsidence footprint. The impact risk results, predicted by Seedsman, are shown in Table 7.3.

##### *Strain*

Strain is the change of horizontal distance between two points. This occurs as extension or compression (NSW DoP 2008). It is expressed in terms of millimetre per metre, where positive strain is tensile strain, and negative strain is compressive strain.

The strain has been predicted for each Aboriginal archaeological site within the potential subsidence footprint. The impact risk results, predicted by Seedsman, are shown in *Table 7.3*.

#### *Valley Closure*

Valley closure is where two sides of a valley move horizontally toward the centre line of the valley (NSW DoP 2008). Seedsman (2012: 40) has stated that Valley closure has been measured to within about 700m in-line of extraction or about a 45° draw angle to the side. At the position of presumed negligible vertical subsidence the range of horizontal movement is less than 20mm to 150mm (at 35° draw angle) or 70mm (at 300m offset from extraction edge). It should be noted that Seedsman (2012:41) also states that due to an inadequate understanding of the variables there is great difficulty in accurately assessing valley closure in this instance.

#### *Upsidence*

Upsidence is the uplift of valley floor strata causing bulging, buckling and shearing of the near surface strata. This can cause the valley floor to 'rise' relative to its position prior to mining (NSW DoP 2008). For upsidence, the range of values at the negligible vertical subsidence limit are less than 20mm to a maximum of 60mm (Seedsman 2012: 40).

#### *Far Field Horizontal Movement*

Far-field horizontal movements involve the *en masse* horizontal displacement of the surface which has been detected in the Southern Coalfield over the past 15 years up to several km from the limits of mining. Far field horizontal movements involved are usually in the order of tens of millimetres. These movements give rise to induced tensile strains that are typically less than 0.01 mm/m. As such, they are immeasurable and their associated impacts are of little significance (DoP, 2008b). This impact is not predicted by the geotechnical report (Seedsman 2012).

### **7.1.3 Cliffs and Slopes**

An assessment of the likely impacts to cliffs and steep slopes within Wonga East and Wonga West indicates that:

- within long wall areas there is a potential for rock fall to occur on 5% of the length of cliffs in Wonga East and most of Wonga West;
- rock falls are likely along 15% of Lizard creek located of Longwall A4-6;
- there are likely to be further subsidence impacts associated with waterfalls on Lizard Creek and Wallandoola Creek should proposed long walls be fully extracted; and

- surface cracking is considered possible in areas of steep slopes, particularly when mining is being conducted in the same direction as the slope. Cracking is anticipated in Long wall A4-6 and in areas of Hawkesbury sandstone in the south of Wonga East.

One site is located within A4-6 (52-2-1187), impacts to this sites has been assessed according to the subsidence estimates provided by Seedsman (2012).

#### 7.1.4 *Consequences and Effects on Aboriginal Sites*

The following discussion (*Section 7.4*) provides an assessment of the potential impacts of mining on Aboriginal heritage site types recorded within the Study Area. It should be noted that different effects of subsidence have the potential to impact on heritage sites different ways.

Rock shelters may be adversely affected by cracking, movement along joints or bedding planes, by block fall and by water seepage. All these impacts may directly affect the stability of the shelter and consequentially any rock art within a shelter.

Impacts arising from valley closure can put additional strain on the cliff tops, which may cause consequential strain on any rock shelters present beneath the upper most landforms. Grinding grooves can be affected by upsidence only where they are located at or near the valley floor and thereby causing cracking as well as cracking from strain. Upsidence and valley closure have not been predicted (Seedsman 2012).

Artefact scatters can be indirectly impacted by tilt, causing rain water to run off in differing ways resulting in increased levels of erosion. Artefact scatters are least likely Aboriginal site type to be impacted by mining subsidence (DoP 2008b).

## 7.2 *BACK ANALYSIS AND IMPACT GUIDELINES*

Previous studies have monitored changes to rock shelters in areas where mining has occurred. However there is insufficient data recorded on the actual impacts versus predicted impacts of subsidence (i.e. amount of movement, subsidence, tilt and stain) to Aboriginal heritage sites to predict what the effects of various levels of subsidence, tilt or strain with any certainty. The available data is from monitoring of sites pre and post mining, but this data does not provide actual versus predicted measurements.

Sefton's monitoring work is summarised in *Section 4.1.4*. The key risk for rock shelters was found to be the size of the overhang. 52 rock shelter sites were monitored over ten years. No rock shelter smaller than 50m<sup>3</sup> was impacted by mining subsidence.

Kayandel (2009) describes monitoring of 103 rock shelters (including Sefton's 2000 work) and shows that eleven sites had been impacted; Aboriginal heritage was impacted at only one of the sites.

Biosis (2009) report found that rock shelter collapse in a conservation area not impacted by mining. That site was over 1.5 km away from the nearest mining activity. The Biosis study also reported a collapse of an overhang located 550 m outside the longwall panel, after heavy rain. It was reported that the collapse of this overhang was not mining related.

Previous monitoring programs (Sefton 2000, Kayandel 2008) have assessed rock overhangs where the predicted tensile strain was greater than or equal to 0.5 mm/m and where the predicted compressive strain was greater than or equal to 2 mm/m.

The results of previous monitoring indicate that the following should be considered in undertaking the impact assessment:

- the predicted amount of subsidence/strain/ tilt;
- the size of the overhang (where known);
- the location of the site in relation to the longwalls. If the site is directly over a goaf it is more likely to be impacted; and
- the data available which indicated that only 10% of sites with predicted impacts have shown actual impact from mining subsidence.

### 7.3

#### *SITES WITHIN THE POTENTIAL SUBSIDENCE FOOTPRINT*

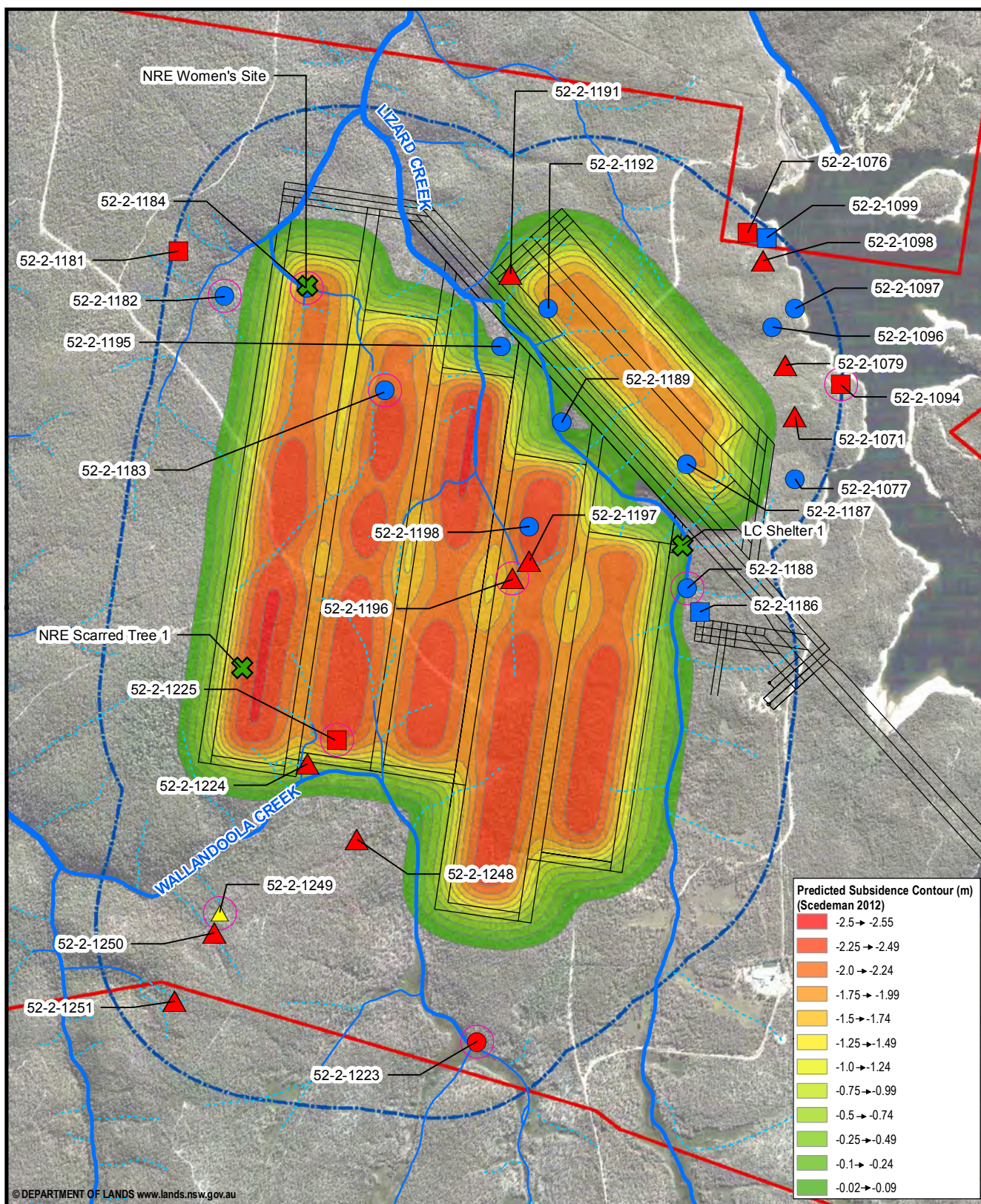
All sites within the Study Area have been considered in this assessment. However, not all of these sites are within the potential subsidence footprint.

*Table 7.1* identifies which sites are located within the potential subsidence footprint (as predicted by Seedsman 2012). These are illustrated on *Figure 7.1* and *Figure 7.2*.

