



Dendrobium Area 3 Archaeological and Cultural Heritage Assessment

Report for BHP Billiton

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ABBREVIATIONS

AHC	Australian Heritage Council
AHIMS	Aboriginal Heritage Information Management System
ATSIC	Aboriginal and Torres Strait Islander Commission
BHPBIC	BHP Billiton Illawarra Coal
CBNTCAC	Cubbitch Barta Native Title Claimants Aboriginal Corporation
CHL	Commonwealth Heritage List
CMP	Conservation Management Plan
DA3A	Dendrobium Area 3A
DA3B	Dendrobium Area 3B
DA3C	Dendrobium Area 3C
DEC	Department of Environment and Conservation (now DECC)
DECC	Department of Environment and Climate Change
DEH	Department of Environment and Heritage
DPI	Department of Primary Industries
EP&A	Environmental Protection and Assessment
EPBC	Environment Protection and Biodiversity Conservation
GSV	Ground surface visibility
ICOMOS	International Council on Monuments and Sites
ILALC	Illawarra Local Aboriginal Land Council
KEJ	Korrewal Elouera Jerrungarugh
LEP	Local Environmental Plan
LGA	Local Government Area
MGA	Map Grid of Australia – unless otherwise specified all coordinates are in MGA
NHL	National Heritage List
NIAC	Northern Illawarra Aboriginal Collective Inc.
NNTT	National Native Title Tribunal
NPWS	National Parks and Wildlife Service (now part of DECC)
REP	Regional Environment Plan
RNE	Register of the National Estate
SCA	Sydney Catchment Authority
SEMP	Subsidence Environmental Management Plan
SHI	State Heritage Inventory
SHR	State Heritage Register
SMP	Subsidence Management Plan

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EXECUTIVE SUMMARY

Background

Biosis Research Pty Ltd was commissioned by BHP Billiton Illawarra Coal to undertake an archaeological and cultural heritage assessment of the proposed Mining Area 3 for the Dendrobium Mine. The proposed Mining Area 3 encompasses an area between Cordeaux and Avon Dams. The project has been completed in accordance with the requirements of the *Conditions of Consent for the Dendrobium Underground Coal Mine*, DA60-03-2001 (Minister for Urban Affairs and Planning 2001), and the Director-General's Requirements (dated 17 April 2007).

The aim of this cultural heritage investigation was to identify, record and assess the value of Aboriginal or historical archaeological sites within the study area. An assessment of the potential impacts to these sites and the broader cultural heritage values of the study area from the proposed underground mining are also included. The archaeological assessment included environmental and archaeological background research; consultation with the Aboriginal community as per the DECC's *Part 6 Requirements Guidelines*; an extensive field survey investigating previously recorded sites and discovering new sites; the modelling of subsidence effects for sites where detailed mine plans exist; and, the assessment of risk for sites outside of the current subsidence modelling areas where detailed mine plans do not exist.

A total of 65 Aboriginal archaeological sites were identified within the study area, with 56 sites being within the proposed mine footprint areas of Dendrobium Area 3A (14 sites); Area 3B (24 sites); and Area 3C (18 sites). There are 9 sites included within the study area, however these are outside the margins of the proposed mine footprint. The sites comprise the following site types: shelter with art; shelter with deposit; shelter with art and deposit; stone artefact scatter or isolated occurrences; axe grinding grooves; and, a suspected stone arrangement. Of the 65 sites within the general study area 50 had been previously recorded. The current field survey relocated 40 of the previously recorded Aboriginal archaeological sites within the current study area. A total of 15 new Aboriginal archaeological sites were identified within the Dendrobium Area 3 study area (Figure 6).

Lake Cordeaux dam is listed on the State Heritage Register, and is in proximity to the study area and mine footprint. The proposed mine will not impact on the physical structures associated with the dam, or the dam's heritage curtilage. A single item of historic heritage was identified during the surveys. This was a small timber bridge, apparently constructed ad hoc from recycled power / telegraph poles.

Impact Assessment

Area 3A

There are 14 Aboriginal archaeological sites within or near the SMP Area. The sites consist of shelters with art ($n=8$); shelters with artefacts/deposit ($n=3$); and open sites with artefacts ($n=3$). There are a further 7 sites within the study area of Area 3A, but these are not in the SMP Area.

Previous studies have shown that stone artefact sites in an open context are not affected by subsidence movements, so there will be no impact to the three open sites from the proposed mining of longwalls in the SMP Area.

Sandstone shelter sites, with art or deposit, have been demonstrated to be susceptible to damage from subsidence movements. If a shelter is situated directly over a longwall or pillar, then there is a risk of impact, as these areas are subject to the greatest subsidence movements. There are seven sandstone shelter sites located directly over longwalls in the Dendrobium Area 3A SMP Area, and three shelters in close proximity to the longwalls. There is a risk of impact to these shelters, either through cracking of rock surfaces, sheering or movement on bedding planes and joints, or block fall. Generally large shelters are more likely to be affected by subsidence movements, as these are naturally more unstable. Monitoring programs have shown that only shelters with internal volumes of greater than 50m^3 , which are also situated directly over a longwall, have suffered impacts from subsidence related movements. Shelter collapse has not been observed during previous monitoring programs of subsidence impacts, and it is unlikely that any of these shelters would collapse. Of the 10 shelter sites directly above, or in close proximity to the longwall layout, 6 have volumes greater than 50m^3 , suggesting that the risk of impact to the other sites is very low.

Area 3B

There are 24 Aboriginal archaeological sites within Area 3B. The sites consist of shelters with art ($n= 14$); shelters with artefacts/deposit ($n= 5$); open sites with artefacts ($n = 2$); and, Potential archaeological deposits (PADs) ($n = 3$). The longwall layout for Area 3B has not been finalised, so it is not possible to describe which sites are over longwalls. However, the subsidence movements in Area 3B will be similar to Area 3A, and again open stone artefact sites will not be impacted by subsidence. Of the 22 shelter sites, 10 have volumes greater than 50m^3 , suggesting that the risk of impact to the overall assemblage of sites is generally very low.

Area 3C

There are 18 Aboriginal archaeological sites within Area 3C. The sites consist of shelters with art ($n= 12$); shelters with artefacts/deposit ($n= 2$); open sites with axe grinding grooves ($n = 2$); an open site with artefacts ($n = 1$); and, a stone arrangement ($n = 1$). The longwall layout for Area 3C has not been finalised, so it is not possible to describe which sites are over

longwalls. However, the subsidence movements in Area 3C will be similar to Area 3A, and again open stone artefact sites will not be impacted by subsidence. The axe grinding groove sites occur on rock shelves and these can be potentially impacted by cracking from subsidence movements.

There is a single item of historic heritage in Area 3C, being a small timber bridge. The subsidence movements at the site are dependant on the final longwall layout, however given the ad hoc construction and small size of the bridge (there are no foundations for example) there is a low potential that it may be impacted by subsidence movements. The significant heritage visual curtilage of the Cordeaux Dam will not be impacted.

Recommendations

Aboriginal archaeological sites

Based on the subsidence predictions provided by MSEC (2007), and the nature of the shelters there is some potential for impacts to occur to the archaeological sites resulting from the proposed longwall mining, therefore the following recommendations are made:

1. A program of archaeological monitoring be designed and implemented for the sites potentially affected by subsidence movements. The program should aim to replicate and where possible develop the recording methods and action triggers already established by Sefton (2000) and those employed in Dendrobium Areas 1 and 2 (Biosis Research 2006).
2. Section 90 applications should be sought as part of the SMP process for Aboriginal archaeological sites that have some potential, however unlikely, to be impacted by the proposed longwall mining. For the Dendrobium Area 3A and SMP Area s90 Consent to Damage should be sought for the following sites:
 - 52-2-0458 (Shelter with Art)
 - 52-2-1646 (Shelter with Art)
 - 52-2-1647 (Shelter with Deposit)
 - 52-2-0273 (Shelter with Art)
 - 52-2-0274 (Shelter with Art)
 - 52-2-0277 (Shelter with Art and Deposit)
 - 52-2-0278 (Shelter with Art)
 - DM13 (Shelter with Deposit)
 - DM15 (Shelter with Art)
 - DM20 (Shelter with Art)
 - DM23 (Shelter with Deposit)
3. Aboriginal archaeological sites within Dendrobium Areas 3B and 3C must be subject to the same predictive subsidence assessment as Area 3A once the longwall layouts have been finalised. Based on these subsidence predictions, recommendations should

be formulated, and are likely to include archaeological monitoring programs and Section 90 Consents to Damage.

Historical archaeological sites

4. Based on the location of identified historical built or archaeological heritage items within the Dendrobium Area 3 Study Area, there are no historic heritage constraints associated with the proposed longwall extraction within the Dendrobium Area 3A SMP Area
5. The locally significant DHS1 (timber bridge) and the state significant heritage curtilage of the Cordeaux Dam must be subject to predictive subsidence assessment once the longwall layouts have been finalised. Based on these subsidence predictions, recommendations for management should be formulated

1.0 INTRODUCTION

Cultural heritage legislation protecting Aboriginal and historic heritage places applies in New South Wales. These places are an important part of our heritage. They are evidence of more than 50,000 years of occupation of New South Wales by Aboriginal people, and of the more recent period of post-contact settlement.

Heritage places can provide us with important information about past lifestyles and cultural change. Preserving and enhancing these important and non-renewable resources is encouraged.

It is an offence under sections of legislation to damage or destroy heritage sites without a permit or consent from the appropriate body (see Appendix 2 for a discussion of relevant heritage legislation and constraints).

When a project or new development is proposed, it must be established if any cultural heritage places are in the area and how they might be affected by the project. Often it is possible to minimise the impact of development or find an alternative to damaging or destroying a heritage place. Therefore, preliminary research and survey to identify heritage places is a fundamental part of the background study for most developments.

The first stage of a study usually incorporates background research to collect information about the land relevant to the proposed development project (the study area). A second stage often involves a field survey of this area.

Possibly the most important part of the study involves assessing the cultural heritage significance of heritage places in the study area. Understanding the significance of a heritage place is essential for formulating management recommendations and making decisions.

The subject matter of this report involves the use of a number of technical words and terms with which the reader may be unfamiliar. An extensive glossary has been included at the end of the report and reference to this may be of assistance.

1.1 Project background

The initial environmental assessments for the Dendrobium Coal Project were completed in 2000-2001, and included an area within the Sydney Metropolitan Catchment Area known as Dendrobium. This included Dendrobium Areas 1, 2 and 3. BHP Billiton Illawarra Coal (BHPBIC) has completed mine operations in Area 1, and is currently mining Area 2 of the Dendrobium Colliery, one of three operating underground mines managed by Illawarra Coal south of Sydney. BHPBIC propose to continue its underground coal mining operations at Dendrobium, by extracting coal from the Wongawilli Seam in Area 3 using longwall mining techniques. The current mining schedule forecasts that longwall mining will commence in Area 3 by mid 2010. Dendrobium Areas 1 and 2 and the proposed Dendrobium Area 3 mine mining area are shown in Figure 1.

In 2007 the proposed alignment of the Area 3 longwall panel was redesigned, and now includes areas outside the perimeter of the approved Mining Area 3. In accordance with the existing development consent conditions and the modified Dendrobium Area 3, a revised subsidence impact assessment for Aboriginal archaeology for Area 3 has been completed (MSEC 2007).

The aim of this cultural heritage investigation was to identify, record and assess the value of Aboriginal or historical archaeological sites within Dendrobium Area 3. Results of this investigation will be used to assess the potential impacts to sites and the broader cultural heritage values of the study area from the proposed underground mining operations. Recommendations designed to minimise impacts to cultural heritage places have been formulated according to legislative constraints and 'best practice' heritage management.

This document provides a discussion of the issues surrounding the cultural heritage values associated with the proposed Dendrobium Area 3 mining area and the likely assessment of these values that will be required to accompany any development application for this project.

1.1.1 The Study Area

The study area is located on the Woronora Plateau in the Wollongong Local Government Area (LGA) and the Sydney Basin Bioregion. The proposed mining operations are located to the west of Lake Cordeaux within the Sydney Metropolitan Catchment Area (Figure 1). The study area is zoned 7a Special Environmental Protection (Water Catchment).

Numerous Fire Roads occur throughout the study area, including sections of Fire Roads 6A, 6C and 6F. The disused Maldon - Donbarton Railway line also occurs in the west of the study area. Two high voltage power easements run approximately north – south in the east of the study area.

Exploration works, including both seismic lines and boreholes, have recently been conducted within the study area. All of these have been subject to archaeological and cultural heritage assessment by Biosis Research (2004, 2006, and 2007) to avoid previously recorded archaeological sites and areas of archaeological sensitivity.

Dendrobium Area 3 has been further divided into three mining units or groups of longwalls. These are defined in Figure 2 as Dendrobium Area 3A, 3B and 3C. These areas will be abbreviated as follows in the remainder of this report:

- Dendrobium Area 3a – DA3A
- Dendrobium Area 3b – DA3B
- Dendrobium Area 3c – DA3C

The proposed longwall layout for DA3A has been precisely defined and is subject to a detailed impact assessment by Mine Subsidence Engineering Consultants [MSEC, 2007 #72].

The longwall layout for DA3A has been defined by applying criteria that are considered to be the thresholds for major impact to the major topographical features of the study area (creek line / cliff line). These criteria have been defined as:

- A maximum predicted closure of 200 mm
- A maximum predicted tensile strain of 0.5 mm/m
- A maximum predicted systematic compressive strain of 2 mm/m

Section 1.2 of the MSEC report defines how these threshold criteria have been shown to minimise physical impacts to major creek lines. That is, when mine geometry and similar geological conditions to those proposed and or observed in DA3A have been observed in other mines have physical impacts on the important topographical features overlying the longwall area have incurred only minor impacts.

The layout of longwalls in DA3B and DA3C will be subject to further definition and additional consultation and investigations to identify a preferred layout which achieves an economically viable mine plan with acceptable subsidence impacts. BHPBIC have however committed to delivering a mine plan that observes the thresholds for major impact as defined for DA3A. To that end, it is appropriate to extrapolate the impacts predicted for DA3A to the greater footprint of Dendrobium Area 3. The specific predictions of DA3A have been applied uniformly to DA3B and DA3C.

1.2 Planning approvals

The initial Development Application (DA 60-03-2001) for the Dendrobium Area 3 project was assessed and determined as an Integrated State Significant Development under the *Environmental Planning and Assessment Act 1979* (NSW). The original determination granted approval for a period of 21 years (Determination of Development Application – Section 1.2(a)). The current application is to modify the existing consent and will also be determined under the EPA Act. Such an application will also be assessed against the provisions of other legislation where appropriate.

BHPBIC intends to apply to ***modify the Dendrobium Mine development consent (DA- 60-03-2001) to incorporate a revised*** Area 3 footprint and longwall layout pursuant to section 75W of the *Environmental Planning and Assessment Act 1979*.

The current Archaeological and Cultural Heritage Assessment has been prepared to meet the consent conditions of DA-60-03-2001, as well as to inform the broader environmental assessment documents required to support the application to alter the Development Consent for Dendrobium Area 3. This report has been prepared to identify the Aboriginal and historic cultural values of the study area and provide recommendations in accordance with the:

- *National Parks and Wildlife Act 1974* (NSW); and

- *Heritage Act 1977* (NSW).

In addition, cultural heritage values form a component of environmental assessment to be considered in a Subsidence Management Plan (SMP) as required under the NSW Department of Mineral Resources *Guideline for Application for Subsidence Management Approvals*. This report also informs the SMP for the current application to modify the DA3A consent.

1.2.1 DA-06-03-2001 Consent Conditions

The proposal to undertake mining operations in Area 3 was approved dependant on a number of Conditions. Conditions relevant to cultural heritage values are as follows:

Section 1.1 Adherence to terms of DA, EIS, etc.

(b) Staged Development requiring further consideration from the Minister for Urban Affairs and Planning.

- (iii) The assessment report for Area C [Area 3] shall include revised modelling and impact prediction of subsidence in this area, based on information obtained by the Applicant through **ongoing monitoring** as part of this consent. Where mitigation measure are proposed, the Application shall provide full justification for such measures based on the experience of mitigation measures in its **subsidence environmental management plans** required by this consent.

The assessment shall include but not be limited to an assessment of:

- **Impacts on any known sites of Aboriginal archaeology**

Section 3.2 Environmental Management Strategies and Plans

(d) The Applicant shall prepare the following environmental management plans:

- **Archaeology and Cultural Management Plans**

Section 3.3.2 Subsidence Environmental Management Plans

(c) In preparing the Subsidence Environmental Management Plans, the Applicant shall:

- (v) review, based on information available at the time, the potential impacts of the proposed mining on ...archaeological resources, heritage resources...take these into consideration in any refinement of the mine plan and design of the appropriate mitigation measures. Works should be designed where possible to avoid areas of **archaeological sensitivity**;

- (xi) describe the physical landforms and environment of the areas, including, but not limited to, watercourses, upland swamps, aquifers, cliff lines and overhangs, and **archaeological sites**;

Section 3.3.3 Subsidence Monitoring

Monitoring shall include the following:

- (iv) **monitoring of rock shelters and overhangs.**

Section 3.4 Heritage Assessment, Management and Monitoring

This includes all points identified in this section, from **archaeological assessment**, to **monitoring** and the development of a **Cultural Heritage Management Plan** for Dendrobium Area 3.

1.2.2 SMP Guideline Requirements

Section 6.9 of the NSW Department of Mineral Resources *Guideline for Application for Subsidence Management Approvals* requires that:

- 5) A statement as to whether the proposed mining is under any heritage items and if so whether an approval by the Heritage Office and/or other relevant authorities is required by the authorities;
- 6) A statement as to whether the proposed mining is under an area of potential archaeological significance and if so whether an archaeological survey of that area has been undertaken. In addition, the applicant should make a statement as to whether an approval under Section 90 of *the National Parks and Wildlife Act 1974* is required by or has been obtained from NPWS for identified archaeological sites that may be affected by subsidence arising from the proposed mining.

These requirements are further expanded in the Consent and this document. The monitoring program addresses these conditions in the following sections.

1.3 Aims

The following is a summary of the major objectives.

- Conduct heritage register searches to identify any previously recorded cultural heritage sites within the survey area. Searches will include the Aboriginal Heritage Information Management System (AHIMS), the National Heritage List, Commonwealth Heritage List, Register of the National Estate, State Heritage Register, Local Environmental Plan and National Trust heritage lists.
- Conduct additional background research in order to recognise any identifiable trends in site distribution and location.
- Consult with identified statutory stakeholders and stakeholders identified through DECC's *Part 6 Approvals – Interim Community Consultation Requirements for Applicants* for the study area.
- Undertake appropriate survey of the study area where existing information is limited. Survey coverage will target landforms with high potential for heritage places within the study area, as identified through background research, that are most likely to be impact by longwall mining.
- Undertake targeted survey to relocate all previously recorded sites within the study area.
- Record and assess sites identified during the survey in compliance with the guidelines endorsed by the NSW Department of Environment and Climate Change (DECC) and the NSW Heritage Office.
- Identify impacts to all identified Aboriginal and historic cultural heritage sites and places based on potential changes as a result of mining subsidence.
- Make recommendations to minimise or mitigate potential subsidence impacts to cultural heritage values within the Dendrobium Area 3.
- Make recommendations to manage the cultural heritage values within the study area.

1.4 Consultation with the Aboriginal community

In accordance with the DECC's *Part 6 Approvals – Interim Community Consultation Requirements for Applicants* Biosis Research notified the following bodies regarding the Dendrobium Area 3 Longwall Mine Area:

- Illawarra Local Aboriginal Land Council;
- The Registrar of Aboriginal Owners;
- Native Title Services;
- The Wollondilly Shire Council; and

- The NSW Department of Environment and Conservation.

Public notifications following the DECC *Interim Community Consultation Requirements for Applicants* were made in March 2007.

- *The Illawarra Mercury*

A register for interested parties was opened on 9 March 2007 and registrations were received by Biosis Research until 23 March 2007. Written response to the notifications was received from the following:

- Illawarra Local Aboriginal Land Council (Sharralyn Robinson)
- The Wadi Wadi Coomaditchie Aboriginal Corporation (Peter Carriage)
- Northern Illawarra Aboriginal Collective (NIAC – Chris Illert)
- Korewal Elouera Jerrungarugh (KEJ – Reuben Brown)
- Cubbitch Barta Native Title Claimants Aboriginal Corporation (Glenda Chalker)
- Aboriginal and Historic Archaeological Solutions (Scott Franks)

Additional responses to the project were received from:

- Bellambi Aboriginal Tent Embassy (Kim Moran)
- Gary Caines
- Kullila Welfare and Housing Aboriginal Corporation (Maria Maher)

In accordance with the DECC's *Part 6 Approvals – Interim Community Consultation Requirements for Applicants* stakeholders were provided with a methodology for the proposed cultural assessment and given 21 days to review the methodology and provide feedback. No formal responses to the methodology were received.

Meetings to discuss broad cultural heritage issues with the project, and the general approach were held with the following organisations:

- Illawarra Local Aboriginal Land Council
- The Wadi Wadi Coomaditchie Aboriginal Corporation
- Bellambi Aboriginal Tent Embassy
- Korewal Elouera Jerrungarugh
- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Aboriginal and Historic Archaeological Solutions

Representatives from the following organisations participated in the fieldwork:

- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Illawarra Local Aboriginal Land Council

- Korewal Elouera Jerrungarugh

1.5 Terminology

For consistency with other reports associated with the SMP for this mining application, the following terminology is used:

- The Study Area – as referred to in this study only is Dendrobium Area 3, including longwall areas A, B and C (Figure 1 and Figure 2)
- Application Area - surface area that is likely to be affected by the proposed mining of Longwall areas A at the Dendrobium Area 3 Mine SMP Area. The extent of the application area has been calculated by combining the areas defined by the following limits: the 35 degree angle of draw line, predicted vertical limit of subsidence (20mm) and areas sensitive to far field movements.
- SMP Area – includes defined Dendrobium Area 3A longwalls
- Subsidence – in terms of this assessment, subsidence is taken to mean the vertical (uplift and subsidence) and horizontal surface movements due to the extraction of coal using longwall mining techniques. The subsidence report (MSEC 2007) describes these mechanisms in detail.
- The MSEC Report – Mine Subsidence Engineering Consultants have prepared the subsidence predictions and impact assessment for this report. It is cited above as (MSEC 2007). The report will hereafter be referred to as the MSEC report unless otherwise stated.

2.0 ABORIGINAL CULTURAL HERITAGE ASSESSMENT METHODOLOGY

2.1 Philosophy

A methodology is a system of principles that are formulated to govern the way an assessment is carried out. In archaeological and cultural heritage assessments the methodology employed is influenced by several factors including: the type of development or project, environmental factors, ethnographic and historical land-uses, and previous archaeological and cultural heritage work.

2.2 Guiding Principles

The methodology employed for this investigation has been designed to conform to the requirements of the relevant advisory documents and guidelines as endorsed by the NSW Department of Environment and Climate Change. These guidelines and documents are:

- *National Parks and Wildlife Act 1974: Part 6 Approvals – Interim Community Consultation Requirements for Applicants* (DEC 2004);
- *Draft Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation* (DEC July 2005);
- *The Australia ICOMOS Burra Charter*;
- *Working Draft Aboriginal Cultural Heritage Standards and Guidelines Kit* (NSW NPWS 1997); and
- *Guidelines for Aboriginal Heritage Impact Assessment (DRAFT)* (DEC no date).

In line with these documents, the methodology adheres to the following principals:

- Aboriginal people are the primary determinants of the significance of their heritage;
- Input from those Aboriginal people with a cultural association to the land is an essential part of assessing the significance of Aboriginal heritage objects and values that could be impacted by an activity;
- Aboriginal heritage can have both cultural and scientific/archaeological significance and both should be the subject of assessment;
- Aboriginal community involvement needs to take place early in the assessment process to ensure that their values and concerns are fully taken into account, and so that their own decision-making structures are able to function adequately; and
- Consideration should be given to measures that could be implemented to avoid, mitigate or offset likely impacts.

The DECC *National Parks and Wildlife Act 1974: Part 6 Approvals – Interim Community Consultation Requirements for Applicants* states that the community consultation process

ensures that Aboriginal communities have the opportunity to positively influence assessment outcomes by:

- Influencing the design of the assessment of cultural and scientific significance;
- Providing relevant information in relation to cultural significance values; and
- Contributing to the development of cultural heritage management recommendations.

2.3 Methodology

The following is a detailed outline of the methods employed for this assessment.

2.3.1 Background Research

The following activities will be undertaken during the background research phase:

- Search for sites registered on the NSW DECC AHIMS for the study area and surrounding vicinity.
- Review of relevant site records for the study area and Woronora Plateau.
- Review of relevant reports from the region.
- Search of the NSW Heritage Office database and State Heritage Register.
- Search of the National Heritage List, Commonwealth Heritage List and Register of the National Estate.
- Inspection of heritage lists in relevant local planning instruments.
- Search of the National Trust Heritage Register.

This data was collated and mapped to show the locations of the previously recorded sites. The data will also be used to formulate predictive statements regarding Aboriginal archaeological site distribution within the study area. The predictive statements will be based on terrain units, and will be used to help determine the specific locations of the field survey.

2.3.2 Cultural and Archaeological Survey

The cultural and archaeological survey will be conducted as follows:

- Known sites will be revisited to confirm their location, and to make a record of their current condition.
- Pedestrian survey will be undertaken across the entire area of the proposed emplacement site.
- The location of all sites will be recorded using a hand-held GPS unit.
- Survey data will be recorded on purpose-designed recording forms.

- Details of sites will be recorded using purpose-designed recording forms.
- Appropriate plans and maps will be prepared.
- Photographs of all sites and features will be taken.
- Appropriate Aboriginal Community representatives will be invited to assist with the field assessment.

2.3.3 Assessment of Significance

The NSW DECC recognises that ‘Aboriginal community are the primary determinants of the significance of their heritage’ (NSW DEC 2004). Biosis Research recognises that our role in the cultural heritage assessment process is to provide specialist skills, particularly in regard to archaeological and heritage management expertise. These specialist skills can be articulated and enhanced through consultation with the Aboriginal community, with the aim of providing a holistic assessment of cultural heritage significance.

Archaeologists study the material cultural heritage—artefacts, sites and structures—of past peoples and societies. However, not all places and sites of cultural heritage value and significance have material evidence. Places, sites and objects have heritage value because of what they mean to people, and because of the values they represent for people. Places, sites and objects will have different heritage values for different people. These different values may require negotiation among various stakeholders and can shape what decisions are made about conservation. Cultural heritage management is the process of investigation, consultation and making decisions about the conservation of heritage places through the assessment of heritage values.

Heritage management is based on the principle that the heritage significance of a place will guide all future decisions that affect the place. The determination of cultural heritage significance relies on a comprehensive approach to heritage assessments and to the values that are attached to heritage places. Cultural heritage significance can be considered to be the importance of a place, site or object arising from the combination of values attributed to it. These values determine the ‘what’ and ‘how’ of conservation and direct management decisions. The categorisation and significance of a place or site will also determine the statutory protection that may be afforded to it.

This approach is laid out in the Australia ICOMOS Burra Charter (1999), which has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. The Burra Charter identifies the following categories of values: aesthetic, historic, scientific and social. Most assessment approaches also include a ranking of significance – high, moderate or low for example. For each value associated with a place, an attempt is made to assess the degree or level of significance in terms such as *unique*, *important*, *representative*, *rare* and so on – which relies on a comparison of that value in relation to other places. One of the more common applications of the significance assessment process is to mitigate or control landscape modifying activities, including the protection or conservation of identified heritage values.

Both professional and community understandings are important when determining heritage and its significance. 'Expert' interpretation will often need to be integrated with other understandings and assessments of heritage. This is particularly relevant in a discussion of Aboriginal cultural heritage, where there can be differences in the way places are valued and in understandings of how knowledge can be used. As a consequence, outcomes should rely on processes and practices that promote integration and an effective incorporation of different values in decision making.

For example, an 'archaeological' site can be of broader interest to groups other than archaeologists. There are additional scientific interests in archaeological sites than those that arise through archaeology alone. Many types of scientific research or 'informational' interests can use data from archaeological sites, and these can all contribute the 'scientific value' of a place or site. Also, the wider interests of the general community can be complementary to archaeological values. In terms of Aboriginal communities, heritage places – including those that are otherwise defined as 'archaeological sites' – will attract differing values. These may include custodianship obligations, education, family or ancestral links, identity, and symbolic representation.

History and traditions are important: this generation has an obligation to future generations to retain certain things as they are currently seen and understood. This includes retaining alternative understandings to those that come through scientific assessments. Heritage places are often more complex than is identified through the scientific determination of value. Cultural and social values can be complex and rich - the past is a vital component of cultural identity. Feelings of belonging and identity are reinforced by knowledge of the existence of a past, and this is further reinforced and maintained in the protection of cultural heritage.

Assessment of Cultural Heritage Significance

As well as the ICOMOS Burra Charter, DECC has endorsed the *Guidelines for Aboriginal Impact Assessment*. The relevant sections of this document are presented and discussed below.

The *Guidelines* state that an area may contain evidence and associations which demonstrate one or any combination of the following Aboriginal heritage values. The values described by the *Guidelines* are drawn from the Burra Charter.

Social value (sometimes termed Aboriginal value) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day Aboriginal 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 one or more Aboriginal communities.

Historic value refers to the associations of a place with a person, event, phase or activity of importance to the history of an Aboriginal community. Historic places may or may not have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). Gaining a sufficient understanding of this aspect of significance will often require the collection of oral histories and archival or documentary research, as well as field documentation. These places may have ‘shared’ historic values with other (non-Aboriginal) communities. Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage, and the Aboriginal involvement and contribution to important regional historical themes is often missing from accepted historical narratives.

Scientific value 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.

Aesthetic value 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.

All Aboriginal sites and places, including those that are considered to be ‘archaeological’ – for example, middens or artefact scatters – may have a particular value and meaning to Aboriginal people.

Cultural Landscapes

In addition to these four definitions of value, the *Guidelines* 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.

Determination of Cultural Heritage Significance

The Burra Charter suggests that heritage practitioners ‘should prepare a succinct statement of cultural significance, supported by, or cross referenced to, sufficient graphic material to help identify the fabric of cultural significance’. The statement must be clear and concise, and must not simply restate the physical or documentary evidence presented as part of the assessment.

This study will present determinations of cultural heritage significance as *statements of significance* that preface a concise discussion of the contributing factors to the cultural heritage significance.

Reference to each of the categories defined above will be made when evaluating cultural significance for sites and places. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category will also be proposed. Consideration of the thresholds for each level of value for the categories will be guided by the contributing factors defined above for each category. The categories are:

- *Social value*
- *Historic value*
- *Scientific value*
- *Aesthetic value*
- *Cultural landscape value*

The determination of cultural landscape value will be applied to both individual sites and places (to explore their associations) and also, to the study area as a whole.

3.0 HERITAGE STATUS AND PLANNING DOCUMENTS

3.1 Commonwealth Registers

3.1.1 National Heritage Registers

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) establishes two mechanisms for protection of heritage places of National or Commonwealth significance. The National Heritage List provides protection to places of cultural significance to the nation of Australia. The Commonwealth Heritage List comprises natural, Aboriginal and historical heritage places owned and controlled by the Commonwealth and therefore mostly includes places associated with defence, communications, customs and other government activities.

Nominations to these two lists are assessed by the Australian Heritage Council (AHC), who also compiles the Register of the National Estate (RNE), a list of places identified as having national estate values. There are no management constraints associated with listing on the RNE unless the listed place is owned by a commonwealth agency.

APPLICATION TO THE STUDY AREA – NATIONAL HERITAGE REGISTERS

No items within the study area are listed on the National Heritage List or the Commonwealth Heritage List.

The Dendrobium Long Wall Area, Wollongong, NSW, Australia was rejected for Emergency Listing on the National Heritage List under Section 324F of the EPBC Act. In the Statement of Reasons for Decision under Section 324F of the Environment Protection and Biodiversity Conservation Act 1999 (11/04/2005), the Hon. Minister Campbell concluded that:

44. In the light of my finding under the heading Possession of National Heritage values above, I concluded that the Illawarra Escarpment and Woronora Plateau may meet criterion (a) and that the vicinity of the Dendrobium Mine contributes to this potential overall value.
45. After considering the information under the heading Threat to National Heritage values, I concluded that the potential National Heritage values of the Illawarra Escarpment and Woronora Plateau is not threatened by mining activities at the Dendrobium Mine Site.
46. In the light of these conclusions, I decided not to include the Dendrobium Mine Site in the National Heritage List pursuant to Section 324F of the EPBC Act.

The Upper Nepean Water Catchment, Mount Keira Rd, Mount Keira, NSW, Australia is identified as an "Indicative Place" on the Register of the National Estate. This is a large-area of the Upper Nepean catchment which also includes water management infrastructure. The Cordeaux and Avon dams are included as part of the Upper Nepean Scheme. Indicative places are not formally listed on the RNE and there is no statutory constraint associated with this "listing".

3.1.2 National Native Title Register

The Commonwealth *Native Title Act* 1993 (Cth) establishes the principles and mechanisms for the recognition, determination of Native Title for Aboriginal people.

The purpose of searching the register is to identify any Traditional Owner groups will current registered claims close to the study area that may identify themselves as relevant stakeholders with traditional knowledge or experience.

APPLICATION TO THE STUDY AREA – NATIONAL NATIVE TITLE REGISTER LISTINGS

A search of the National Native Title Register, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements was completed on 12 March 2007. There are no lands determined to have native title, no registered native title claims or indigenous land use agreements within the study area or its immediate vicinity.

3.2 State Registers

3.2.1 National Parks and Wildlife Act Registers

The Department of Environment and Climate Change (DECC) maintains two registers of heritage sites under the auspices of the NSW *National Parks and Wildlife Act 1974*. All Aboriginal sites in NSW are required to be registered on the Aboriginal Heritage Information Management System (AHIMS) register. Historic heritage places within lands managed by DECC (lands such as National Parks) are listed on the Historic Heritage Information Management System (HHIMS). As the study area is not within lands managed by DECC, the HHIMS Register was not searched.

AHIMS: A search of the AHIMS register was undertaken at the commencement of the project. The AHIMS database is maintained by the Department of Environment and Climate Change and contains a list of all Aboriginal objects, Aboriginal places and other Aboriginal heritage values in NSW that have been registered as required under the NSW *National Parks and Wildlife Act 1974*.

The area searched on the AHIMS database was larger than the study area, as Aboriginal sites recorded within the wider area will provide a regional perspective on the types of sites that maybe expected to be found within the study area.

APPLICATION TO THE STUDY AREA – AHIMS DATABASE

A search of the AHIMS Database completed on 12 March 2007 identified 83 previously recorded Aboriginal sites within 2 kilometres of the Dendrobium Area 3 Study Area (see Section 4.4.5 and Appendix 2). Forty four of these sites are situated within the current study area.

3.2.2 Heritage Act Registers

The NSW Heritage Office, part of the Department of Planning, maintains registers of heritage and archaeological items that are of significance to New South Wales.

State Heritage Register: The State Heritage Register (SHR) contains items that have been assessed as being of State Significance to New South Wales. The State Heritage Inventory (SHI) contains items that are listed on Local Environmental Plans and/or on a State Government Agency's Section 170 registers. Items on the SHI have been identified as having heritage significance, but have not been included on the SHR.

If an item or place does not appear on either the SHR or SHI this may not mean that the item or place does not have heritage or archaeological significance; many items have not been assessed to determine their heritage significance. An assessment is required for items that are 50 years or older. Items that appear on either the SHR or SHI have a defined level of statutory protection. This is discussed more fully in Appendix 4.

APPLICATION TO THE STUDY AREA – NSW STATE HERITAGE REGISTER LISTINGS

One item in the study area is listed on the State Heritage Register.

- Cordeaux Dam – the southern limit of the Cordeaux Dam heritage curtilage is within the DA3 study area. The curtilage was established to protect significant views and vistas of the dam from surrounding ridgelines. It should be noted that there is no dam infrastructure identified within the current study area.

APPLICATION TO THE STUDY AREA – NSW STATE HERITAGE INVENTORY LISTINGS

The Cordeaux Dam is also listed on the State Heritage Inventory, via listing on the Sydney Catchment Authority's Section 170 Heritage and Conservation Register. In terms of procedural application this s170 listing is subordinate to the listing of this site on the SHR.

The NSW Heritage Act 1977 currently affords automatic statutory protection to 'certain relics' that form part of archaeological deposits. Sections 139–145 of the Act prevent the excavation of a relic, except in accordance with a gazetted exception or an excavation permit issued by the Heritage Council of New South Wales. Consultation and discussion with the NSW Heritage Office should begin well before lodging an application for a permit to disturb or destroy a historical archaeological site.

APPLICATION TO THE STUDY AREA – NSW HERITAGE ACT 1977 RELICS PROVISIONS

There are no identified archaeological sites within the study area; however, the relics provisions are applicable to relics regardless of heritage listing. Archaeological sites that may be identified in the study area during survey will be protected by the relics provisions of the NSW *Heritage Act 1977*.

3.2.3 Environmental Planning and Assessment Act Registers

The *Environmental Planning and Assessment Act 1979* includes provisions for local government authorities to consider environmental impacts in land-use planning and decision making. Such impacts are generally considered in relation to the planning provisions contained in the Local Environment Plan (LEP) or regional Environment Plan (REP).

Local Environmental Plans: Each Local Government Area (LGA) is required to create and maintain a LEP that includes Aboriginal and historic heritage items. Local Councils identify items that are of significance within their LGA, and these items are listed on heritage schedules in the local LEP and are protected under the *EP&A Act 1979* and *Heritage Act 1977*.

APPLICATION TO THE STUDY AREA – WINGECARRIBEE LEP 1989 SCHEDULE 2

There are no heritage items within the study area listed on the Wingecarribee LEP 1989. “Avon Dam” (inventory number 2680224) is listed in Schedule 2 of the *Wingecarribee LEP 1989*. This listing is a direct transfer of the SHR listing of the dam, and as such the listing curtilage is congruous with the SHR listing curtilage. Discussion with Kate Wooll (Strategic Planner, Wingecarribee Shire Council 30/08/07) indicated that while the listing applies to a large area, Council is particularly concerned with the built elements of the dam, including architectural / engineering items and associated houses and buildings. Built elements and the identified heritage curtilage are not within the current study area.

APPLICATION TO THE STUDY AREA – WOLLONDILLY LEP 1991 SCHEDULE 1

“Cordeaux Dam and Pumping Station” is listed in Schedule 1 of the Wollondilly LEP 1991. Discussion with Martin Cooper (Planner, Wollondilly Shire Council) indicated that Council could not identify a curtilage to their listing. Consequently it is unclear if this listing applies to lands currently within the current study area.

APPLICATION TO THE STUDY AREA – WOLLONGONG LEP 1990 SCHEDULE 1

No items within the study area are listed in the heritage schedule of the *Wollongong LEP 1990*.

Regional Environmental Plans: Under the EP&A Act, broad scale regional plans have also been developed that address cultural heritage resources that may extend beyond the geographic limit of one LGA. The following REPs with heritage provisions apply to parts of the current study area.

Illawarra REP No 1: The *Illawarra REP No. 1* applies to the Kiama, Shellharbour, Shoalhaven, Wingecarribee and Wollongong local government areas. The REP provides a planning and decision making framework for how to best use land resources, improve quality of life and protect regional interests and investment. The Illawarra REP identifies the Illawarra region as possessing unique characteristics worth preserving and distinguishes items of cultural heritage.

APPLICATION TO THE STUDY AREA – ILLAWARRA REP 1986 NO 1

No items within the study area are listed in the heritage schedule of the *Illawarra REP Plan No. 1*.

Sydney REP No 20 – Hawkesbury-Nepean River (No 2-1997): This REP applies to lands associated with the Hawkesbury Nepean River within the Greater Metropolitan Region, including the Wollondilly LGA. The plan seeks to protect and enhance cultural heritage values along the river and promote acknowledgement of the importance of the river in contributing to the significance of such items and places. Schedule 1 of the REP lists heritage items which are not protected under other local environmental planning instruments.

APPLICATION TO THE STUDY AREA – SYDNEY REP NO 20 – HAWKESBURY-NEPEAN RIVER 1997

No items within the study area are included in Schedule 1 of the *Sydney REP No 20*.

3.3 Non-Statutory Registers

3.3.1 The National Trust of Australia (NSW)

The National Trust of Australia (NSW) is a community-based conservation organisation. The Trust maintains a Register of heritage items and places. Although the Register has no legal foundation or statutory power, it is recognised as an authoritative statement on the significance to the community of particular items, and is held in high esteem by the public. The National Trust lists items or places that have heritage or cultural value to the community and, as such, the Trust encourages and promotes the public appreciation, knowledge, and enjoyment of heritage items for future and present generations.

APPLICATION TO THE STUDY AREA – NATIONAL TRUST OF AUSTRALIA (NSW)

No items classified (listed) by the National Trust of Australia are located within the study area associated with this proposal.

While the National Trust has classified Cordeaux Dam, the listing comprises Cordeaux Dam Wall, including bywash and valve houses and these items are not within the current study area.

While the National Trust has classified Avon Dam, the listing comprises Avon Dam, valve houses, spillway channel and saw tooth weir and these items are not within the current study area.

3.4 Summary of heritage listings in the study area

There are 40 previously identified heritage items within the Dendrobium Area 3 study area. These are summarised in Table 1 below.

<i>ITEM</i>	RNE	CHL	NHL	AHIMS	SHR	SHI	WLEP 1989	WLEP 1991	IREP 1986	SREP 20 1997	NATIONAL TRUST
Cordeaux Dam heritage curtilage					Y	Y		?			
40 Aboriginal sites within Dendrobium Area 3 Study Area – see Appendix 2 and Figure 6				Y							

Table 1: Summary of known heritage items within the study area

4.0 ENVIRONMENTAL CONTEXT

A description of the environmental background to the study area is provided in order to give context to the archaeological assessment. The environmental aspects of an area will influence the type of archaeological remains that are likely to be present.

Firstly, the environmental conditions of the study area may have influenced the land use by people in the past, and secondly, they will affect the processes by which sites are preserved. Environmental values of an area can also contribute to the cultural significance and attachments people have to a place.

The following background is a brief summary of information relevant to the current assessment of archaeological values of the study area.

4.1 Geology, Soils and Landforms

The geology of the present study is dominated by Hawkesbury Sandstone, exposed where the overlying Wianamatta Formation has been dissected by major water courses such as the Cordueax, Avon and Nepean rivers (Branagan and Packham 2000:59). The Middle Triassic Hawkesbury Sandstone consists of overlapping beds of quartz-rich sandstone. The more recent Middle Triassic Wianamatta Group comprises primarily of shales. These formations are underlain by deep Permian Coal Measures that consist of shale sandstone, conglomerates, tuff, chert and coal.

Dendrobium Area 3 is situated on the southern Woronora Plateau within the Cordeaux and Avon Catchments. The soils derived from the above described geological formations within the study area are dominated by the Hawkesbury (ha) and Lucas Heights (lh) soil landscapes as mapped on the Wollongong 1:100,000 mapsheet (Hazelton and Tille 1990). In general, soils in these areas are loose, shallow and sandy.

Two major soil landscapes have been defined within the study area (Hazelton and Tille 1990). Each soil landscape has distinct morphological and topological characteristics. This results in each landscape having different archaeological potential. Because they are defined by a combination of soils, topography, vegetation and weathering conditions, soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure. There is one colluvial landscape (Hawkesbury) and one residual landscape (Lucas Heights) in the study area (Hazelton and Tille 1990: 23-6, 45-9). Residual soil landscapes are characterised by areas where soils are derived from the long-term, in situ weathering of parent materials. Examples of these types of soil landscapes are flats, plains and plateaus with poorly defined drainage lines. Colluvial soil landscapes are dominated by areas where mass movement is the principal agent of accumulation. Cliffs, scarps, and steep slopes are examples of colluvial soil landscapes.

The Hawkesbury Sandstone Soil landscape is characterised by rugged sandstone escarpment and ridges, with moderate to steep slopes and narrow, deeply incised valleys of the Woronora

Plateau (Hazelton & Tille 1990). Sandstone rock outcrops are very common, and occurs as boulders, benches and large blocks, often forming scarps up to 10 metres high. It is confined to the margins of the major rivers including the Nepean and Avon, and larger tributaries. The soils in this landscape are shallow, discontinuous and generally sandy. The Hawkesbury landscape is the most archaeologically sensitive landscape in the study area, as the blocks and weathered scarps provide overhangs with a suitable environment for rock art and in some cases the accumulation of cultural deposits; however deposits with the potential for deep, stratified archaeological sites are very limited. Previous archaeological work in the region has demonstrated an abundance of rock art associated with this landscape, and the steep gorges and gullies are where most archaeological survey has been focused.

The Lucas Heights Soil landscape can be described as having gently undulating crests, ridges and plateau surfaces, with local relief between 10 to 50 metres and slopes of less than ten per cent (Hazelton & Tille 1990). The soils are generally yellowed to lateritic podsollic, however, this landscape is known for outcrops and limited deep soil bases (Hazelton & Tille 1990). Limitations include stoniness, hard-setting surfaces and low soil fertility. Within the study area this soil type is confined to the ridge tops and gentle slopes. Although this soil landscape consisted of generally shallower soils, it is still considered to be of some Aboriginal archaeological potential. These site types are more likely to comprise isolated stone artefact occurrences situated on travel routes rather than campsites.

In general, the study area consists of rugged sandstone escarpment and ridges, with moderate to steep slopes and narrow, deeply incised valleys. These areas are most likely to contain significant sandstone overhangs that may have been used as shelter sites. Those sections of the study area that is located away from major water courses will comprise gently undulating crests, ridges and plateau surfaces. On open plateau, adjacent to swamps where open sandstone platforms occur, axe grinding groove sites are most likely to occur.

4.2 Climate

In general, the climate within the study area is warm to temperate. There are, however, significant variations within the various landscape types. Average maximum daytime temperatures in the Wollongong region range from 26 degrees Centigrade in summer and 17 degrees Centigrade in winter. Autumn is the wettest time of the year and winter the driest, with average annual rainfall at over 1,000 millimetres (Bureau of Meteorology 2005). The plateau region is cooler and drier than the coast. Conditions in the study area would have been relatively mild during human habitation of the region and would not have posed any major restriction to a hunter-gatherer lifestyle.

The climate of the study area would have allowed a hunter-gatherer lifestyle year-round in the Holocene period that is the last 10,000 years. The prior glacial period would have been cooler and drier and the coast would have been a considerable distance away from its present position. Sea levels were lower as most of the water was trapped in glacial ice. Mainland Australia had few glaciers, which were located in alpine areas. A cooler climate would have

affected a hunter gatherer lifestyle as, for example, flora and fauna resources would be different than that found in today's warmer climates.

4.3 Flora and Fauna

For the purposes of discussing the significance of plant species in relation of historic and Aboriginal use, the details of each community will not be discussed here in detail. The details of individual plant communities can be found in Biosis Research (2007b). Instead, a general summary of four broad vegetation types that are relevant to traditional usages will be summarised below.

Upland Swamps

The Upland Swamps of the Illawarra Escarpment and Woronora Plateau are low heaths and sedgeland ranging in height from 0.5 metres to 3 metres. Species composition is variable but typical shrub species may include *Acacia rubida* (Wattle), *Banksia paludosa* (Swamp Banksia), *Banksia robur* (Large-leaved Banksia), *Banksia ericifolia* (Heath Banksia), *Hakea teretifolia* (Dagger Hakea) and *Leptospermum* spp. (Tea trees, Tanton). The ground layer is dominated by a variety of herbs, sedges and grasses including *Dodonaea triquetra* (Common Hop Bush), *Lomandra longifolia* (Spiny headed Mat Rush), *Baumea teretifolia* (Wrinkle-nut Twig-rush), *Gahnia sieberi* (Red-fruited Saw Sedge), *Lepidosperma limicola*, *Leptocarpus tenax* (Twine-rush), *Entolasia stricta*, and *Gleichenia dicarpa* (Pouched Coral Fern).

Ridge-top Woodland

The ridges and plateaus of the study area support eucalypt woodland and open forest to a maximum height of 15 metres. The unit is relatively homogeneous throughout the broader sandstone ridges and plateaus and has well-defined tree, small tree, shrub and ground layers. Characteristic tree species include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus racemosa* (Scribbly Gum) and *Eucalyptus sieberi* (Silvertop Ash). A variety of stringybark species are also usually present in smaller numbers. *Banksia serrata* (Old Man Banksia) and *Leptospermum trinervium* (Paperbark Tea-tree) dominate the small tree layer while *Banksia spinulosa* (Hair Pin Banksia), *Dillwynia retorta*, *Platysace linearifolia*, *Petrophile sessilis*, *Eriostemon australasius*, *Isopogon anemonifolius*, *Phyllanthus hirtellus*, *Lambertia formosa*, *Hakea sericea* and *Persoonia levis* are common shrub species amongst many others. The composition of the ground layer is largely determined by localised drainage patterns but may include *Cyathochaeta diandra*, *Gahnia sieberiana*, *Lomandra* spp., *Dampiera stricta*, *Lepyrodia scariosa* and *Lepidosperma laterale*.

Gully Forest

Gully forest occupies the slopes and gullies of the Woronora Plateau. It is a dry forest to a height of 25 metres dominated by *Eucalyptus piperita* (Sydney Peppermint) and *Corymbia gummifera* (Red Bloodwood). A diverse shrub layer that includes *Banksia spinulosa* (Hair-pin Banksia), *Persoonia* spp. (Geebungs), *Acacia longifolia*, *A. myrtifolia*, *A. ulicifolia*, *A.*

binervata, *Pultenaea* spp. (Bush Peas) and *Leucopogon lanceolatus* (Lance Beard-heath) is present. *Telopea speciosissima* (Waratah) are also common and are conspicuous when in flower. *Banksia serrata* (Old Man Banksia) is common as a small tree. The ground cover is similarly diverse with combinations of *Entolasia stricta*, *Lomandra* spp. (Mat Rushes), *Dendrobium speciosum* (Rock Orchid), *Patersonia glabrata* (Leafy Purple Flag), *Dianella caerulea* (Blue Flax-lily), *Billardiera scandens* (Apple Berry), *Gonocarpus teucroides* (Raspwort), *Lomatia silaifolia* (Crinkle Bush) and *Phyllanthus hirtellus* (Thyme Spurge) found consistently within sites. Variation occurs within this vegetation type in response to the degree of shelter and rainfall.

Warm Temperate Rainforest

Warm Temperate Rainforest occurs in gully lines and south and east-facing slopes. This vegetation type is composed of a closed canopy of *Ceratopetalum apetalum* (Coachwood) and *Doryphora sassafras* (Sassafras) that can reach heights up to 30 metres. *Acmena smithii* (Lilly Pilly), *Cryptocarya glaucescens* (Jackwood), *Acacia melanoxylon* (Blackwood), *A. binervata* (Two-veined Hickory) and *Backhousia myrtifolia* (Grey Myrtle) are common in the small tree layer. Limited sunlight penetrates the canopy and as a consequence only a sparse understorey of shade tolerant species are present including *Lastreopsis decomposita* (Trim Shield Fern), *Microsorium scandens* (Fragrant Fern), *Arthropteris tenella*, *Morinda jasminoides* (Sweet Morinda), *Polyosma cunninghamii* (Featherwood), *Tasmannia insipida* (Brush Pepperbush) and *Livistona australis* (Cabbage-tree Palm). Greater elevation on the Woronora Plateau favours the growth of rainforest species associated with cool temperate environments such as *Quintinia sieberi* (Possumwood) and *Eucryphia moorei* (Pinkwood).

The vegetation across the plateau would have contained a diverse range of fauna (NSW NPWS 2002), including koalas, quolls, rock wallabies, bandicoots as well as birds such as cockatoos, falcons and owls. Along the waterways there would have been frogs, platypus and within the waters there would have been numerous fish species, such as perch, eels and galaxias. The plateau was an abundant resource for Aboriginal people. Aboriginal people hunted animals for food and materials. For example, the bones of animals could be fashioned into fishhooks and other everyday implements.

4.4 Resource Statement

Based on the background information provided from various source material, it is possible to speculate what resources would have been available for both Aboriginal and European exploitation.

Quartz is the main stone raw-material type suitable for Aboriginal tool manufacture that would be likely to occur in the vicinity of the study area in any abundance. This would be in the form of pebbles derived from the Hawkesbury sandstone. Elsewhere on the Woronora Plateau and Cumberland Lowlands the potential raw materials for stone artefact making include silcrete, chert, tuff, mudstone, quartz, quartzite and basalt (Smith 1989). Deposits of

clays and ochres suitable for art, particularly stencil art, are locally available in the vicinity of the study area and its adjacent land systems.

The continuous flow of water along Wongawilli Creek and associated tributaries would have provided a constant supply of water, and supported a diverse natural environment that would have provided vast and plentiful flora and faunal resources.

The Woronora Plateau would have provided a wide diversity of resources for the Aboriginal hunter-gatherer population. This diversity is even greater when it is considered how close the coastal resource areas are to the rugged plateau. Many of the plants found in the area could be used by Aboriginal people for numerous purposes. These include using wood to make implements, berries, leaves and tubers for food and medicines as well as bark for shelter construction.

Many of the plants found within the area were important to both Aboriginal people and early Europeans inhabiting the area and could be used for numerous purposes. Based on the known species that occur within the study area, the following table summarises how these would have been utilised by the Aboriginal people once inhabiting the area. These include using the wood to make implements; berries, leaves and tubers for food and medicines as well as bark for shelters (Table 2 below).

SPECIES	*TRADITIONAL USE
Ridge Top Woodland	
<i>Banksia serrata</i> (Old Man Banksia)	The nectar of the flowers was sucked or soaked to make a sweet beverage. The cones were used for retaining fire as they will remain alight for a considerable period
<i>Banksia spinulosa</i> (Hair-pin Banksia)	
<i>Corymbia gummifera</i> (Red Bloodwood)	The nectar from flowers was sucked. The resinous sap was used to stop fibre fishing lines from fraying. The red resinous sap was also used to attract <i>Cryptococcus</i> insects which form sweet tasting galls. The exudate was also used internally and applied externally in powdered form to treat sores
<i>Eucalyptus agglomerate</i> (Blue-leaved Stringybark)	The bark from these trees was made for making canoes. Also used the bark for making twine by rolling the fibres of soaked bark against their thighs
<i>Eucalyptus sieberi</i> (Silver Top Ash)	A fine grained hard wood used for tool handles, such as axes and oars
<i>Leptospermum trinervium</i> (Paperbark Tea-tree)	The leaves are pungent and crushed for medicinal purposes
<i>Gahnia sieberiana</i> (Saw sedge)	The seeds were pounded to produce flour and the bases of the leaves are edible
<i>Personia levis</i> (Borad Leaf Geebung,.)	The fruits were eaten, although difficult to collect ripe as birds eat the unripened fruit. The bark of the Geebung was used to make a solution in which fishing lines were soaked for strength
<i>Lomandra cylindricabn</i> (Mat Rush)	Both the flowers and the bases of the leaves (pea like flavour) were edible
<i>Xanthorrhoea media</i> (Forest Grass Tree)	The flower stems produce significant nectar which can be eaten or placed in water to sweeten drinks. The stalks were used for spear shafts and the resin as glue for tools and weapons. The resin was collected as a powder by beating the leaf bases. The resin could also be collected in the trunks of old, dead, burnt stumps
Gully Forest	
<i>Acianthus</i> spp. (Orchids)	The tubers of this plant were eaten and were an important source of nourishment
<i>Corymbia gummifera</i> (Red Bloodwood)	The nectar from flowers was sucked. The resinous sap was used to stop fibre fishing lines from fraying. The red resinous sap was also used to attract <i>Cryptococcus</i> insects which form sweet tasting galls. The exudate was also used internally and applied externally in powdered form to treat sores

<i>Eucalyptus piperita</i> (Sydney Peppermint)	**First plant to be used medicinally by Europeans – the oil from the leaves was distilled**
<i>Eucalyptus agglomerate</i> (Blue-leaved Stringybark)	The bark from these trees was made for making canoes
<i>Dendrobium speciosum</i> (Rock Orchid)	The starchy stems are roasted and eaten, and also chewed and rubbed into sore, burns and wounds
<i>Dianella species</i> (Blue Flax Lilies)	The fruits were eaten raw. The roots were also eaten after pounding and roasting. The strong leaf fibres were made into string.
<i>Persoonia levis</i> (Borad Leaf Geebung), <i>Persoonia. pinifolia</i> (Pine-leaf Geebung)	The fruits were eaten, although difficult to collect ripe as birds eat the unripened fruit. The bark of the Geebung was used to make a solution in which fishing lines were soaked for strength
Upland Swamps	
<i>Acacia rubida</i> (Red-stemmed Wattle)	Seeds were ground for flour
<i>Banksia paludosa</i> (Swamp Banksia)	The nectar of the flowers was sucked or soaked to make a sweet beverage. The cones were used for retaining fire as they will remain alight for a considerable period
<i>Banksia robur</i> (Large-leaved Banksia)	The nectar of the flowers was sucked or soaked to make a sweet beverage. The cones were used for retaining fire as they will remain alight for a considerable period
<i>Banksia ericifolia</i> (Heath Banksia)	The flowers were sourced for their sweet nectar and either sucked or soaked
<i>Dodonaea triquetra</i> (Common Hop Bush)	The leaves were chewed for toothache and used as a poultice for stonefish and stingray wounds. The liquid made from soaking the roots was used for open cuts and sores
<i>Lomandra longifolia</i> (Spiny headed Mat Rush)	The seeds were ground for flour. The flowers and the base of the leaves are edible. The tough leaves were also used to make baskets
<i>Pteridium esculentum</i> (Common Bracken Fern)	The rhizome of this plant was a staple food source – roasted first to destroy the toxins before being chewed/eaten
<i>Gahnia sieberiana</i> (Saw sedge)	The seeds were pounded to produce flour and the bases of the leaves are edible
Warm Temperate Forest	
<i>Acacia melanoxylan</i> (Blackwood)	The seeds were collected and eaten
<i>Amema smithii</i> (Lilypilly)	The fruit was edible
<i>Livistona australis</i> (Caggabe Tree Palm)	The tip of this palm is edible. The leaves were used as roof thatch and for weaving baskets. The bark was used for making fishing lines
<i>Lomandra longifolia</i> (Spiny headed Mat Rush)	The seeds were ground for flour. The flowers and the base of the leaves are edible. The tough leaves were also used to make baskets

Table 2: Traditional Aboriginal plant resources and use within the study area

**** Sources: Robinson 1991; Stewart and Percival 1997 ****

The various fauna species present within the study area would have provided a range of resources for the Aboriginal peoples. Terrestrial and avian resources were not only used for food, but also provided a significant contribution to the social and ceremonial aspects of Aboriginal life. Mammals such as kangaroos and wallabies and arboreal mammals such as possums can be used as a food source and also for tool making. For example, tail sinews are known to have been used as a fastening cord, whilst ‘bone points’ which would have functioned as awls or piercers are an often abundant part of the archaeological record. Ethnographic observations of early European settlers coming in contact with Aboriginal people noted the use of a variety of animal parts; claws, talons, bone, skin, teeth, shell, fur and feathers were all used for a variety of tools and non-utilitarian functions. Aquatic species such as freshwater crayfish would have been easily accessible in larger waterways, such as the Wongawilli Creek (Rosen 1995). Aquatic vertebrates such as fish and eels would also have been present in the larger creeks and waterways.

Previous archaeological investigation within the study area has identified sources of ochre on the Woronora Plateau (Sefton 1998:33). Cavernous weathering results in the disintegration of a sandstone surface, exposing coloured (yellow: goethite-rich or red: hematite-rich) sandstone. Often, the case-hardened surfaces present around these disintegrating areas are undercut (Sefton 1998:36).

5.0 ABORIGINAL CONTEXT

5.1 Ethnohistory & Contact History

It is generally accepted that people have inhabited the Australian landmass for at least 50,000 years (Allen and O'Connell 2003). Dates of the earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. The timing for the human occupation of the Sydney Basin is still uncertain. Whilst there is some possible evidence for occupation of the region around 40,000 years ago, the earliest undisputed radiocarbon date from the region comes from a rock shelter site north of Penrith on the Nepean, known as Shaws Creek K2, which has been dated to 14,700 +/- 250 BP (Attenbrow 2002: 20). This site is over 50 km north from the study area along the Nepean River. To the south, along the coast just north of Shellharbour the site of Bass Point has been dated at 17,101 +/- 750 BP (Flood 1999). Closer to the study area on the Woronora Plateau the oldest date for Aboriginal occupation so far recorded is 2,200 +/- 70 BP at Mill Creek 11 (Koettig 1985). Such a 'young' date is more likely a reflection of conditions of archaeological site preservation and sporadic archaeological excavation, than actual evidence of the presence or absence of an Aboriginal hunter-gatherer population prior to this time.

Our knowledge of Aboriginal people and their land-use patterns and lifestyles prior to European contact is mainly reliant on documents written by non-Aboriginal people. The inherent bias of the class and cultures of these authors necessarily affect such documents. They were also often describing a culture that they did not fully understand – a culture that was in a heightened state of disruption given the arrival of settlers and disease. Early written records can, however, be used in conjunction with archaeological information and surviving oral histories from members of the Aboriginal community in order to gain a picture of Aboriginal life in the region.

The Dendrobium study area is recognised as being within the traditional lands described as Wodi Wodi tribal group. The traditional Wodi Wodi land extended from around Stanwell Park to the Shoalhaven River, and as far in land as Picton, Moss Vale and Marulan. The Wodi Wodi spoke the Dharawal language, however Dharawal (Tharwal) was not a word they had heard of or used themselves (Tindale 1974, Navin Officer 2000:20). Many of the town and place names of the Illawarra are derived from the Dharawal language.

Traditional Aboriginal social organisation consisted of clans and bands. It was through clans that associations with lands and sites were dictated. Marriage was between clans, and groups that included individuals who had married into the group are referred to as bands. In day to day life bands ranged over economic areas that included lands of more than a single clan. Attenbrow (2002) sums up the situation succinctly by saying “whilst the relationship of clan to country was principally religious in character, that of band to range was economic.”

Interactions between different types of social groupings would have varied with seasons and resource availability. It has been noted that interactions between the groups inhabiting the many resource zones of the Sydney Basin (coastal and inland) would have varied but were

continuous. This is reflected in the relatively homogenous observable cultural features such as art motifs, technology and resource use (McDonald 1992).

The arrival of European colonists in early 1788 wrought swift and catastrophic change to the Aboriginal people of the Illawarra region. Europeans began appearing in the area before the end of the eighteenth century, and by the first couple decades of the nineteenth century forestry had begun in the region, and the land was broken up for pastoral and dairy enterprises throughout that century. Conflict, disease and dispossession took a terrible toll on the Wodi Wodi and Tharawal peoples. In 1820 approximately 3,000 Aboriginal people were living in the Illawarra, but by 1899 their numbers had declined to only 33 people of non-mixed descent. Today many Wodi Wodi and Tharawal people continue to live in the Illawarra.

5.2 The Archaeological Record - Regional Overview

Previous archaeological work in the region began in the early 1960s, with the identification of a large shelter containing Aboriginal art and deposit by Fred McCarthy in 1961. This shelter site became known as 'Whale Cave' and has been discussed as part of academic investigations into regional variations of rock art and the prehistory of the Illawarra (Officer 1984; Sefton 1988; and McDonald 1994). Very little archaeological excavation work has been undertaken in this region of the Sydney Basin. The majority of this work has focussed on coastal and estuarine regions. Those shelters that have been excavated within the inland plateau environment have yielded dates of 2220 ± 70 BP, with evidence of the earliest occupation at Mill Creek 11 (Koettig 1985). More recent dating of the deposits at Mill Creek 11 and 14 yielded similar dates (Koettig 1990:22).

More recently, archaeological work has been in the form of environmental impact assessment survey in response to mining activities in the Illawarra (Sefton 1990, 1991 and 1994; Navin Officer 2000; Biosis Research 2004).

Officer (1984) completed his Honours Thesis, which involved the formal analysis of 57 sandstone shelters and 7 engraving sites in the Campbelltown region to explore and describe the formal variability within a local body of art, at a local and regional level (Officer 1984: 2). To complete this analysis, a hierarchical motif classification system was formulated. The results identified considerable heterogeneity in this body of art, in motifs and present traits. He also identified strong localised ties between the coast and hinterland, despite a linguistic boundary and other evidence for cultural dichotomy here (Officer 1984).

Sefton (1988) completed post graduate work that focussed on site and artefact patterns on the Woronora Plateau. The data used for this investigation has been collected over a number of years (between 1970 and 1998) by the Illawarra Prehistory Group. The study area comprises a 351km square area that stretches from the Illawarra Escarpment in the east, north as far as the Woronora River, west to Wallandoola River and the southern reaches of the Cataract Catchment (Sefton 1988: 5).

The major associations considered included patterned relationships between sites, the cultural material they contain, the drainage basin on the Woronora Plateau in which they are located and their coastal or inland location. When using the data to determine spatial patterning, a number of factors should be considered, including survey technique, site or artefact destruction, survival or visibility, environmental variability or human socio-cultural behaviour. Ethnohistorical information and site patterning data will then be used to formulate a north/south territory boundary between the Tharawal and Wodi Wodi people.

One of the major limitations of Sefton's assessment for Aboriginal sites was that the survey technique was not designed to systematically identify surface stone artefact scatters, but rather focussed on sandstone overhangs, open sandstone outcrops or platforms, and grinding grooves (1988:13). The analysis of archaeological sites was solely focussed on grinding grooves, engravings, and shelter sites and the archaeological features that are associated with them. The results of field work completed over the last 20 years were used as the basis of analysis to identify patterns and determine the relationship between shelter distribution, archaeological content, and suitable environment, economic strategy and settlement patterns.

Many archaeologists argue against the use of site frequency to determine population density and land use patterns as it does not take into consideration behavioural change and archaeological site visibility that bias the interpretation of the archaeological record (Ross 1981; Vinnicombe 1980; Attenbrow 1987). However, Sefton argues that site density can be used as an indicator of spatial distribution or density of the Aboriginal population within the study area using multivariate analysis (Sefton 1988:62).

She concludes that the high density of grinding grooves located within the Georges River Basin indicated a higher population density in this basin than that in the Cataract River Basin (Sefton 1988:62). Despite a correlation between the presence of rock engravings and grinding grooves at the same location, rock engravings are generally restricted to the coastal regions rather than inland regions (Sefton 1988:69). The overall distribution of shelters is markedly similar to the distribution of grinding grooves (Sefton 1989:120). Variations in distribution can be attributed to appropriate environmental requirements, ie. sandstone overhangs or sandstone platforms.

The analysis of shelter sites and attributes demonstrated clear patterns between shelters, shelter attributes, drainage basins on the Woronora Plateau and the inland/coastal associations of the shelter sites (Sefton 1988:166). The results indicated a difference in settlement patterns, population size and differential use of the study area. These differences corresponded with the ethnographic observations of a coastal/inland subdivision of the *Tharawal* population, and the concept of a drainage basin based territorial division within the study area (Sefton 1988).

Rich (1989) undertook a survey of for proposed road upgrades, of Fire Road no. 15 and Cordeaux Road near Mount Kembla partly along the Illawarra Escarpment and along American Creek. Rich (1989: 12) provided a discussion of the likelihood of sites being located within her study area. She noted that the top of the Illawarra Escarpment is quite flat

and would have been a good access route for travel between the coast and inland. Sites located on the escarpment would reflect temporary stop over camps with low density scatters representing maintenance and sharpening of tools rather than the manufacturing of tools. However such low density of artefacts would be difficult to locate due to the poor visibility in the area, and within the road corridor study area, would probably have been damaged or destroyed by the development of the road. Along American Creek which was within the road corridor it is possible that open occupation sites may have been present, these would probably have been low density scatters reflecting local materials and utilized by small family groups (Rich 1989:12).

During the survey no Aboriginal Archaeological sites were located within the road corridor, nor had any sites previously been recorded within the corridor. The survey corridor was very narrow up to 10m wide of the existing road, and it did not include any of the flat ground at the top of the escarpment or along American creek. The corridor was very disturbed by road construction and ground visibility was very low due to grass cover, leaf litter and gravel and bitumen roads.

Sefton (1990) completed archaeological survey of the Cordeaux and Woronora rivers as part of the Illawarra Prehistory Group with a grant received from the Australian Institute of Aboriginal and Torres Strait Islander Studies. The areas surveyed comprise two areas 30 kilometres apart one is in the Cordeaux Catchment area and is relevant to the current study area, the other is in the Woronora Eastern Catchment area.

During the survey a total of 87 archaeological sites were located within the Cordeaux Catchment study area, these include both previously recorded sites and recorded during the survey. Sefton (1990: 26-27) provides useful statistical data about site types and content based on the site information recorded during the survey. The most common site type were shelters 58, followed by 29 grinding sites, 2 rock engraving sites and 2 engraved groove channel sites. A total of 667 motifs are depicted within the shelters. The most common art technique is charcoal drawing 571 motifs, followed by 57 red drawings, 42 red stencil, 17 white stencil 13 red painting, 7 bichrome and 4 white drawing.

Within the Cordeaux Catchment two major art sites were identified during the survey. These are Donald Castle Creek 4 and Donald Castle Creek 12. Both sites are suffering from water damage and charcoal deterioration. The report (1990:30) recommended that the sites should be assessed by a rock art conservator.

Sefton (1994) undertook archaeological survey of the Avon River as part of the Illawarra Prehistory Group with a grant received from the Australian Institute of Aboriginal and Torres Strait Islander Studies. This survey was undertaken with a grant received from the Australian Institute of Aboriginal and Torres Strait Islander Studies. The study area is located in the Avon Catchment area. The study area was mostly on Hawkesbury Sandstone, and Sefton derived her methodology based on her knowledge of the geology and topography and the study of maps, she formed the following model that was used as her methodology:

- Stone arrangements and rock engravings were considered likely to occur on flat sandstone caps on ridge tops or in saddles;
- Grinding grooves were considered likely to occur on waterpans at ridgetop level or on sandstone associated with swamps;
- Engraved groove channels and rock engravings were likely to occur associated with swamps;
- Under ridgetop caps sandstone overhangs may be present and may contain art, archaeological deposit and / or art, archaeological deposit and/or grinding grooves;
- On valley slopes sandstone overhangs frequently occur and these may contain art, archaeological deposit and / or art, archaeological deposit and/or grinding grooves;
- Surface deposits in overhangs were searched for stone artefacts and shell.