**Table 7.1 Sites within the Potential Subsidence Footprint**

| <b>AHIMS Site Number</b>      | <b>Scientific Significance</b> | <b>Site Type</b>                                        | <b>Within potential subsidence footprint</b> |
|-------------------------------|--------------------------------|---------------------------------------------------------|----------------------------------------------|
| <b>Wonga West</b>             |                                |                                                         |                                              |
| 52-2-1071                     | Low                            | Axe grinding grooves                                    | No                                           |
| 52-2-1076                     | High                           | Shelter with Art and Deposit                            | No                                           |
| 52-2-1077                     | High                           | Shelter with Art                                        | No                                           |
| 52-2-1079                     | Moderate                       | Axe grinding groove                                     | No                                           |
| 52-2-1094                     | High                           | Shelter with Art and Deposit                            | No                                           |
| 52-2-1096                     | High                           | Shelter with Art                                        | No                                           |
| 52-2-1097                     | High                           | Shelter with Art                                        | No                                           |
| 52-2-1098                     | Moderate                       | Axe grinding groove                                     | No                                           |
| 52-2-1099                     | Moderate                       | Shelter with Deposit                                    | No                                           |
| 52-2-1181                     | Moderate                       | Shelter with Art and Deposit                            | No                                           |
| 52-2-1182                     | Low                            | Shelter with Art                                        | No                                           |
| <b>52-2-1183</b>              | High                           | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| <b>52-2-1184</b>              | Low                            | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| 52-2-1186                     | Moderate                       | Shelter with Deposit                                    | No                                           |
| <b>52-2-1187</b>              | High                           | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| 52-2-1188                     | Low                            | Shelter with Art                                        | No                                           |
| <b>52-2-1189</b>              | Low                            | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| <b>52-2-1191</b>              | Low                            | <b>Axe grinding grooves</b>                             | <b>Yes</b>                                   |
| <b>52-2-1192</b>              | Low                            | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| <b>52-2-1195</b>              | Low                            | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| <b>52-2-1196</b>              | Low                            | <b>Axe grinding grooves</b>                             | <b>Yes</b>                                   |
| <b>52-2-1197</b>              | Low                            | <b>Axe grinding grooves</b>                             | <b>Yes</b>                                   |
| <b>52-2-1198</b>              | High                           | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| 52-2-1223                     | Low                            | Shelter with Deposit, and Axe grinding grooves          | No                                           |
| <b>52-2-1224</b>              | Low                            | <b>Axe grinding grooves</b>                             | <b>Yes</b>                                   |
| <b>52-2-1225</b>              | Low                            | <b>Shelter with Art and Deposit</b>                     | <b>Yes</b>                                   |
| 52-2-1248                     | Moderate                       | Axe grinding grooves                                    | No                                           |
| 52-2-1249                     | High                           | Shelter with Art, and Axe grinding grooves              | No                                           |
| 52-2-1250                     | Low                            | Axe grinding grooves                                    | No                                           |
| 52-2-1251                     | Low                            | Axe grinding grooves                                    | No                                           |
| <b>New NRE Rock shelter 1</b> | Moderate                       | <b>Shelter with Art</b>                                 | <b>Yes</b>                                   |
| <b>New NRE Women's Site</b>   | High                           | <b>Water Hole with Aboriginal Ceremony and Dreaming</b> | <b>Yes</b>                                   |
| <b>New NRE Scarred Tree</b>   | Low                            | <b>Scarred Tree</b>                                     | <b>Yes</b>                                   |
| <b>Total In</b>               |                                |                                                         | <b>15</b>                                    |
| <b>Total Out</b>              |                                |                                                         | <b>18</b>                                    |

| AHIMS Site Number   | Scientific Significance | Site Type                                             | Within potential subsidence footprint |
|---------------------|-------------------------|-------------------------------------------------------|---------------------------------------|
| <b>Wonga East</b>   |                         |                                                       |                                       |
| 52-2-0083           | Moderate                | Shelter with Deposit                                  | No                                    |
| 52-2-0099           | Low                     | Shelter with Art and Deposit and axe grinding grooves | No                                    |
| 52-2-0229           | Low                     | Axe grinding grooves                                  | No                                    |
| 52-2-0233           | Low                     | Axe grinding grooves                                  | No                                    |
| 52-2-0603           | Low                     | Shelter with Art                                      | No                                    |
| 52-2-1081           | Moderate                | Shelter with Art and Deposit and axe grinding grooves | No                                    |
| 52-2-1082           | Moderate                | Shelter with Art                                      | No                                    |
| 52-2-1095           | High                    | Shelter with Art                                      | No                                    |
| 52-3-0310           | High                    | Shelter with Art and Deposit and axe grinding grooves | No                                    |
| <b>52-3-0311</b>    | Moderate                | <b>Shelter with Deposit</b>                           | <b>Yes</b>                            |
| 52-3-0312           | Moderate                | Shelter with Deposit                                  | No                                    |
| <b>52-3-0313</b>    | Low                     | Artefact Scatter                                      | <b>Yes</b>                            |
| 52-3-0314           | High                    | Shelter with Art                                      | No                                    |
| 52-3-0317           | Moderate                | Shelter with Deposit                                  | No                                    |
| 52-3-0318           | Moderate                | Shelter with Art                                      | No                                    |
| 52-3-0319           | Moderate                | Shelter with Deposit                                  | No                                    |
| <b>52-3-0320</b>    | Low                     | <b>Axe grinding grooves</b>                           | <b>Yes</b>                            |
| 52-3-0322           | Low                     | Axe grinding grooves                                  | No                                    |
| 52-3-0323           | Moderate                | Shelter with Deposit                                  | No                                    |
| 52-3-0325           | Moderate                | Shelter with Art                                      | No                                    |
| <b>Wonga East 1</b> | Moderate                | <b>Shelter with Deposit</b>                           | <b>Yes</b>                            |
| <b>Wonga East 2</b> | Moderate                | Shelter with Deposit                                  | <b>Yes</b>                            |
| <b>Wonga East 3</b> | Moderate                | <b>Shelter with Deposit</b>                           | <b>Yes</b>                            |
| <b>Total In</b>     |                         |                                                       | <b>6</b>                              |
| <b>Total Out</b>    |                         |                                                       | <b>17</b>                             |



#### Legend

- Project Application Area
- Study Area - Wonga West

#### Stream\_Order\_Nov2012

- Order\_**
- 1st order stream
  - 2nd order stream
  - 3rd order stream
  - 4th order and above stream

✕ Identified Heritage Site (ERM 2009)

○ Relocated AHIMS Site (ERM 2009)

#### AHIMS Site Type

- ▲ Axe Grinding Groove
- ▲ Axe Grinding Groove, Shelter with Art
- ▲ Axe Grinding Groove, Shelter with Deposit
- Shelter with Art
- Shelter with Art, Shelter with Deposit
- Shelter with Deposit

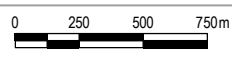
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Project: NRE No.1 Colliery Aboriginal Heritage Assessment

Drawing No: 0079383s\_AHA\_G016\_R0.mxd

Date: 15/11/2012 Drawing size: A4

Drawn by: SQW Reviewed by: MK

Scale: Refer to Scale Bar



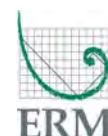
Maps and figures contained within this document may be based on third party data, may not be to scale and is intended for use as a guide only. ERM does not warrant the accuracy of any such maps or figures.

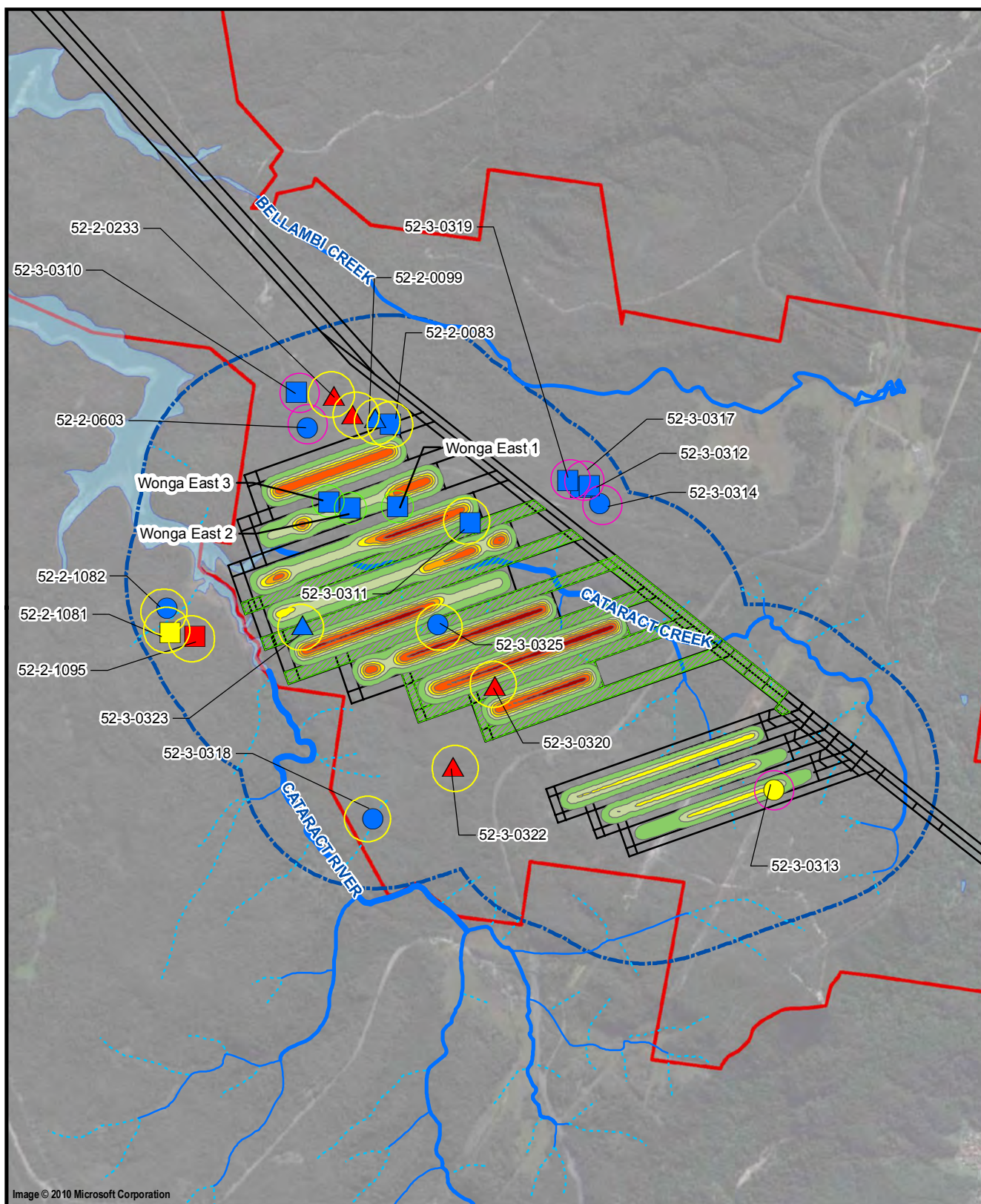
**Figure 7.1**

**Archaeological sites located within the Wonga West subsidence footprint**

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch,  
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney





#### Legend

- Project Application Area
- Study Area - Wonga East
- Subject to separate application (MP 10\_0046\_MOD 1)

#### AHIMS Site Type

- ▲ Axe Grinding Groove
- ▲ Axe Grinding Groove, Shelter with Art, Shelter with Deposit
- Open Camp Site
- Shelter with Art
- Shelter with Deposit
- Relocated AHIMS Site (Biosis 2012)
- Relocated AHIMS Site (ERM 2009)
- New AHIMS Site (Biosis 2012)

- 1st order stream
- 2nd order stream
- 3rd order stream
- 4th order and above stream

#### Predicted Subsidence Contour (m) (Seedsman 2012)

- 0.02 -0.19
- 0.2 -0.39
- 0.4 -0.59
- 0.6 -0.79
- 0.8 -0.99
- 1.0 -1.2

Client: Gujarat NRE Coking Coal Limited  
Project: NRE No.1 Colliery Aboriginal Heritage Assessment

Drawing No: 0079383s\_AHA\_GIS013\_R2.mxd

Date: 28/11/2012 Drawing size: A4

Drawn by: KB Reviewed by: MK

Scale: Refer to Scale Bar

0 250 500 750m

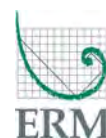
Maps and figures contained within this document may be based on third party data, may not be to scale and is intended for use as a guide only. ERM does not warrant the accuracy of any such maps or figures.

**Figure 7.2**

**Archaeological sites located within the Wonga East subsidence footprint**

Environmental Resources Management Australia Pty Ltd

Brisbane, Canberra, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



The impact assessment has focused on the sites within the potential subsidence footprint. Seedsman (2012) notes that sites outside the potential subsidence footprint are unlikely to be impacted by the longwall mining.

#### 7.4

#### *PREDICTED IMPACTS TO SITES*

Seedsman (2012) provided an indication of the predicted subsidence, strain and tilt in relation to the potential subsidence footprint. This information along with the size of the rock shelter and the placement of the site in relation to the goaf (factors identified as relevant by Sefton 2000) have been allocated a scaling in order to quantify potential likelihood of impact to the affected sites. The scaling is presented in *Table 7.2*.

**Table 7.2** *Risk factor Scaling*

| <b>Risk Factor</b>     | <b>Low</b>            | <b>Medium</b> | <b>High</b>           |
|------------------------|-----------------------|---------------|-----------------------|
| <b>Subsidence</b>      | 0-1000mm              | 1001-2000mm   | 2001+mm               |
| <b>Tilt (+ or -)</b>   | 0-9mm/m               | 10-19mm/m     | 20+mm/m               |
| <b>Strain (+ or -)</b> | 0-9mm/m               | 10-19mm/m     | 20+mm/m               |
| <b>Size of Shelter</b> | less 50m <sup>3</sup> |               | Over 50m <sup>3</sup> |
| <b>Over Goaf</b>       | No                    |               | Yes                   |

Three levels of likelihood have been allocated to each risk factor. This information has been applied to each site within the predicted subsidence footprint to determine the impact likelihood. The results are presented in *Table 7.3*.

Note that not all factors have been given the same weight. A higher weight has been applied to sites located over the goaf. As there is no precise way to predict actual impact and previous monitoring programs have indicated that only 10 % of the recorded sites are likely to be impacted (Sefton 2000), this approach is considered reasonable.

There are five levels of impact risk:

- high, where the potential impact risk to the site is likely;
- moderate, where the potential impact risk to the site is possible;
- low, where there is limited potential impact risk;
- very low, where potential impact risk is unlikely; and
- negligible, where potential impacts are not predicted to affect the site.

A moderate impact likelihood was the highest recorded in this assessment and was applied to 15 sites. The remaining six sites within the predicted subsidence footprint recording impact likelihood of very low or negligible.

**Table 7.3**      *Impact Likelihood*

| AHIMS Site Number                                                                                                                                                                                                     | Relocated | Subsidence (mm) | Final Tilt (mm/m) | Final Strain (mm/m) | Size of overhang      | Over Goaf <sup>1</sup> | Impact Risk |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|-------------------|---------------------|-----------------------|------------------------|-------------|
| <b>Wonga West</b>                                                                                                                                                                                                     |           |                 |                   |                     |                       |                        |             |
| 52-2-1183                                                                                                                                                                                                             | Yes       | 2200 (H)        | 2 (L)             | -3 (L)              | 79m <sup>3</sup> (H)  | Yes (H)                | Moderate    |
| 52-2-1184                                                                                                                                                                                                             | Yes       | 1920 (M)        | 3 (L)             | -4 (L)              | 4m <sup>3</sup> (L)   | Yes (H)                | Moderate    |
| 52-2-1187                                                                                                                                                                                                             | No        | 1500 (M)        | 8 (L)             | -6 (L)              | 20m <sup>3</sup> (L)  | Yes (H)                | Moderate    |
| 52-2-1189                                                                                                                                                                                                             | No        | 20 (L)          | 0.9 (L)           | 1 (L)               | 16.m <sup>2</sup> (L) | No (L)                 | Negligible  |
| 52-2-1191                                                                                                                                                                                                             | No        | 400 (L)         | 6 (L)             | 3.5 (L)             | NA (L)                | No (L)                 | Negligible  |
| 52-2-1192                                                                                                                                                                                                             | No        | 1700 (M)        | 8 (L)             | -5(L)               | 18m <sup>3</sup> (L)  | Yes (H)                | Moderate    |
| 52-2-1195                                                                                                                                                                                                             | No        | 500 (L)         | 1.5 (L)           | 3 (L)               | 54m <sup>3</sup> (H)  | No (L)                 | Very Low    |
| 52-2-1196                                                                                                                                                                                                             | Yes       | 1800 (M)        | 4 (L)             | -2(L)               | NA (L)                | Yes (H)                | Moderate    |
| 52-2-1197                                                                                                                                                                                                             | No        | 2250 (H)        | 3 (L)             | -2.5(L)             | NA (L)                | Yes (H)                | Moderate    |
| 52-2-1198                                                                                                                                                                                                             | No        | 2300 (H)        | 2 (L)             | -2.5(L)             | 15m <sup>3</sup> (L)  | Yes (H)                | Moderate    |
| 52-2-1224                                                                                                                                                                                                             | No        | 700 (L)         | 8 (L)             | 4(L)                | NA(L)                 | No (L)                 | Negligible  |
| 52-2-1225                                                                                                                                                                                                             | Yes       | 2200 (H)        | 6 (L)             | -6(L)               | 72m <sup>3</sup> (H)  | Yes (H)                | Moderate    |
| New LC1                                                                                                                                                                                                               | Yes       | 25 (L)          | 1.5 (L)           | 2 (L)               | 81m <sup>3</sup> (H)  | No (L)                 | Very Low    |
| New NRE Women's Site                                                                                                                                                                                                  | Yes       | 500 (L)         | 16 (M)            | 5 (L)               | NA(L)                 | Yes (H)                | Moderate    |
| New NRE Scarred Tree                                                                                                                                                                                                  | Yes       | 2250 (H)        | 8 (M)             | -8 (L)              | NA(L)                 | Yes(H)                 | Moderate    |
| <b>Wonga East</b>                                                                                                                                                                                                     |           |                 |                   |                     |                       |                        |             |
| 52-3-0311                                                                                                                                                                                                             | No        | 20 (L)          | 2 (L)             | 5 (L)               | 62m <sup>3</sup> (H)  | Yes (H)                | Moderate    |
| 52-3-0313                                                                                                                                                                                                             | Yes       | 20 (L)          | 10 (M)            | 0 (L)               | NA (L)                | Yes (H)                | Moderate    |
| 52-3-0320                                                                                                                                                                                                             | No        | 20 (L)          | 5 (L)             | 2 (L)               | NA (L)                | Yes (H)                | Moderate    |
| Wonga East 1                                                                                                                                                                                                          | No        | 20 (L)          | 5 (L)             | -2 (L)              | NA (L)                | Yes (H)                | Moderate    |
| Wonga East 2                                                                                                                                                                                                          | No        | 200 (L)         | 0 (L)             | 2 (L)               | NA (L)                | Yes (H)                | Moderate    |
| Wonga East 3                                                                                                                                                                                                          | No        | 20 (L)          | NA (L)            | NA (L)              | NA (L)                | No (L)                 | Very Low    |
| 1. For sites that have not been relocated the location has been determined using the co-ordinates provided on the AHIMs site card which may be inaccurate. The location of re-located sites can be accurately stated. |           |                 |                   |                     |                       |                        |             |

#### 7.4.1 *Rating the Impact Assessment*

In order to rank the level of potential impact to each Aboriginal site, an impact assessment score has been prepared. The impact assessment score combines, by summation, impact likelihood (as determined in *Table 7.3*) and the scientific significance of the site (as summarised in *Table 6.2*). The lower the final score, the higher the risk.

**Table 7.4** *Impact Assessment Score*

| Impact risk | Score | Scientific significance | Score |
|-------------|-------|-------------------------|-------|
| High        | 1     | High                    | 1     |
| Moderate    | 2     | High/moderate           | 2     |
| Low         | 3     | Moderate                | 3     |
| Very low    | 4     | low                     | 4     |
| Negligible  | 5     |                         |       |

The results for reach site are summarised in *Table 7.5*.