The survey concentrated on sandstone outcrops and surface scatters were only looked for where walking tracks had exposed ground. Within the Avon Catchment study area, 53 shelters with art were located, 17 had stone artefacts. Thirteen grinding grooves were located followed by 2 stone arrangements and 1 engraved groove channel.

McDonald (1994) completed a PhD thesis that focussed on prehistoric rock art within the Sydney region. The rock art that was examined included open sites comprising engravings or petroglyphs, and rock shelter sites, comprising rock art consisting of drawings, stencils, paintings and engravings. Information gathered from previous archaeological work throughout the Sydney Basin was used to define a model for cultural interaction that can describe this prehistoric art system, which was to be based on the information exchange theory.

In essence, the model proposed in this thesis is that because the shelter art has a greater visibility to a broader section of the community, it had potential to function in a different fashion to the engraved art of the region which is not associated with habitation debris (McDonald 1994:124).

Resource exploitation in the inland systems would have been focussed on the resources associated with the river systems, with specialisation in hunting macropods and fish/eels. This is reflected in the types of images depicted in shelter art .

A number of major differences were identified in site type frequency and site component variations. Shelters with art south of the Georges River had a much lower number associated with deposits (25/365:31%), while to the north, almost one third (111/365) contained both art and deposit components (McDonald 1994:103). Further, almost one third (7/25: 28%) of shelter sites with deposits contained grinding grooves, whereas only 12 of 113 sites (10.6%) north of the river contained grinding grooves. It should be pointed out that it is highly probable that the number of shelters with art and deposits is much greater than recorded, due to observer bias, increasing the figures for pigment art and occupation deposit correlation.

This is also the trend when looking at the presence of rock engraving sites. North of the Georges, 155 of the 365 sites contain rock engravings, while south of the Georges, only 2 out of 181 sites contain rock engravings (McDonald 1994:115).

Shelter Art

An extremely large proportion of motifs (41%) recorded consist of unidentifiable motifs (McDonald 1994:104), which can be attributed to poor preservation from the great instability of the sandstone surfaces within the shelters. Of the identifiable motifs, hand stencils and hand variations predominate (49%). The other main depictable motifs include macropods (9%), anthropomorphs (7%) and other land animals (5.5%). The majority of this art is depictive (66.1%), followed by stencilling (32.6%) and engraving (1.3%) (McDonald 1994:106). Of these, most are created using dry pigments, such as charcoal. The remainder have been painted, and very few are a combination of both. Colours used in stencilling are dominated by red and white, with a small number of localised yellow and black stencils also recorded (McDonald 1994:113-114). Depictive motifs have been executed in outline and infill form (38%), although outline only forms are just as common.

Sub-surface excavation work undertaken by Attenbrow (1987) on a sample selection of sites revealed that 90% of shelters identified as having PAD actually contained archaeological deposits, such as stone tools.

She noted that in comparing the two art forms, sheltered and open art sites, it could be said that there are two synchronous art forms in the Sydney Basin. The comparison revealed two underlying similarities between the art forms, firstly that they are both relatively recent and, secondly that they are roughly contemporaneous (McDonald 1994:115).

Motif Types

The site size and motif focus vary across the Sydney Basin region (McDonald 1994:215). General trends that were observed indicated higher proportions of land animals inland, compared to marine and fish depictions at coastal sites. Analysis of the Tharawal sites (n=52) reveals an assemblage which is markedly different to the northern language groups (McDonald 1994:229). A comparison between the two drainage basins within this language area suggests geographic influences created differences in its coastal and inland sub-groups.

Shelter Art Motif

The analyses indicate that hand stencils do not predominate the recognisable motifs, unlike all other regions within the Sydney Basin (McDonald 1994:282). Macropods dominate the depictive motifs, followed by other land animals, anthropomorphs and birds, demonstrating a less common focus on depicting marine animals, despite being located on the coast (McDonald 1994: 285). This finding contrasts markedly with the engraving component. The depiction of women and hero figures are also extremely rare. Results also identified an increase predominance of black pigment and concomitant scarcity of white pigment in this

region. White pigments are the preferred medium in the north of the region, while black pigments are more commonly used in the southern regions.

There are significant variations in motif assemblages throughout the region. Motif classes that are present in the northern and southern areas are not present in the central area of the Sydney Basin (McDonald 1994:327). Similarities in Tharawal and southern Darug motifs, compared with northern Darug motifs, indicate that the proposed boundary between these two language groups was unimportant (McDonald 1994:327).

Colour usage in the different language areas reveals definite stylistic preferences across the region.

McDonald's (1994) thesis concluded that there are major variations in rock art technique and motif type between southern areas on the Woronora Plateau and the central and northern areas of the Sydney basin.

Sefton (1997) completed archaeological survey of the Avon River as part of the Illawarra Prehistory Group with a grant received from the Australian Institute of Aboriginal and Torres Strait Islander Studies. The study area includes the western section of the Avon River, between Illawarra escarpment and the confluence with the Nepean River. It is west of the current study area, on the opposite site of Lake Avon. During this survey, the same methodology was used as for her 1994 survey, (see above). The results of the survey found 104 shelters were identified and that art was the most frequent artefact found in shelters, 82 shelters with art were located and most of the shelters contained a deposit. Grinding groove was the most frequent artefact found in open sites, 19 in total. Stone artefacts were found in 50 of the shelters, there were 6 stone arrangements and 2 engraved groove channel sites. Shell was found in one of the shelters.

McDonald (1999) undertook an archaeological conservation plan of an Aboriginal site 'Whale Cave' listed on the National Parks and Wildlife NSW State Register. The site contains extensive pigment art assemblage and occupation deposit, it is located in the Cordeaux Catchment just south of the current study area. The roof of the shelter is unstable and the art is being adversely affected by water seepage. The art assemblage contains more than 200 motifs with black, white, red and yellow motifs. The ranges of styles of the drawings include outline, infilled, outline and infilled, geometric cross-hatching infilling. Whale cave is unusual in the local area, due to the high proportion of painted motifs; the high use of white pigment, the high proportion of identifiable assemblages and the large size of the assemblage.

The cave is collapsing due to the natural weathering of the sandstone and mining subsidence which occurred in 1979-1980. Large blocks of the roof had collapsed, and the remainder of the roof appears to be held up by a number of timber props that were installed in 1984.

McDonald made a series of recommendations to better conserve the art and to extract as much archaeological information as possible, some of these recommendations include:

- A rock art analyst should record the rock art assemblage;
- Outside of the shelter should be grouted at the joints;
- The shelters occupation deposit should be test excavated (it is the deepest deposit recorded in the area and so has an immense amount of research potential).
- Arts condition should be checked on a 3-6 month basis;
- Water entry and seepage needs to be minimised possibly by diverting water away from the site by the construction of drains;
- New hardwood props should be installed.

Navin Officer (2000) completed a large scale cultural heritage assessment for the Dendrobium Coal Project, which included Longwall Areas 1 to 3. Other areas in the study included Nebo Colliery, Kemira Colliery and the West Cliff Colliery Emplacements. Sample areas selected for the field survey were within the zones of proposed impact that were assessed as being archaeologically sensitive, that had gaps in the record or were areas of potential impact. The survey methodology aimed to re-assess previously recorded sites and identify new sites within impact zones. The field survey consisted of targeted surveys of two types, the first involving selected areas aimed at locating sandstone shelters ie. sandstone cliff lines and open sandstone platforms, and the second to focus on areas of exposure where the potential for detection of open campsites occurred ie. along existing tracks. Any large trees spotted during survey were also targeted and inspected for cultural scarring (Navin Officer 2000: 12).

The Navin Officer survey relocated nineteen previously recorded Aboriginal sites, and discovered eleven previously unrecorded sites. Within Longwall Area 1, one new site was recorded and identified; this site is a sandstone rock shelter containing art. At Longwall Area 2 one previously recorded site was relocated, this site was an artefact scatter (52-2-2043) located near sandy Creek and consisting of twelve artefacts. Two previously unrecorded sites were located and recorded within Longwall Area 2, one was a sandstone rock shelter with art, and the other is an open artefact scatter. Within Longwall Area 3 seventeen previously recorded sites were relocated and re-recorded and six previously unrecorded sites were located and recorded. These sites included 15 sandstone rock shelters with art, one sandstone rock shelter with art and artefacts, one sandstone rock shelter with artefacts and PAD, one stone arrangement and one isolated find.

For the majority of sites identified within the study area no further archaeological work was recommended, however for sites D9, SCR28, D4, D5, 52-2-0535, DCC30, BR12, BR13, BR17, BR32, BR20 further archaeological work has been recommended, either a detailed recording of the site and or archaeological monitoring (Navin Officer 2000: 66-67).

Biosis Research (2004) undertook an archaeological survey of the Lake Cordeaux Foreshore and proposed seismic lines within Dendrobium Area 3. This archaeological survey was undertaken where proposed seismic testing and borehole drilling in the Dendrobium Area 3 and on the lake Cordeaux foreshore to assess risks to archaeological heritage from the proposed works. The seismic line alignments were undertaken by walking the entire length of

the alignments and all areas of archaeological potential within the proximity of the seismic lines were closely inspected, especially sandstone overhangs and shelters. Survey of the boreholes involved inspecting a 100m radius around the spot of the proposed borehole. Pedestrian survey was conducted along sample transects of the proposed foreshore seismic testing lines. Landforms where the dominant foreshore slope was gentle and areas where overhangs occurred were surveyed.

The survey resulted in the discovery of 10 new Aboriginal archaeological sites. Two of the sites were located in the seismic line survey, one was a shelter with art the other a shelter with deposit. One of the new sites was located at a borehole location, the site is an Isolated find. The remaining seven sites were located on the Lake Cordeaux Foreshore and were all stone artefacts sites, three Isolated Finds and four Artefact scatters.

Biosis Research (2004: 27) found that the types of site discovered during the seismic transects and borehole survey are very much characteristic of the sites that have been previously recorded in Dendrobium Area 3. Overall the sites discovered conform to the models previously developed for the area, which can be summarised as follows: Shelter sites will be common where conditions are suitable, and most will contain art; stone artefact sites are present, though difficult to detect, and rarely contain high numbers or densities of artefacts; other sites, may be present depending on local conditions. However, the results of the foreshore survey are quite different from the site prediction models formed for the region. The results of the foreshore survey shows that, contrary to previous experience, artefacts are continuously scattered across the landscape and in some cases appear in very large, dense concentrations (or “sites”). Indeed, in areas that were favourable and desirable locations for occupation in the past, the artefact frequencies and densities are very high and it is likely similar stone artefact sites occur throughout the catchment area in similar topographic and environmental contexts.

5.3 AHIMS Results

The NSW Department of Environment and Climate Change’s (DECC) Aboriginal Heritage Information Management System (AHIMS) database was conducted in March 2007. The search identified those sites within an 8 x 10 km area, centred on the Dendrobium Area 3 Study Area, between Cordeaux and Avon Dams. A total of 83 sites (including duplicate references) were recorded in the 8 x 10km search area, with a total of 49 previously recorded sites (excluding duplicate entries) are located within the Dendrobium Area 3 study area (refer to Figure 1, Figure 6). The current project discovered 16 previously unrecorded sites within the Dendrobium Area 3 study area. Brief descriptions of each of these sites are included in Appendix 2. Details of specific site locations are considered sensitive and have not been included in this report. It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area.

Of the 83 previously recorded sites in the general region, the dominant site types are shelters with art (62%), followed by shelters with deposit (11%) and shelters with art and deposit (12%). There is a significant difference between the frequencies of these site types compared with other recorded site types. Overall, there is a significantly lower frequency of stone artefact occurrences (1.2%), grinding grooves (9%), stone arrangements (1.2%) and open camp sites (3.6%) occur within the search area (Table 3).

<i>SITE TYPE</i>	<i>NUMBER</i>	<i>AS % OF ALL SITES</i>
Shelter with Art	51	62%
Shelter with Deposit	9	11%
Shelter with art; Shelter with deposit	10	12%
Open Camp Site	3	3.6%
Isolated Artefact	1	1.2%
Axe Grinding Groove	8	9%
Stone Arrangement	1	1.2%
Total:	83	100%

Table 3: Aboriginal sites by site type within the vicinity of Dendrobium Area 3

The site types and frequency that have already been identified between Cordeaux and Avon Dams provide an indication of potential archaeological sites that are likely to occur within the proposed Dendrobium Area 3 Study Area.

5.4 Discussion and Predictive Model

The archaeological predictive model has been formulated based on the results of the location and type of Aboriginal sites that were recorded within the regional area, the results of the database searches and information about previous archaeological work. This information has been broken down into patterns that have been compared to the character of the study area to allow for an understanding of Aboriginal archaeological potential.

Based on this information, the following predictive model for the study area has been developed, indicating the most likely through to the least likely site types to occur within the present study area using the AHIMS data.

Rock shelters with art and / or deposits

Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground as characterised by the cliff lines and sandstone outcrops situated along the Cordeaux and Avon dams, Wongawilli, Sandy and Donald's Castle creeks, their tributaries and other small unnamed water lines. These naturally formed features may contain rock art, stone artefacts or midden deposits. The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space occurs in areas where such geological features occur, ie. Hawksbury Sandstone. Such topographical features dominate the topography of the present study area.

The AHIMS database search revealed that rock shelters with art and/or deposit are the most frequently recorded site types within the study area and surrounding region. Of the 83 sites reported by the search, 70 comprise shelters with art and/or deposit. Thus, rock shelters with art and/or deposit are the most likely site types to be encountered.

Axe Grinding Grooves

Axe grinding grooves are often found on large, open and relatively flat areas of sandstone shelving and outcrops. Individual grooves are elongated, narrow depressions often found in sedimentary rock, such as sandstone, in association with water sources, including creeks and swamps. Water was essential in the shaping and sharpening process in the manufacture of each axe. In the Woronora Plateau region engraved channels, often used to divert the run of water, are a feature associated with some axe grinding grooves.

Axe grinding grooves are second to sandstone shelter sites in being the most common site type found within the region. However, as such sites have not been maintained since European settlement; they will be difficult to locate beneath vegetation and debris. A significant number of creeks and tributaries, including Wongawilli and Donald's Castle Creek, within the study area, there is a moderate likelihood that grinding grooves will occur in association with these.

Open campsites, artefact scatters and isolated finds

Sites can comprise high-density concentrations or sparse low-density 'background' scatters. These represent campsites of everyday activities, hunting and gathering and tool manufacture. Isolated stone artefact occurrences can be located anywhere in the landscape and most likely represent discard or loss during transitory movement.

The identification of these sites depends greatly on ground surface visibility, resulting in the boundaries of a site being defined by the visible extent of the artefacts on the surface. Thick vegetation occurs throughout the present study area and is likely to obscure stone artefact scatters or isolated occurrences. The infrequent occurrence of these throughout the region can be attributed to this lack of ground surface visibility rather than the absence of such sites.

Thus, there is a low likelihood of identifying such sites within the presents study area, unless areas of open ground surface are visible, such as existing Fire Tracks. Stone artefact sites that have been previously recorded have been located along ridgelines, on the plateau in associated with drainage lines in areas of disturbance allowing ground surface visibility.

Rock Engravings

Rock engravings are created by repeatedly scraping or hammering soft, sedimentary rock surfaces, such as sandstone. These sites can include outlined or filled motifs of animals, human figures, pathways or dreaming/ceremonial symbols. Such sites are situated where open areas of suitable sandstone are present.

Very few of these sites have been previously recorded throughout the region surrounding the study area, despite there being numerous exposures of sandstone. This can be attributed to cultural differences between groups within the Sydney basin. Most such sites are situated north of the study area. Thus, it is considered very unlikely that these sites will occur within the study area.

Stone Arrangements

Stone arrangements can include circles, mounds, lines and various other patterns, most commonly associated with ceremonial sites, mythological or sacred sites, such as bora grounds or rings. The vast majority of these sites are situated on ridgelines or higher elevations within the landscape where surface stone is available.

A single stone arrangement has been recorded within the study area, but very few stone arrangement sites have been previously recorded throughout the region surrounding the study area. Again, this can be attributed to cultural differences between groups within the Sydney basin. Large expanses of sandstone shelving that are suitable for stone arrangements are very rare in the study area, therefore it is unlikely that additional stone arrangements will occur within the present study area.

Stone Artefact / Pigment Sources

Stone quarry sites will only be located where exposures of suitable raw stone material occur, for use in stone artefact manufacture. Stone sources are located west of the study area, on the Cumberland Plain, and include silcrete and quartzite outcrops. Other stone sources might have included flint and chert which would be likely to be found to the east of the study area, along the coastal strip. Throughout the sandstone country, sources of raw material might include pebbles and cobbles (usually quartz) that have gradually weathered out of the sandstone over time. It is likely that stone artefacts manufactured from the above raw materials will be located within the study area. Whilst there may have been opportunistic use of pebbles eroding from sandstone, there is not likely to be stone quarries in the immediate region.

Pigment sources will only be identified in areas where the geology dictates and the required processes have exposed such sources. Potential pigment sources may occur in shelters or exposed sandstone, however demonstrating that occurrences of iron rich sandstone are actual pigment sources is virtually impossible. There are no known ochre quarries within the study area, and the likelihood of identifying this site type is low.

Scarred Trees

Scarred trees exhibit scars caused by the removal of bark used in the manufacture of shields, canoes, containers or shelters. These generally occur on older trees or trees of size from which a suitably sized piece of bark can be removed. Appropriate tree species are known to occur within the study area. As the area is part of the Sydney Catchment it has been somewhat protected from timber cutting and clearance. However, preservation of dead trees and high

intensity periodic bush fires will reduce the likelihood of these sites being present. As such, there is low potential for identifying scarred trees where these remnant tree species have survived.

Carved Trees

Carved trees, or dendroglyphs, are trees with patterns or motifs carved into their trunk. In New South Wales carved trees occur most frequently in central-NSW, although the range of this site type extends across the entire state, including the southern highlands (Bell 1982). No scarred trees have been reported from the immediate region surrounding the study area, but carved trees have been reported from the Picton area (Etheridge 1918). Through land clearance and bush fires, many of these trees no longer exist. Therefore it is highly unlikely that these sites will occur within the study area.

Burials

Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. In the wider region, burials have been limited to soft sediment deposits, which are confined to the coastline and estuaries, some distance east of the present study area. The location of burials can be indicated by carved trees, or become exposed in eroding or shifting sand or soft sediment deposits.

Within the region there are limited or no suitable soft sediments in which burials will be associated within the study area. It is therefore highly unlikely that these sites types will occur within the present study area.

Aboriginal Ceremony and Dreaming Sites

These types of highly significant sites include natural mythological sites, ceremonial sites, increase sites, and dreaming story sites or places that can comprise delineated (physical) sites/places and non-delineated sites/places (non-physical). These are places used for a formal act or series of acts prescribed by ritual, belief in a mythological manifestation, religious belief or observance, protocol or convention that is connected with the traditional cultural life of Aboriginal people past or present. For example, natural mythological sites can comprise spectacular hills or rock outcrops, waterholes or waterways, or unseen pathways which are part of dreaming stories. Physical aspects of ceremonial sites that have been identified within the Sydney Basin include earth rings, stone arrangements and pathways that were once associated with public gatherings, corroborees, or initiation rituals.

Given the topography of the study area and the nature of each river to Aboriginal culture, there is limited potential to identify unregistered ceremonial and dreaming places are within the present study area.

Aboriginal Places

Aboriginal *places* may not have any “archaeological” indicators of a site, but are nonetheless significant to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings. Often these places are significant in the living memory of a community. There is some potential that Aboriginal places of spiritual and cultural significance will be found in association with the Wongawilli Creek. The closest site that is considered to be of such significance to the local Aboriginal people is a large shelter with extensive art, known as Whale Cave, several kilometres south of the study area. There are often difficulties in obtaining such information due to displacement of traditional Aboriginal communities in the region however.

6.0 HISTORICAL CONTEXT

Historical research has been undertaken to identify the historical context of the study area. This history incorporates an understanding of land-use, building patterns, areas of disturbance, as well, as land owner histories. This research will lead to understanding historical archaeological potential for the site.

The historic background is based on information held at the following repositories:

- *State Library of NSW – Mitchell Library*

The Mitchell library contains many primary source maps and plans for NSW, as well as many secondary sources that relate to the history of NSW.

- *Heritage Office Library*

The Heritage Office library holds a limited collection of heritage studies and consultancy reports. It also holds a full catalogue of Conservation Management Plans endorsed by the Heritage Council of NSW.

- *Department of Lands – Parish Maps*

The Department of lands hold copies of county, town and parish maps for much of NSW. The maps contain information regarding the alienation of land, crown grants, mineral leases, resumptions and infrastructure such as road and rail corridors.

All of this information has been used locate known and potential historical archaeological sites.

6.1 Land-use history of the study area

Bass and Flinders noted the Port Kembla area and Lake Illawarra during March 1796, and explorer G. W. Evans crossed the mouth of Lake Illawarra in 1812 (LIA 2004). Cedar getters began taking timber from the Illawarra area probably around 1815, with most of the Cedar being exhausted by the early 1820s (NSW Heritage Office 1996b). European settlement of the Cordeaux River and its surrounds began in late 1840's. The government surveyor, Peter Carr, was sent to the Cordeaux River to begin formal allotment of the region in 1852 and notes that several families had already settled and begun clearing small parcels of land (McNamara 2000). In 1857 the Government Mineralogist Mr Jevron noted that only two families had set up residence in the area, the Fishlock and Moran families, and land clearing had taken place along the banks of the river (McNamara 2000). This settlement was not within the current study area.

Through the 1860s till the 1900's the region around the Cordeaux River was gradually sold off in large allotments to families. While no formal township grew around the river, land use predominantly comprised orchards and grazing and minor timber industries.

Dairy grazing and orchards sprouted along the flats adjacent to the river and in selected areas around the steep slopes and hills. Apples dominated the orchards, however, the industry expanded to include plums, quinces, pears, loquats, lemons, oranges and peaches (McNamara 2000).

Many of the allotments where farmsteads were established around the Cordeaux River were down along the southern section of the river, where there were larger flat sections of land.

6.1.1 Upper Nepean Water Scheme (including Cataract, Cordeaux, Avon and Nepean dams)

In 1867 a commission was appointed to recommend a reliable water supply scheme to meet the needs of the increasing population in Sydney and its suburbs. The Upper Nepean water catchment was gazetted on 6th July 1880 as a water reserve for the 'Catchment Area for Water Supply for Sydney and Suburbs' (refer to Plate 1). The area reserved was 357 square miles (924 km²) and captured four major water courses, the Cataract, Cordeaux, Avon and Nepean rivers. The Cordeaux River catchment formed approximately 35 square miles (90 km²) and the Avon River catchment approximately 55 square miles (142 km²) (Graham Brooks 2003a:9 & 2003b:8).

Work on the Upper Nepean Water Scheme began in 1888 and initially commenced as a run of rivers scheme¹ whereby the headwaters of the Nepean, Cataract, Cordeaux and Avon rivers were tapped through a series of weirs and water diverted to Prospect Reservoir via 64 kilometres of tunnels, canals and aqueducts known as the Upper Canal System (Sydney Catchment Authority 2002: 5).

In 1901-1902 Sydney experienced a severe drought which brought the city close to complete water famine. Restrictions imposed upon the use of water allowed water to only be used for domestic and trade purposes (Arid 1961: 25). It soon became clear that the initial Upper Nepean Water Scheme was inadequate to meet Sydney's water demand, and the scheme was progressively developed through the construction of four major dams on the Cataract, Cordeaux, Avon and Nepean rivers.

Construction of the Cataract Dam, the first of the four Metropolitan Dams was completed in 1907 (HO Cordeaux Dam). Low rainfall in the catchment combined with increased water consumption meant that there was a need for a second water storage site. The site for a reservoir on Cordeaux River was selected but due to the following seasons of good rainfall construction did not begin until 1918 and was not completed until 1926 (Arid 1961: 28). The third of the dams, the Avon Dam, was commenced in 1921 and completed in 1927, while construction of the Nepean Dam commenced in 1925 and was completed in 1935. The four

¹ A run of river scheme is the diversion of the natural flow of water without regulation by storage reservoirs.

dams impounded water which was then diverted to Prospect Reservoir via the Upper Canal System. The Cataract and Avon dams are discussed in more detail in the following sections.

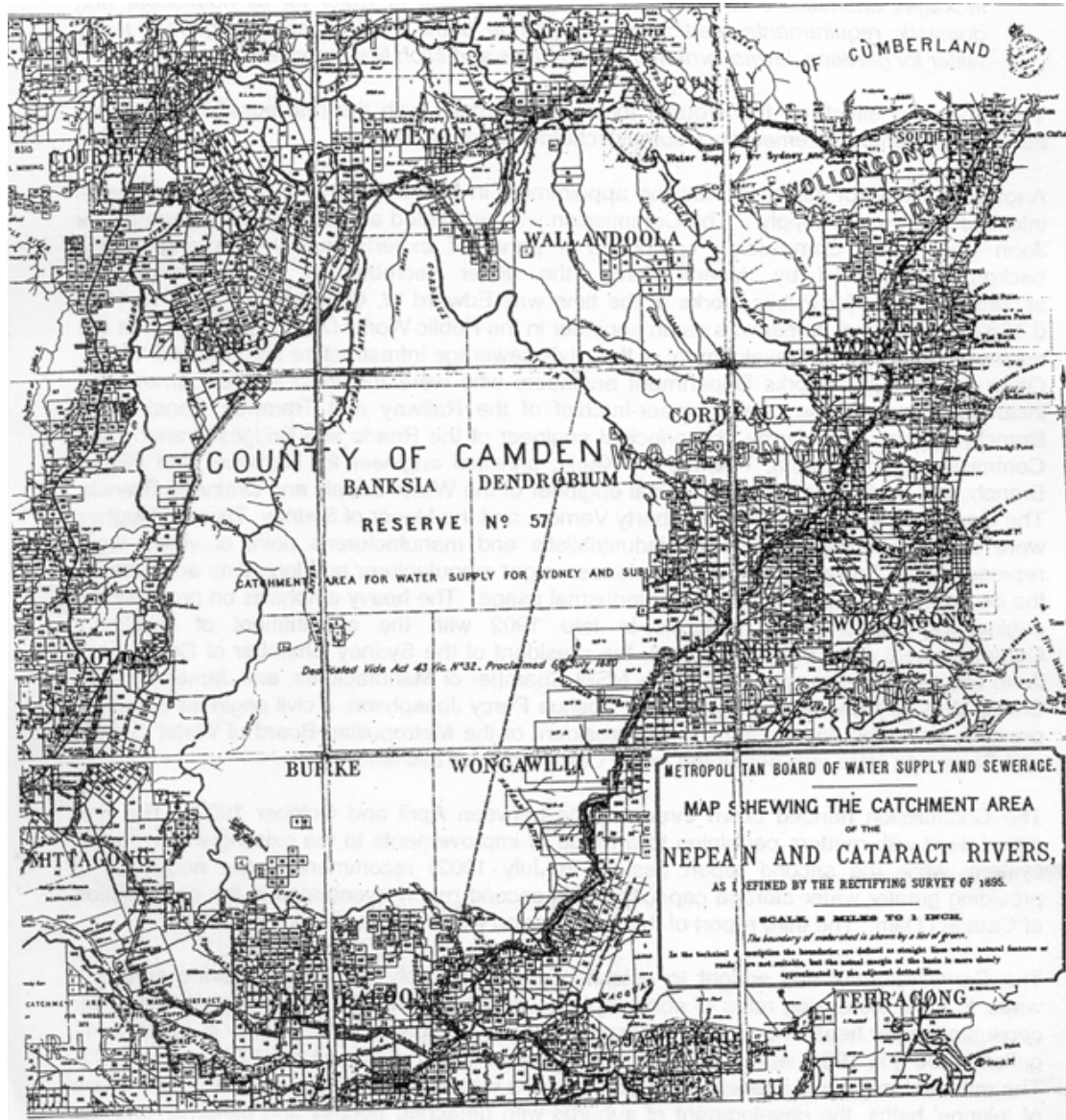


Plate 1: Historic map showing the reservation of the Catchment area (source: Graham Brooks and Associates).

At the time of gazettal, much of the larger Upper Nepean catchment area was unalienated Crown land, largely due to the poor soil quality and forest cover which made the area unsuitable for agricultural or pastoral use. In areas of deeper soils, such as on the volcanic intrusions in the upper reaches of the Cordeaux and Cataract rivers and Cataract Creek, limited settlement occurred. Following the 1902 decision to construct Cataract Dam all alienated land within that catchment area was resumed. ‘The resumption of land in the upper reaches of the Cordeaux River followed in the 1910s’ (Graham Brooks 2003a:10).

- Cordeaux Dam

The construction authority for the dam was the Public Works Department with all ‘work being undertaken with the Public Works Department acting as the head contractor’ (Graham Brooks 2003a:12).

The preliminary works necessary for the commencement of the construction of the dam were undertaken by the Public Works Department through 1917 and 1918. This work included detailed surveys of the [dam] site, the building of the town water supply system for the construction township, making the road of access to the dam site from the mail east/west arterial road, the Wilton/Bulli Road and the laying of 11 miles (17.6 km) of 2 feet (0.6 m) gauge tramway (with ropeway over the Nepean River) from the main southern line railhead at Douglas Park.

Undertaken concurrently with the completion of the transportation routes was commencement of works such as the opening up of the quarry site to supply the sandstone used in the construction of the dam, and the clearing of the river basin to allow for excavation of the dam foundations. Also commenced at this time was the construction of a curved concrete coffer dam and channel used to divert the river flow during the initial stages of construction of the dam wall, and the terracing of the hillside of the dam wall to house the cableway towers and other plant and machinery. A sawmill was also constructed to furnish milled timber from the timbers cut out of the river basin for the erection of offices and quarters for staff and workmen and to house plant and equipment.

Graham Brooks 2003a:12

‘The dam wall is constructed of cyclopean masonry consisting of local Hawkesbury sandstone blocks, quarried from the northern hillside upstream of the dam wall, set and packed in sandstone concrete’ (Graham Brooks 2003a:23). The upstream and downstream faces were faced with blue metal concrete or sandstone concrete. Cordeaux Dam wall is arched to a radius of 2,870 feet (874.7 m) in plan, with a straight spillway (refer to Plate 2). Arched dam walls have greater structural stability over straight walls (such as was built at Cataract Dam). To provide ‘some measure of protection against cracking through contraction and expansion or for unequal settlement in its varying mass and weight, radial joints were provided in a series of 15 vertical blocks that for the dam wall’ (Graham Brooks 2003a:23). Each end of the dam wall is flanked by sandstone pylons decorated with lotus columns.

During the construction of the dam cement and metal were transported from the main southern railway to the site via a steam operated aerial ropeway built across the Nepean George and then along a narrow gauge line. The dam was upgraded in 1988 (Sydney Catchment Authority 2002: 7).

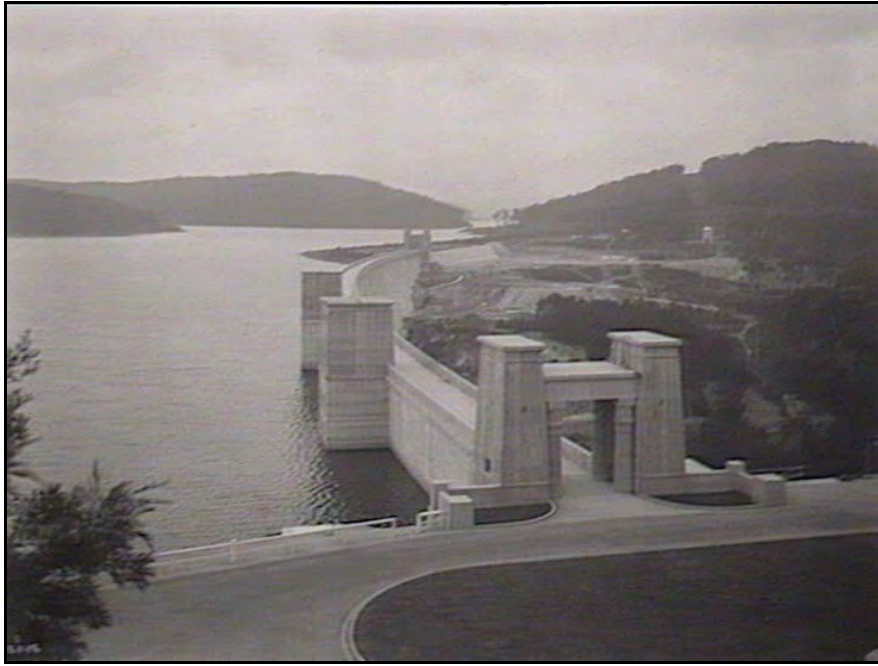


Plate 2: Cordeaux Dam after completion – 26/11/1926. (source: State Library GPO 1-51670)

The dam was built by a labour force that resided at the construction site in a purpose built township. This system was employed at all four of the metropolitan dams and the town infrastructure was disassembled and moved to the next construction site as the scheme progressed, or demolished if not required. Married employees and their families rented cottages, and single men lived in the barracks. Whole families resided at the dam site and the towns were equipped with facilities including a school and post office etc.

- Avon Dam

In 1921 the Public Works Department began work on a third and much higher dam at a selected site on the Avon River. The Avon Dam was built with similar materials and construction techniques as the Cordeaux Dam (Arid 1961: 29).

As with the Cordeaux Dam, early site preparation works were carried out prior to commencement of large-scale construction. Such works included the construction of a macadam access road from Bargo (materials for Avon Dam were transported by road), levelling and terracing of the areas surrounding the construction site, clearing of the valley floor and laying out of the construction town site (Graham Brooks 2003b:9-15). World War 1 veterans staying at a nearby rehabilitation camp built the original roadway into the Avon Dam site in the early 1920's as well as a secondary road between the Cordeaux and Avon dams to allow lumber from the Cordeaux sawmill to be brought to the Avon dam construction site.

The Avon Dam was opened in 1927 and was very similar to Cordeaux Dam. The dam wall was 'constructed of cyclopean masonry consisting of Hawkesbury sandstone blocks, quarried from the channel for the spillway, set and packed in sandstone concrete' (Graham Brooks

2003b:20, refer to Plate 3). The upstream and downstream faces were faced with blue metal concrete or sandstone concrete, cast in situ using formwork. Cordeaux Dam wall is arched to a radius of 1,200 feet (365.7 m) in plan and is 200 feet (61 m) in height. To provide 'some measure of protection against cracking through contraction and expansion or for unequal settlement in its varying mass and weight, radial joints were provided in a series of seven vertical blocks that for the dam wall' (Graham Brooks 2003b:21). Each end of the dam wall is flanked by sandstone pylons decorated with lotus columns.

Remedial works of the late 1960s included buttressing the downstream wall face with a compacted crushed sandstone embankment (Graham Brooks 2003b:21). The dam currently services the Wollongong area and there is an electrical pumping station at Flying Fox Creek.