**Table 7.5** *Impact Assessment Score*

| AHIMS Site Number    | Site Type                                        | Impact Risk | Scientific significance | Impact Assessment Score |
|----------------------|--------------------------------------------------|-------------|-------------------------|-------------------------|
| <b>Wonga West</b>    |                                                  |             |                         |                         |
| 2-2-1183             | Shelter with Art                                 | Moderate    | High                    | 3                       |
| 52-2-1184            | Shelter with Art                                 | Moderate    | Low                     | 6                       |
| 52-2-1187            | Shelter with Art                                 | Moderate    | High                    | 3                       |
| 52-2-1189            | Shelter with Art                                 | Negligible  | Low                     | 9                       |
| 52-2-1191            | Axe grinding grooves                             | Negligible  | Low                     | 9                       |
| 52-2-1192            | Shelter with Art                                 | Moderate    | Low                     | 6                       |
| 52-2-1195            | Shelter with Art                                 | Very Low    | Low                     | 8                       |
| 52-2-1196            | Axe grinding grooves                             | Moderate    | Low                     | 6                       |
| 52-2-1197            | Axe grinding grooves                             | Moderate    | Low                     | 6                       |
| 52-2-1198            | Shelter with Art                                 | Moderate    | High                    | 3                       |
| 52-2-1224            | Axe grinding grooves                             | Negligible  | Low                     | 9                       |
| 52-2-1225            | Shelter with Art and Deposit                     | Moderate    | Low                     | 6                       |
| New LC1              | Shelter with Art                                 | Very Low    | Moderate                | 7                       |
| New NRE Women's Site | Water Hole with Aboriginal Ceremony and Dreaming | Moderate    | High                    | 3                       |
| New NRE Scarred Tree | Scarred Tree                                     | Moderate    | Low                     | 6                       |
| <b>Wonga East</b>    |                                                  |             |                         |                         |
| 52-3-0311            | Shelter with Deposit                             | Moderate    | Moderate                | 5                       |
| 52-3-0313            | Artefact Scatter                                 | Moderate    | Low                     | 6                       |
| 52-3-0320            | Axe grinding grooves                             | Moderate    | Low                     | 6                       |
| Wonga East 1         | Shelter with deposit                             | Moderate    | Moderate                | 5                       |
| Wonga East 2         | Shelter with deposit                             | Moderate    | Moderate                | 5                       |
| Wonga East 3         | Shelter with deposit                             | Very Low    | Moderate                | 7                       |

The impact assessment scores are between 3 and 9; where 3 is a moderate risk to a highly significant site and 9 is a negligible risk to a low significance site. Sites with impact assessment scores between 2 and 5 need to be managed.

#### 7.4.2 *Impact Assessment by Area*

##### *Wonga West*

There are 33 sites in Wonga West, 18 of which will not be impacted by mining subsidence.

There are 15 sites within the potential subsidence footprint including:

- three rock shelters with high significance (52-2-1183 , 52-2-1187 and 52-2-1198);
- one rock shelters with moderate significance (New NRE Rock Shelter 1);
- five rock shelters with low significance (52-2-1184, 52-2-1189, 52-2-1192, 52-2-1195 and 52-2-1225);
- four axe grinding grooves with low significance (52-2-1191, 52-2-1196, 52-2-1197 and 52-2-1224);
- one women's site with high significance (New NRE Women's Site); and
- one scarred tree with low significance (New NRE Scarred Tree).

##### *Wonga East*

There are 23 sites in the Wonga East Study Area, 17 of which will not be impacted by mine subsidence. The undisturbed sites include 14 shelters and three axe grinding grooves. Three sites are of high scientific significance, six have moderate significance and four have low significance.

There are six sites within the potential subsidence footprint. These include:

- four rock shelters with moderate significance (52-3-0311, Wonga East 1, Wonga East 2 & Wonga East 3);
- one axe grinding grooves with low significance (52-3-0320); and
- one artefact scatter with low significance (52-3-0313).

Where high or moderately significant sites within the envelope defined by a 600 m barrier around the mining footprint at Wonga East and Wonga West are at moderate or high risk they should be actively managed and monitored throughout and following the mining period. *Section 8* details proposed management and mitigation measures.

The focus of mine planning was to eliminate subsidence risks where possible by avoiding significant environmental features including Aboriginal heritage sites. (Seedsman 2012). Mine planning was informed by a risk assessment workshop reported in Failure Mode and Effect Analysis Report (Olsen 2012).

The following management measures are made having regard to the findings of the Study Area inspection, background research, predictive modelling, heritage significance assessment, relevant NSW legislation protecting Aboriginal heritage (refer to *Annex C*), the OEH Aboriginal Cultural Heritage Assessment Guidelines and consultation with local Aboriginal stakeholders.

### 8.1

#### STRATEGY - AVOIDANCE

The iterative mine planning process involved consideration of longwall options in light of archaeological constraints, in order to avoid impact to areas of high conservation value. A number of surface features above the proposed mining area were identified through the risk management workshop process (Olsen 2012). Luke Kirkwood, ERM archaeologist was involved in the risk assessment workshop process. Utilising an elimination approach for risk management, NRE are proposing not to undertake longwall extraction under or close to some features of special significance (Olsen Consulting 2012).

The proposed mine plans have avoided longwall extraction directly under third and fourth order creeks (Seedsman Geotechnics 2012), with the exception of an unnamed tributary of Lizard Creek in Wonga West and within proximity to Cataract Dam. In addition the proponent has provided an undertaking that it will terminate mining beneath Cataract Creek if subsidence and ground movements exceed 250 mm and the creek experiences greater than minimal impact. This approach has enabled large number of significant aboriginal sites to be avoided, particularly those sites located adjacent to Cataract Dam.

There are 56 Aboriginal archaeological sites recorded within Study Area comprising 12 sites of high scientific significance, 20 sites of moderate scientific significance and 24 sites of low significance. The avoidance strategy has ensured that 35 of these sites are not within the potential subsidence footprint. Eight high significance sites, 15 moderate significance sites and 12 of the low significance sites have been avoided.

### 8.2

#### STRATEGY - MONITORING

Twenty-one sites are within the potential subsidence footprint. Four sites are of high archaeological significance and five sites are of moderate archaeological significance. Where high or moderately significant sites are at moderate or high impact risk they will be actively managed.

There are five site types present within the potential subsidence footprint. These are axe grinding grooves, artefact scatters, scarred trees, water holes and rock shelters. These will be managed in different ways as the subsidence may impact these sites in different ways. The enclosed sites may collapse, while the open sites may crack or be impacted by tilt.

### 8.2.1 *Open Sites*

Axe grinding grooves and artefact scatter sites within the potential subsidence footprint have an impact assessment score of 7 or more and are therefore at a low or very low risk from mine related subsidence. Where relocation of these sites is able to be achieved, monitoring will involve visual inspection and update to the AHIMS site card pre and post mining.

The scarred tree has an impact assessment score of six and therefore is unlikely to be adversely impacted by the project. It requires no further management or mitigation.

The women's site has a score of three and requires further management. The women's site will be photographically recorded and plans drawn, prior to mining. The women's site will be included in a monitoring program developed in consultation with the female elders as this site may be sensitive and may be taboo for males to visit.

### 8.2.2 *Enclosed Sites*

Seven enclosed (shelter) sites will be monitored; these are 52-2-1183, 52-2-1187, 52-2-1198 and 52-2-1225 in the Wonga West Study Area; and 52-3-0311 Wonga East 1 and Wonga East 2 in the Wonga East Study Area. The monitoring program will include monitoring in line with Sefton's (2000) program. All seven shelters will be subject to monitoring at the following times:

- pre mining;
- three months after mining beneath the shelter;
- six months after mining beneath the shelter; and
- post mining.

Archival photographic recording of the three Wonga West sites with high significance (52-2-1183, 52-2-1187 and 52-2-1198) will be undertaken in conjunction with the initial pre mining monitoring. This will include:

- photographic recording of the art and the shelter in its entirety; and
- archival recording including sketch plans of the art and shelter.

This information will be produced in a report to be provided to NRE, and a copy given to OEH. The AHIMS site cards will be updated with the information.

If any of the sites show changes during the course of monitoring, additional management and mitigation measures will be determined on a case by case basis by a qualified archaeologist in consultation with an Aboriginal representative.

The remaining shelters in the potential subsidence footprint do not require monitoring. These shelters will be re-located if possible and monitored pre and post mining. The AHIMS site cards will be updated as the sites are located.

The monitoring of all the sites will be undertaken by a qualified archaeologist with the involvement of the Aboriginal community. As the rock shelters with art are of high significance, and the area in which they are found is not generally accessible to the Aboriginal community, sites officers from the Aboriginal community groups will be invited along to attend the monitoring inspection. This will provide sites officers with a teaching and learning experience regarding these cultural heritage sites.

### 8.3 SUMMARY OF MITIGATION MEASURES

Table 8.1 provides a summary of the management measures for sites within the potential subsidence footprint.