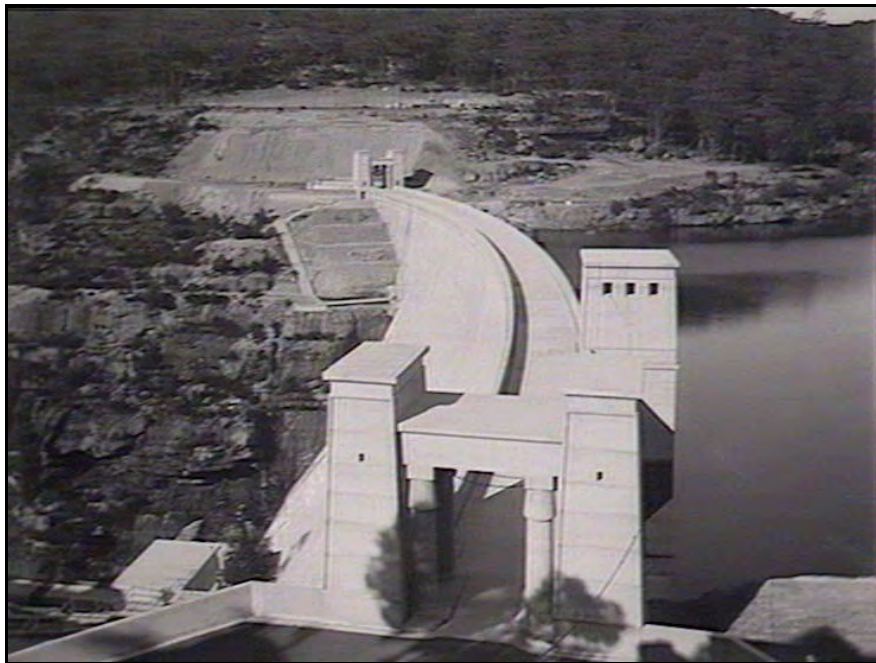


Plate 3: Avon Dam after completion – 30/06/1927. (source: State Library GPO 1-50292)

6.1.2 Coal Mining

Coal deposits in the Illawarra were first officially documented by George Bass in 1797 near Coalcliff (<http://www.illawarracoal.com>). A number of coal seams were subsequently discovered throughout the Illawarra over the next century and coal mining became a major industry in the region.

Oil bearing shale from the slopes of Mount Kembla was tested in 1849 and subsequently the Pioneer Kerosene Mine was established beside American Creek. The mine became the first kerosene mine in Australia. The present day site is the Nebo Colliery, but at the time the land was owned by Mr. John Graham. By 1880 the mine had closed down (<http://www.wollongong.nsw.gov.au>).

Coal was first mined at Mt Kembla in 1865. Kerosene had become uneconomical to produce, but coal mining had proven to be extremely lucrative (<http://www.wollongong.nsw.gov.au>). In 1882 a railway was built to Port Kembla and 60 men were employed to open up an eight foot coal seam to the north of the Kerosene mine. By 1883, 110 men were employed and 336 men were employed by 1901 (Rich 1989: 14; <http://www.wollongong.nsw.gov.au>).

Another mine was proposed to the north of the Mount Kembla mine in 1888. It was not until 1954 that tunnel and rail access along Brandy and Water creeks were opened as an outlet route for coal from Kemira Colliery at Mount Kembla (<http://www.wollongong.nsw.gov.au>).

6.2 The Archaeological Record

Rich (1989) undertook a survey of for proposed road upgrades, of Fire Road no. 15 and Cordeaux Road near Mount Kembla partly along the Illawarra Escarpment and along American Creek. Three historic sites were identified from historical research undertaken prior to the survey. The sites are as follows:

- Cordeaux Road and Fire Road No.15

Cordeaux Road was located as an existing road on a map dated 1849 and follows the same route as Cordeaux Road today. Another undated map shows a road along the top of the Illawarra escarpment in the same location as Fire Road No. 15. An 1889 map shows both these historic roads along their present routes.

- Windy Gully Cemetery

The cemetery was established for some of the boys and men who died in the Mount Kembla Mine disaster in 1902. The cemetery has 28 marked burial plots, there are rectangular depressions which are probably unmarked graves and a mass grave has been reported in which an unknown number of unidentifiable bodies were buried in plain pine coffins (Tindall 1987 in Rich 1989: 17).

- Windy Gully Miners' Clubrooms Group

A group of miners cottages and clubrooms reportedly opened a few years before the mine disaster possibly in 1893. There are five buildings in all, two free standing cottages one of weatherboard and one of fibro and three terraces two of brick and one of weatherboard.

Two of the three recorded sites are associated with the mining industry. Mining especially coal mining has been a major industry in the history of the Illawarra region. The Cordeaux Road and north end of Fire Road no. 15 have been upgraded and maintained so they do not contain their original fabric. However, the roads do mark out part of the earlier road system and Cordeaux Road is probably contemporary with the miners' Clubroom complex as it passes by the site.

Navin Officer (2000) completed a large scale cultural heritage assessment for the Dendrobium Coal Project. As part of this project lands within the Dendrobium, Nebo, Kemira

and West Cliff collieries were surveyed. Much of the current DA3A study area was surveyed in 2000 as part of the Navin Officer project. During the survey no historical sites were identified within the current DA3A study area; indeed the only historical site located during the survey was infrastructure associated with the Nebo Colliery which was opened by BHP in 1946. Officer (2000:68) recommended that further heritage assessment was required prior to implementation of any design, planning and construction works associated with the then proposed development.

Biosis Research (2004) completed a targeted archaeological survey of proposed seismic testing and borehole drilling areas within Dendrobium Area 3 and along the Lake Cordeaux foreshore to assess risks to archaeological heritage from the proposed works. There is some overlap with this survey and the current study area. Survey of the Lake Cordeaux foreshore east of the current study area identified three previously unrecorded historic sites. The sites consisted of a built structure with associated remains (tin shed, piles and inlet pipes) interpreted as a pump house, a stone survey cairn consisting of sandstone cobble cairn with a wooden centre post and tin marker, and an isolated bottle find. The pump house and stone survey cairn were assessed as being of local significance, while the bottle was assessed as being of negligible significance. It was recommended that the relationship between the pump house and Cordeaux Dam (as a State significant item) required further exploration.

Ian Campbell, Ministerial Determination (2005). In 2005 the Honourable Ian Campbell Minister for the Environment and Heritage released a statement of reasons for his decision not to include the Dendrobium Mine Site, in the National Heritage List. The application for an Emergency listing of the Dendrobium Mine area was made to the Department of Environment and Heritage (DEH) by Ms June Pronk of the Illawarra Escarpment Coalition to include the mine site above and below ground on the National Heritage Register. The request claimed that:

- Dendrobium Mine Site had unspecified National Heritage Values;
- indigenous and non-indigenous cultural heritage surveys had not been conducted and significant built heritage in the area had been ignored; and
- Longwall Mining posed a number of threats to both the natural and cultural heritage of the area.

DEH initiated consultation with relevant identified stakeholders. The Minister upon considering the request had to determine if:

1. *the place has or may have one or more National heritage values; and*
2. *any of those values is under threat.*

The Illawarra Escarpment Coalition did not identify which National heritage criteria supported their claims that the area had National heritage significance, nor did they provide

any evidence of National Heritage significance. Therefore the Minister examined the available evidence against each criterion. The Minister found that the Illawarra Escarpment and Woronora Plateau may meet Criterion (a) and the vicinity of the Dendrobium Mine contributes to this potential overall value.

Criterion (a): the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history

Under *Criterion (a)* the Minister examined:

- The history of the water catchment management and the upper Nepean Water System but found that there was not sufficient evidence to conclude that those features were of outstanding National heritage value.
- Some small surface features may exist in the Dendrobium Mine Site but he found that there was insufficient evidence to conclude that these features have outstanding National heritage value.
- The history of the Appin Conflict of 1816 whereby Aborigines were massacred at Broughton Pass by a formally sanctioned military action against indigenous people. There are other examples of sanctioned military actions against Aboriginal people in the history of Australia the Minister concluded that available evidence was insufficient to “form the belief that the area where the Appin conflict occurred may have outstanding value to the nation under criterion (a) because of its importance of [sic] in the course or pattern of Australia's cultural history” (Point 23).
- The Illawarra Escarpment and Woronora Plateau constitutes one of the most significant areas for species richness in temperate Australia for both flora and fauna and ranks within the top 30 places in Australia for such values. The Minister concluded that “the species richness exhibited by an array of terrestrial species in the Illawarra Escarpment and Woronora Plateau may have outstanding heritage value under criterion (a)” (Point 24).

However, the Minister concluded that the natural heritage of the Dendrobium Mine was not under threat by mining activities and so it was rejected from being listed on the National Heritage Register.

Biosis Research (2007) conducted an archaeological survey of the proposed Stage 3 West Cliff Coal Wash Emplacement Area, north-west of the current study area, located near Appin. Prior to the development of the West Cliff Mine and its associated infrastructure the study area was not subject to significant historical occupation or development. From the mid-19th Century and prior to reservation as a mining lease the area was set aside as pasturage for the township of Appin. A sparse collection of artefacts, features and graffiti suggest/confirms, in accordance with the site prediction model developed for the study, that the study area was the subject of ephemeral occupation and recreational and vocational use, especially during the

mid-20th Century (c1930s and later). Certainly historic occupation of sandstone shelters and similar environments is documented in the region. The study area's proximity to the township of Appin has resulted in the mining lease, particularly the area next to Appin Road, being used to dump an assortment of domestic rubbish. The other main historical feature of the study area is that it has been the subject of minerals exploration (c1970 and after), resulting in cleared seismic lines, tracks and drill pads.

Two historical sites were identified within the study area: a sandstone retaining wall track; and a transient occupation or work site. Based on artefacts associated with both these sites they appear to date to the mid-20th Century, and are characteristic of the ephemeral occupation expected to occur in the sandstone gorge country of the region.

6.3 Heritage Registers

There is one site listed on the NSW State Heritage Register located within the Dendrobium study area, this being the heritage curtilage of the Cordeaux Dam (note that there is no dam infrastructure within the current study area) (Table 4). The impounded water of the Avon Dam forms the south-western boarder of the study area. The Avon Dam is also listed on the SHR, although neither the dam nor its heritage curtilage lies within the Dendrobium Area 3 study area.

<i>HERITAGE LISTING</i>	<i>SITE NAME</i>	<i>SITE TYPE</i>	<i>SITE DESCRIPTION</i>
SHR	Cordeaux Dam	Water Supply Reservoir / Dam	<p>Arched dam, composed of cyclopean masonry consisting of sandstone blocks quarried from the site, embedded in concrete. Each end of dam wall is flanked by sandstone pylons.</p> <p>The southern tip of the heritage curtilage established to protect views and vistas of the dam wall from surrounding ridges lies within the northern extent of the study area.</p>

Table 4: Summary of SHR listing description

6.4 Discussion

The Cordeaux and Avon dam areas were initially settled by Europeans in the mid-1800s, with the dominant character of settlement being small farm enterprises, although these are confined to the richer soils and gentle topography around large river flats and foot slopes. The earliest European incursion into the area was by cedar getters, however this was largely ephemeral visitation.

Construction of the dam that forms Lake Cordeaux occurred between 1920 1926. Avon Dam was commenced in 1921 and completed in 1927. Both dams have been identified as items of State heritage significance and included on the State Heritage Register. Avon Dam and heritage curtilage are not within the current study area. Cordeaux Dam heritage curtilage is

within the current study area although there is no identified dam infrastructure (walls, spillways etc) within the current study area.

The nature of the current proposal will not affect any known or potential historical archaeological sites.

7.0 SURVEY

7.1 Survey Methods

Survey methods for Aboriginal archaeological sites have been designed in consultation with the Local Aboriginal community. They have been designed to locate archaeological sites within the study area with reference to the following information:

- Previously recorded sites within the Study Area;
- Areas of potential as identified by the background research (regional site patterns when compared to the physical environment of the study area);
- Areas of high archaeological potential within the Dendrobium Area 3 Study Area (including sandstone cliff lines, and creeks and tributaries), and;

The survey was conducted within the Dendrobium Area 3 Study Area. A number of sections of the study area have been previously surveyed by Sefton (1993-1994; 1996-1997; 1988; 1989; 1990; 1991), Navin Officer (2000), and Biosis Research (2004; 2006; 2007). The survey methods involved two approaches: targeted survey of archaeologically sensitive landforms most likely to contain sites; and transect survey of predetermined areas of previous impact.

The most sensitive landforms associated with Aboriginal archaeological sites within the study area are those associated with the Hawkesbury soil landscape, as described in Section 4.1. These landforms comprise drainage features which produce deeply incised, rocky gullies and valleys suitable for the formation of sandstone overhangs and shelters. The previous surveys either tended to focus on these more sensitive landforms by undertaking targeted contour and drainage surveys, or by employing opportunistic surveys that focused on areas of previous disturbance (vehicle tracks for example) or potential impact areas (seismic lines for example). This was achieved by walking parallel to these characteristic topographic features and inspecting for suitable overhangs and open sandstone platforms. Figure 3 shows transects previously surveyed within Dendrobium Area 3 by Navin Officer (2000) and Biosis Research (2004, 2006, 2007). Survey transects conducted by the Illawarra Prehistory Group (Sefton 1993-1994; 1996-1997; 1988; 1989; 1990; 1991) were not specifically recorded.

The methodology for the present archaeological survey was finalised in April 2007 (Biosis Research 2007). The methodology implemented was the same as that proposed and agreed upon by registered stakeholders and outlined, in principle, in Section 2 of this report. The survey was conducted as follows:

The survey involved using a targeted survey method of 'contour surveying', as has been used previously in this and similar environments (Navin Officer 2000; Sefton 1993-1994; 1996-1997; 1988; 1989; 1990; 1991). The survey targeted areas within Dendrobium Areas 3A, 3B and 3C, inspecting landforms and areas identified in the predictive modelling as having a high likelihood for the presence of archaeological sites. In general, all sandstone cliff lines and

ridgelines, creeks and drainage lines were surveyed. All traversed areas were recorded using hand-held GPS units.

The spurs and side slopes of the study area, particularly those that flank Wongawilli Creek, are high steep slopes, often extending several hundred linear metres from top to base. For each transect the survey team spread out evenly along the length of the slopes (from top to bottom), and proceeded in a line moving along the side of the slope—or contour—with each member maintaining a consistent level, and hence spacing, between themselves. For much of the study area the rugged nature of the slopes, scarps and cliffs naturally constrained or separated the survey lines. Generally however it was observed that the slopes ‘stepped’ down in stages, with less inclined slopes breaking to cliffs, scarps or boulder terraces (where sandstone shelter sites are likely to occur) before becoming less inclined again, and then breaking again. This stepped slope profile is a characteristic of the Hawkesbury landscape (Hazelton and Tille 1990: 46).

7.1.1 Identification and Recording of archaeological sites

Within Area 3A all the previously recorded sandstone shelter sites were relocated and re-recorded during the survey. All newly discovered Aboriginal archaeological sites within the study area were also recorded. New co-ordinates for each re-recorded site were taken, along with photographs and updated information about each sites’ condition. All sites except 4 shelters with deposit and one shelter with art were relocated and re-recorded in Area 3B; within Area 3C all shelters except 2 shelters with art were relocated and re-recorded.

7.1.2 Identification and Recording of Historic Features

During the surveys for Aboriginal archaeological sites, the survey team concurrently assessed these areas for any evidence of historic land use or occupation. In particular this includes historic use of sandstone overhangs or land use along fire trails and creek lines within the wider study area. All newly recorded historic sites were recorded, photographed and co-ordinates taken.

7.1.3 Identification and Recording of Traditional Resources

During the archaeological surveys the identification and recording of any traditional resources within the study area was conducted in close consultation with the relevant local Aboriginal community. Numerous plant resources were identified during the field survey in consultation with Aboriginal stakeholders and using the results of the botanical surveys (Biosis Research 2007).

7.1.4 Constraints to the survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the survey. The factors that contributed most to how detectable

archaeological sites were in the study area were visibility and exposure (see below). In rugged situations such as those within Dendrobium Area 3, occupational health and safety interests can also constrain the effectiveness of archaeological survey. A brief discussion of these factors is presented below.

7.1.4.1 Visibility

In most archaeological reports and guidelines visibility refers to *ground surface visibility*, and is usually a percentage estimate of the ground surface that is visible and allowing for the detection of (usually stone) artefacts that may be present on the ground surface (NSW NPWS 1997: Appendix 4). The primary factor that affects visibility is vegetation cover; however other things such as introduced fill will also significantly hamper visibility and surface site detection. At the Dendrobium Areas 3 study area the major contributing factor that restricts visibility is vegetation cover. The majority of the study area is covered by dense woodland vegetation, obscuring much of the ground surface, and providing very poor surface visibility. Despite recent drought conditions, ground surface visibility remained low, apart from those areas that have been subject to ground disturbance works (see discussion on *exposure* below).

Navin Officer (2000: 49-50) provide a good discussion on considerations of visibility and site obtrusiveness on the Woronora Plateau and Illawarra Escarpment. The obtrusiveness of sandstone rock shelter and overhang sites, even in heavily vegetated areas is always high, so these sites are likely to be detected and inspected during survey. In comparison the obtrusiveness of surface sites, such as axe grinding grooves, engraved channels and motifs on sandstone platforms, or stone artefact scatters, which occur virtually anywhere, is low to very low because of the limited ground surface visibility described above. At Dendrobium Area 3 it was noted that sandstone shelves suitable for axe grinding grooves and channels are more often than not covered in leaf litter from bushes that grow on trapped sediment. The concept of visibility is also applicable to the surface of shelter sites when considering archaeological potential or looking for artefacts exposed in drip lines (Navin Officer 2000: 49).

7.1.4.2 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed, and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Whilst also usually expressed as a percentage estimate, exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke and Smith 2004: 79, NSW NPWS 1997: Appendix 4). Factors that affect archaeological exposure include the natural geomorphic process acting on a landscape—whether it is aggrading, stable or eroding—and the level of previous disturbance which will expose or potentially bury archaeological sites. The majority of the study area is a colluvial landscape, with the remainder being a residual landscape. Neither of these landscapes is particularly likely to reveal buried artefacts, although residual landscapes are likely to accumulate archaeological material over long periods. Disturbance in the study area is

associated with natural and human agencies. Natural agents generally effect small areas and include the burrowing and scratching in soil by animals such as wombats, foxes, rabbits and wallabies, and sometimes exposure from slumping or scalding. Disturbance associated with recent human action is prevalent in the study area, and covers large sections of the land surface. The agents include mining exploration activities (tracks and seismic lines), other vehicle tracks, hard stand areas and associated infrastructure pads. Similarly, Fire Trails that occur within the Sydney Metropolitan Catchments have been continually maintained by the Sydney Catchment Authority. Overall, the study area displays moderate evidence of disturbance; however areas of better ground surface visibility are limited. Physical ground disturbance that occurs within the study area has been noted and is clearly visible on all mapping.

7.1.4.3 Safety

In general, the weather conditions did not hinder the survey effort, although heavy rains resulted in precautionary measures where wet or slippery surfaces might be encountered. There are many high cliffs and scarps in the study area, and the edges of these were not approached closer than 2 m by the survey team. In some areas, though not common, the vegetation is impenetrably thick, posing a risk of eye injury, falls and cuts or abrasions. The transect survey methodology was varied to ensure the safety of the survey team, sometimes resulting in uneven survey transects due to avoiding the edges of steep cliff lines or walking around impenetrably thick vegetation. This is not considered to be a significant constraint to the targeted contour survey given the uncommon occurrence of impenetrable vegetation, whilst all cliff lines and scarps were inspected from below as well as above, which is where any archaeological material would occur in these cases.

7.1.5 Measures of survey effectiveness

When estimating the effectiveness of our surveys we follow Navin Officer (2000) in providing appropriate and informative estimates of effectiveness of the different types of survey techniques employed. The targeted contour survey focused on sandstone exposure sites such as shelters and axe grinding grooves, and as such we will not provide estimates of ground surface visibility and exposure as these are not particularly informative regarding the obtrusiveness and likely incidence of discovery of the site types (sandstone shelters) likely to occur in the gorge environment. Rather, following Navin Officer (2000: 49) 'qualitative judgements in regard to the incidence of rock exposures and their potential to host archaeological sites' were recorded and are provided below.

Some transects included sections of existing Fire Trails and some recent seismic lines, providing areas of ground exposure that were inspected when encountered, however these areas are not considered to be a significant part of the survey, so they are not quantified in this report.

7.1.6 Survey team summary

The Dendrobium Area 3 survey was conducted during April, May and June 2007, resulting in a total survey effort of approximately 103 person days, with the survey team changing on a day to day basis due to team member availability (Table 5). Representatives from the Illawarra Local Aboriginal Land Council, Korrewal Elouera Jerrungarugh, and the Cubbitch Barta Native Title Claimants Aboriginal Corporation were present on various days of survey for Aboriginal archaeological and cultural heritage sites. The weather conditions for the survey were mild, with some overcast with occasional showers, for the majority of the survey period.

<i>DATE</i>	<i>SURVEY TEAM</i>	<i>PERSON DAYS</i>
23 April 2007	Stephen Henry and John Hunt (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Melanie Thomson, Sarah Burke and Scott Rogerson (Biosis Research)	6
24 April 2007	Stephen Henry and John Hunt (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Melanie Thomson, Sarah Burke and Scott Rogerson (Biosis Research)	6
7 May 2007	Neville Mahr and William Butler (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Glenda Chalker (Cubbitch Barta Native Title Claimants Aboriginal Corporation) Melanie Thomson, Sarah Burke and Scott Rogerson (Biosis Research)	7
8 May 2007	Neville Mahr and William Butler (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Alfred Fasseldene (Cubbitch Barta Native Title Claimants Aboriginal Corporation) Melanie Thomson, Sarah Burke and Scott Rogerson (Biosis Research)	7
9 May 2007	Neville Mahr and William Butler (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Alfred Fasseldene (Cubbitch Barta Native Title Claimants Aboriginal Corporation) Melanie Thomson, Sarah Burke and Scott Rogerson (Biosis Research)	7
10 May 2007	Rodney Freeman and Jay Marsden (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Alfred Fasseldene (Cubbitch Barta Native Title Claimants Aboriginal Corporation) Melanie Thomson, Jamie Reeves and Scott Rogerson (Biosis Research)	7
11 May 2007	Rodney Freeman and Jay Marsden (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Alfred Fasseldene (Cubbitch Barta Native Title Claimants Aboriginal Corporation) Melanie Thomson, Jamie Reeves and Scott Rogerson (Biosis Research)	7
14 May 2007	John Hunt and Stephen Henry (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Melanie Thomson, and Scott Rogerson (Biosis Research)	5
15 May 2007	John Hunt and Stephen Henry (Illawarra LALC) Bart Brown (Korrewal Elouera Jerrungarugh) Melanie Thomson and Scott Rogerson (Biosis Research)	5
16 May 2007	John Hunt and Stephen Henry (Illawarra LALC) Bart Brown and Warren Ingram (Korrewal Elouera Jerrungarugh) Melanie Thomson and Scott Rogerson (Biosis Research)	6
17 May 2007	Craig Tungai and Neville Mahr (Illawarra LALC) Bart Brown and Warren Ingram (Korrewal Elouera Jerrungarugh) Melanie Thomson and Scott Rogerson (Biosis Research)	6
28 May 2007	Johnny Padget (Illawarra LALC) Bart Brown and Warren Ingram (Korrewal Elouera Jerrungarugh) Melanie Thomson and Scott Rogerson (Biosis Research)	6
29 May 2007	Johnny Padget (Illawarra LALC) Bart Brown and Warren Ingram (Korrewal Elouera Jerrungarugh) Melanie Thomson, Jamie Reeves and Scott Rogerson (Biosis Research)	7
30 May 2007	Roy Kennedy (Illawarra LALC) Bart Brown and Warren Ingram (Korrewal Elouera Jerrungarugh) Melanie Thomson, Jamie Reeves and Scott Rogerson (Biosis Research)	7

31 May 2007	Roy Kennedy (Illawarra LALC) Bart Brown and Warren Ingram (Korrewal Elouera Jerrungarugh) Melanie Thomson, Jamie Reeves and Scott Rogerson (Biosis Research)	7
1 June 2007	Roy Kennedy (Illawarra LALC) Bart Brown and Warren Ingram (Korrewal Elouera Jerrungarugh) Melanie Thomson, Jamie Reeves and Scott Rogerson (Biosis Research)	7
Total survey effort:(person days)		103

Table 5: Survey Team Effort Summary

7.2 Survey Results

7.2.1 Existing Condition of the Study Area

The study area is heavily vegetated forest and woodland, with moderate to steep slopes, rocky gorges and drainage lines. Ground surface and vegetation disturbance is generally limited to linear development that supports management of the catchment area (undressed tracks, small bridges, drains, and water flow management); minerals exploration (bore hole locations, seismic lines) and ‘through infrastructure’ such as electricity easements and the uncompleted Maldon-Dumbarton Railway.

There are two topographically distinct two soil landscapes within the study area. The Lucas Heights landscape occurs on the western and north-western margin of the study area and accounts for a small portion of the study area’s surface. This landscape is basically a shale capped plateau with shallow drainage lines, occasional upland swamps and low undulating rises. Sandstone outcrop in this area is limited to low scarps and occasional boulders, with sandstone rock bars in the creeks. The Hawkesbury soil landscape accounts for the vast majority (approximately 90%) of the study area. Within this area there are steeply incised creeks and drainage lines, thin ridges and occasional steep hills. Sandstone outcrop is very frequent, with cliffs, high scarps, talus slopes, boulders, ledges and steep slopes all being present: in some places the cliffs and scarps are not accessible on foot. Sandstone shelter and overhang formation by block-fall and chemical weathering is extremely common, especially along the Wongawilli Creek and its immediate tributaries. Shelters range in size from massive overhangs or caverns, to small walls or sheltered areas formed by detached boulders.

The results of the survey were analysed using the approach taken by Navin Officer (2000). This provides useful and informative results on the obtrusiveness and likely incidence of discovery of the archaeological site types associated within the sandstone valley and gorge environments of the Woronora Plateau region. Table 6 summarises the incidence of suitable rock exposures (archaeological potential) that are most likely to contain archaeological sites within the 2 identified land systems of the study area.

LANDSYSTEM SAMPLE	LANDFORM UNIT	SANDSTONE OUTCROP TYPE	TOTAL LENGTHS SURVEYED (KM)	TOTAL AREA SURVEYED (HECTARES)	RECORDED ABORIGINAL SITES
Hawkesbury Sandstone	Steep rocky drainage lines and ridges. Steep and precipitous sandstone outcrops, detached blocks and cliffs or gorges. Well incised steep drainage line, often with drop-offs	Cliffs, scarps, benches and boulders	82.8	1239	62
Lucas Heights	Moderate hill slopes with cobble, boulder and shelf outcrops and low rounded scarps. Moderately incised drainage features	Limited areas of rock outcrop, vehicle tracks and easements	9.2	138	nil

Table 6: Survey coverage of block survey and targeted landform survey

The analysis used for the targeted survey is qualitative rather than quantitative, as ground surface visibility is generally poor and all sites are associated with the occurrence of sandstone overhangs within this environment. Therefore, the results are based on the observable and suitable sandstone overhangs that have archaeological site potential.

The survey revealed that the most suitable sandstone overhangs occur within the steep scarps and gorges of the Hawkesbury land system, usually associated with the Wongawilli Creek and its immediate tributaries (Table 6). This is typical of the area, and has been described previously (Navin Officer 2000). All the known and newly recorded sites are located within the rugged Hawkesbury Sandstone landforms. Bear in mind, however, that the vast majority (approximately 90%) of the study area is formed by these landforms. Despite the rugged terrain of the study area, sandstone shelters/overhangs will always be highly visible compared with site types not associated with sandstone shelters, such as open campsites. When considered in conjunction with the previous survey efforts (Figure 4, Figure 5) it can be seen that the Dendrobium Area 3 study area is one of the most intensively surveyed locations on the Woronora Plateau. This provides confidence that the nature and character of the archaeological record of the area has been robustly determined in the current assessment.

7.2.2 Sites discovered during the current survey

There were 16 additional sites discovered by the current survey: with 5 sites each in each of Area 3A, Area 3B and Area 3C; and a single site located south of the Area3A SMP Area. The newly discovered site types included: Shelters with Art ($n = 7$); Shelters with Art and Deposit ($n = 2$); Shelter with Deposit ($n = 4$); and open stone artefacts ($n = 3$). The type and frequency of newly recorded sites was consistent with the site types and frequencies previously reported for the region, with shelter sites, particularly shelters with art, accounting for the majority of sites.

7.2.3 Overview of Aboriginal Sites

The majority of Aboriginal archaeological sites, including sandstone shelters with art and/or deposit, grinding grooves and stone artefact sites that were previously identified by Sefton (1993-1994; 1996-1997; 1988; 1989; 1990; 1991), Navin Officer (2000) and Biosis Research (2004; 2006; 2007) were relocated during the field survey (see Section 7.1.1). Each site revisited was photographed and re-assessed for changes since the original site recordings, and new coordinates were recorded using a hand held GPS.

7.2.3.1 Area 3A

There are 14 Aboriginal archaeological sites within or near the SMP Area. The sites consist of shelters with art ($n=8$); shelters with artefacts/deposit ($n=3$); and open sites with artefacts ($n=3$). There are a further 6 sites within the study area of Dendrobium Area 3A, but these are not in the current SMP Area (Figure 8).

7.2.3.2 Area 3B

There are 24 Aboriginal archaeological sites within Area 3B. The sites consist of shelters with art ($n= 14$); shelters with artefacts/deposit ($n= 5$); open sites with artefacts ($n = 2$); and, potential archaeological deposits (PADs) ($n = 3$).

7.2.3.3 Area 3C

There are 18 Aboriginal archaeological sites within Area 3C. The sites consist of shelters with art ($n= 12$); a shelter with artefacts/deposit ($n= 2$); open sites with axe grinding grooves ($n = 2$); an open site with artefacts ($n = 1$); and, a stone arrangement ($n = 1$).

Table 7 summarises the Aboriginal archaeological sites by site type and Dendrobium Mine Area.

<i>SITE NUMBER</i>	<i>SITE NAME</i>	<i>SITE TYPE</i>
Dendrobium Area 3A – SMP Area		
52-2-0458	Browns Road Site 33	Shelter with Art
52-2-1646	Browns Road Site 32	Shelter with Art
52-2-1647	Browns Road Site 20	Shelter with Deposit
52-5-0273	Sandy Creek Road 21	Shelter with Art
52-5-0274	Sandy Creek Road 22	Shelter with Art; Shelter with Deposit
52-5-0277	Sandy Creek Road 25	Shelter with Art; Shelter with Deposit
52-5-0278	Sandy Creek Road 26	Shelter with Art
52-2-2043	Sandy Creek Road 28	Stone Artefact
52-2-3052	SCA Special Area Fire Trail 6C	Stone Artefact
NEW RECORD	DM13	Shelter with deposit
NEW RECORD	DM14	Stone artefact
NEW RECORD	DM15	Shelter with art
NEW RECORD	DM20	Shelter with art
NEW RECORD	DM23	Shelter with deposit
Dendrobium Area 3B – General Area		
52-2-1562	Donald Castle Creek 1	Shelter with Art
52-2-1622	Browns Road Site 7	Shelter with Deposit
52-2-1623	Browns Road Site 8	Shelter with Deposit
52-2-1626	Browns Road Site 11	Shelter with Art
52-2-1627	Browns Road Site 12	Shelter with Art
52-2-1628	Browns Road Site 13	Shelter with Art
52-2-1770	Upper Avon 34	Shelter with Deposit
52-2-1771	Upper Avon 35	Shelter with Deposit
52-2-1772	Upper Avon 36	Shelter with Art
52-2-1773	Upper Avon 37	Shelter with Deposit
52-2-1774	Upper Avon 38	Shelter with Art
52-2-1775	Upper Avon 39	Shelter with Deposit
52-2-1776	Upper Avon 40	Shelter with Art; Shelter with Deposit
52-2-1777	Upper Avon 41	Shelter with Deposit
52-2-2208	Dendrobium 1	Stone artefact
52-2-2209	Dendrobium 2	Stone artefact
52-2-2229	Site 1 - DB 1	Shelter with Art
52-2-2246	Dendrobium 6	Stone Artefact
52-2-2248	Dendrobium 7	Shelter with Art

<i>SITE NUMBER</i>	<i>SITE NAME</i>	<i>SITE TYPE</i>
52-2-3088	Dendrobium 8	Shelter with Art
NEW RECORD	DM2	Stone Artefact
NEW RECORD	DM16	Shelter with art
NEW RECORD	DM17	Shelter with deposit
NEW RECORD	DM22	Shelter with art
NEW RECORD	DM21	Shelter with art
Dendrobium Area 3C – General Area		
52-2-0019, 0544, 0753	Sandy Creek Road 2	Shelter with Art; Shelter with Deposit
52-2-0571	Sandy Creek Road 3	Shelter with Art
52-2-0570	Sandy Creek Road 4	Shelter with Art
52-2-0535	Sandy Creek Stone Arrangement	Stone Arrangement
52-5-0275	Sandy Creek Road 23	Shelter with Art
52-5-0276	Sandy Creek Road 24	Shelter with Art
52-2-1563	Donald Castle Creek 2	Axe Grinding Groove
52-2-1564	Donald Castle Creek 3	Axe Grinding Groove
52-2-1591	Donald Castle Creek 30	Shelter with Art
52-2-1632	Browns Road Site 17	Shelter with Art
52-2-1633	Browns Road Site 18	Shelter with Art
52-2-1634	Browns Road Site 19	Shelter with Art
52-2-2219	Dendrobium 3	Shelter with Art
NEW RECORD	DM1	Shelter with Art
NEW RECORD	DM10	Shelter with Deposit
NEW RECORD	DM18	Shelter with Art
NEW RECORD	Dm19	Shelter with Art
Outside SMP Area but within Study Area		
52-2-1643	Browns Road Site 29	Shelter with Art
52-2-1644	Browns Road Site 30	Shelter with Art
52-2-1645	Browns Road Site 31	Shelter with Art
52-5-0271	Sandy Creek Road 19	Shelter with Art
52-5-0272	Sandy Creek Road 20	Shelter with Art
52-5-0268	Sandy Creek Road 16	Shelter with Art
52-5-0269	Sandy Creek Road 17	Shelter with Art
NEW RECORD	DM 12	Shelter with art; Shelter with deposit
NEW RECORD	DM9	Stone Artefact

Table 7: Aboriginal archaeological sites recorded within Dendrobium Area 3

7.2.4 The location of the sites within the landscape

It was noted above that the rugged Hawkesbury sandstone landscape is where the majority of the archaeological sites—sandstone shelters with art / deposit—occur. Part of the reason for this is simply that the rugged, broken landscape provides many sandstone features and overhangs that are suitable for Aboriginal use as shelters or places for artistic expression. Anecdotal observations have long suggested that the majority of sites are located on the moderate to steep slopes associated with the drainage lines of the area. Comparing a slope analysis model with the distribution of all recorded sites for Dendrobium Area 3 provides actual data on the relationship between slope, and archaeological site distribution (Figure 7). Chart 1 presents a histogram of site distribution per slope gradient, grouped into five degree intervals, it clearly shows that the sites are located on what may be considered the moderate to steep slopes (20 – 35 degrees slope gradient).