**Table 8.1 Management Measures for the Identified Aboriginal Sites**

| AHIMS Site Number | Site Type            | Relocated during survey | Impact Assessment Score | Management Requirement                                                                                                      |
|-------------------|----------------------|-------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Wonga West</b> |                      |                         |                         |                                                                                                                             |
| 52-2-1183         | Shelter with Art     | Yes                     | 3                       | Monitoring and photographic archival recording with aboriginal sites officer. Update AHIMS Site card.                       |
| 52-2-1184         | Shelter with Art     | Yes                     | 6                       | Monitor pre and post mining with Aboriginal sites officers. Update AHIMS Site card.                                         |
| 52-2-1187         | Shelter with Art     | No                      | 3                       | Relocate if possible. Monitoring and photographic archival recording with aboriginal sites officer. Update AHIMS Site card. |
| 52-2-1189         | Shelter with art     | No                      | 9                       | Relocate if possible. Monitoring pre and post mining with Aboriginal sites officers. Update AHIMS Site card.                |
| 52-2-1191         | Axe grinding grooves | No                      | 9                       | Relocate if possible. Visual inspection Pre & Post mining Update AHIMS site card.                                           |
| 52-2-1192         | Shelter with Art     | No                      | 6                       | Relocate if possible. Monitoring pre and post mining with Aboriginal sites officers. Update AHIMS Site card.                |

| AHIMS Site Number    | Site Type                                        | Relocated during survey | Impact Assessment Score | Management Requirement                                                                                                      |
|----------------------|--------------------------------------------------|-------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 52-2-1195            | Shelter with Art                                 | No                      | 8                       | Relocate if possible. Monitoring pre and post mining with Aboriginal sites officer. Update AHIMS Site card.                 |
| 52-2-1196            | Axe grinding grooves                             | Yes                     | 6                       | Visual inspection Pre & Post mining. Update AHIMS site card.                                                                |
| 52-2-1197            | Axe grinding grooves                             | No                      | 6                       | Relocate if possible. Visual inspection Pre & Post mining. Update AHIMS site card.                                          |
| 52-2-1198            | Shelter with Art                                 | No                      | 3                       | Relocate if possible. Monitoring and photographic archival recording with aboriginal sites officer. Update AHIMS Site card. |
| 52-2-1224            | Axe grinding grooves                             | No                      | 9                       | Relocate if possible. Visual inspection Pre & Post mining. Update AHIMS site card.                                          |
| 52-2-1225            | Shelter with Art and Deposit                     | Yes                     | 5                       | Monitoring pre and post mining with Aboriginal sites officer. Update AHIMS Site card.                                       |
| New LC1              | Shelter with Art                                 | Yes                     | 7                       | Monitoring pre and post mining with Aboriginal sites officers. Update AHIMS Site card.                                      |
| New NRE Women's Site | Water Hole with Aboriginal Ceremony and Dreaming | Yes                     | 3                       | Monitoring programme to be established in consultation with the female elders. Update AHIMS site card.                      |
| New NRE Scarred Tree | Scarred Tree                                     | Yes                     | 6                       | Visual inspection Pre & Post mining and update AHIMS site card.                                                             |
| <b>Wonga East</b>    |                                                  |                         |                         |                                                                                                                             |
| 52-3-0311            | Shelter with Deposit                             | No                      | 5                       | Relocate if possible. Monitoring and Update AHIMS Site card.                                                                |
| 52-3-0313            | Artefact Scatter                                 | Yes                     | 6                       | Visual inspection Pre & Post mining with aboriginal sites officer. Update AHIMS site card.                                  |
| 52-3-0320            | Axe grinding grooves                             | No                      | 6                       | Relocate if possible. Visual inspection Pre & Post mining with aboriginal sites officer. Update AHIMS site card.            |
| Wonga East 1         | Shelter with Deposit                             | No                      | 5                       | Relocate if possible Monitoring pre and post mining with Aboriginal sites officers. Update AHIMS Site card.                 |
| Wonga East 2         | Shelter with Deposit                             | No                      | 7                       | Relocate if possible Monitoring pre and post mining with Aboriginal sites officers. Update AHIMS Site card                  |
| Wonga East 3         | Shelter with Deposit                             | No                      | 7                       | Relocate if possible. Visual inspection Pre & Post mining. Update AHIMS site card.                                          |

## REFERENCES

- Allen, J. and O'Connell, J.F. 2003, The long and the short of it: Archaeological approaches to determining when humans first colonised Australia and New Guinea. *Australian Archaeology*, Number 57, pp5-19.
- Attenbrow, V. 2002, *Sydney's Aboriginal Past: investigating the archaeological and historical records*, UNSW Press, Sydney.
- Biosis Research (2005a) Dendrobium Access Track upgrade: Indigenous Archaeological Survey. Report to BHP Billiton.
- Biosis Research 2005b, Elouera Colliery Longwall 14: Indigenous Archaeological Survey. Unpublished report to Delta Mining.
- Biosis Research 2006a Elouera Colliery Longwall 17: Indigenous Archaeological Survey. Unpublished report to Delta Mining.
- Biosis Research 2006b, Elouera Colliery Longwall 14: Indigenous Archaeological Survey. Unpublished report to Delta Mining.
- Biosis Research 2006c. Report on Section 90 #2211: Sandy Creek, Lake Cordeaux Catchment Area, NSW. Report to BHP Billiton Illawarra Coal.
- Biosis Research 2006d. Report on Section 90 #2284: Fire Trail 6C, Lake Cordeaux Catchment Area, NSW. Report to BHP Billiton Illawarra Coal.
- Biosis Research (2007a) Dendrobium Area 3 Archaeological and Cultural Heritage Assessment. Report to BHP Billiton Illawarra Coal.
- Biosis Research (2007b) Dendrobium Colliery Area 2 Longwalls 3 to 5A. Impacts of Subsistence on Indigenous and Historical Archaeological Sites. Report to BHP Billiton Illawarra Coal.
- Biosis Research (2008a) Archaeological and Cultural Heritage Impact Assessment of Proposed Longwalls 11, 12, 15, 16 and 19 and Pillar Extraction Area 1 – NRE Wongawilli Colliery, NSW. Report B. Report to NRE Gujarat Minerals Limited.
- Biosis Research (2008b) Dendrobium Colliery Longwall 3 End of Panel Report Cultural Heritage. Report to BHP Billiton Illawarra Coal.
- DEC. 2005. *A History of Aboriginal People of the Illawarra 1770 to 1970*. Hurstville. NSW.
- DEC. Undated A. *Early Contact Map*. Hurstville. NSW.
- DEC. Undated B. *Murni Dhungang Jirrar. Living in the Illawarra*. Hurstville. NSW.

ERM 2006 NRE No. 1 - V Mains Preliminary Aboriginal Heritage Predictions. Report to Gujarat NRE FCGL Pty Ltd.

ERM. In progress. Wongawilli Aboriginal Heritage Predictions. Report to Gujarat NRE FCGL Pty Ltd.

Fanning, P., and Holdaway, S. 2001. Stone Artefact Scatters in Western NSW, Australia: Geomorphic Controls on Artefact Size and Distribution. *Geoarchaeology: An International Journal*. **16(6)**: 667-686.

Flood, J. 1999, *Archaeology of the dreamtime: the story of prehistoric Australia and its people* (revised edition), Angus and Robertson, Sydney.

Heritage Concepts. 2005. *Aboriginal Archaeological Assessment and Statement of Heritage Impact: Macquarie Shores Cycleway*. Report to Shellharbour City Council.

Matthews, R.H. 1901, The Thurralwal Language. *Journal and Proceedings of the Royal Society of NSW* 35:127-160.

Metropolitan 2009. *The Metropolitan Coal Project Review Report*. State of NSW through the NSW Planning Assessment Commission.

McDonald, J. 1992. 'Chapter 2: Aboriginal Usage of the Hawkesbury-Nepean. In Prehistory'. In Sue Rosen Pty Ltd. (ed) *Hawkesbury-Nepean Historic Environmental Changes Study. Volume II*. Water Resources Branch – Water Board, Sydney-Illawarra-Blue Mountains.

McDonald, J. 1994. *Dreamtime Superhighway: An analysis of Sydney Basin Rock Art and Prehistoric Information Exchange*. Unpublished PhD Thesis. ANU.

Navin Officer 2006 *Electricity Substation Site Mount Ousley Road Wollongong, NSW*. Report to Integral Energy

NSW NPWS 1997, *National Parks and Wildlife Service 'Guidelines for Archaeological Survey Reporting (Working Draft)'*, Cultural Heritage Services Division, Sydney.

Organ, M., and Speechley, C. 1997. *Illawarra Aborigines*. In *A History of Wollongong*, pp. 7-21. Wollongong City Council and Oxford University Press.

Saunders, P. (Navin Officer). 1997. *Elouera Colliery Proposed Seismic Lines A-D. Archaeological Survey*. Report to Technical Services, Illawarra Colliery, BHP Coal.

Saunders, P. (Navin Officer). 1998. *Elouera Colliery Proposed Seismic Lines 1-8. Archaeological Survey*. Report to Technical Services, Illawarra Colliery, BHP Coal.

Sefton, C. 1988. *Prehistory of the Illawarra*. Unpublished MA Thesis. University of Sydney.

- Sefton, C. 1991. *1990-1991 Archaeological Survey of the Cordeaux River by the Illawarra Prehistory Group*. Unpublished report to the Australian Institute of Aboriginal and Torres Strait Islander Studies.
- Sefton, C. 1992. Archaeological research related to Elouera Colliery Longwalls 1-3 and proposals for the monitoring of art shelters for the effects of mining subsidence. Unpublished report for BHP Steel Collieries Division.
- Sefton, C. 1996. *Archaeological Investigation of Longwalls 4-6, Elouera Colliery*. Unpublished report to Collieries Division BHP Steel.
- Sefton, C. 2000. *Overview of the Monitoring of Sandstone Overhangs for the Effects of Mining Subsidence Illawarra Coal Measures*. Report for Collieries Division, BHP Coal.
- Sefton, C. 2001. Archaeological Investigation of Longwall 7-8 Application Elouera Colliery. Unpublished report to BHP Coal Illawarra Collieries.
- Sefton, C. 2002, Archaeological survey of Longwalls 9 and 10 Application Elouera Colliery. Unpublished report to BHP Billiton Illawarra Coal holdings Pty Ltd
- Speight, J.G. 1990 Landforms. In Australian Soil and Land Survey Field Handbook. McDonald, R.C et al. Inkata Press.
- Summerfield, M. 1991 *Global Geomorphology: An introduction to the study of landforms*. Longman Scientific and Technical. England.
- NSW. State of NSW through the NSW Department of Planning. 2008. *Impact of underground coal mining on natural features in the Southern Coalfield: strategic review*.
- NSW. State of NSW through the NSW Department of Planning. 2009. *The Metropolitan Coal Project Review Report*.
- Summerfield, M. 1991 *Global Geomorphology: An introduction to the study of landforms*. Longman Scientific and Technical. England.
- Tindale, N. 1940. "Distribution of Australian Aboriginal Tribes: A field survey" in Transactions of the Royal Society of South Australia. Vol 64 (1) pp 140-230.
- Tindale, N.B. 1974, *Aboriginal Tribes of Australia*, Australian National University, Canberra.
- Wandsnider, L.A., and Camilli, E.L. 1992. The Character of Surface Archaeological Deposits and its Influence on Survey Accuracy. *Journal of Field Archaeological*. **19(2)**: 169-188.

Annex A

## Russell Vale Site Aboriginal Heritage Assessment

## **A                    *RUSSELL VALE ABORIGINAL HERITAGE***

### **A.1                    *INTRODUCTION***

An Aboriginal heritage assessment was undertaken by ERM for the surface facilities upgrade at the Russell Vale site. This study looked at the existing conditions on the site. A field survey with Aboriginal community representatives was undertaken to determine if Aboriginal archaeological sites were present or if there was any potential for unidentified sites to be present at the Russell Vale site.

#### **A.1.1                *Study Area***

The study area for assessment of the surface facilities upgrade focuses on the Russell Vale site. The Russell Vale site occupies approximately 100 ha east of the Illawarra Escarpment. The Russell Vale site includes the administration offices and coal handling facilities.

#### **A.1.2                *AHIMs Data***

A search of the DECCW Aboriginal Heritage Information Management System (AIHMS) database for an area 12 km by 12 km, with the NRE No.1 Colliery at the centre of the search, was undertaken on 17 October 2008. The search identified 254 recorded Aboriginal sites, the substantial majority of which were shelter sites containing a combination of art, archaeological deposits and grinding groove. No sites were identified at the Russell Vale site. West of the Russell Vale site on the Woronora Plateau there are three registered sites 52-2-1147, 52-3-0313 and 52-3-0324, all three are open artefact scatters that sit at the top of the slope. Two are recorded as close to a creek.

East of the Russell Vale site there are sites recorded along the coast and these are all predominantly midden sites.

#### **A.1.3                *Predictive Model***

The Russell Vale site has been extensively modified during the European use and the long history of mining at this location. The Russell Vale site is located on the lower slopes of the Woronora plateau, and as such contains some sandstone features but few areas of sandstone overhangs as found further up in the Woronora Plateau.

*Table A.1* provides a description of the various archaeological site types and the environments where they are generally found. A statement is made on the likely presence of each site type within the Russell Vale site.

**Table A.1**      *Aboriginal sites commonly found in the local area*

| Site types              | Definitions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stone artefact scatters | <p>Stone artefact scatters are collections of stone, frequently brought from other areas, which demonstrate evidence for Aboriginal working, use and/or discard of the stone at a single location. Stone artefact concentrations may be associated with any of the site types listed in this table.</p> <p>Where such sites are buried by sediment they may not be noticeable unless exposed by erosion.</p> <p>These sites may be found in any undisturbed landform across the local area, but are most likely to be associated with waterways, flat landforms and ridgeline. It is anticipated that if stone artefact scatters are present they will be found in association with Bellambi Gully Creek.</p>                                                                                           |
| Isolated finds          | <p>Sites consisting of only one identified stone artefact, isolated from any other artefacts or archaeological evidence (and defined by an arbitrary separation distance of 50 m). They are generally indicative of sporadic past Aboriginal use of a location.</p> <p>A distinction should be drawn between isolated finds which are a component of the background distribution and objects such as axes, hammer stones, grinding dishes etc which would have been used repeatedly.</p> <p>These sites may be found in any undisturbed landform across the local area, but are most likely to be associated with waterways, flat landforms and ridgeline. It is anticipated that if isolated stone artefacts are present they will be found in association with the original Bellambi Gully Creek.</p> |
| Grinding grooves        | <p>Grooves resulting from the grinding of stone axes or other implements are found on flat areas of suitable sandstone. They are often located near waterholes or creek beds as water is necessary in the sharpening process. In areas where suitable outcrops of rock were not available, transportable pieces of sandstone were used.</p> <p>These site may be found on open sandstone platforms if they occur near the original Bellambi Gully Creek., if this site type is found it is anticipated that they would be located close to or within original Bellambi Gully Creek.</p>                                                                                                                                                                                                                 |
| Shelter sites           | <p>Sandstone shelters and overhangs were used by Aboriginal people to provide habitation areas sheltered from the rain and sun. The deposits in such sites are commonly very important because they often contain clearly stratified material in a good state of preservation.</p> <p>The Russell Vale site does not contain areas of stone overhangs and thus it is not expected that this site type will be present.</p>                                                                                                                                                                                                                                                                                                                                                                              |

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Quarries                                                | <p>These are areas where stone was obtained for flaked artefacts or ground-edge artefacts, or where ochre was obtained for rock paintings, body decoration or decorating wooden artefacts.</p> <p>There are no known sources of stone tool raw materials located within the study area and thus this site type is not predicted to be present.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Art sites                                               | <p>Aboriginal paintings, drawings and stencils are commonly found where suitable surfaces occur in sandstone shelters and overhangs. These sites are often referred to as rock shelters with painted art. Rock engravings, carvings or peckings are also to be found on sandstone surfaces both in the open and in shelters. These are referred to as rock engraving sites.</p> <p>As there are no overhangs at the Russell Vale site and no large open sandstone platforms it is not expected that this site type will be present within the study area.</p>                                                                                                                                                                                                                                           |
| Scarred trees                                           | <p>Scarred trees bear the marks of bark and wood removal for utilisation as canoes, shields, boomerangs or containers. It is commonly very difficult to confidently distinguish between Aboriginal scars and natural scars or those made by Europeans. Scars may also originate as 'foot-marks', small pockets cut into the bark of a tree enabling the tree to be climbed.</p> <p>The Russell Vale site has been cleared of original vegetation and there is no chance of scarred trees being present.</p>                                                                                                                                                                                                                                                                                             |
| Burial sites                                            | <p>Burials may be of isolated individuals, or they may form complex burial grounds. Often associated with other site types such as middens, or mounds.</p> <p>These sites are not expected to be located within the local area .</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Stone arrangements, carved trees and ceremonial grounds | <p>These site types are often interrelated. Stone arrangements vary from simple cairns or piles of rocks to more elaborate arrangements; patterns of stone laid out to form circles and other designs, or standing slabs of rock held upright by stones around the base.</p> <p>Carved trees may have intricate geometric or linear patterns or representations of animals carved into their trunks. Ceremonial grounds and graves were often marked by such trees.</p> <p>Bora grounds are a common type of ceremonial site and they are generally associated with initiation ceremonies. They comprise two circles, generally edged with low banks of earth but sometimes of stone, a short distance apart and connected by a path.</p> <p>It cannot be predicted whether these sites will occur.</p> |

#### **A.1.4**      *Fieldwork*

Fieldwork was undertaken on 20 April 2010. Two Aboriginal community representatives Peter Falk (DKH) and Richard Campbell (ILALC) accompanied Dr Diana Neuweger (ERM).

##### *Methodology*

The field survey looked at the areas to be disturbed by the proposed facility upgrades and the area of the original Bellambi Gully Creek.

A hand held GPS was used to record the tracks walked during fieldwork. *Figure A.1* shows the survey tracks undertaken. A digital SLR camera was used to record photographs (refer to *photographs A.1* to *A.5*).

##### *Results*

There were no Aboriginal archaeological sites recorded during the field survey. The Russell Vale site has been extensively modified and cleared. There were no old growth trees located within the areas to be impacted by the facility upgrades. There were no areas of archaeological potential identified during the field survey. The Aboriginal community did not express any concern that the proposed works will impact on cultural or spiritual sites.

Ground visibility was almost non existent over the entire Russell Vale site. Vegetation growth along the Bellambi Gully Creek was dense and gave very limited visibility. Coal reject has been dumped over parts of the Russell Vale site for road base and eliminates visibility of the original ground surface.

Legend

- Project Application Area
- Survey Transect



Figure A.1  
Survey Transects Recorded During  
Fieldwork

|              |                                                      |
|--------------|------------------------------------------------------|
| Client:      | Gujarat NRE Coking Coal Limited                      |
| Project:     | NRE No. 1 Colliery<br>Aboriginal Heritage Assessment |
| Drawing No:  | 0075833h_AHA_AHA_C001_RO.cdr                         |
| Date:        | 25/10/2012                                           |
| Drawn by:    | JD                                                   |
| Reviewed by: | TM                                                   |
| Scale:       | Refer to Scale Bar                                   |



Maps and figures contained within this document may be based on third party data. ERM does not warrant the accuracy of any such maps or figures.

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*Photograph A.1 Showing vegetation growth around Bellambi Gully Creek*



*Photograph A.2 Concrete culvert via which the open channel of Bellambi Gully Creek is currently directed into the underground pipe.*



*Photograph A.3 Coal reject road base*



*Photograph A.4 Hillslope in central western area near the ROM Stockpile showing some terracing of the hill slope and past vegetation clearing.*



*Photograph A.5 The original creek line crossed the decline conveyor and is currently channelled in a concrete culvert under the conveyor.*

The Aboriginal representatives present considered that as the site has been extensively modified, there is no concern that any Aboriginal sites may be harmed by the proposed works. The Aboriginal representatives advised that no monitoring of works would be required but that a Management Plan for chance find protocols should be in place prior to works being undertaken.

## A.2

### *MITIGATION MEASURES*

There are no Aboriginal heritage sites or values present within the Russell Vale site, no management for Aboriginal Heritage is required.

A Management Plan for the discovery of suspected Aboriginal objects (chance finds) will be put in place prior to works commencing.