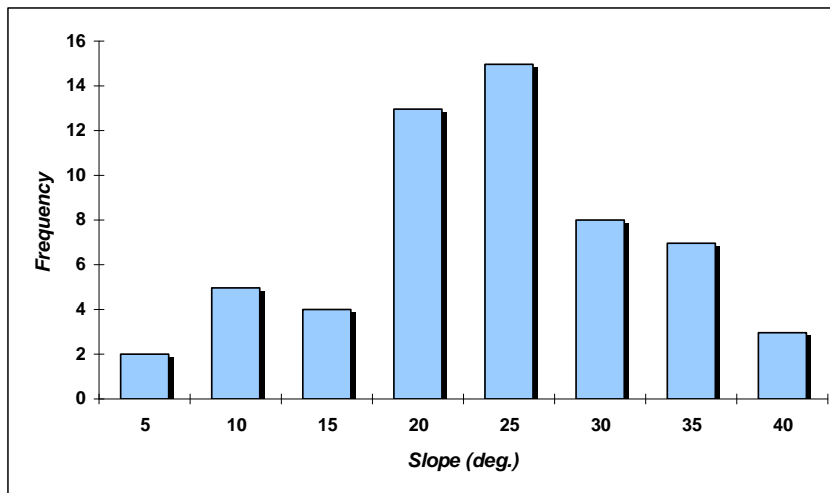


Chart 1. Histogram of site distribution on slopes

The data includes open context as well as closed context sites, with open artefact sites and axe grinding grooves accounting for some of the sites in the low gradient categories. What is apparent is that Aboriginal use of the study area seems to focus on the moderate to steep slopes where suitable overhangs for occupation and art occur, but use of lower gradient areas is relatively much less, while very steep slopes (greater than 45 degree gradient) are apparently not used at all. This is not surprising given the rugged and inaccessible nature of the very steep slopes. It should be noted that there is probably some survey bias, and bias from archaeological exposure and visibility in the low gradient areas, where open stone artefact sites are likely to occur, but not likely to be discovered unless there are ground surface impacts (such as vehicle tracks) to cause exposure.

7.3 Description of Shelter Art Sites

The following discussion presents an overview of the shelter art sites within Dendrobium Area 3. The aim of this section is to provide a characterisation and summary of the overall art assemblage present here so that this may help inform the forthcoming significance assessment.

7.3.1 Assemblage size

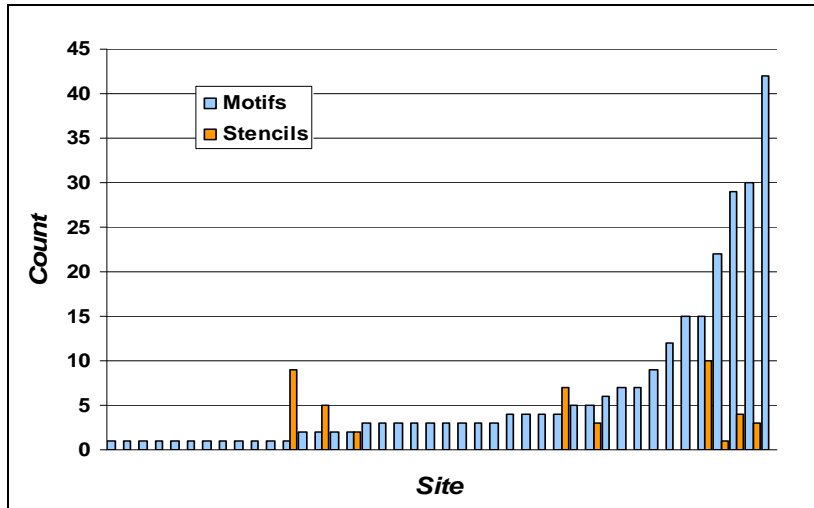
Shelters with art are the most frequent type of site within the study area, as they are regionally. Table 8 summarises the site frequency from the Dendrobium Area 3 study area, and clearly shows that shelters with art (sometimes these also have archaeological deposit) account for 64% of all sites.

Site type	<i>n</i>	%
Shelter with Art	35	54
Shelter with Deposit	13	20
Stone Artefact	6	9
Shelter with Art; Shelter with Deposit	7	11
Axe Grinding Groove	3	5
Stone Arrangement	1	2
Total	65	100

Table 8. Site type frequency within the study area

In total there are 254 motifs present at the 42 shelters with art in the study area, giving a mean motif count of 6 motifs per site. This is slightly lower than the 9 motifs per site reported by Sefton (1994, 1997) for a similar area of the Woronora Plateau, and is possibly a reflection of the amount of survey we were able to carry out, detecting many sites with single motifs.

When summing up the distribution and nature of art sites on the Woronora Plateau Caryl Sefton noted that '[there is] a high *range* of art count per shelter but a high frequency of shelters with low art counts' (Sefton 1988). In other words there is a heterogeneous assemblage of art, however the majority of sites contain only individual or very few motifs. The sites with high motif counts are of obvious value and significance, providing opportunities to look at the superposition of art, a range of motif types and styles, application techniques and differential preservation at individual sites. However, the single and low number motif sites are also important, because their distribution provides an insight into Aboriginal peoples' past use of the study area. Less frequent site types such as axe grinding grooves and stone artefact sites are also important for this reason. Chart 2 presents the motif and stencil count for each art site in the study area, sorted by motif count.



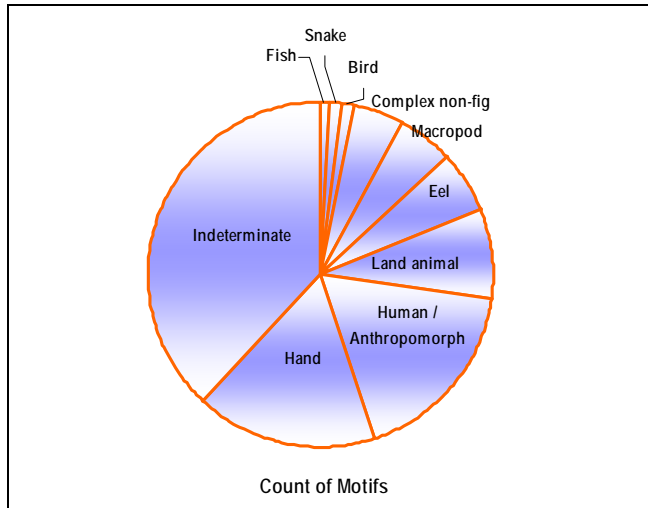


Chart 3. Frequency of basic motif type.

As is often reported for the Sydney basin charcoal rock art, indeterminate motifs are the most common motif type. Hand stencils or prints are also common in the study area, but human / anthropomorphic forms are very common. There is a range of other motif types represented in the study area, including a diversity of animals and some macropods, and even a fish. On the whole the results appear to support Sefton's assertion that human / anthropomorphic motifs are common in this part of the Woronora Plateau. Certainly they are well represented in the study area, providing a good assemblage of this motif type in a relatively small area.

The site Sandy Creek Road 3 contains a large assemblage of complex non-figurative charcoal motifs. The motifs are regular (with the same design repeated several times) but it is not clear what these motifs represent. Possibly the motifs represent plants, or plant products such as food, but this can only be speculated.

7.3.3 Techniques

Charcoal is the most often used media for art in the study area, and this is a feature characteristic of the entire Woronora Plateau. In order of frequency red ochre, yellow ochre and white clay are also used, although much less frequently than black pigment / charcoal (Chart 4).

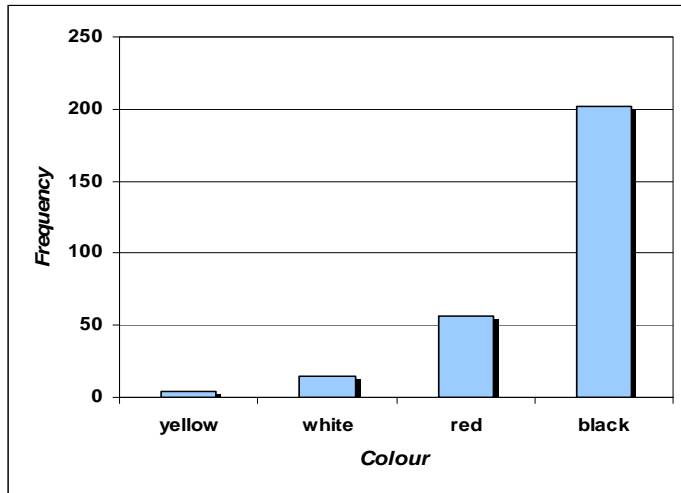


Chart 4. Colour of motifs in the study area.

The dominant form of drawing or painting in the study area is outline and infill, with outline and solid techniques being much less frequent. There is some scratched art evidenced at the sites Sandy Creek Road 3 and DM21, but these are the only two sites at which this technique was used. Stencils are limited to adult and children’s hands only, with no material culture items such as axes or boomerangs being stencilled. Chart 5 presents the frequency of each basic form of art or motif, excluding scratching.

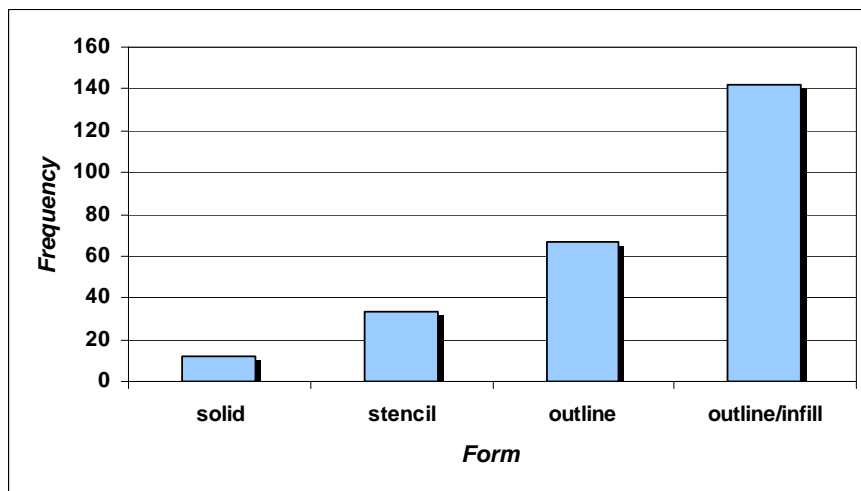


Chart 5. Art and motif form.

Outline / infill art is by far the most common expression, with simple outline being half as popular as the outline / infill. Outline / infill, outline and solid motifs of charcoal and red / yellow ochre are all represented within the study area. Stencils are well represented, especially considering that in many cases they are not as well preserved as the charcoal assemblages.

A summary and further discussion of the archaeological sites in the study area is included in Section 7.5.1 below.

7.4 Historic Sites

Two historic sites were identified during survey work conducted for this assessment.

7.4.1 DHS1 – Timber bridge

Located on a tributary of the Cordeaux River was a timber bridge constructed (refer to Plate 4) of what appear to be recycled telegraph poles. The bridge is located on an earlier road alignment of Fire Trail 6C and is orientated north - south.

Comprising four bearers extending between banks, with decking timbers laid across (refer to Plate 5), the bridge is considered to be of basic construction. All timbers have a circular section; average diameter of bearers and decking is approximately 400 mm and 200 mm respectively. The bridge measures approximately 6.8 m long and 3.6 m wide. Decking timbers are fixed to each bearer with an iron bolt (hexagonal head and circular-section shaft – refer to Plate 6). The ends of the decking elements are either square sawn or “pencilled” to a point (refer to Plate 7). The original road in this area is unformed, and there are no evident earthworks or masonry, suggesting there were no abutments or retaining walls.



Plate 4: Timber corduroy bridge across tributary of Cordeaux River. **Plate 5:** Circular section deck timbers.

The bridge is in exceptionally poor condition, with timber elements rotted and decayed. It is no longer used by vehicles which have been diverted approx 10 m to the east and cross the tributary via a new earthen crossing with culverts. It is unclear when the bridge was constructed, however it is highly unlikely that it was associated with the construction of the Cordeaux Dam; the dam was a large government undertaking which employed substantive engineering elements. This item shares little in common with the road infrastructure constructed for the Metropolitan Dam Scheme.



Plate 6: Iron bolts used to fix deck timbers to bearers.



Plate 7: Decking elements, square sawn or “pencil” ends.

7.4.2 Heritage curtilage of Cordeaux Dam

The study area extends under the visual curtilage of the Cordeaux Dam as established in the CMP for the dam (Graham Brooks 2003:51). To date, no fabric associated with the Cordeaux Dam has been identified in the study area. The CMP notes the importance of the

Visual relationship between:

- The dam walls and the immediate upstream and downstream areas of the catchment, and
- Realised and potential views of the dam wall from the surrounding hillsides (p. 50).

The visual curtilage was established to include “views to and from the dam over the pool of water upstream of the dam wall and the route of water delivery downstream of the dam wall” (p. 51). The visual curtilage reflects the SHR boundary for the Cordeaux Dam as an item of State significance (Plate 8).



Plate 8: View from the northern edge of the study area to Cordeaux Dam wall

7.5 Discussion

7.5.1 Aboriginal Archaeological Sites

7.5.1.1 Regional Trends

The study area is situated on the Woronora Plateau, dominated by Hawkesbury Sandstone. Formation processes in this environment, such as block fall and cavernous weathering, create sandstone ledges and overhangs and cliff lines, like those found throughout the study area. Other formations include open areas of flat, sandstone outcrops, primarily adjacent to or in water lines and swamps. These features of the Hawkesbury Sandstone exhibit evidence of habitation, art, and functional use by the Aboriginal groups that once inhabited the area. Within sandstone overhangs such occupation is evident from archaeological deposit recorded and excavated over the past 40 years by archaeologists. Deep deposits are limited due to the nature and formation of soils associated with the Hawkesbury Sandstone.

The study area would have provided a range of natural resources for the local Aboriginal inhabitants to exploit. Ethnographic information regarding the study area indicates that these inhabitants belonged to the *Tharawal* speaking people, although the study area is close to cultural boundaries, as possibly represented in the art assemblages. Within this group a number of sub-groups, or clans, would have existed, and inhabited various areas within the language groups' boundary. The division of these 'clans' within the region is said to have followed natural boundaries, such as the Illawarra escarpment, dividing those that inhabited the coast from those that inhabited the hinterland.

The analysis undertaken by Sefton has indicated a pattern between shelters, shelter attributes and drainage basins (1998). Such patterns can be on a regional or localised scale (Officer 1984; McDonald 1994). Based on these findings, we expected to find, and did find shelter sites with art and/or deposit, with grinding grooves and stone artefact sites being present in lesser numbers. The shelter sites contain a high percentage of charcoal motifs comprising primarily human motifs and terrestrial animals, and would generally have shallow archaeological deposits if present.

7.5.1.2 Survey Methodology

Based on all previous archaeological work on a regional and localised level, the survey methodology devised for the current study involved targeted survey of known landforms of archaeological sensitivity, focussing on moderate to steep sandstone slopes and ridgelines throughout Dendrobium Area 3. These areas are characteristic exposed sandstone environments, and shelter sites are very common. The current survey showed empirically that shelter sites in the study area occur on mid to steep slope ranges, generally slopes between 20 – 30 degree gradients. Shelter sites occur rarely on slopes ranges lower than this, and never on slope gradients greater than 40 degrees. The overall lack of ground surface visibility within the Hawkesbury Sandstone environment, which makes up the majority of the study area,

means there is a lack of recorded open stone artefact sites. The survey methodology is determined to have been very successful, with an additional 16 archaeological sites (or approximately 25%) having been identified in the study area.

7.5.1.3 Archaeological Sites

There are 65 Aboriginal archaeological sites within the Dendrobium Area 3 study area. The sites include shelters with art, shelters with art and archaeological deposit, shelters with archaeological deposit, open stone artefact sites, axe grinding grooves and a possible stone arrangement. The most common site type is shelters with art, with the dominant art component being outline and infill charcoal motifs. There are 254 motifs in the study area. The most common technique is outline and infill. The majority of the motifs are indeterminate; nevertheless there is also a high frequency of human / anthropomorphic motifs which is apparently characteristic of this part of the Woronora Plateau. Stencils and land animals are also well represented in the art assemblage, with hand prints and scratching being represented in a couple of sites only. Whilst there is a great diversity of motifs, the majority of the sites contain only single or a few motifs.

Overall the sites recorded within the study area exhibit a high percentage of charcoal outline and infill motifs, with a smaller percentage of red ochre hand stencils. This ratio of technique and motif type is typical within this region, further highlighting localised patterns, and wider patterns following catchment areas. Possibly these reflect boundaries between clans of *Tharawal* speaking people, as indicated by ethnographic sources. It is unclear exactly what such boundaries would look like archaeologically, but it is reasonable to expect that cultural expression through art played some role in signalling the relationship between identity and locality in the landscape (McDonald 1994). The range of site types, and the observation that the study area would have contained a range of traditional resources, shows that Aboriginal people utilised the Dendrobium Area 3 study area for a range of activities. Such activities would have included utilitarian activities such as stone axe maintenance and chipped stone artefact manufacture and discard, the latter being a by-product of day to day activities, rather than an activity specific to the locality. At least some resource gathering would also have taken place in the study area, and sites with complex non-figurative motifs possibly represent plants or plant food products. Many sandstone shelters in the study area contain surface chipped stone artefacts and archaeological deposit, demonstrating that people occupied the sandstone shelters and overhangs, although the antiquity, continuity, frequency and duration of these occupations are not known. Many shelters are very small, and would accommodate only a few people comfortably, suggesting that the shelters were probably used in a transient or opportunistic way, rather than for long term occupation for long periods.

Based on the evidence of the present study it can be concluded that the study area contains a fairly typical example of archaeological sites in this region of the Woronora Plateau. Generally the observations arising from this current study are consistent with previous major studies of the area (Navin Officer 2000, Sefton 1991). The study area contains both a diversity of sites and a diversity of motifs and art techniques. The sites and art are in various

conditions, but generally the charcoal art is poorly preserved. Combined with the cumulative survey efforts of previous researchers the current surveys present a strong sample of the archaeology of the study area, giving us confidence that the archaeological and cultural values of the study area can be accurately characterised.

7.5.2 Historical archaeological sites

The only potential historic fabric identified in the study area was site DHS1 – Timber Bridge. The bridge is essentially a corduroy bridge, reminiscent of early bridges in timber getting areas, but certainly of more recent origin. There is no visible evidence of an earlier creek crossing in the area, though presumably there was at least a causeway crossing prior to construction of the bridge. The bridge is of a basic engineering type and is in exceptionally poor condition, having been abandoned and the road diverted around.

The study area does include a small portion of the heritage curtilage established around the Cordeaux Dam in the Graham Brooks and Associates CMP (2003). There is no fabric associated with the curtilage, rather, it has been established to acknowledge the significance of and protect views to the dam wall from the surrounding hillside.

The lack of historic heritage sites within the study area is not inconsistent with the land use history of the area. The study area was unalienated Crown land prior to declaration as a water supply reserve. This lack of sustained historic occupation is reflected in the historic archaeological record of the study area.

8.0 SIGNIFICANCE ASSESSMENT

8.1 Introduction to the Assessment Process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia 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 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 significance of Aboriginal and historic sites and places will be 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 Environment and Heritage (DEH) and the NSW Department of Environment and Conservation (DEC) and Heritage Office and. The relevant sections of these guidelines are presented below.

8.2 Aboriginal Sites – Assessment of Significance

The following Aboriginal significance assessment is based on Part 1 of the *DEC Guidelines for Aboriginal Heritage Impact Assessment* (1997). 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 will be made when evaluating Aboriginal significance for sites and places.

In addition to the previously outlined heritage values, the *DEC Guidelines* 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 former is discussed in greater depth below, as it is more comprehensively addressed in the *Guidelines for Aboriginal Impact Assessment*. However we note here that it is best practice for archaeologists when undertaking significance assessments to keep in mind that scientific assessments are part of a larger picture.

The determinations of Aboriginal significance for sites and places will then be expressed as *statements of significance* that preface a concise discussion of the contributing factors to Aboriginal cultural heritage significance. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category will also be proposed and presented in a summary table.

8.2.1 Aboriginal community or cultural values

The NSW DEC recognises that ‘Aboriginal community are the primary determinants of the significance of their heritage’ (NSW DEC 2004). Biosis Research recognises that our role in the cultural heritage assessment process is to provide specialist skills, particularly in regard to archaeological and heritage management expertise. These specialist skills can be articulated and enhanced through consultation with the Aboriginal community, with the aim of providing a comprehensive assessment of cultural heritage significance.

The heritage assessment criteria outlined above that relate to community or cultural values include social, historic and aesthetic value. Social and aesthetic values are often closely related. Social value refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day Aboriginal community. Aesthetic values related to Aboriginal sites and places that may contain particular sensory, scenic, architectural and creative values and meaning to Aboriginal people. Historic value refers to the associations of a place with a person, event, phase or activity of importance to the history of an Aboriginal community. Gaining a sufficient understanding of this aspect of significance will often require the collection of oral histories and archival or documentary research, as well as field documentation. Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage, and the Aboriginal involvement and contribution to important regional historical themes is often missing from accepted historical narratives.

These aspects of heritage significance can only be determined through consultative processes with one or more Aboriginal communities. In terms of Aboriginal communities, heritage places – including those that are otherwise defined as ‘archaeological sites’ – will always attract differing values. These may include custodianship obligations, education, family or ancestral links, identity, and symbolic representation. History and traditions are important: this generation has an obligation to future generations to retain certain things as they are currently seen and understood. This includes retaining alternative understandings to those that come through scientific assessments. Heritage places are often more complex than is identified through the scientific determination of value. Cultural and social values can be complex and rich - the past is a vital component of cultural identity. Feelings of belonging and identity are reinforced by knowledge of the existence of a past, and this is further reinforced and maintained in the protection of cultural heritage.

Statement of Cultural Significance

All Aboriginal cultural heritage sites located in the study area are considered to be of cultural significance to the Illawarra Local Aboriginal Land Council, Korrewal Elouera J and the Cubbitch Barta Native Title Claimants Aboriginal Corporation, and it is important that comment on the area is provided directly by members of these Aboriginal communities. The sites are evidence of past Aboriginal occupation and use of the area, and are the main source of information about the Aboriginal past. In addition, any recorded (and unrecorded) pre-

contact sites are of cultural significance because they are rare or, at least, uncommon site-types. In particular, many sites in the greater Sydney region have been destroyed as a result of land clearance and land-use practices in the historic period.

8.2.2 Aboriginal (Scientific) Significance

Archaeological significance (also called scientific significance) 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 will be 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 1997). For this reason, the NSW NPWS 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 1997: 26). The NPWS criteria for archaeological significance assessment are based largely on the Register of the National Estate Criteria, and under the heading of ‘research potential’ include the following aspects and definitions (NPWS 1997):

General site considerations, including factors such as:

- *Site intactness or integrity*: This includes the state of preservation of archaeological objects, as well as the stratigraphic integrity of the site, the taphonomic processes acting on the site, the impact of past artefact collections made at the site.
- *The connectedness* of the site to other sites – when considered as part of a larger assemblage or landscape the site may have greater research potential than if it was simply considered in isolation.
- *Chronological potential* refers to the potential of a site to provide a dateable framework extending back into the past. The potential antiquity of a site is also an important consideration, as older sites are relatively less common than younger sites. In many cases stratified, dateable artefact bearing deposits are sufficiently rare to be a very valuable resource.

Representativeness

- *Representativeness* refers to the ability of a site or object to serve as a representative example of sites in the same class. This aspect of value is only meaningful when considered in conjunction with a conservation goal, and must be determined against the archaeological record at various scales of consideration - local, regional and continental for example. It takes into account site and object variability, connectedness and a consideration of what is already, and likely to be, conserved. Burke and Smith (2004: 247) define representativeness as ‘an assessment of whether

or not a place is a good example of its type, illustrating clearly the attributes of its significance.’

Rarity

- *Rarity* is, of course, closely related to representativeness (if a site is rare, it is likely to have high representative value), and will include a consideration of those issues discussed under general site considerations. In many ways, the determination of rarity is a summation of exceptional research potential, or a representative of a small class of sites or objects. Burke and Smith (2004: 247) further describe rarity as ‘an assessment of whether the place represents a rare, endangered or unusual aspect of our history or cultural environment that has few parallels elsewhere.’

In addition to the research potential related value factors, the NSW NPWS (1997: 32) also discuss *Educational Potential* and *Aesthetic Significance*, as items that may be included in scientific significance. The NPWS general advice is that archaeologists should give careful consideration prior to attempting to determine educational and aesthetic values (NPWS 1997: 32). We make no attempt to determine educational potential of sites under scientific assessment, but do consider educational value as a contributing factor that may be included in an assessment of social significance by the Aboriginal community.

Aesthetic values

There is a diverse yet accessible literature regarding identifying aesthetic values and determining aesthetic significance (Burke and Smith 2004: 248-9, Kerr 1996: 15-16, Pearson and Sullivan 1999: 134-8). It is generally agreed that aesthetic values are an important part of cultural heritage significance, however they are dependent on an individual’s sensory response, which means determining aesthetic value is fraught with difficulty, and should be applied on a case-by-case basis as it is not always a value applicable to archaeological sites (Burke and Smith 2004: 248). However, when dealing with shelter and rock art sites aesthetic values and landscape context are an important consideration. The question ‘does the place have a relationship between its parts and the setting which reinforces the quality of both’, while originally proposed in an architectural context (Kerr 1996: 15), is relevant also for rock art and shelter sites in a bushland setting where there is often an important relationship between the cultural site and natural environment.

8.2.3 Statement of Archaeological Significance

Section 8.2.5 provides a summary of the significance for all Aboriginal archaeological sites situated within Dendrobium Area 3 Study Area. The significance of each site follows the assessment process outlined in Section 2.3.3. The detailed statements of significance can be located in Appendix 4 of this report. This includes a statement of significance based on the categories defined in the Burra Charter. These categories include social, historic, scientific, aesthetic and cultural landscape values. Nomination of the level of value—high, moderate,

low or not applicable—for each relevant category will also be proposed. The determination of cultural landscape value will be 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 scientific significance and cultural significance of each site will be summarised in Table 9 below.

8.2.4 Cultural landscape values / significance

The principle behind a cultural landscape is that ‘the significance of individual features is derived from their inter-relatedness within the cultural landscape’ (NSW NPWS n.d.: 5-6). This means that sites or places cannot be ‘assessed in isolation’ but must be considered as parts of a wider context of features with cultural and social value. Hence the site or place will possibly have values derived from its association with other sites and places, and its context within the physical landscape. 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 (NSW NPWS n.d.: 5).

We firstly approach the assessment of cultural landscape values by considering the value of the assemblage of sites at Dendrobium Area 3 as just that – an assemblage of sites in a wider context of other sites, and in the context of a well preserved bushland environment. It is important to note that the value of the cultural landscape as a social phenomenon does not have to rely on robust archaeological interpretation; but rather is a contemporary expression of value to the Aboriginal community, archaeologists, and the community at large. We believe this is in-line with current approaches and policy directions for the NSW DEC (NSW NPWS n.d., Byrne, Brayshaw and Ireland 2001).

The study area is situated on the Woronora Plateau, in an area that has been subjected to relatively minimal environmental disturbance because of its reservation as a Catchment Area. As a landscape the study area contains value because it contains a relatively high number of archaeological sites, in a relatively undisturbed environment. The majority of the archaeological sites are sandstone shelters with art and the juxtaposition of these sites with the often dramatic bushland setting creates a strong sense of place. Other site types—such as open stone artefacts sites, axe grinding groove sites and a possible stone arrangement—combine with the landscape and the art and shelter sites to provide a detailed record of Aboriginal use of the study area prior to European arrival in the region. In addition, the presence of many archaeological sites on the Woronora Plateau and Illawarra Escarpment is a well known fact amongst local Aboriginal communities. This gives the landscape value as a well known and highly visible cultural resource for the local Aboriginal communities. The rugged sandstone bushland and its many archaeological sites are in many ways a touchstone of identity for Aboriginal people of the Illawarra. The study area must be considered to have high value as a cultural landscape.

8.2.5 Aboriginal Sites – Significance Summary

The determination of Aboriginal significance relies on a comprehensive approach to cultural heritage assessments and to the values that are attached to heritage places. Aboriginal heritage significance can be considered to be the importance of a place, site or object arising from the combination of values attributed to it. These values determine the ‘what’ and ‘how’ of conservation and direct management decisions.

The following table (Table 9) summarises the determinations of significance presented in Appendix 3.

<i>SITE NAME AND NUMBER</i>	<i>COMMUNITY OR CULTURAL SIGNIFICANCE</i>	<i>ARCHAEOLOGICAL OR SCIENTIFIC</i>
Dendrobium Area 3A – SMP Area		
Browns Road Site 33 (52-2-0458)	High	Moderate
Browns Road Site 32 (52-2-1646)	High	High
Browns Road Site 20 (52-2-1647)	High	Low
Sandy Creek Road 21 (52-5-0273)	High	Low
Sandy Creek Road 22 (52-5-0274)	High	Low
Sandy Creek Road 25 (52-5-0277)	High	Moderate
Sandy Creek Road 26 (52-5-0278)	High	Low
Sandy Creek Road 28(52-2-2043)	High	Moderate
SCA Special Area Fire Trail 6C (52-2-3052)	High	Low
DM13 (NEW RECORD)	High	Low
DM14 (NEW RECORD)	High	Low
DM15 (NEW RECORD)	High	Low
DM20 (NEW RECORD)	High	Low
DM23 (NEW RECORD)	High	Moderate
Dendrobium Area 3B – General Area		
Donald Castle Creek 1 (52-2-1562)	High	Low
Browns Road Site 7 (52-2-1622)	High	Low
Browns Road Site 8 (52-2-1623)	High	Low
Browns Road Site 11 (52-2-1626)	High	Low
Browns Road Site 12 (52-2-1627)	High	Moderate
Browns Road Site 13 (52-2-1628)	High	Low
Upper Avon 35 (52-2-1771)	High	Moderate
Upper Avon 36 (52-2-1772)	High	High
Upper Avon 37 (52-2-1773)	High	Low
Upper Avon 38 (52-2-1774)	High	Low
Upper Avon 39 (52-2-1775)	High	Low
Upper Avon 40 (52-2-1776)	High	Low
Upper Avon 41 (52-2-1777)	High	Low
Dendrobium 1 (52-2-2208)	High	Low
Dendrobium 2 (52-2-2209)	High	Low
Site 1 - DB 1 (52-2-2229)	High	Low
Dendrobium 6 (52-2-2246)	High	Low
Dendrobium 7 (52-2-2248)	High	Low
Dendrobium 8 (52-2-3088)	High	Low

DM2 (NEW RECORD)	High	Low
DM16 (NEW RECORD)	High	High
DM17 (NEW RECORD)	High	Low
DM22 (NEW RECORD)	High	Low
DM21 (NEW RECORD)	High	High
Dendrobium Area 3C – General Area		
Sandy Creek Road 2 (52-2-0019, 0544, 0753)	High	Moderate
Sandy Creek Road 3 (52-2-0751)	High	High
Sandy Creek Road 4 (52-2-0750)	High	Low
Sandy Creek Stone Arrangement (52-2-0535)	High	High
Sandy Creek Road 23 (52-5-0275)	High	Low
Sandy Creek Road 24 (52-5-0276)	High	Low
Donald Castle Creek 2 (52-2-1563)	High	Low
Donald Castle Creek 3 (52-2-1564)	High	Low
Donald Castle Creek 30 (52-2-1591)	High	Moderate
Browns Road Site 17 (52-2-1632)	High	Low
Browns Road Site 18 (52-2-1633)	High	Low
Browns Road Site 19 (52-2-1634)	High	Low
Dendrobium 3 (52-2-2219)	High	Low
DM1 (new record)	High	Low
DM 9 (new record)	High	Low
DM10 (new record)	High	Low
DM18 (new record)	High	Low
DM 19 (new record)	High	Low
Outside SMP Area but within General Study Area		
Browns Road Site 29 (52-2-1643)	High	High
Browns Road Site 30 (52-2-1644)	High	Low
Browns Road Site 31 (52-2-1645)	High	Low
Sandy Creek Road 19 (52-5-0271)	High	Low
Sandy Creek Road 20 (52-5-0272)	High	Moderate
Sandy Creek Road 16 (52-5-0268)	High	Low
Sandy Creek Road 17 (52-5-0269)	High	Low
Upper Avon 34 (52-2-1770)	High	Low
DM 12 (NEW RECORD)	High	High

Table 9: Summary of significance for sites at Dendrobium Area 3

9.0 HISTORIC SITES – ASSESSMENT OF SIGNIFICANCE

9.1.1 Heritage Assessment Criteria

The State Heritage Register, which was established by the amendments to the NSW *Heritage Act* in 1999, has a separate set of significance assessment criteria broadly based on those of the Australia ICOMOS Burra Charter (1999).

To be assessed for listing on the State Heritage Register an item will need to meet one or more of the following criteria:

CRITERION	DESCRIPTION	CATEGORY
A	An item is important in the course, or pattern, of NSW's cultural or natural history;	Nature of
B	An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history;	Nature of
C	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW;	Nature of
D	An item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons;	Nature of
E	An item has the potential to yield information that will contribute to an understanding of NSW's cultural and natural history;	Nature of
F	An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history;	Comparative
G	An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places; or cultural or natural environments.	Comparative

Table 10: Criteria for the assessment of historic cultural heritage

Amendments to the *Heritage Act* clarify and strengthen responsibility for the management of heritage items at the Local and State level. Consequently, items can be assessed as having **Local** or **State** level significance. Items should also be assigned a grading, in order to better explain its place within a cultural landscape. Criteria for grading an item or place are discussed in Section 8.1.

An item cannot be excluded from listing on the State Heritage Register on the basis that items with similar characteristics have already been listed. These criteria can be applied to items of State and Local significance.

These assessment criteria are useful in considering a wide range of heritage items, and may be applied to sites with items of standing heritage as well as areas with the potential to contain archaeological deposits.

9.1.2 Grading of significance

The heritage guidelines on assessing significance also include a set of gradings of significance. These are used to identify if loss of integrity or condition diminishes significance.

<i>GRADING</i>	<i>JUSTIFICATION</i>	<i>STATUS</i>
Exceptional	Rare or outstanding element directly contributing to an item's local and State significance.	Fulfils criteria for local or State listing.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from the significance.	Fulfils criteria for local or State listing.
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or State listing.
Little	Alterations may detract from the overall significance but its role, function, design or fabric can still be interpreted.	Does not fulfil criteria for local or State listing.
Intrusive / Nil	Damaging to the item's heritage significance. Difficult to interpret.	Does not fulfil criteria for local or State listing.

Table 11: NSW Heritage Office grading of heritage significance

An assessment of significance is based on the attributed value of an item or place, while the grading also considers the current condition. The grading system works both ways. An item may be inherently significant at either State or local level, yet modifications and alterations have detracted from the significance of particular elements. The grading system is a useful tool by which an appropriate management regime may be developed. Identification and conservation of highly significant elements will ensure the heritage value of the item is not diminished. Elements of exceptional significance should be conserved and enhanced where possible, while elements of little or no significance may be open to a range of management options.

The basis for these assessments is determined on a case-by-case scenario and is outlined in the following significance assessments.

9.1.3 Historic sites – assessment of significance

- DHS1 – Timber bridge

It should be noted that the lack of historic information regarding this particular bridge has limited the assessment of significance. In lieu of specific detail, the bridge has been assessed as a piece of generic roadway infrastructure, with particular reference to fabric and condition.

A	<p>An item is important in the course, or pattern, of NSW's cultural or natural history;</p> <p>DHS1 has limited intrinsic value as an item of roadway infrastructure. The bridge is associated with an historic road alignment, and although the bridge appears to be of relatively recent construction, it is indicative of the continued use of the road as a transport route. The bridge allowed passage across a tributary of the Cordueax River and ensured better access through the Metropolitan Special Area. As the age of the bridge is indeterminate, it is unclear if the bridge is of historic significance.</p>
B	<p>An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history;</p> <p>Not applicable.</p>
C	<p>An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW;</p> <p>DHS1 has some small aesthetic value as a historic "ruin" in a bush landscape. The bridge does not demonstrate any creative or technical achievement. The bridge employs basic engineering and construction techniques using materials to hand. There is nothing to suggest that the bridge was constructed by government department (DPW / DMR etc), it instead being of a rural vernacular type.</p>
D	<p>An item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons;</p> <p>Not applicable.</p>
E	<p>An item has the potential to yield information that will contribute to an understanding of NSW's cultural and natural history;</p> <p>Not applicable.</p>
F	<p>An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history;</p> <p>Not applicable.</p>
G	<p>An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places; or cultural or natural environments.</p> <p>DHS1 is representative of basic corduroy bridge engineering and construction techniques.</p>

Statement of significance

While DHS1 Timber Bridge has some limited aesthetic and representative value, the structure is in poor condition and is of indeterminate age. The bridge is not an engineering achievement, nor is it considered rare. The bridge appears to be an opportunistic use of materials to hand to produce a simple and relatively effective creek crossing to ensure use of Fire Trail 6C. The bridge is of a rural vernacular and does not appear to be of standardised government construction.

Despite the poorly understood history of the bridge and its poor condition the bridge the precautionary principle has been employed and the bridge assessed as being of **local**

significance. Should additional historic information be identified which clarifies the purpose of the bridge, the assessment of significance should be revised.

- Visual curtilage of Cordeaux Dam

The assessment of significance as pertaining to the visual catchment of the dam has been reproduced from the Heritage Council of NSW endorsed CMP. Reference should be made to the CMP and/or the SHR listing for the Cordeaux Dam for the full assessment of significance for the dam, its fabric and associated infrastructure.

The Cordeaux Dam is a recognised item of State heritage significance with an identified heritage curtilage. The curtilage boundary has been placed so as to ensure conservation of significant elements of the site including significant views and vistas of heritage fabric and significant setting of heritage fabric. The heritage curtilage is essentially the demarcation of the significant landscape of the dam. Although there is no heritage fabric associated with the dam located in the study area, the aesthetic significance of the dam is appreciable from within the study area.

A	An item is important in the course, or pattern, of NSW's cultural or natural history; Not applicable.
B	An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history; Not applicable.
C	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW; The wall of Cordeaux Dam is an engineering work imbued with a sense of high aesthetic values expressed through the long curved wall set within the valley of the Cordeaux River.... Upstream of the dam wall this setting is characterised by the broad expanse of the pool of water bordered by the crests of the valley sides. Downstream of the dam wall the setting is characterised by the steeper inclines that graduate into the gorge created by the river's flow over time. Collectively this topography at times of high water levels imparts a picturesque scene when viewed from selective vantage points above and on the dam wall.
D	An item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons; Not applicable.
E	An item has the potential to yield information that will contribute to an understanding of NSW's cultural and natural history; Not applicable.

F An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history;

Not applicable.

G An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places; or cultural or natural environments.

Not applicable.

Statement of Significance

The portion of the heritage curtilage of Cordeaux Dam located within the study area is of **State significance** for the views it allows of the dam. While there is no tangible heritage fabric within the study area, these views provide a direct appreciation of the Cordeaux Dam in its natural bush setting and the rugged terrain of the Cordeaux Gorge. When viewed from a distance, such as within the study area, understanding of Cordeaux Dam as a large-scale engineering achievement in a remote setting is communicated immediately and effectively.

10.0 IMPACT ASSESSMENT

10.1 Potential Impacts

The potential impacts that result from subsidence relate to the tilt and strain that occurs during and after the coal has been extracted. The discussion below is based on MSEC (2007) predictions for the proposed longwall mining area.

Subsidence

Subsidence refers to vertical and associated horizontal displacement of a point. In the case of this study it refers to subsidence resulting from the extraction of coal using longwall methods. The amplitude of subsidence is usually expressed in millimeters (MSEC 2007).

Tilt

Tilt is calculated as the change in subsidence between two points divided by the distance between those points. Tilt is, therefore, the first derivative of the subsidence profile. The convention usually adopted is for a positive tilt to indicate the ground increasing in subsidence in the direction of measurement. The maximum tilt, or the steepest portion of the subsidence profile, occurs at the point of inflection in the subsidence trough, where the subsidence is roughly equal to one half of the maximum subsidence. Tilt is usually expressed in millimetres per metre (MSEC 2007).

Strain

Strain is caused by bending and differential horizontal movements in the strata. Measured strain is determined from monitored survey data by calculating the horizontal change in length of a section of a subsidence profile and dividing this by the initial horizontal length of that section. If the section has been extended, the ground is in tension and the change in length and the resulting strain are positive. If the section has been shortened, the ground is in compression and the change in length and the resulting strains are negative. The unit of measurement adopted for strain is millimetres per metre. The maximum strains coincide with the maximum curvature and hence the maximum tensile strains occur towards the sides of the panel whilst the maximum compressive strains occur towards the bottom of the subsidence trough (MSEC 2007).

10.2 Overview of Subsidence and Aboriginal Archaeological Sites

Longwall mining subsidence effects to the sandstone environments around the Sydney basin have been incidentally documented for some time (Sefton 2000:12-13). In the Southern Coalfield, Caryll Sefton has conducted a long term monitoring program, and reviewed the effects of longwall mining on sandstone overhang Aboriginal archaeological sites over a 10 year period (Sefton 2000). The review included data collected from the longwall mine areas of Tahmoor, Appin, Tower, West Cliff, Metropolitan, Elouera and Cordeaux Collieries. At the time of the review 52 sandstone overhang sites had been monitored by Sefton prior to,

during and after longwall mining in the vicinity of the sites (Sefton 2000: 15). Of the 52 sites monitored only five had evidence of impact from longwall mining (Sefton 2000: 17-18). The impacts can be grouped into four effect categories: cracking; movement along existing joints / bedding planes; block fall; and change of water seepage. No art panels in the monitoring program have been directly impacted by subsidence effects noted by Sefton.

Sefton conducted a Principal Components Analysis using 16 variables recorded for all the sites, including the subsidence parameters (2000:30). Sefton found that the components most associated with observed changes were the overhang size (particularly length); wet overhangs; location near the valley bottom; location above the goaf; and block-fall type shelters. No monitored overhang has collapsed. High estimated strain values were also associated with observed changes (Sefton 2000:31). Sefton concludes that 'the over-riding factor which appears to be significant is overhang size where large overhangs are at greater risk' (2000:38). In particular, no monitored overhang less than 50m³ has suffered subsidence impacts, regardless of other risk components. Not all sites larger than 50m³ will be impacted. Of those monitored overhangs larger than 50m³ only one-fifth (5 of 23) have suffered damage. Where impacts were present, these were not noticeable until 3- 6 months subsequent to the nearest longwall panel being mined.

Sefton has described the task of predicting subsidence impacts to individual archaeological sites as 'difficult and complex' (2000). However at a wider level our ability to confidently predict subsidence effects to the landscape is constantly improving. Sefton's systematic monitoring documents both natural changes in overhangs and changes that can be confidently attributed to longwall mining. The changes that are attributable to mining are due to overhang destabilisation. These include block fall, exfoliation, cracking and associated changes in water seepage. These changes can also occur naturally in the absence of mining, as a result of weathering (Sefton 2000). Sefton recommended that shelters smaller than 50m³ need not be monitored because no shelters in this size class had been impacted in her sample and that shelters with archaeological deposit or PAD need not be monitored because changes or impacts from subsidence could not be demonstrated to this site type.

10.3 Aboriginal Archaeological Heritage Sites

Predicted mining subsidence data have been calculated for the study area by Mine Subsidence Engineering Consultants (MSEC 2007). Table 12 shows the results of the subsidence modelling. Detailed predictions for sites within Dendrobium Area 3B and Dendrobium Area 3C will not be available until mine layouts are finalised, however they are expected to be of a similar magnitude to Dendrobium Area 3A. An impact assessment for each of the sites is presented in more detail following Table 12: the impact assessments make reference to the MSEC (2007) predictions and assessment and to Sefton's observations and recommendations stemming from her monitoring program.

Site Number	Site Name	Site Type	Maximum Predicted Cumulative:			
			Subsidence (mm)	Travelling Tilt (mm/m)	Travelling Tensile Strain (mm/m)	Travelling Compressive Strain (mm/m)
52-2-0458	Browns Road Site 33	Shelter with Art	220	2.9	0.6	0.2
52-2-1646	Browns Road Site 32	Shelter with Art	150	3.9	0.8	0.3
52-2-1647	Browns Road Site 20	Shelter with deposit	<20	0.1	<0.1	<0.1
52-2-2043	Sandy Creek Road 28	Stone Artefacts	<20	0.1	<0.1	<0.1
52-2-3052	SCA Special Area Fire Trail 6C	Stone Artefacts	75	1.0	0.2	0.1
52-5-0273	Sandy Creek Road 21	Shelter with art and deposit	1485	5.7	1.6	1.3
52-5-0274	Sandy Creek Road 22	Shelter with art	235	4.6	1.9	1.5
52-5-0277	Sandy Creek Road 25	Shelter with art and deposit	1540	7.4	1.8	3.6
52-5-0278	Sandy Creek Road 26	Shelter with art	1540	7.6	1.8	3.6
NEW RECORD	DM13	Shelter with deposit	1615	15	2.5	2.0
NEW RECORD	DM14	Stone artefacts	1400	10	1.4	2.5
NEW RECORD	DM15	Shelter with art	1265	15	2.8	2.1
NEW RECORD	DM20	Shelter with art	1660	6.0	1.4	1.1
NEW RECORD	DM23	Shelter with deposit	<20	<0.1	<0.1	<0.1

Table 12: Subsidence, tilt and strain predictions for each of the Aboriginal archaeological sites within the Study Area (results provided by MSEC 2007: 73)

10.3.1 Site specific impact assessments Area 3A

The site specific impact assessments for the sites in Dendrobium Area 3A are presented below and are summarised in Table 13. The impact assessments are described in terms of risk of impact. The highest category used for risk of impact is *moderate*: this done to recognise the difficulty in making precise statements of impact, and to incorporate Sefton's (2000) observations, described in detail above, that generally impacts to sites are rare (occurring in <10% of monitored cases) and that when impacts have been recorded they have been relatively minor - not impacting art surfaces for example. Hence the category *moderate* means impacts are possible, but likely to occur in roughly 10% of cases. The other categories used to describe risk include sites whose features, size and position over longwall goafs places them in a class that has not previously been impacted in formal monitoring regimes. These categories are: *low* (impacts are unlikely); *very low* (impacts are highly unlikely); and *negligible* (impacts are highly unlikely, and would likely be indistinguishable from the natural background environment).

<i>Browns Road Site 33</i>	<i>52-2-0458</i>	<i>Shelter with Art</i>
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This site has low predicted systematic tensile strains, and is not located over a goaf area. Rock falls, fracturing of strata and shear movements near the surface are very rare outside of goaf areas. The site has a very low volume – 16m³ – placing outside the risk category of larger sites. The risk of impact at this site is very low.

<i>Browns Road Site 32</i>	<i>52-2-1646</i>	<i>Shelter with Art</i>
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This site has very low predicted systematic tensile strains, and is not located over a goaf area. The site's volume is 202m³, which places it in the risk category of larger sites. However, rock falls, fracturing of strata and shear movements near the surface are very rare outside of goaf areas. The risk of impact at this site is very low.

<i>Browns Road Site 20</i>	<i>52-2-1647</i>	<i>Shelter with Deposit</i>
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This site has very low predicted systematic tensile strains, and is not located over a goaf area. The site's volume is 160m³, which places it in the risk category of larger sites. However, rock falls, fracturing of strata and shear movements near the surface are very rare outside of goaf areas. The risk of impact at this site is very low.

<i>Sandy Creek Road 28</i>	<i>52-2-2043</i>	<i>Stone Artefacts</i>
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This site has very low predicted systematic tensile strains, and is a stone artefact scatter located on a vehicle track, outside of the goaf area. The artefacts are situated on the ground surface or in the upper regolith, and the site could potentially be affected by cracking of the ground surface, although this may not actually impact objects (artefacts) at the site. Subsidence effects at such a site are predicted to be negligible.

<i>SCA Special Area Fire Trail 6C</i>	<i>52-2-3052</i>	<i>Stone Artefacts</i>
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This site has low predicted systematic tensile strains, and is a stone artefact scatter located on a vehicle track, outside of the goaf area. The artefacts are situated on the ground surface or in the upper regolith, and the site could potentially be affected by cracking of the ground surface, although this may not actually impact objects (artefacts) at the site. Subsidence effects at such a site are predicted to be negligible.

<i>Sandy Creek Road 21</i>	<i>52-5-0273</i>	<i>Shelter with Art and Deposit</i>
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This site has moderate predicted systematic tensile strains, as it is located directly over a goaf. The site's volume is 59m³, which places it just in the risk category of larger sites. Fracturing and shear movements of strata, and rock falls associated with cliffs have been reported in similar situations. Hence, the risk of impact to this site is moderate.

<i>Sandy Creek Road 22</i>	<i>52-5-0274</i>	<i>Shelter with Art</i>
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This site has moderate predicted systematic tensile strains, as it is located at the end a goaf. The site's volume is 35m³, which places it outside the risk category of larger sites. Fracturing

DM23**NEW RECORD****Shelter with Deposit**

This site has very low predicted systematic tensile strains, and is situated well outside the goaf area. The site is a very large overhang with a volume of 19,200m³. Although a very large and a highly weathered, inherently unstable shelter the shelter is not likely to be impacted as it is outside of the zone where rock falls have been previously observed. The shelter is a shelter with deposit, and impacts are not likely to occur to the archaeological deposit. Overall the risk of impact to the shelter is low.

Table 13 presents a summary of the predicted risk of impact to the archaeological sites in Dendrobium Area 3A, as well as the sites' assessed archaeological significance.

Site Number	Site Name	Site Type	Significance	Risk of Impact
52-2-0458	Browns Road Site 33	Shelter with Art	Low	Very Low
52-2-1646	Browns Road Site 32	Shelter with Art	High	Very Low
52-2-1647	Browns Road Site 20	Shelter with deposit	Low	Very Low
52-2-2043	Sandy Creek Road 28	Stone Artefacts	Moderate	Negligible
52-2-3052	SCA Special Area Fire Trail 6C	Stone Artefacts	Low	Negligible
52-5-0273	Sandy Creek Road 21	Shelter with art and deposit	Low	Moderate
52-5-0274	Sandy Creek Road 22	Shelter with art	Low	Low
52-5-0277	Sandy Creek Road 25	Shelter with art and deposit	Moderate	Low
52-5-0278	Sandy Creek Road 26	Shelter with art	Low	Moderate
NEW RECORD	DM13	Shelter with deposit	Low	Moderate
NEW RECORD	DM14	Stone artefacts	Low	Negligible
NEW RECORD	DM15	Shelter with art	Low	Low
NEW RECORD	DM20	Shelter with art	Low	Moderate
NEW RECORD	DM23	Shelter with deposit	Moderate	Low

Table 13. Summary of risk of impact to sites in Area 3A

There are 6 sites with either negligible or very low risk of impact from the proposed mining, including the only site assessed to have high archaeological significance in Area 3A. There are 4 sites that have a low risk of impact, including 2 shelters with deposit; of these 4 sites 2 have moderate archaeological significance and 2 have low archaeological significance. The highest risk category – moderate – contains 4 archaeological sites; these are all shelters with art and / or archaeological deposit, however all these sites have been assessed as having low archaeological significance.

In conclusion, and by way of further summary, there is a generally low risk of impact to the archaeological values of Dendrobium Area 3A as a whole. This leads naturally to the conclusion that the impact to the cultural landscape will be very low. Whilst there may be some impact to individual sites, based on what we know from previous monitoring these

impacts will occur rarely, and when they do occur will be on a relatively small scale. The cultural landscape of Area 3A contains a dense and diverse range of archaeological sites in a bushland environment that should also not be significantly impacted by the proposed longwall mining. There is a low level of predicted and potential impact to the archaeological sites, and the similarly a low level of expected impact to the surrounding environment within which they are contained. This being the case the principle nexus of value contributing to the cultural landscape—the relationship between the cultural sites and the natural environment which create a strong sense of place, both at individual sites and for the area as a whole—will not be at risk of significant impact from the proposal.

10.3.2 General impact assessments Area 3B and Area 3C

Detailed subsidence predictions for sites within Dendrobium Area 3B and Dendrobium Area 3C will not be available until mine layouts are finalised. The sites present in Area 3B and Area 3C are widely distributed, and thus are likely to be subjected to a full range of predicted systematic subsidence movements. It is reasonable to expect that longwall widths and extraction heights for Area 3B and Area 3C will be similar to those currently proposed for Area 3A. Hence, the magnitude and range of systematic subsidence movements will be similar in Area 3B and Area 3C to those predicted for Area 3A.

At a *prima facie* level we can make general observations about risk of impact based on site type, and for sandstone shelters site size. It must be noted however that more detailed assessments cannot be made until the final mine plans are developed for these areas, allowing more detail—such as whether or not sites are located over the longwall goaf—to be included. The general observations for the sites in Area 3B and Area 3C are presented in Table 14, with sites that have a higher likelihood of impact being shaded.

Of the 42 sites remaining in Dendrobium Area 3B and Area 3C, 15 fall into the category of having a relatively higher likelihood of being at risk of impact from future longwalls (these sites are shaded in Table 14). Of these 15 sites: 10 are of low archaeological significance; 2 are of moderate archaeological significance; and 3 are of high archaeological significance.

We cannot comment in any more detail on the impacts to archaeological sites in Dendrobium Area 3B and Area 3C without a detailed mine plan and specific subsidence predictions, however at a broad scale the potential impacts are likely to be the same low order of magnitude that has been assessed for Area 3A. It was also argued above that the proposed longwall mining did not pose a significant threat of impact to the cultural landscape, and this observation holds for the entire Dendrobium area should mine planning and extraction methods be similar to those suggested for Area 3A.

Site Name	Site No.	Site Type	volume	Reason
Dendrobium Area 3B				
Donald Castle Creek 1	52-2-1562	Shelter with Art	14	<50m ³
Browns Road Site 7	52-2-1622	Shelter with Deposit	45	<50m ³ , and near edge of area
Browns Road Site 8	52-2-1623	Shelter with Deposit	65	>50m ³
Browns Road Site 11	52-2-1626	Shelter with Art	32	<50m ³
Browns Road Site 12	52-2-1627	Shelter with Art	89	>50m ³
Browns Road Site 13	52-2-1628	Shelter with Art	74	>50m ³
Upper Avon 35	52-2-1771	Shelter with Deposit	236	>50m ³ , but near edge of area
Upper Avon 36	52-2-1772	Shelter with Art	1221	>50m ³ , but near edge of area
Upper Avon 37	52-2-1773	Shelter with Deposit	22	<50m ³ , and near edge of area
Upper Avon 38	52-2-1774	Shelter with Art	108	>50m ³ , but near edge of area
Upper Avon 39	52-2-1775	Shelter with Deposit	132	>50m ³ , but near edge of area
Upper Avon 40	52-2-1776	Shelter with Art and Deposit	117	>50m ³ , but near edge of area
Upper Avon 41	52-2-1777	Shelter with Deposit	216	>50m ³ , but near edge of area
Dendrobium 1	52-2-2208	Shelter with Deposit	76	>50m ³
Dendrobium 2	52-2-2209	Shelter with Art	38	<50m ³
Site 1 - DB 1	52-2-2229	Shelter with Art	11	<50m ³
Dendrobium 6	52-2-2246	Stone Artefact	-	Open site
Dendrobium 7	52-2-2248	Shelter with Art	48	<50m ³
Dendrobium 8	52-2-3088	Shelter with Art	13	<50m ³
DM16	DM16	Shelter with art	100	>50m ³
DM17	DM17	Shelter with Deposit	68	>50m ³
DM2	DM2	Stone Artefact	-	Open site
DM21	DM21	Shelter with Art and Deposit	50	>50m ³
DM22	DM22	Shelter with art	17	<50m ³ , and near edge of area
Dendrobium Area 3C				
Sandy Creek Road 2	52-2-0019 52-2-0544 52-3-753	Shelter with Art and Deposit	210	>50m ³
Sandy Creek Stone Arrangement	52-2-0535	Stone Arrangement	-	Located on large rock outcrop
Donald Castle Creek 2	52-2-1563	Axe Grinding Groove	-	Located on rock bar
Donald Castle Creek 3	52-2-1564	Axe Grinding Groove	-	Located on rock bar
Donald Castle Creek 30	52-2-1591	Shelter with Art	108	>50m ³ , but near edge of area
Browns Road Site 17	52-2-1632	Shelter with Art	3	<50m ³
Browns Road Site 18	52-2-1633	Shelter with Art	45	<50m ³
Browns Road Site 19	52-2-1634	Shelter with Art	65	>50m ³
Dendrobium 3	52-2-2219	Shelter with Art	75	>50m ³
Sandy Creek Site 4	52-3-0750	Shelter with Art	30	<50m ³ , and near edge of area
Sandy Creek Site 3	52-3-0751	Shelter with Art	4	<50m ³ , and near edge of area
Sandy Creek Road 23	52-5-0275	Shelter with Art	10	<50m ³
Sandy Creek Road 24	52-5-0276	Shelter with Art	93	>50m ³
DM1	DM1	Shelter with Art	18	<50m ³
DM10	DM10	Shelter with Deposit	42	<50m ³
DM18	DM18	Shelter with Art	112	>50m ³
DM19	DM19	Shelter with art	15	<50m ³
DM9	DM9	Stone Artefact	-	Open site

Table 14. General risk observations for Area 3B and Area3C

10.4 Historical Archaeological and Heritage Sites

MSEC (2007) have modelled and calculated the potential impacts from mining subsidence movements to the features that have been identified. It can be seen from these predictions that none of these structures are likely to be significantly impacted by the proposed longwalls. The prediction from MSEC is that the impact assessments for all structures are considered Tilt Impact Category A and Strain Impact Category 0, which are both considered to be negligible and insignificant.

- DHS1 – timber bridge

The MSEC report includes the following information regarding DHS1.

The bridge is located 1.7 kilometres of the proposed Longwalls 6 to 10 in Area 3A and over 2 kilometres north-east of the future longwalls in Areas 3B. It is unlikely, therefore, that the bridge would be subjected to any significant systematic subsidence, valley related, or far-field horizontal movements resulting from the extraction of the proposed and future longwalls in these areas.

The maximum predicted systematic subsidence and valley related movements at the bridge, resulting from the extraction of the future longwalls in Area 3C will depend on the final longwall layout in this area. The impact assessment based on the final longwall layouts in Area 3C will be provided as part of the application for SMP Approval for the future longwalls in these areas.

MSEC 2007:75

As such, there are no impacts predicted to occur to the bridge associated with the extraction of coal in Areas 3A and 3B. Impacts associated with coal extraction in Area 3C may only be predicted when the longwall layout in that area has been established securely enough to allow predictive modelling. Given this, there are no predicted impacts to the bridge associated with the current application however further impact analysis of the bridge will be required as a component of the SMP approval for Area 3C.

- Cordeaux Dam heritage curtilage

There is no heritage fabric associated with the heritage curtilage of Cordeaux Dam located within the current study area; instead, the portion of the curtilage within the study area has been identified in order to preserve significant views to the dam wall. The CMP for Cordeaux Dam states that “significant views within the Dam site [heritage curtilage area] should be conserved” (Graham Brooks and Associates, 2003:103). The proposed extraction of coal within Dendrobium Area 3 will have no impact on views to the dam wall from within the heritage curtilage, as the longwalls are subsurface workings.

11.0 MANAGEMENT MEASURES

Ideally heritage management involves conservation of sites through the preservation and conservation of fabric and context. In cases where conservation is not possible or practical, several options for management are available. For archaeological sites management often involves mitigation through the salvage of features or artefacts and retrieval of information through excavation or collection, and interpretation, especially where impact cannot be avoided. The impact assessment presented above demonstrated that, taking into consideration what we know from previous monitoring programs associated with longwall mines, overall there was a low risk of impact to the majority of archaeological sites within Dendrobium Area 3A. This observation has been extended to include Dendrobium Area 3B and Area 3C because they are in a similar environment, with similar depths of cover to the coal seam, and the height of the void subsequent to coal extraction is expected to also be similar. Hence impacts in these areas should be of a similar magnitude to those in Area 3A.

The expected low impacts to archaeological sites and cultural heritage in Area 3A present a situation where management responses to potential impacts need to be carefully considered and measured so as to be commensurate with the level of risk of impact. Excavation of archaeological deposits or invasive sampling or recording of rock art is a form of destruction, so this is not necessarily an appropriate management response in cases where there is only a low risk of impact. In such a case the archaeological management actions are themselves an impact, when taking no action could be argued to be a form of conservation through no interference.

For long wall mining in the Southern Coalfield management measures of archaeological sites have focused on monitoring of sites to detect impacts as soon as possible to when they occur, and to implement management approaches at an appropriate scale in response to impacts (Sefton 2000). The potential impacts can be: cracking; movement along existing joints / bedding planes; block fall; and change of water seepage. Of the monitored sites at those where there was impact none of the impacts had directly affected a rock art panel. Currently monitoring programs for cultural heritage sites in the southern coalfield are regulated through the Subsidence Management Plan approvals process.

There is always an element of unpredictability when dealing with subsidence impacts, and this does not mesh well with the definitive statutory definitions of impact to archaeological sites that are described in the *National Parks and Wildlife Act 1974 (NSW)*. Based on Sefton's (2000) monitoring results we can predict that approximately 10% of the sites that are mined beneath or are located very near to longwalls will be impacted by subsidence related movements at the ground surface. There is a tendency for sites greater than 50m³ in volume to be impacted, and only sites located directly above longwall goafs have been impacted. However not all sites, even those identified in the higher risk categories will be impacted. From a regulatory point of view this results in the question of which sites should be subject to statutory consent for destruction, defacement or damage. Put another way the issue is, of all the shelter sites, which 10% should be subject to application for statutory approval, given the

inherent instability in the shelters (especially the larger ones) and the residual risk of impact that remains even after all other information has been considered.

The approach taken here to which sites should be subject to statutory consent is conservative, with every shelter site located over or in very close proximity to mine workings being recommended for statutory consent to damage. In addition, any shelter site with exceptional characteristics, even if not directly associated with the mine workings should also be included for statutory consent application. Stone artefact sites are not affected by subsidence impacts, as the subsidence impacts at open sites is generally less than ground surface processes such as erosion that would be expected in the natural environment of the open sites.

The management measures implemented for the sites will be coordinated in the first instance through a monitoring program of the shelter sites. The monitoring program will:

- Identify impacts associated with subsidence movements through detailed observation of structural features and, if present, rock art at the sites.
- Include detailed baseline and archival recording of rock art at the sites.
- For consistency include recording of principal components used in previous monitoring programs.
- Include a series of triggers for appropriate management responses if impacts are recognised and documented.

12.0 RECOMMENDATIONS

12.1 Aboriginal Heritage Recommendations

Based on the subsidence predictions provided by MSEC (2007), and the nature of the shelters there is some potential for impacts to occur to the archaeological sites resulting from the proposed longwall mining, therefore the following recommendations are made:

1. A program of archaeological monitoring be designed and implemented for the sites potentially affected by subsidence movements. The program should aim to replicate and where possible develop the recording methods and action triggers already established by Sefton (2000) and those employed in Dendrobium Areas 1 and 2 (Biosis Research 2006).
2. Section 90 applications should be sought as part of the SMP process for Aboriginal archaeological sites that have some potential, however unlikely, to be impacted by the proposed longwall mining. For the Dendrobium Area 3A and SMP Area s90 Consent to Damage should be sought for the following sites:
 - 52-2-0458 (Shelter with Art)
 - 52-2-1646 (Shelter with Art)
 - 52-2-1647 (Shelter with Deposit)
 - 52-2-0273 (Shelter with Art)
 - 52-2-0274 (Shelter with Art)
 - 52-2-0277 (Shelter with Art and Deposit)
 - 52-2-0278 (Shelter with Art)
 - DM13 (Shelter with Deposit)
 - DM15 (Shelter with Art)
 - DM20 (Shelter with Art)
 - DM23 (Shelter with Deposit)
3. Aboriginal archaeological sites within Dendrobium Areas 3B and 3C must be subject to the same predictive subsidence assessment as Area 3A once the longwall layouts have been finalised. Based on these subsidence predictions, recommendations should be formulated, and are likely to include archaeological monitoring programs and Section 90 Consents to Destroy / Damage / Deface.

12.2 Historic Heritage Recommendations

There are no identified historic built heritage items within the DA3A area. As the works within the study area will occur at depth below the surface, there are no historic archaeological constraints. Within the larger Dendrobium Area 3 area, two historic heritage items have been identified. While the final longwall layout of DA3B and DA3C have yet to be confirmed, there are currently no identified impacts to either the locally significant DHS1 –

timber bridge or the state significant heritage curtilage of the Cordeaux Dam. Given this the following recommendations are made:

4. There are no historic heritage constraints associated with the proposed longwall extraction within the DA3A Area. Works are able to progress within this area.
5. A revised historic heritage impact assessment and recommendations must be prepared to accompany the SMP application for future works in DA3B and DA3C. This assessment may identify the requirement for permits under the NSW *Heritage Act 1977*. No additional historical cultural survey work will be required given the extensive coverage of the recently completed works.

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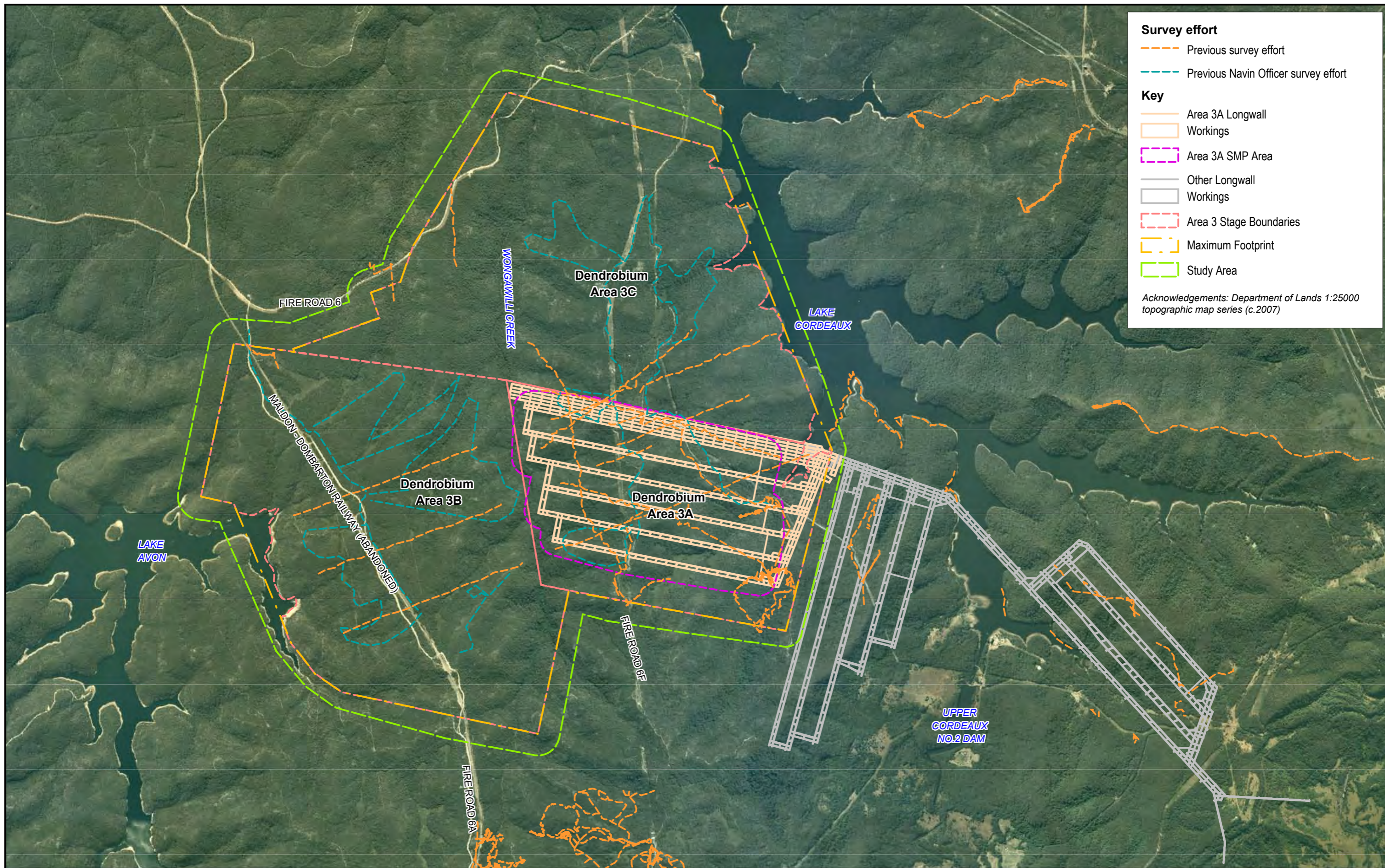
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FIGURES



Survey effort

- Previous survey effort
- Previous Navin Officer survey effort

Key

- Area 3A Longwall
- Workings
- Area 3A SMP Area
- Other Longwall
- Workings
- Area 3 Stage Boundaries
- Maximum Footprint
- Study Area

Acknowledgements: Department of Lands 1:25000 topographic map series (c.2007)

Figure 3: Previous survey effort within the present study area.

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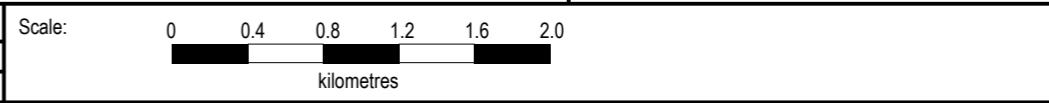


Figure 3: Previous survey effort within the present study area.