The following provides a chance find protocol in the unlikely event that an artefact or site is found at the Russell Vale site. If a potential Indigenous artefact or site is identified the following actions should be undertaken:

- contact the registered stakeholder groups who participated in fieldwork, Illawarra Local Aboriginal Land Council and the D'harawal Knowledge Holders and have a representative identify if the suspected item is in fact an Aboriginal site or object;
- if the identification is positive, contact a qualified archaeologist to record the site or object. The archaeologist in consultation with the registered stakeholder groups should provide management and mitigation measures as necessary, and provide a short report of the investigation to NRE and a copy to DECCW;
- if human skeletal remains are found the following actions should be undertaken;
  - stop works in the immediate area of the remains;
  - the local police contacted, a physical anthropologist or archaeologist contacted;
  - if the remains are determined to be of antiquity and of Indigenous origin contacted the registered stakeholder groups; and
- management and mitigation measures should be drawn up in consultation with the registered stakeholder groups and the archaeologist.

Annex B

## Aboriginal Stakeholder Consultation Log

**Table B.1 Stage 1 – Aboriginal Group Registration; Advisory Requests Sent**

| Organisation                | Contact            | Date Sent     | Comment                                                                 | Reference |
|-----------------------------|--------------------|---------------|-------------------------------------------------------------------------|-----------|
| Illawarra Mercury Newspaper | Michelle McCormack | 03 October 08 | Add to run on 10 October 2008 requesting response by 20 October 2008    | Annex B2  |
| DECCW                       | Laurel Alexander   | 03 October 08 | Emailed; response 15 October 2 groups                                   | Annex B3  |
| Illawarra LALC              |                    | 16 October 08 | Response to Advertisement: 9 groups                                     | Annex B3  |
| Registrar Aboriginal Owners | Kylie McLeod       | 03 October 08 | Emailed                                                                 | Annex B3  |
| Native Title Services       |                    | 03 October 08 | 2 active claims Sada Services and Cubbitch Barta Clan (not in our area) | Annex B3  |
| Local Council               | Joel Thompson      | 03 October 08 | Emailed                                                                 | Annex B3  |

**Table B.2 Aboriginal Group Registrations**

| Organisation                                       | Contact person     | Date Registered | Comments                        |
|----------------------------------------------------|--------------------|-----------------|---------------------------------|
| Illawarra LALC                                     | Sharralyn Robinson | 16 October 08   | Registered Interest             |
| D'harawal Knowledge Holders                        | Peter Faulk        | 21 October 08   | Registered Interest             |
| Northern Illawarra Aboriginal Collective (NIAC)    | Daniela Reverberi  | 27 October 08   | Fax to Register Interest        |
| Wodi Wodi Elders Corporation                       |                    | 30 October 08   | Phone call registering interest |
| Kullila Welfare and Housing Aboriginal Corporation | Maria Mah          | 14 October 08   | Phone call registering interest |

**Table B.3 Stage 2 - Briefing & Methodology Advice Sent**

| Organisation                                       | Date Sent      | Reference |
|----------------------------------------------------|----------------|-----------|
| NIAC (representing 3 groups)                       | 06 November 08 | Annex B5  |
| Illawarra LALC                                     | 06 November 08 | Annex B5  |
| Wodi Wodi Elders Corporation                       | 06 November 08 | Annex B5  |
| D'harawal Knowledge Holders                        | 11 November 08 | Annex B5  |
| Kullila Welfare and Housing Aboriginal Corporation | 14 November 08 | Annex B5  |

**Table B.4 Stage 3 - Aboriginal Group Comments Received**

| Organisation                 | Date Received  | Comment                          |
|------------------------------|----------------|----------------------------------|
| D'harawal Knowledge Holders  | 24 November 08 | Letter Registering for fieldwork |
| Illawarra LALC               | 27 November 08 | Email Registering for fieldwork  |
| NIAC (representing 3 groups) | 01 November 08 | Letter Registering for fieldwork |

**Table B.5 Stage 4 – Field Survey**

| Organisation                | Field Representative(s)                                         | Date(s) of fieldwork  |
|-----------------------------|-----------------------------------------------------------------|-----------------------|
| D'harawal Knowledge Holders | Virginia Faulk                                                  | 09 and 10 February 09 |
| Illawarra LALC              | Steve Henry                                                     | 09 and 10 February 09 |
| D'harawal Knowledge Holders | Peter Falk                                                      | 9-19 November 2009    |
| Illawarra LALC              | Michael Pixton, Allan Walker, Craig Tungai and Richard Campbell | 9-19 November 2009    |
| D'harawal Knowledge Holders | Peter Falk                                                      | 20 April 10           |
| Illawarra LALC              | Richard Campbell                                                | 20 April 10           |

**Table B.6 Stage 5 – Draft Report Sent**

| Organisation                                       | Contact person     | Date Sent       | Feedback Received & Date |
|----------------------------------------------------|--------------------|-----------------|--------------------------|
| Illawarra LALC                                     | Sharralyn Robinson | 7 November 2012 | Awaiting Feedback        |
| D'harawal Knowledge Holders                        | Peter Falk         | 7 November 2012 | Awaiting Feedback        |
| Northern Illawarra Aboriginal Collective (NIAC)    | Daniela Reverberi  | 7 November 2012 | Awaiting Feedback        |
| Wodi Wodi Elders Corporation                       |                    | 7 November 2012 | Awaiting Feedback        |
| Kullila Welfare and Housing Aboriginal Corporation | Maria Mah          | 7 November 2012 | Awaiting Feedback        |
|                                                    |                    |                 |                          |

**Table B.7 Stage 6 – Aboriginal Community Comments Received**

| Organisation   | Contact person     | Date Received | Comment                            | Reference |
|----------------|--------------------|---------------|------------------------------------|-----------|
| Illawarra LALC | Sharralyn Robinson | 20 April 2010 | Comments on Russell Vale Fieldwork | B6        |
|                |                    |               |                                    |           |
|                |                    |               |                                    |           |
|                |                    |               |                                    |           |
|                |                    |               |                                    |           |
|                |                    |               |                                    |           |
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|                |                    |               |                                    |           |

## *NOTICE OF ABORIGINAL CONSULTATION*

### *NRE NO. 1 COLLIERY, RUSSELL VALE*

An Aboriginal heritage assessment is proposed for planned extensions to underground mining operations at NRE No. 1 Colliery, Russell Vale. Local Aboriginal parties wishing to be consulted for this assessment are invited to register a written expression of their interest by 20 October 2008

Please respond in writing to:

Attn: Diana Neuweiger  
Environmental Resources Management Australia  
Locked Bag 24  
Broadway NSW 2007

Or by fax on 02 8584 8800.

Environmental  
Resources Management  
Australia

Building C,  
33 Saunders Street  
Pyrmont NSW 2009

Locked Bag 24,  
Broadway NSW 2007

Telephone +61 2 8584 8888  
Facsimile +61 2 8584 8800

[www.erm.com](http://www.erm.com)

Friday, 28 May 2010

*Illawarra Local Aboriginal Land Council*  
3 Ellen Street  
Wollongong NSW 2500

Our Reference: 0079383 Heritage L01

Dear Sir/Madam,



**RE: ABORIGINAL HERITAGE ASSESSMENT – NRE NO. 1 COLLIERY,  
RUSSELL VALE**

In accordance with the Department of Environment and Climate Change Interim Community Consultation Requirements, Environmental Resources Management Australia Pty Ltd (ERM) wishes to inform you that that we are undertaking an Aboriginal heritage assessment of an area proposed for expansion of underground mining operations by NRE No. 1 Colliery, at Russell Vale NSW (please find enclosed a map of the study area). The study is being undertaken on behalf of Gujarat NRE Minerals Ltd as part of environmental assessments of the area.

We would be grateful if you could indicate within ten working days whether your organisation is interested in being consulted regarding this project. In addition could you please supply us with a list of all known Aboriginal groups or individuals who would be interested in being consulted on this project. If you have any specific information concerning the cultural values of the study area, it would be much appreciated if you could let us know. Our contact details are provided at the top right hand side of this letter.

If you have any queries concerning the project, please feel free to contact me by email ([Diana.neuweger@erm.com](mailto:Diana.neuweger@erm.com)) or on the numbers listed above.

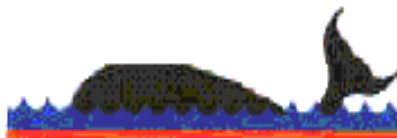
Many thanks,

Diana Neuweger  
Heritage Consultant



Environmental Resources  
Management Australia Pty Ltd  
A.C.N. 002 773 248  
A.B.N. 12 002 773 248

Offices worldwide



# Illawarra Local Aboriginal Land Council

3 Ellen Street WOLLONGONG NSW 2500

Ph: 42263338 Fax: 42263360

31 October 2007

To whom it may concern

As the Acting CEO of the Illawarra Local Aboriginal Land Council I write to inform your organisation of the following Motion endorsed at an Illawarra Local Aboriginal Land Council (ILALC) Ordinary Meeting dated 16 October 2007.

Could you please inform all relevant Divisions within your organisation of the following Motion:

The Motion stated that the Northern Illawarra Aboriginal Collective (**NIAC**) does not represent and is not accepted by the Illawarra Local Aboriginal Community. (All Members present agreed with this Motion)

It needs to be acknowledged that NIAC cannot speak on Country within the Illawarra region as determined by the ILALC members.

If you require any further information regarding this matter, please don't hesitate to contact me on the number listed below.

---

Yours in UNITY

Sharralyn Robinson  
Illawarra Local Aboriginal Land Council  
Acting CEO  
Ph: 42 26 3338  
Fax: 42 26 3360  
M: 0410 125463

Friday, 28 May 2010

Kullila Welfare and Housing Aboriginal Corporation  
14 Werrang Rd  
Primbee 2502

*Our Reference: 0079383 Methodology L02.doc*

Dear Maria,



**RE: ABORIGINAL HERITAGE ASSESSMENT FOR NRE NO.1  
COLLIERY**

As we indicated in our letter of 21 November 2008, Environmental Resources Management Australia (ERM) is undertaking an Aboriginal heritage assessment of an area of NRE No. 1 Colliery proposed for underground mining, at Russell Vale NSW (please find attached a map of the area). The study is being undertaken on behalf of Gujarat NRE Minerals Ltd as part of environmental assessments.

This fax provides Kullila Welfare and Housing Aboriginal Corporation with a proposed methodology for this heritage assessment. We would appreciate it if you could provide us with any written feedback on this methodology by **1 December 2008** (our fax number is 8584 8800, or you can email [diana.neuweger@erm.com](mailto:diana.neuweger@erm.com)). Please provide all correspondence on letter-headed paper addressed to Diana Neuweger.

We welcome your feedback on the method of assessing the Aboriginal heritage significance of the study area, and we understand that there are a number of methods that could be used in such an assessment. We would also welcome any information that you could provide us with concerning the cultural heritage values of the study area.

We propose to assess Aboriginal heritage of the study area through a week long archaeological survey on a date to be advised in December. This survey will aim to locate any previously unidentified Aboriginal heritage sites that occur within the study area, and to assess their significance. The survey will be undertaken on foot and will cover all archaeologically sensitive landforms in the study area, focusing particularly on any soil exposures. Landform elements where we think sites may occur include:

- within 50 m of the 2<sup>nd</sup> order and above water courses within the study area, including Wallandoola Creek, Lizard Creek, Bellambi Creek and Cataract Creek; and
- ridgelines and elevated areas suitable for camping or travelling through the country.

During the heritage assessment, we propose to:

- identify and record any Aboriginal heritage sites located during the survey;
- take GPS readings and mark site locations on a map;
- estimate the effective survey coverage of the study area;
- assess the impact of the proposed development on known Aboriginal heritage values;
- assess the scientific and Aboriginal significance of sites; and
- provide recommendations on how to manage and mitigate proposed development impacts on known Aboriginal heritage values.

When these tasks have been completed, ERM will provide a copy of the draft Aboriginal heritage assessment report to Kullila Welfare and Housing Aboriginal Corporation for comment.

Following current NSW DECC Aboriginal heritage consultation guidelines, if Kullila Welfare and Housing Aboriginal Corporation would like to participate in the survey, we invite you to provide (by **December 1 2008**) an offer of your services which describes the skills or experience of a Kullila Welfare and Housing Aboriginal Corporation representative in one or more of the following:

- field identification or survey techniques (including confirmation of physical ability to undertake fieldwork);
- cultural knowledge of the study area and surrounds; and
- ability to assist in communicating the results of the survey back to the stakeholder community for the assessment of cultural values and significance, and returning advice on their response to ERM (DECC Interim Community Consultation Requirements, January 2005, page 8).

A decision to employ any Aboriginal field survey representatives will be based upon the information supplied in these offers. Any employment will be offered by the client and not by ERM. Client decisions are independent of ERM and may not reflect our opinions and/or advice.

In order to participate in the survey, Aboriginal representatives must be adequately insured. Could you please provide your insurance status and copies of your certificate of currency for details concerning your public liability and workers compensation insurance. We would greatly appreciate it if you could respond to us in writing by Monday 1 December 2008 (to [diana.neuweger@erm.com](mailto:diana.neuweger@erm.com) or by fax on 8584 8800) with this information in addition to any offer of services. Our contact details are listed at the top right hand side of this fax.

In summary, we request, by **Monday 1 December 2008**:

1. any feedback with regard to the proposed methodology;
2. any further knowledge with regard to Aboriginal heritage within the study area;
3. an offer of your services on the survey if you wish to participate, and any associated rates;
4. details of the skills and experience of the representative proposing to undertake the survey; and
5. certificates of currency for workers compensation and public liability insurance.

If you have any queries concerning the project, please feel free to contact me by email ([Diana.neuweger@erm.com](mailto:Diana.neuweger@erm.com)) or on the numbers listed above.

Many thanks,

for Environmental Resources Management Australia Pty Ltd

A handwritten signature in black ink, appearing to read 'D. Neuweger', followed by a long horizontal flourish.

Dr Diana Neuweger



3 Ellen Street WOLLONGONG NSW 2500

Ph: 42263338 Fax: 42263360

**ENVIRONMENTAL RESOURCES MANAGEMENT**

**ARCHAEOLOGIST-DIANNA NEUWEGER**

**REPORT**

**ABORIGINAL ARCHAEOLOGICAL AND CULTURAL  
HERITAGE IMPACT ASSESSMENT  
NRE 1 COLLIERY RUSSELL VALE**

**ABORIGINAL SITE OFFICERS**

**STEVEN HENRY**

**9-10 FEBRUARY 2009 23-24-25 MARCH 2009**

**RICHARD CAMPBELL**

**20 APRIL 2010**



3 Ellen Street WOLLONGONG NSW 2500

Ph: 42263338 Fax: 42263360

## **SURVEY AIM**

To identify impacts to all identified Aboriginal and Historical cultural heritage sites and places based on potential changes as a result of underground mining and to make recommendations to protect and preserve identified sites for future generations.

## **SURVEY EXAMINATION**

**Steven Henry**

A visual inspection on foot was conducted of the study area proposed for underground mining at the NRE No.1 Colliery at Russell Vale. Ground visibility was poor due to the thick undergrowth; no new or existing registered sites were identified.

**Richard Campbell**

Today I participated in the induction and then Archaeologist, Dianna Neuweiger and I participated in a field survey on foot of the proposed area. Ground visibility was poor due to the thick undergrowth and coalwash everywhere.

No new or existing registered sites were identified.

## **OUTCOME**

Due to the thick undergrowth and coalwash everywhere it made it impossible to identify new or existing registered sites.

## **RECOMMENDATIONS**

- The Illawarra local Aboriginal Land Council objects to all longwall mining projects that impact on Aboriginal Heritage and culture. It has clearly been identified that longwall mining causes subsidence and movement; it is therefore imperative that all Aboriginal sites be preserved for future generations.
- Gujarat NRE enters into discussion with the ILALC to address employment opportunities for local Aboriginal people.

If you require any further information regarding this report, please don't hesitate to contact me on the number listed below.

Yours in UNITY

Sharralyn Robinson  
CEO  
Ph: 42 263338  
Fax: 42263360  
M: 0410 125463

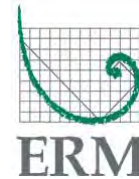
6 November 2012

Peter Faulk  
D'harawal Knowledge Holders  
PO Box 392  
BUNDANOON NSW 2578

*Our Reference:* 0079383

**Attention:** Peter Faulk

Dear Peter,



**RE: NRE NO.1 COLLIERY ABORIGINAL HERITAGE ASSESSMENT  
REPORT FOR NRE NO.1 EXPANSION PROJECT EA  
(APPLICATION NUMBER MP 09\_0013)**

In accordance with the Department of Environment, Climate Change and Water (DECCW) *Interim Community Consultation Requirements Guideline 2005*, Environmental Resources Management Australia Pty Ltd (ERM) has enclosed a copy of its "NRE No.1 Colliery Aboriginal Heritage Assessment" report. The study is being undertaken on behalf of Gujarat NRE Coking Coal Ltd and forms part of the NRE No.1 expansion project EA (application number # MP 09\_0013).

Community consultation for this project was undertaken in accordance with the DECCW Interim consultation guidelines, not the current 2010 guidelines. The 2010 guidelines are required if an Aboriginal Heritage Impact Permit (AHIP) is required, but as this project is still under Part 3A guidelines and is still a State Significant Project under part 89C of the *Environmental Planning and Assessment Act 1979*, Aboriginal heritage impact permits under section 90 of the *National Parks and Wildlife Act 1979* are not required.

ERM has identified that D'harawal Knowledge Holders registered its interest for this project on the 21 October 2008. Three field surveys were undertaken for this project on the 9 and 10 February 2009, the 9-19 November 2009 and on the 20 April 2010. NRE was provided with a list of Aboriginal stakeholders and undertook group selection and engagement for these surveys.

In accordance with Step 3 of the *Interim Community Consultation Requirements Guideline 2005*, ERM's "NRE No.1 Colliery Aboriginal Heritage Assessment" report is enclosed. We would be grateful if you could please review the document and return any comments within 21 days. Feedback provided will be

addressed in final reporting and any subsequent management plans. Please forward all correspondence or queries concerning the project to myself via email ([janene.may@erm.com](mailto:janene.may@erm.com)) or the contact details provided at the top right hand side of this letter.

Yours sincerely,  
for Environmental Resources Management Australia Pty Ltd

A handwritten signature in black ink, appearing to read 'Janene', with a stylized, sweeping underline.

Janene May  
Archaeologist

A handwritten signature in black ink, appearing to read 'S. O'Connor', with a stylized, sweeping underline.

Steve O'Connor  
Principle

Annex C

## Legislation

## C.1

### HERITAGE LEGISLATION

Aboriginal cultural heritage in NSW is protected by the *National Parks and Wildlife Act 1974* (NP&W Act). Land managers are required to consider the affects of their activities or proposed development on the environment under several pieces of legislation, principally the *Environmental Planning and Assessment Act 1979* (EP&A Act) for projects where Part 3A of the EP&A Act applies. Cultural heritage, which includes indigenous heritage, is subsumed within the definition of “environment”. Commonwealth legislation protecting indigenous heritage may also apply to indigenous heritage places in NSW in certain circumstances. Key legislation is summarised below.

#### C.1.1

##### *Environmental Planning and Assessment Act 1979*

The EP&A Act requires that environmental impacts are considered in land-use planning, including impacts on Aboriginal and non-Aboriginal heritage. Various planning instruments prepared under the Act identify permissible land use and development constraints.

OEH provide guidelines for Aboriginal heritage assessment, including those conducted under the EP&A Act.

#### C.1.2

##### *Aboriginal And Torres Strait Islander Heritage Protection Act 1984 (Commonwealth)*

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* protects areas and/or objects which are of significance to Aboriginal people and which are under threat of destruction. The Act can, in certain circumstances override state and territory provisions, or it can be implemented in circumstances where state or territory provisions are lacking or are not enforced. A significant area or object is defined as one that is of particular importance to Aboriginal people according to Aboriginal tradition. The Act must be invoked by or on behalf of an Aboriginal or Torres Strait Islander or organisation.

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| India     | Sweden      |
| Indonesia | Taiwan      |
| Ireland   | Thailand    |
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