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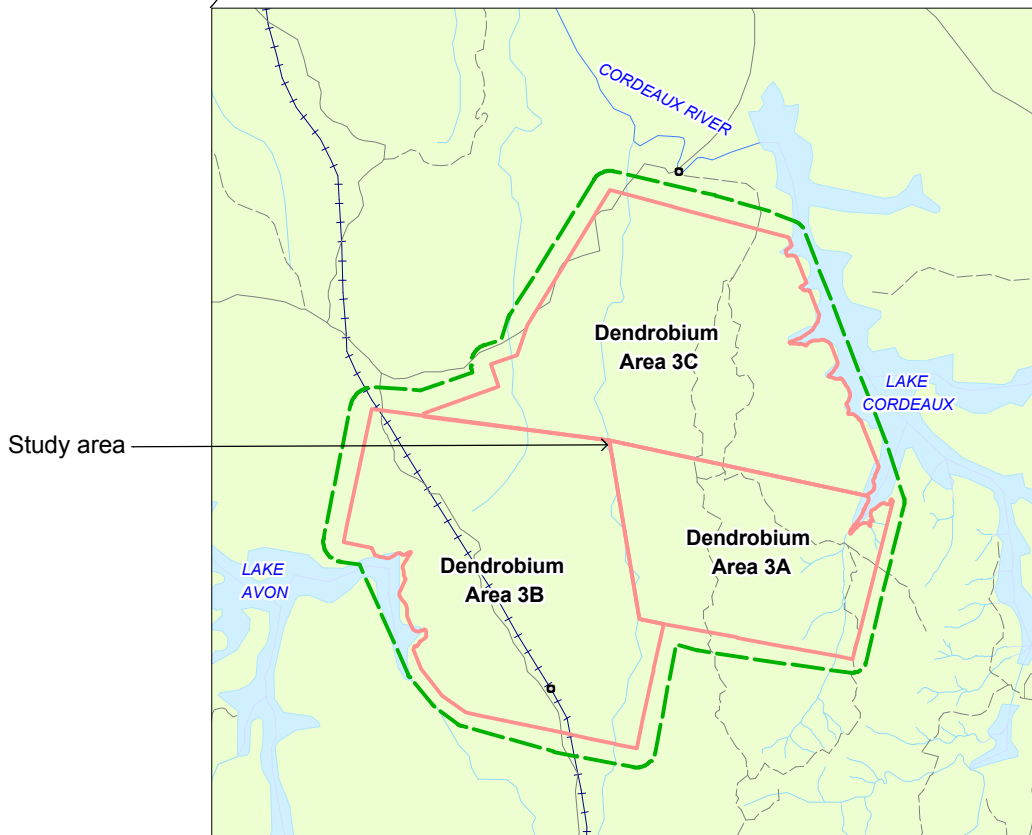
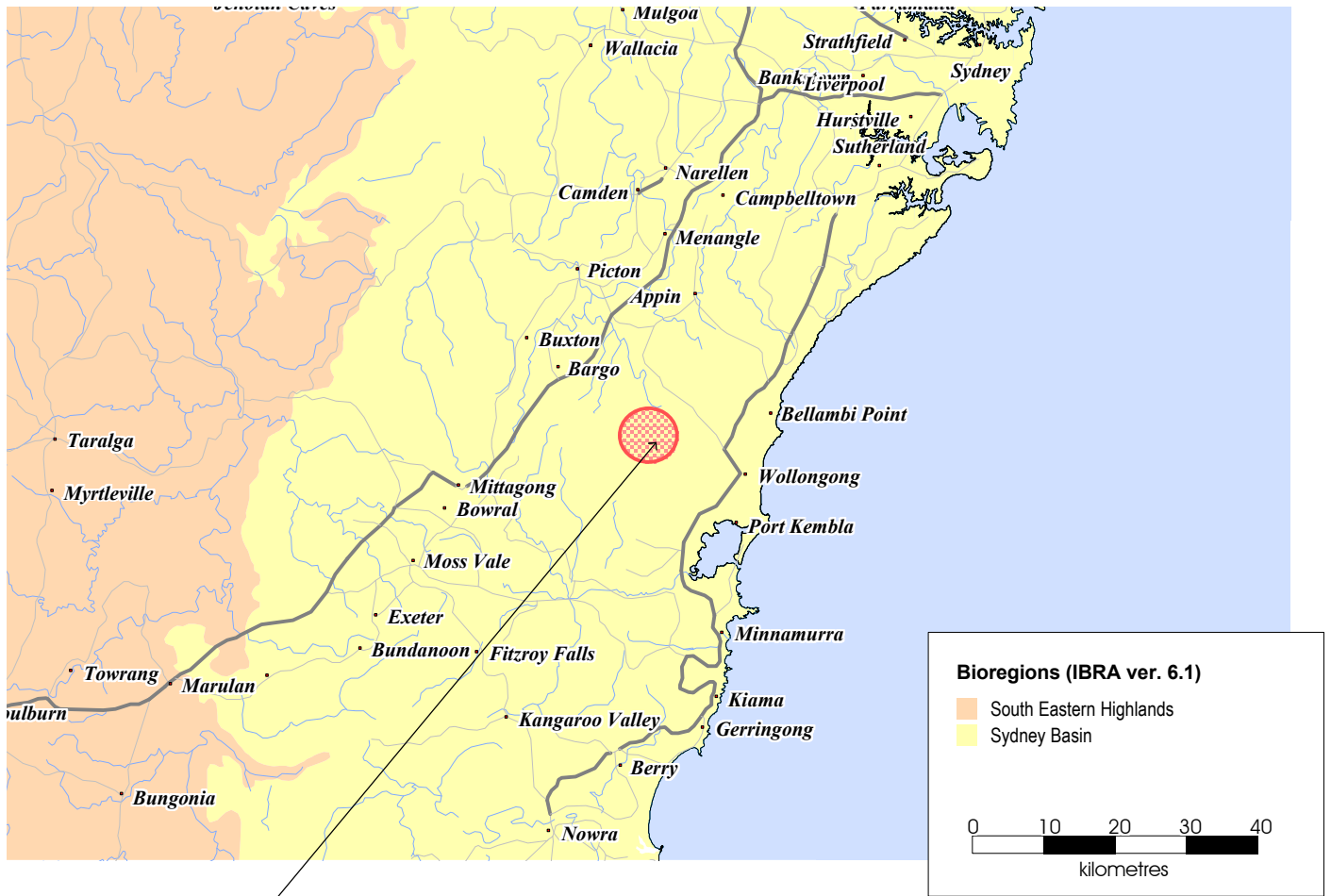




Key

- Area 3A Longwall
- Workings
- Area 3A SMP Area
- Other Longwall
- Workings
- Area 3 Stage Boundaries
- Maximum Footprint
- Study Area

Acknowledgements: BHP Billiton



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Figure 1: Location of the Study Area in a regional context.

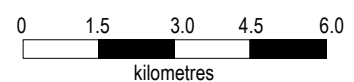
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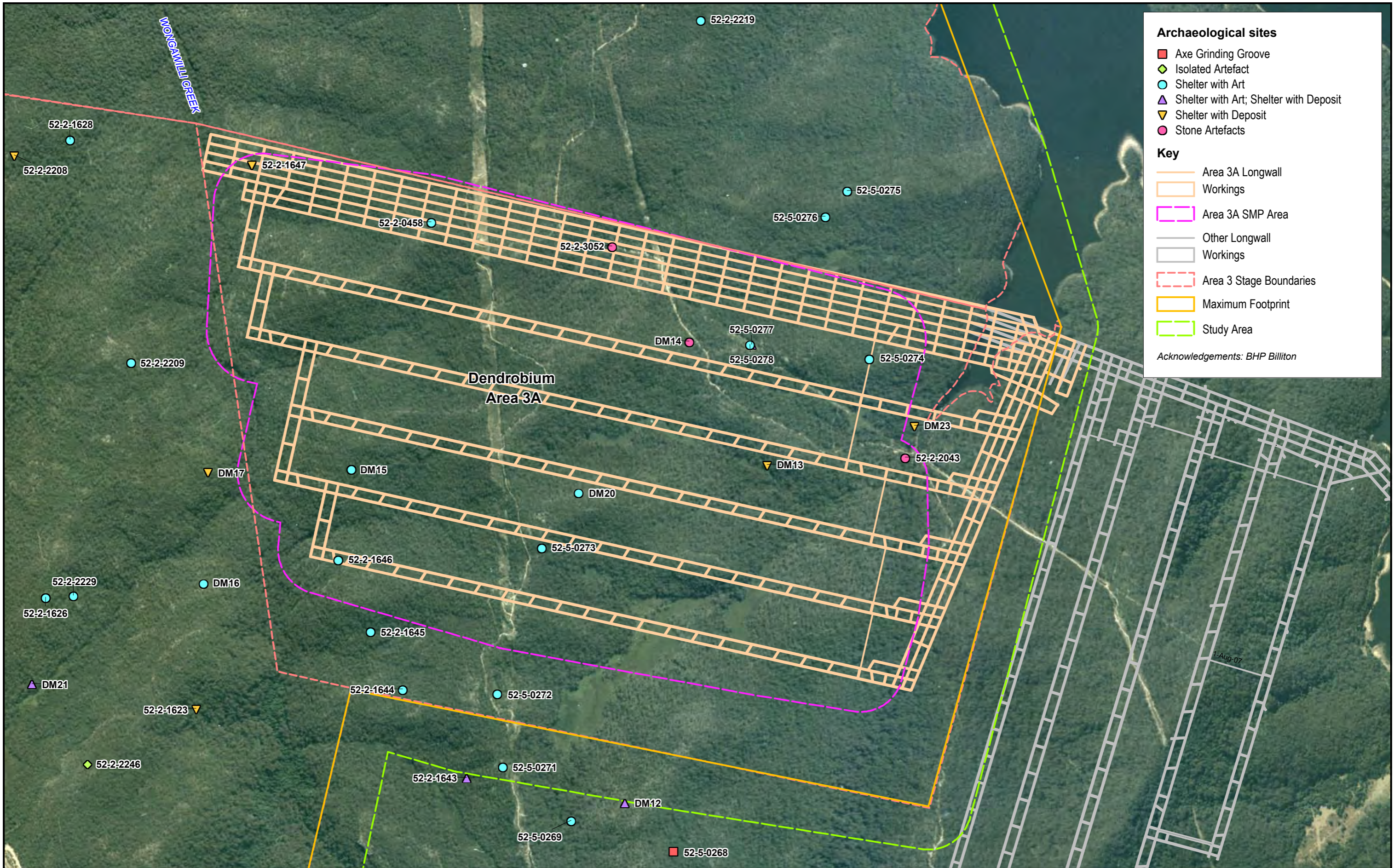
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Scale:





Archaeological sites

- Axe Grinding Groove
- ◆ Isolated Artefact
- Shelter with Art
- ▲ Shelter with Art; Shelter with Deposit
- ▼ Shelter with Deposit
- Stone Artefacts

Key

- Area 3A Longwall
- Workings
- Area 3A SMP Area
- Other Longwall
- Workings
- - - Area 3 Stage Boundaries
- Maximum Footprint
- Study Area

Acknowledgements: BHP Billiton



Relief areas

- Cliff
- Steep slope

Archaeological sites

- Axe Grinding Groove
- Isolated Artefact
- Shelter with Art
- Shelter with Art; Shelter with Deposit
- Shelter with Deposit
- Stone Arrangement
- Stone Artefacts
- Historic Timber Bridge

Key

- Area 3A Longwall
- Workings
- Area 3A SMP Area
- Other Longwall
- Workings
- Area 3 Stage Boundaries
- Maximum Footprint
- Study Area

Acknowledgements: BHP Billiton

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Figure 7: Archaeological sites over cliffs and steep slopes within Dendrobium Area 3.

DATE: 24 October 2007
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 File number: S4653
 Location: ..4000\4600s\4653\Mapping\S4653 F7_slope sites.WOR

Scale: 0 0.4 0.8 1.2 1.6 2.0 kilometres

Figure 7: Archaeological sites over cliffs and steep slopes within Dendrobium Area 3.

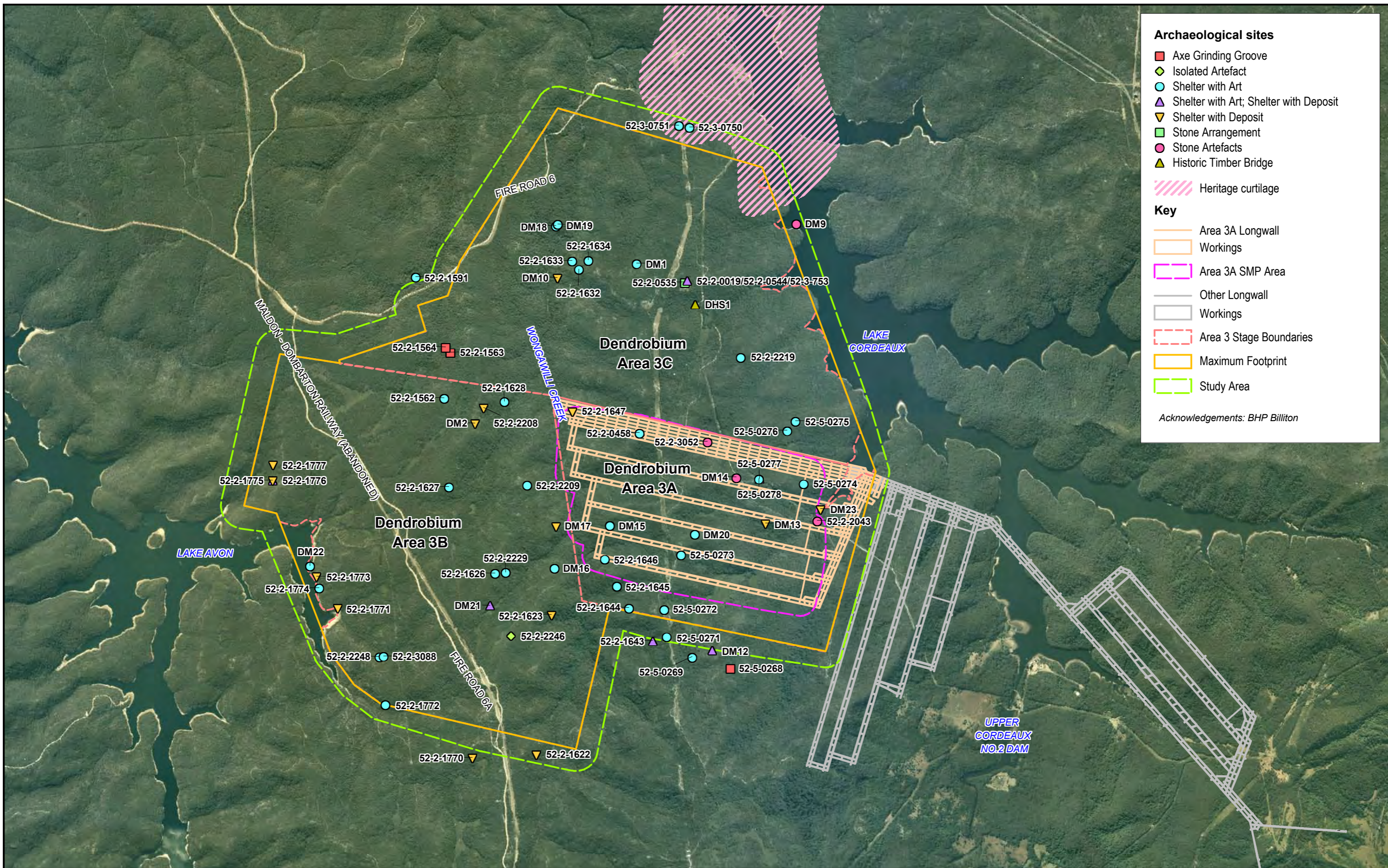
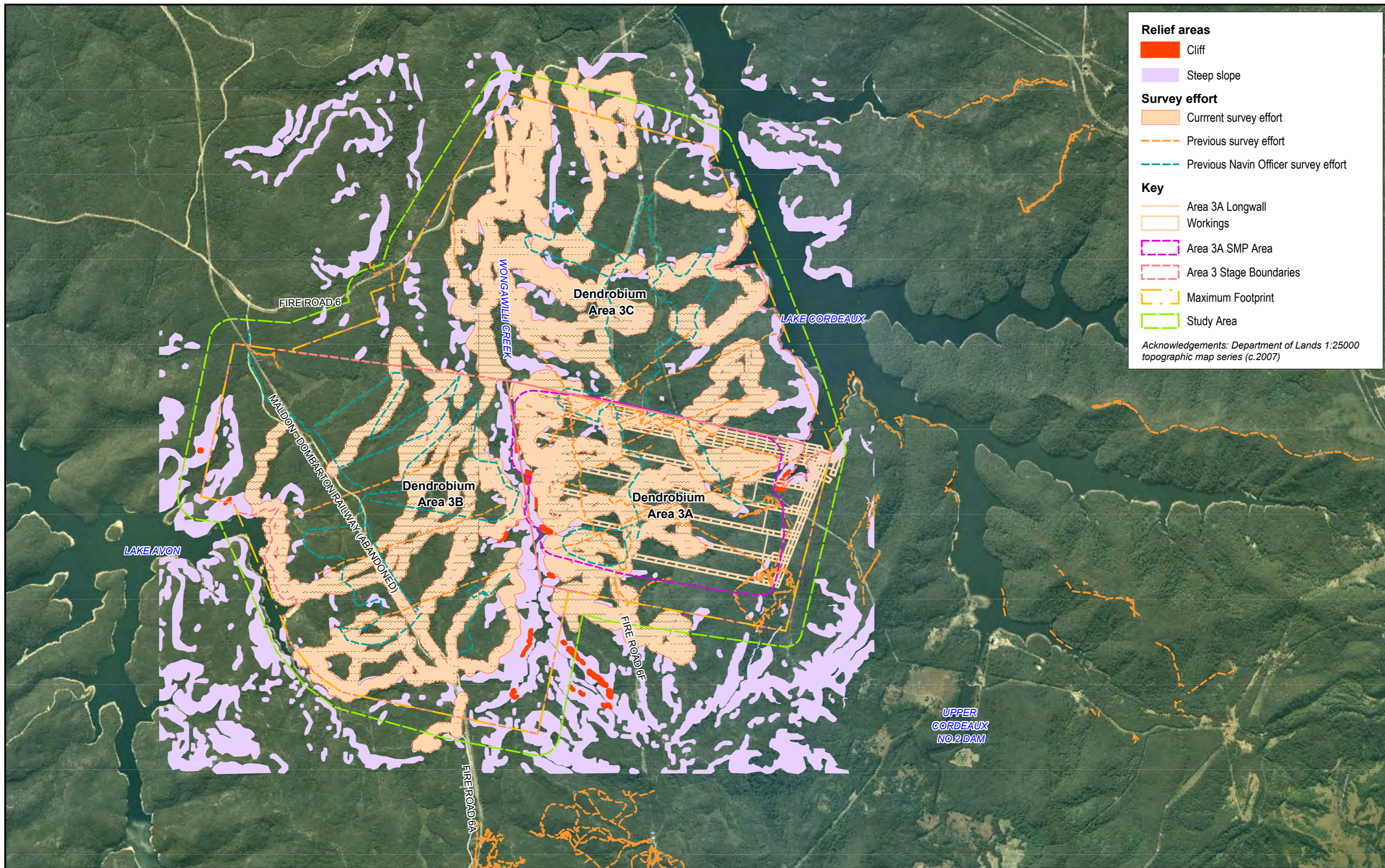


Figure 6: Recorded Aboriginal and historic sites within the Dendrobium Area 3 Study Area.

Figure 6: Recorded Aboriginal and historic sites within the Dendrobium Area 3 Study Area.



Relief areas

- Cliff
- Steep slope

Survey effort

- Current survey effort
- Previous survey effort
- Previous Navin Officer survey effort

Key

- Area 3A Longwall
- Workings
- Area 3A SMP Area
- Area 3 Stage Boundaries
- Maximum Footprint
- Study Area

Acknowledgements: Department of Lands 1:25000 topographic map series (c.2007)

Figure 5: Current survey effort on slope analysis within Dendrobium Area 3.

DATE: 24 October 2007	File number: S4653
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Figure 5: Current survey effort on slope analysis within Dendrobium Area 3.

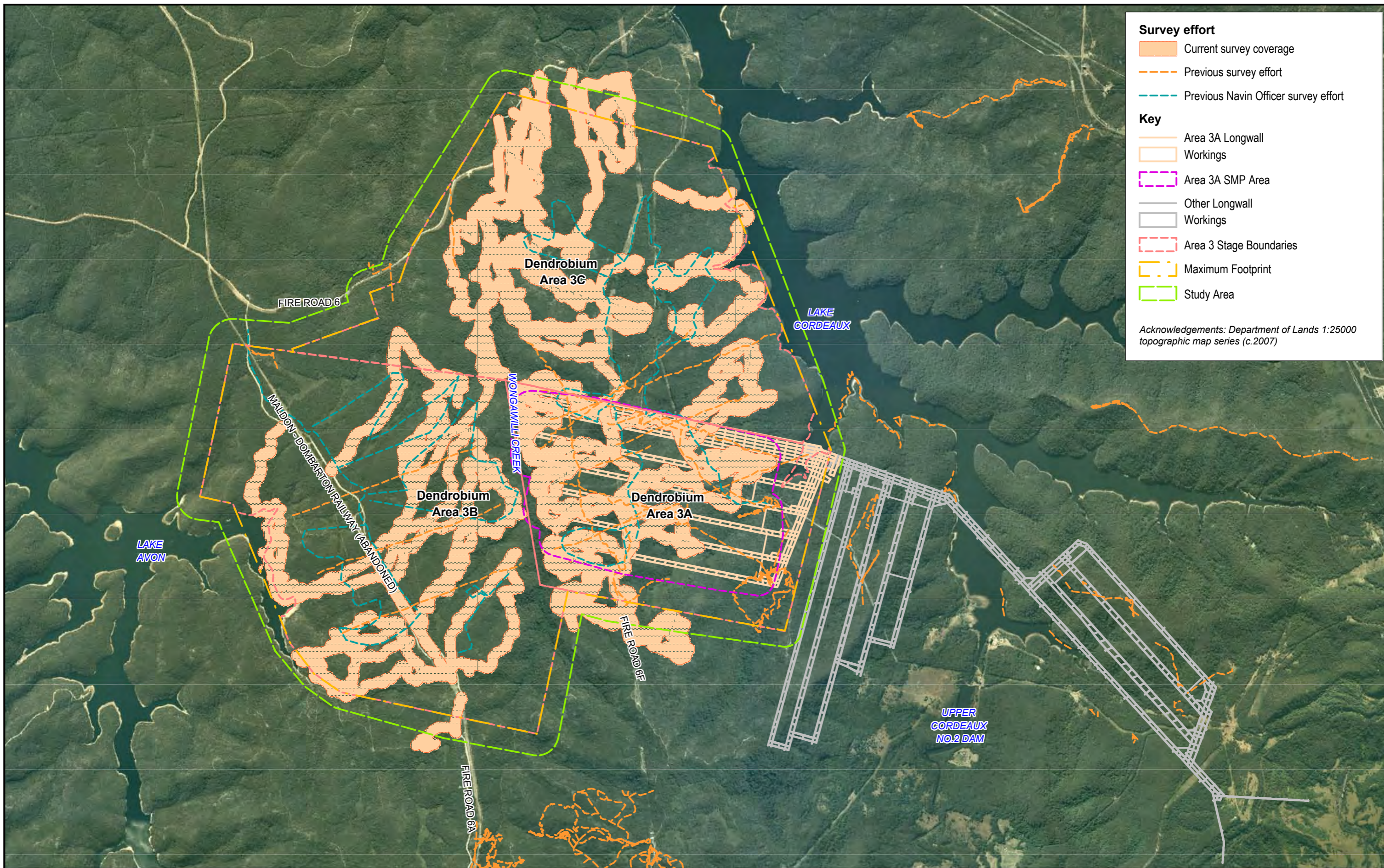


Figure 4: Current survey effort within the present study area.

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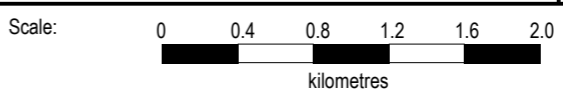


Figure 4: Current survey effort within the present study area.

APPENDICES

APPENDIX 1: ABORIGINAL ARCHAEOLOGICAL SITE INVENTORY

<i>AHIMS Site NO.</i>	<i>Site Name</i>	<i>Site Type</i>	<i>Site description</i>
<i>Sites within the maximum footprint area</i>			
52-2-0019/0544/3-753	Cordeaux Reservoir; Sandy Creek Road 2	Shelter with Art	Shelter with indeterminate charcoal motifs, white clay hand stencils and artefacts
52-2-0458	West Cordeaux; Brown Roads Site 33	Shelter with Art	Sandstone overhang with 6 charcoal indeterminates
52-2-1562	Donald Castle Creek Site 1	Shelter with Art	1 charcoal outline and infill frontal human figure and 1 indeterminate.
52-2-1563	Donald Castle Creek Site 2	Axe grinding Groove	Grinding groove in water flow on the bed of Donald Castle Creek
52-2-1564	Donald Castle Creek Site 3	Axe grinding Groove	Grinding groove in water flow on the bed of Donald Castle Creek
52-2-1591	Donald Castle Creek Site 30	Shelter with Art	Indeterminate, 7 birds, 2 kangaroos and one female figurine in charcoal outline
52-2-1623	Browns Road Site 8	Artefact	Deposit under sandstone overhang.
52-2-1626	Browns Road Site 11	Shelter with Art	6 charcoal drawings on sandstone overhang
52-2-1627	Browns Road Site 12	Shelter with Art	6 indeterminate, 1 frontal female figure, 1 horizontal outline human figure.
52-2-1628	Browns Road Site 13	Shelter with Art	5 indeterminates, 3 kangaroos and 1 infill bird print.
52-2-1632	Browns Road Site 17	Shelter with Art	Head with two eyes of a bird, 1 earless tailless animal, 2 indeterminates, all charcoal outline on rear of wall
52-2-1633	Browns Road Site 18	Shelter with Art	1 frontal male figure and 1 indeterminate (both charcoal)
52-2-1634	Browns Road Site 19	Shelter with Art	3 charcoal outline kangaroos on roof of shelter
52-2-1646	Browns Road Site 32	Shelter with Art	Hand stencils, charcoal outline on bats, kangaroos, possums, fish
52-2-1647	Browns Road Site 20	Artefact	One bipolar and 4 quartz chips, under shelter
52-2-1771	Upper Avon River 35	Artefact	1 fossilized wood bipolar cone, 1 fossilized wood flake piece, 3 grey indurated mudstone flaked pieces, 2 bipolar quartz flakes.
52-2-1772	Upper Avon River 36	Shelter with Art & Deposit	Various artefacts as well as art of human figures, birds and kangaroos
52-2-1773	Upper Avon River 37	Artefact	Disturbed deposit containing 1 grey silcrete flake
52-2-1774	Upper Avon River 38	Shelter with Art	5 charcoal indeterminates
52-2-1775	Upper Avon River 39	Artefact	Split broken edge ground axe, 2 quartz bipolar flakes
52-2-1776	Upper Avon River 40	Shelter with Art & Deposit	4 charcoal indeterminates, 1 red ochre hand stencil, 2 indurated mudstones flaked pieces, 2 quartz bipolar flakes, 1 quartz bipolar cones
52-2-1777	Upper Avon River 41	Shelter with Deposit	Site card missing
52-2-2043	Sandy Creek Road 28	Artefact	Various quartz and chert flakes and cores
52-2-2208	Dendrobium 1	Artefact	2 quartz flake fragments
52-2-2209	Dendrobium 2	Artefact	No description
52-2-2219	Dendrobium 3	Shelter with Art	Art is in poor condition
52-2-2229	Site 1 DB1	Artefact	1 charcoal indeterminate
52-2-2246	Dendrobium 6	Artefact	One undescribed artefact
52-2-2248	Dendrobium 7	Shelter with Art	No description
52-2-0273	Sandy Creek Road 21	Shelter with Art	Charcoal echidna and indeterminate
52-2-0274	Sandy Creek Road 22	Axe grinding groove	26 grinding grooves
52-2-0275	Sandy Creek Road 23	Axe grinding groove	Grinding grooves
52-2-0276	Sandy Creek Road 24	Shelter with Art & Deposit	Red indeterminate drawing
52-2-0277	Sandy Creek Road 25	Shelter with Art	Charcoal outline of 3 echidnas, 2 wallabies and 1 fish
52-2-0278	Sandy Creek Road 26	Shelter with Art	1 charcoal outline frontal human figure, 1 charcoal and infill indeterminate
52-2-0535	Sandy Creek Stone Arrangement	Stone arrangement	7 heaps of stone
52-2-1622	Browns Road Site 7	Shelter with Art	1 chert flake, 1 fossilized wood flake, 2 quartz bipolar pieces, 1 broken chert flake with use wear on one margin

52-2-3052	SCA Special Area Fire Trail 6C	Artefact	Two tuff stone flakes and one fragment of tuff flake
52-2-3088	Dendrobium 8	Artefact	Card missing
52-3-0751	Sandy Creek Road 3	Shelter with Art	Numerous charcoal motifs and red ochre hand stencils
52-3-0750	Sandy Creek Road 4	Shelter with Art	Number of hand stencils
New Record	DM1	Shelter with Art	4 charcoal motifs - gliders
New Record	DM2	Stone Artefact	Single artefact on old seismic track
New Record	DM10	Shelter with Deposit	2 artefacts located in dripline
New Record	DM13	Shelter with Deposit	5 artefacts exposed by wombat burrowing
New Record	DM14	Stone Artefact	Single artefact on Fire Road 6C
New Record	DM15	Shelter with Art	Single charcoal motif - anthropomorph or bat
New Record	DM16	Shelter with Art	Shelter with charcoal and ochre outline and infill motifs, including wombats
New Record	DM17	Shelter with Deposit	Shelter with single quartz artefact on floor surface
New Record	DM18	Shelter with Art	Single indeterminate charcoal motif
New Record	DM19	Shelter with Art	Single charcoal marsupial motif
New Record	DM20	Shelter with Art	Shelter with indeterminate charcoal motifs
New Record	DM21	Shelter with Art & Deposit	Shelter with ochre stencils, clay hand print and indeterminate charcoal motifs
New Record	DM22	Shelter with art	Shelter with charcoal anthropomorph and indeterminate motif
New Record	DM23	Shelter with Deposit	Very large shelter with four artefact and associated deposit
New Record	DM9	Stone Artefact	Single artefact exposed on margin of Lake Cordeaux
Sites within the study area			
52-2-1642	Browns Road Site 28	Shelter with Art	Various figures in charcoal outline and infill. Figures include frontal human, and indeterminates
52-2-1644	Browns Road Site 30	Shelter with Art	Charcoal human figure and one quartz bipolar flake
52-2-1645	Browns Road Site 31	Shelter with Art	1 charcoal outline and infill kangaroo, 2 charcoal indeterminates
52-2-0268	Sandy Creek Road 16	Axe grinding groove	1 fish and kangaroo charcoal outline with infill
52-2-0269	Sandy Creek Road 17	Shelter with Art	2.6m long and 0.35m wide engraving of an eel
52-2-0271	Sandy Creek Road 19	Shelter with Art	2 charcoal macropods
52-2-0272	Sandy Creek Road 20	Shelter with Art	Charcoal outline of a man, 2 wallabies, 2 echidnas and a fish
52-2-1770	Upper Avon 34	Artefact	1 quartz bipolar core
New Record	DM12	Shelter with Art & Deposit	2 children's hand stencils in white clay and many artefacts on shelter floor surface
Sites within the 8 x 10km AHIMS search area			
52-2-1566	Donald Castle Creek Site 5	Axe grinding Groove	Grinding groove underneath shelter
52-2-1567	Donald Castle Creek Site 6	Shelter with Art	2 charcoal indeterminates under a shelter
52-2-1568	Donald Castle Creek Site 7	Axe grinding Groove	Grinding groove underneath shelter
52-2-1592	Donald Castle Creek Site 31	Axe grinding Groove	Grinding groove under sandstone outcrop
52-2-1642	Browns Road Site 28	Shelter with Art	Various figures in charcoal outline and infill. Figures include frontal human, and indeterminates
52-2-1643	Browns Road Site 29	Shelter with Art & Deposit	Various animals and human figures in charcoal outline and infill, red and yellow ochre
52-2-1644	Browns Road Site 30	Shelter with Art	Charcoal human figure and one quartz bipolar flake
52-2-1645	Browns Road Site 31	Shelter with Art	1 charcoal outline and infill kangaroo, 2 charcoal indeterminates
52-2-1749	Upper Avon River 24	Shelter with Art	6 charcoal indeterminates and 2 bird tracks on rear of wall
52-2-1750	Upper Avon River 25	Stone Arrangement	Pile of stones measuring 1.2 x 1.1m x 0.7m
52-2-1762	Upper Avon River 26	Axe grinding Groove	7 grinding grooves under sandstone outcrop
52-2-1769	Upper Avon River 33	Shelter with Art & Deposit	1 charcoal indeterminate, 1 silcrete flake, 1 silcrete flaked piece, 6 bipolar quartz flakes.
52-2-1778	Upper Avon River 42	Artefact	2 fossilized wood flakes 3 quartz bipolar flakes
52-2-1790	Upper Avon River 39*	Shelter with Art & Deposit	18 motifs in charcoal
52-2-0265	Sandy Creek Road 13	Shelter with Art	Undescribed charcoal painting with infill
52-2-0266	Sandy Creek Road 14	Shelter with Art & Deposit	3 grinding grooves

52-2-0267	Sandy Creek Road 15	Shelter with Art & Deposit	Undescribed site
52-2-0268	Sandy Creek Road 16	Axe grinding groove	1 fish and kangaroo charcoal outline with infill
52-2-0269	Sandy Creek Road 17	Shelter with Art	2.6m long and 0.35m wide engraving of an eel
52-2-0270	Sandy Creek Road 18	Shelter with Art	Charcoal drawings of 6 wallabies, 2 men, snake, boomerang and Wandjuia
52-2-0271	Sandy Creek Road 19	Shelter with Art	2 charcoal macropods
52-2-0272	Sandy Creek Road 20	Shelter with Art	Charcoal outline of a man, 2 wallabies, 2 echidnas and a fish
52-2-0017	Cordeaux Reservoir 2	Shelter with Art	No description
52-2-1569	Donald Castle Creek Site 8	Shelter with Art	1 charcoal and red ochre outline drawing (bichrome) on the rear wall
52-2-1570	Donald Castle Creek Site 9	Shelter with Art	2 charcoal outline and infill indeterminates, 1 charcoal outline and infill of small frontal human figure
52-2-1641	Browns Road Site 27	Artefact	2 grinding grooves in the water flow area and 3 more grinding grooves in the upper edge of the outcrop.
52-2-1787	Upper Avon 31	Axe Grinding Groove	12 grinding grooves beneath a 1m pothole
52-2-1788	Upper Avon 32	Shelter with Art	No description
52-2-1770	Upper Avon 34	Artefact	1 quartz bipolar core
52-2-2247	Dendrobium 5	Artefact	Stone artefacts
52-3-0755	Sandy Creek Road 11	Shelter with Art	Well preserved assemblage of charcoal motifs - anthropomorphs and macropods
52-3-0756	Sandy Creek Road 12	Shelter with Art	Well preserved assemblage of charcoal motifs - anthropomorphs and macropods
52-2-1028	No 1 Reservoir, Sandy Creek	Shelter with Art	Red ochre sketches

APPENDIX 2: ABORIGINAL ARCHAEOLOGICAL SITE DESCRIPTIONS: SITE CONTENT AND CONDITION

Previously Recorded Aboriginal Archaeological Sites

The majority of the previously identified sites were originally recorded by the Illawarra Prehistory Group during their systematic surveys of the Cordeaux and Avon Catchment Areas, which include Sandy Creek and the Wongawilli and its associated tributaries. These were recorded between 1980 and 1990. More recently sites have been recorded by Navin Officer (2000) and Biosis Research (2004 and 2007). All previously recorded site details and plans were re-assessed and considered to be accurate. These can be accessed on AHIMS register at DECC.

Sandy Creek Road 2 (52-2-19, 52-2-544, 52-753)

This site is a shelter with art and deposit. This site has been registered three times, resulting in the site being allocated 3 separate site numbers on the AHIMS register at DECC. The site was originally recorded by the Australian Museum. It was re-recorded and registered in both 1980 and again in 1993 by the Illawarra Prehistory Group.

The site is situated in a small, north facing cavernously weathered overhang, beneath a large open sandstone outcrop on top of a major ridgeline between Fire Trail 6F and 6C. The site is located approximately 300 m north of a small drainage line. The sandstone overhang measures 10 x 10.5 x 2 m (Plate 9), and the living area measures approximately 10 x 5 m in size.

The art within the overhang consists of a 2 white hand stencils (Plate 10), one red hand stencil, a charcoal outline and infill bat? OR human figure?, and one charcoal outline indeterminate. The motif identified as being a human figure has been identified by another observer as a bat. As the motif is quite faded, it is difficult to make a distinction. A possible source of ochre was also located at this site



Plate 9: Shelter with art site 52-2-19, 52-2-544, 52-3-753, between Fire Trail 6F and 6C.

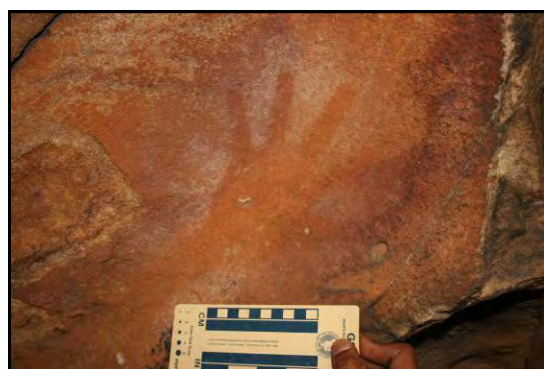


Plate 10: Fading white hand stencil on 52-2-19, 52-2-544, 52-3-753 shelter surface.

The floor of the shelter consists of brown yellow sandy loam from the weathering of the shelter and is estimated to be between 30 and 50 cm deep. At the time of the original recording, 3 quartz bipolar flakes and 4 flaked pieces (2 fossilized wood, 1 silcrete and 1 chert) were located in the drip line. These could not be relocated during the recent survey. This is most likely due to poor visibility from wombat diggings and poor light near the end of the day.

The conditions in the shelter remain the same to that when the site was originally recorded. However, the art work has fading and the charcoal lines of what was a human figure OR but is unclear. The shelter surface has suffered some fire damage and there are horizontal cracks along the roof. There has also been some block fall within the overhang and the surface has suffered some exfoliation. The shelter site is relatively dry; however there is some micro organism growth on the surfaces. The floor of the shelter, particularly towards the rear, has been significantly disturbed by wombat diggings.

Sandy Creek Road 3 (52-3-751)

This shelter with art site is situated on the upper scarp at the end of a prominent ridge line that has been cleared during the construction of the 330kV overhead power line. The site comprises two linked cavernously weathered caverns on the northern face of the upper scarp of the ridge. The weathered caverns form a moderately sized overhang that measures 8 x 2 x 1.3 m, and have a limited floor space of about 1 x 2 m each (Plate 11 and Plate 12).



Plate 11: First weathered cavern containing art at site 52-3-751



Plate 12: Second weathered cavern containing art at site 52-3-751

This shelter contains a high density of art motifs. The art is located on the rear and site walls of the cavern. The art consists of 4 charcoal outline and infill human figures with large eyes (Plate 13), 5 red ochre hand stencils (Plate 14), 2 charcoal outline and infill snakes, 1 charcoal outline and infill eel, 1 charcoal outline eel, 9 small charcoal infill and outline circles, 2 large charcoal infill and outline circles, 1 charcoal outline and infill animal, 2 charcoal outline and infill indeterminates, 1 charcoal outline indeterminate. There are at least 12 panels within both weathered caverns that contain art.



Plate 13: Example of art contained in first cavern at site 52-3-751



Plate 14: Example of art contained in second cavern at 52-3-751

The small living floors consist of very shallow fine buff sand on an underlying flat sandstone platform, which is visible in places. No stone artefacts could be identified

The conditions within the caverns are quite dry, and both receive several hours of direct sunlight during the late afternoon. The chemical weathering processes that have formed the caverns are continual, with large sections of exfoliation and granular weathering, particularly in the second cavern. A number of small naturally formed cracks and tree root growth are also responsible for the deterioration of the cavern surfaces. A number of small cracks dissect the art panels in the second cavern. Two moderate vertical joints are also present.

The surfaces of this site also contain black micro-organism growth and some white mineral efflorescence. Water seepage is also evident, particularly over the lip of the shelter in certain places and at the rear of the shelter where tree roots have broken the surface.

Overall, the condition of the site is considered to be poor, with constant exposure to sunlight and the elements, continuing weathering process, water seepage, micro-organisms and cracking from natural process, such as tree roots.

Sandy Creek Road 4 (52-3-750)

This site is sandstone shelter containing ochre hand stencils is situated on the mid slopes of a prominent ridgeline, 300 metres east of the 330kV overhead transmission line. The site comprises a small cavernously weathered shelter that faces east, north east and measure 5 x 3 x 2 m (Plate 15 and Plate 16).

This shelter contains 5 charcoal indeterminate motifs and 4 red ochre hand stencils, one of which is a child's hand (Plate 17 and Plate 18).



Plate 15: Small cavernously weathered sandstone overhang of 52-3-750.



Plate 16: Red ochre hand stencils on 52-3-750 shelter surface.

The site is in poor condition, and has been formed by cavernous weathering. The shelter contains a case hardened surface mould and lichen but not on the art panels. It also contains irregular vertical cracks. Water seeps out at the base of the shelter. The small living floor area consists of shall buff coloured sediment that does not contain artefacts.



Plate 17: Single red ochre hand stencil located at site 52-3-750



Plate 18: Patrial charcoal motifs situated at site 52-3-750

Browns Road Site 33 (52-2-458)

The site is located on the upper level of a ridgeline on a small stand alone sandstone outcrop, situated 300 m west of Fire Road 6F and the 330kV overhead power line, and north of the junction of Fire Trails 6F and 6C. It is situated approximately 300 m north of a Wongawilli tributary. The sandstone overhang faces west and is 9.6 x 1.5 x 1.2 m in size. The living area formed by block fall and cavernous weathering is 5 x 1 m in size.

The original recording of the site noted 6 charcoal outline indeterminate motifs on three separate panels. The recent survey identified only two panels; both contains the charcoal motifs previously recorded (Plate 19). The third panel could not be relocated. The current

survey recorded a fourth panel 2.0 x 3.0m of red ochre and potential infill of indeterminate features (Plate 20).



Plate 19: Charcoal motifs on 52-2-458 shelter surface.

Plate 20: Indistinguishable red ochre motifs on 52-2-458 shelter surface.

The floor of the shelter consists of pale yellow sandy loam estimated to be between 5 and 15 cm deep. This floor deposits appear to be a recent accumulation of exfoliation and weathering processes. No stone artefacts were identified within the deposit.

The site conditions remain relatively stable, although one art panel could not be identified. It is most likely that this panel has been subject to weathering or exfoliation. The two charcoal panels that were re-assessed remain protected by a thin silica skin. The shelter is dry without the presence of micro-organisms.

Sandy Creek Road 1 (52-2-535)

The site comprises up to 6 obvious piles of small to moderate pieces of stone, located on the top of the first major ridgeline to the south of the northern intersection of 6C and 6F. The site is on the highest point of the ridge making it a good view point. It is situated in the centre of a large open platform of sandstone approximately 150 x 150 m in size (Plate 21). It is located adjacent to shelter with art site 52-2-458 and is approximately 300 m north of the nearest creek.



Plate 21: Sandstone platform with stone arrangement piles, site 52-2-535.

Plate 22: Stone arrangement from site 52-2-535.

The site is virtually devoid of cobbles and blocks except in the vicinity of the stone piles. The original recording of the site by Sefton notes “the stone piles are definitely not natural and shown to the group as being Aboriginal in origin 20 years ago”. The stone arrangement consists of 6 obvious heaps of stone located on the irregular sandstone surface, and a further 2 potential, but highly deteriorated and spread piles of stones (Plate 22). The six distinguishable piles of stone are roughly circular in arrangement. The similarity in distances and the shape that the piles create suggest that these piles were purposely placed.

Two less obvious stone piles, and at least one of the 6 more obvious stone piles have been scattered from natural causes, as the sandstone platform is open and exposed. Due to the nature, shape and equidistance of some of the stone piles, it is considered more likely that site was constructed by Europeans. Possibly this was as a reference mark or marker for the Sandy Creek rain gauge. As a precautionary measure the site should remain to be considered as Aboriginal in origin until a definitive alternative construction can be proved. The site remains in the same condition as when it was first recorded.

Sandy Creek Road 16 (52-5-268)

This site is an axe grinding groove. The site was registered by the Illawarra Prehistory Group in 1993 from survey work completed in the region during the 1970s. The site is located in the creek bed of the first western tributary to Sandy Creek. The sandstone outcrop is 3 x 2 m in size, adjacent to a 2 x 1.5 m pothole, located above a 2 m waterfall. Water flow over the site is from south to north along the long axis of the site. The grinding groove is located at the north end of the outcrop where water flows from the pothole and over the waterfall (Plate 23).



Plate 23: Grinding groove covered with water, site 52-5-268

The site was re-recorded during the current survey, located as a poorly preserved grinding groove. Good water flow was occurring across the site, hence the grinding groove is water worn. It was also part obscured by leaf litter. Despite this, the site is considered to be in the same condition as it was when originally recorded.

Sandy Creek Road 17 (52-5-269)

This shelter with art site is situated within a moderate sandstone overhang formed by block fall and cavernous weathering. It is located approximately 50 m north of a small Sandy Creek tributary near the head of a small swamp. The sandstone overhang faces west and measures 9 x 4.5 x 3.5 m in size (Plate 24), with a living area is 1 x 2 m in size. The art is located on the roof of the overhang, and consists of one red ochre human motif, one indeterminate red ochre motif, and two charcoal outline indeterminate motifs (Plate 25).



Plate 24: Entrance to rock shelter, site 52-5-269

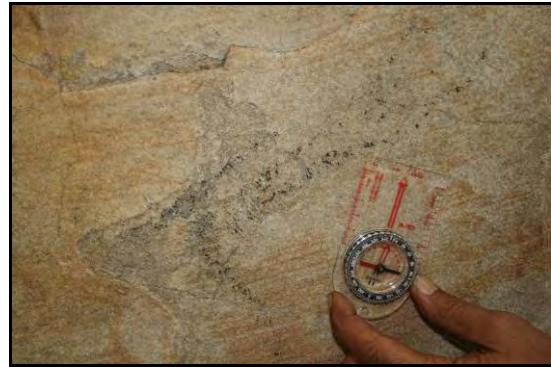


Plate 25: Indeterminate charcoal motif in site 52-5-269

Sections of the floor area are obscured by sandstone blockfall. The small area that does contain deposit consists of brown yellow sand, approximately 15 cm deep, which has been deposited from slope wash and the weathering of the shelter. The deposit is undisturbed and there is a large area of level ground in front between the shelter and the creek.

The art remains in poor condition, being quite faded. The shelter surface appears to have suffered some exfoliation from recent bushfire. Mould also grows on some of the shelter surfaces and there is evidence of bats residing within the shelter. The floor has partially disturbed by wombat diggings.

Sandy Creek Road 19 (52-5-271)

This small sandstone overhang has been formed by cavernous weathering and is situated on the second cliff line from the top of the ridge, between Fire Trail 6F and the 330kV Overhead power line. The sandstone outcrop is quite prominent and can be seen from the top of the adjacent northern ridgeline. The sandstone overhang measures 5 x 3 x 2 m with no living area (Plate 26). The original recording identified two motifs on the rear of the wall: 1 charcoal indeterminate and 1 charcoal frontal human figure with eyes.



Plate 26: Sandstone overhang of shelter art site 52-5-271



Plate 27: Possible anthropomorphic charcoal outline in site 52-5-271

During the current survey only part of the charcoal outline anthropomorph with large eyes could be re-identified (Plate 27). The motif is situated on a panel that measured 1 x 0.5 m.

The shelter deposit is less than 5 cm and consists of pale yellow sand that has formed from the chemical weathering processes within the shelter. The art is in poor condition due to weathering and fading. It is likely that the other indeterminate charcoal art is no longer present due to weathering processes. The site contained no water at the time of the survey however it is exposed to the elements, such as wind erosion, sun and rain. There are no micro-organisms present on the shelter surface. There is a wombat hole at the base of the shelter.

Sandy Creek Road 20 (52-5-272)

This site is situated in a small, cavernously weathered sandstone cavern on the eastern face of a small, stand alone sandstone outcrop on the second cliff line from the top of a ridge. The shelter is located in a cleared area under the 330kV overhead power lines. The overhang measures 2.5 x 2.5 x 1.5 m in size located (Plate 28), with a limited living area measuring approximately 2 x 1 m in size.

The original recording of the site identified art located on the rear and side walls of the shelter. The art consisted of 1 charcoal indeterminate, 1 charcoal outline profile human figure and 1 dry red ochre frontal male human figure with boomerang in his hand. The current survey only re-recorded one panel, measuring 2 x 2m in size, containing only 2 motifs, the red ochre frontal human figure (Plate 29) and one charcoal outline and infill indeterminate motif.

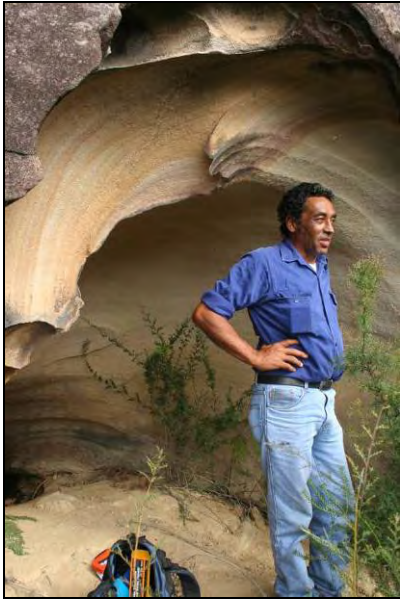


Plate 28: Small weathered cavern with art at site 52-5-272



Plate 29: Red ochre infill human figure in site 52-5-272

The floor of the shelter contains a shallow, recent deposit of between 5 to 20 cm of yellow sand formed by chemical and cavernous weathering.

The site is poor condition as it is subject to continuous weathering and exfoliation from exposure to the elements. The site is however, very dry with no seepage and no micro-organism growth on the sandstone surface. The original recording of the site identified some fine cracks on the sandstone art surface. The deposit has been disturbed by wombat diggings.

Sandy Creek Road 21 (52-5-273)

The shelter is located on a long narrow sandstone cliff line east of the Fire Trail 6F that has been formed by blockfall and cavernous weathering. The shelter is situated on an eastern facing overhang on the upper ridge cliff line and is located 150 m south east of a Sandy Creek tributary.

The art within the shelter includes one outline and infill human anthropomorph with large eyes, one charcoal outline and infill indeterminate and one charcoal outline indeterminate (Plate 30).



Plate 30: Charcoal anthropomorph with large eyes at site 52-5-273
Plate 31: Stone artefacts located in site 52-5-273

The deposit in the shelter comprises a dark grey brown sandy loam. A number of smothered quartz pebbles were identified in the drip line. A total of five artefacts were recorded and of which were found in the drip line. This included 1 silcrete flake, 1 silcrete core fragment, 1 broken quartz flake, 1 chert flake fragment and 1 petrified wood flake (Plate 31).

The shelter is mostly dry however there is some water seepage over the lip of the shelter which has caused erosion at the drip line of the shelter, and caused lichen and mould growth on some surfaces of the shelter roof. The art, however, remains in the same condition despite being slightly faded. Since the original time of recorded some surface exfoliation has occurred.

Sandy Creek Road 22 (52-5-274)

This sandstone overhang is situated 400 m north of the Fire Trail 6C on upper cliff lines of a small ridge line, 400 m northwest of Sandy Creek, and has been formed by blockfall and cavernous weathering. The sandstone overhang measures 7 x 2.8 x 1.8 m in size (Plate 32), with a living area measuring approximately 10 x 4 m in size.

The art is located on the rear wall and comprises 3 charcoal indeterminate motifs on two separate panels (Plate 33).



Plate 32: Moderate sandstone overhang at site 52-2-274
Plate 33: Charcoal motif at shelter site 52-2-274

The deposit consists of shallow yellow brown sand that is no more than 15 cm deep. The deposit appears to be relatively undisturbed, however, no stone artefacts were identified.

The art within the shelter appears to be in the same condition as when it was originally recorded. The shelter is relatively dry, although is exposed to several hours of direct sunlight every day (Plate 32), contributing to the deterioration of the art. No seepage was noted and there are no micro-organisms present on the surface of the art. There are some horizontal bedding planes present at this site and significant exfoliation process adjacent to the art panels.

Sandy Creek Road 23 (52-5-275)

This shelter with are is located on the northern side of a small outcrop of the top of the ridgeline, 800 m west of the edge of the Dam and 800 m east of Fire Trail 6C. The small cavernously weathered overhang measures 4 x 1.5 x 1.6 m in size, with a limited living area of approximately 1 x 1 m in size.

The art within the shelter was originally located on the rear wall and consisted of 1 charcoal indeterminate drawing in extremely poor condition. During the current survey the art could not be relocated, due primarily to the micro-organism growth and weathering processes present at this site (Plate 34).



Plate 34: art shelter site 52-5-275, the dark panels have very poor visibility and are where the art is located.

The shelter floor consists of pale yellow sand deposited by recent weathering and possible slope wash. It is no more than 20 cm deep. The site suffers from weathering, exfoliation, and exposure to the weather and micro-organism growth. It is considered to be in poorer condition.

Sandy Creek Road 24 (52-5-276)

This sandstone shelter with are and deposit is located on the second ridge north of where Sandy Creek enters Lake Cordeaux, about 800 m west of the lake. The narrow sandstone overhang is situated on an upper outcrop of the south side of the ridge and was formed by

block fall and cavernous weathering. It measures 14 x 3.5 x 1.9 m in size (Plate 35) and has a living area measures 10 x 2 m.

The art originally recorded comprised 1 patch of red ochre and 2 red ochre indeterminate drawings, however the art was not re-located during the current survey. During the original recording of the site artefacts were located within the shelter under the drip line. These included 1 silcrete bipolar core and 3 quartz bipolar flakes. During the current survey 4 quartz flakes were located (Plate 36) and 1 mudstone flake. The deposit on the shelter floor consists of grey loamy sand formed by the weathering of the shelter and is between 5 and 30 cm deep.



Plate 35: art and artefact shelter site 52-5-276



Plate 36: Artefacts located within site 52-5-276

The site suffers from some severe erosion and weathering, and a small amount of water seepage occurs over the lip of the shelter only. There is lichen growing across many of the shelters surfaces and may account for not locating the art. The floor deposit of the shelter is relatively undisturbed with a little evidence of animal movement. There are a number of horizontal bedding planes and no cracks.

Sandy Creek Road 25 (52-5-277)

This art and artefact shelter site is located under a small power line that runs from fire trail 6C down to the mouth of Sandy creek. The site is located on the northern face of the upper sandstone outcrops north of Sandy Creek, the closest drink water is a tributary 200m away. The small sandstone cavern was formed by block fall and cavernous weathering, and is situated on a large angular block. The overhang measures 4 x 0.7 x 1.7 m in size and there is no living area.

The original recording of this site identified 9 red ochre hand stencils located on the rear wall. All the stencils were adult and 6 were of the left hand wand 3 were of the right hand (Plate 37). The current survey identified one more red ochre hand stencil within the shelter making a total of ten. The current survey also recorded an artefact within the site, a quartz core (Plate 38). The deposit on the shelter floor is yellow sand 5 to15 cm deep, deposited from the erosion of the shelter surface.

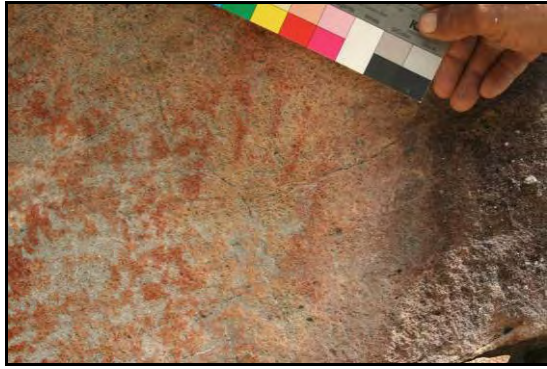


Plate 37: Red ochre hand stencil in shelter site 52-5-277



Plate 38: Quartz core artefact located within shelter site 52-5-277

The shelter shows no signs of water seepage, and no micro-organisms are present, however, the site is exposed to the elements such as wind erosion and weathering which causes continuous exfoliation. There has been some disturbance by wombats on the floor of the shelter. The art is in poor to fair condition.

Sandy Creek Road 26 (52-5-278)

This art shelter site is a small cavernously weathered cavern on the western face of the same sandstone outcrop as 52-2-277. The overhang is situated below the top cliff line on small sandstone outcrop, on the northern edge of the 66kV power line easement that runs from Fire Trail 6C down to the mouth of Sandy Creek. The closest water source to this site is located 200m away at a tributary of Sandy Creek. The shelter was formed by block fall and cavernous weathering and the sandstone overhang measures 3 x 2 x 3 m in size (Plate 39). The shelter has a stone floor with no deposit or living area. The art is located on the rear wall and is one charcoal indeterminate (Plate 40).



Plate 39: Art shelter site 52-5-278

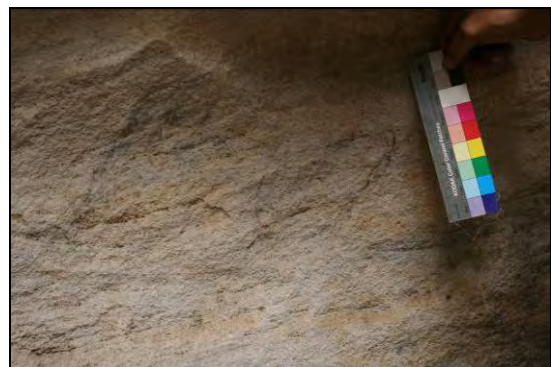


Plate 40: Charcoal motif in shelter site 52-5-278

The site is in poor condition. The surface of the shelter has been significantly weathered causing deterioration of the charcoal art. The surface of the shelter has evidence of water

leeching, however there are no micro-organisms growing on the surfaces. Ongoing weathering is an additional conservation concern.

Donald Castle Creek Site 1 (52-2-1562)

This art shelter site is located 150m from the western side of the swamp towards the end of a small ridgeline, 2km from fire road 6A. The sandstone overhang is 6.5 m in length and faces north east (Plate 41). The art within the shelter is located on the rear wall and consists of 1 charcoal outline and infill motif of a frontal human figure and 1 charcoal indeterminate motif (Plate 42). The deposit on the floor of the shelter is cream sandy loam approximately 20 cm deep, which has been deposited from slope wash and cavernous weathering. The living area is 3 x 1 m in size and there is a level area at the front of the shelter which is also 3 x 1 m in size.

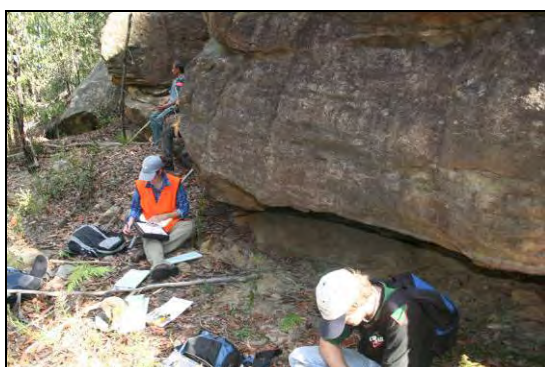


Plate 41: Overhang at shelter with art site 52-2-1562

Plate 42: Charcoal motif identified in 52-2-1562

The art is in poor condition, it is fading and there is lichen growing on the shelter surfaces. The floor deposit however is undisturbed.

Donald Castle Creek Site 2 (52-2-1563)

This grinding groove site is located in the bed of Donald castle Creek about 900 m upstream from the junction with number 6 fire road. The original recording of the grinding groove located it in the water flow on a sandstone outcrop which measured 6 x 5 m in size. The vegetation around the site is open woodland. The original recording of the site noted that the site was in reasonable condition although one of the grooves was faint.



Plate 43: Debris on rock platform covering grinding grooves, site 52-2-1563

During the current survey the sandstone platform was relocated at the site, however due to vegetation litter and sediment on the platform the grinding grooves could not be identified (Plate 43).

Donald Castle Creek Site 3 (52-2-1564)

This grinding groove site is located in the bed of Donald Castle Creek main branch about 120m upstream from a fork where a minor branch flows in on the west side. The original recording of the site identified 2 grinding grooves located in the water flow on a sandstone outcrop which measured 6 x 6 m in size. The platform had many potholes adjacent to the grinding grooves, and they are approximately 10km north of the waterfall. The vegetation around the site is open woodland.

The original recording of the site noted that the site was in reasonable condition although one of the grooves was faint.

During the current survey the waterfall and the sandstone platform were relocated, however due to vegetation litter and sediment on the platform the grinding grooves could not be identified.

Donald Castle Creek Site 30 (52-2-1591)

This shelter with art site is located on a small western tributary of Donald Castle Creek, approximately 150 m north of Firetrail 6. The overhang measures 9 x 3 x 4 m. There is no shelter floor, however the area between the shelter and the tributary would have been a very suitable campsite (Plate 44). The art assemblage consists of 15 charcoal outline and infill motifs that were reported as being in poor to fair condition when recorded by the Illawarra Prehistory Group in 1990. The motifs include indeterminate motifs, kangaroos and one frontal human female figure, with breasts, eyes and a vulva (Plate 45).



Plate 44: Moderate overhang at site 52-2-1591

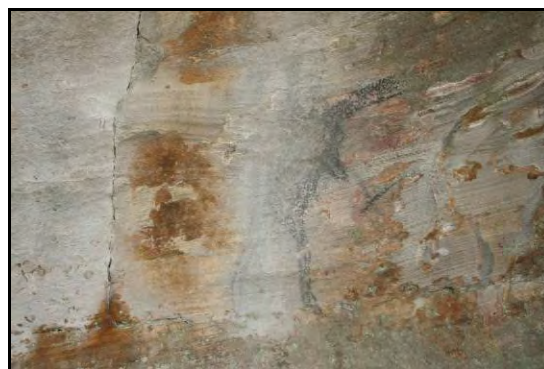


Plate 45: Charcoal infill and outline charcoal female motif at site 52-2-1591

There is no living floor area at this site due to uneven blockfall and the presence of small trees. What deposit is present consists of dark grey sand. During the current survey it was noted that the art had deteriorated due to a white, opaque mineral accretion. The overhang itself is in a stable condition.

Browns Road Site 7 (52-2-1622)

This shelter and artefact site is located under the third cliff line from the top about 200m west of Wongawilli Creek and 500 m east of fire road 6A, about 2km north of the 6A-6H junction. The site is located 200 m from Wongawilli Creek. The sandstone overhang measures 15 x 2 x 1.5 m in size with a living area 5 x 2 m in size and a flat platform in front of the shelter 1 x 2 m in size. The floor deposit is grey loamy sand to a depth of 30 cm caused by slope wash and weathering. No art was recorded within the shelter but during the original survey five artefacts were located on the drip line. The artefacts are 1 chert flake, 1 fossilized wood flake, 2 quartz bipolar pieces, 1 broken chert flake with use wear on one margin.

Browns Road Site 8 (52-2-1623)

This shelter and artefact site is located 150 m east of fire trail 6Q about 1km from the 6A-6Q junction. The site is located 200 m from a tributary of Wongawilli Creek. The sandstone overhang measures 8 x 4.5 x 1.8 m in size and has a living area 3 x 2 m in size. The site was formed by block fall and cavernous weathering. The floor deposit is light brown loamy sand 10 cm deep deposited by slope wash and weathering. No art was recorded within the shelter but during the original survey 1 chert flake artefact was located on the drip line.

Browns Road Site 11 (52-2-1626)

This art shelter site is located on the second last western tributary to Wongawilli Creek before Donald castle Creek leaves 6A. The site is located 1.2 km north of 6A-6Q junction. The sandstone overhang measures 8 x 2 x 2 m and the living area is 1 x 3 m (Plate 46). The site was formed by block fall and cavernous weathering. The art within the shelter extends the full length of the shelter with remnants of 6 charcoal undeterminable motifs and 1 charcoal outline and infill of an eel motif (Plate 47). The floor deposit is grey loamy sand to a depth of 20 cm.



Plate 46: Large sandstone overhang of site 52-2-1626.

Plate 47: Charcoal eel motif in site 52-2-1626.

The art is in fair to poor condition and the floor deposit is undisturbed.

Browns Road Site 12 (52-2-1627)

This site is a shelter with art, located on the second cliff line down from the top of the ridge. The site is located on the western mid slope overlooking a tributary of Wongawilli Creek. It is about 1km from 6A fire road and 400 m past the first swamp and under the top cliff line. The shelter was formed by block fall and cavernous weathering. There is more recent block fall located along the back of the shelter. The sandstone overhang measures 17 x 3.5 x 1.5 m in size (Plate 48) the living area is 1 x 1m in size and the shelter faces east.

The art within the shelter was described in a prior site recording as consisting of from left to right on the rear wall 1 eel, 6 indeterminates, 1 oval, 1 frontal female figure, all with outline and infill and 1 outline human figure. On the upper roof wall are two indeterminates with outline and infill, 1 charcoal outline frontal human male. During the current survey 2 panels were recorded each 3 x 0.5 m in size, containing a total of 10 Charcoal outline and infill motifs (Plate 49).



Plate 48: art shelter site 52-2-1627



Plate 49: charcoal motifs in site 52-2-1627

The floor of the shelter originally was recorded as having a deposit 22 cm deep that consists of cream sandy loam from the weathering of the shelter. The current survey found that the deposit was limited due to recent block fall.

The site is in good condition, the shelter is dry and the artwork is well preserved. There are wasp nests and lichen on the surfaces of the shelter as well as dust from the roadway.

Browns Road Site 13 (52-2-1628)

This art shelter site is located on the last creek which flows into the Wongawilli Creek before Donald Castle Creek about 2km from fire road 6A. The shelter is situated on the second bottom cliff line above a small waterfall in the creek valley. There is a swamp to the east of the shelter. The aspect is to the east north east with an excellent vista. The sandstone overhang measures 14 x 3.5 x 1.5 m and was formed by block fall (Plate 50). There is no living area. The floor is mainly a sandstone rock ledge with a 2 m drop below the site. There is a limited deposit of yellow sand. Artwork recorded in the original site card consists of 2 charcoal

outline and infill indeterminates on the rear wall, 2 charcoal outline and infill kangaroos and 1 white outline and charcoal infill bird print under slabs forming the roof and towards the rear, and on another section of the roof 1 charcoal kangaroo in outline and infill and 3 indeterminate motifs in outline and infill. These motifs were re-recorded in the current survey across two panels (Plate 51).



Plate 50: shelter overhang depicting minimal floor deposit, site 52-2-1628. **Plate 51:** art motif in site 52-2-1628.

The shelter has had rock fall at the back of the shelter and extreme cavernous weathering. There is evidence of water seepage at the northern end of the shelter and there is lichen, mould and white organism growth on the surface of the shelter obscuring and damaging art work.

Browns Road Site 17 (52-2-1632)

This art shelter site is a small weathered cavern situated on the western face of a flat open sandstone outcrop above Wongawilli Creek, on the upper valley slopes north of the gully below Craters Rook. The sandstone overhand measures 2.5 x 0.8 x 1.4 m in size, there is no living area and a stone floor with minimal yellow sand deposit (Plate 52). There are three panels each containing 1 motif. One panel is 80 x 40 cm in size and depicts a charcoal outline of a head with two eyes, the second panel is 130 X 30 cm and depicts a charcoal outline of an animal (Plate 53), and the third panel is 90 x 60cm and depicts a motif in charcoal with infill.



Plate 52: sandstone overhang, site 52-2-1632 **Plate 53:** animal motif in site 52-2-1632

The site is in poor condition, there is a vertical crack on the edge of the motif with infill and the shelter is subject to continuous cavernous weathering. The surfaces of the shelter have black mould growth, and there are wasp nests within the shelter.

Browns Road Site 18 (52-2-1633)

This art shelter site is located on the lower valley slopes below a large level area on Wongawilli Creek. The sandstone overhang measures 7 x 3.4 x 1.9 m in size with a living area 3 x 2 m in size (Plate 54). The floor deposit is yellow clay loam 23 cm deep. Art work located on the rear wall consists of 1 charcoal indeterminate motif. Artwork on the roof consists of 1 charcoal frontal male human figure 600cm long (Plate 55) and 1 charcoal indeterminate motif.



Plate 54: sandstone overhang site 52-2-1633



Plate 55: charcoal human figure in site 52-2-1633.

The condition as the site remains the same as in the original site recording, the art is in poor condition and the deposit is undisturbed.

Browns Road Site 19 (52-2-1634)

This art shelter site is located under a waterfall on a side tributary of the Wongawilli Creek. The shelter was formed by chemical weathering and exfoliation. The sandstone overhang measures 18 x 8.2 x 4 m in size and faces northwest, the living area is 20 x 6 m in size. The floor deposit is 50 cm deep and consists of a dark yellow brown sandy loam. The art in the shelter was originally recorded as 3 charcoal outline kangaroos on the roof at the south end of the shelter. During the current survey only 2 of these motifs could be located, one was on a panel 1 x 30 cm in size and was only partially complete, the other was complete and on a panel 70 x 30 cm in size.

The shelter has water dripping down the eastern end of its side surface and white mould is growing on the surfaces. There is also a wasp nest on the shelter surfaces. The artwork is in poor condition, one of the motifs is only partially complete.

Browns Road Site 29 (52-2-1643)

This art shelter site is located on a small drainage line that flows south into the seventh Wongawilli tributary. It is set back from the tributary creek channel on the second cliff line from the creek, 200 m west of fire trail 6F and about 1.8km north of the 6D intersection. Access is via the drainage line. The sandstone overhang measures 15 x 7 x 3.8 m in size and there are two living areas 2 x 2 m and 4 x 1 m. The site was formed by block fall. The floor deposit is medium grey brown to black sandy loam 5 to 20 cm deep. The deposit area was not large as most of the floor was rock. The artwork within this shelter is impressive there are 10 to 16 panels with 39 motifs. These motifs were of human figures and animals, many were drawn with charcoal infill and outline and some were charcoal outline with red, yellow and white ochre infill (Plate 56). Some of the surfaces had etching over the drawings (Plate 57).

Five artefacts were located during the current survey on the drip line of the shelter. These include 1 silcrete flake fragment, 1 quartz core, 2 quartz flakes and 1 broken quartz flake.



Plate 56: ochre and charcoal motifs from site 52-2-1643.



Plate 57: ochre and charcoal motifs with etching from site 52-2-1643.

The shelter suffers from cavernous weathering and exfoliation, recent exfoliation on some art is evident. A large area of the floor surface has been buried by a root collapse at the back of the shelter. There is some water seepage at the eastern end of the shelter and along the back wall of the shelter. There are white leeching patches and black mould growing on the surfaces.

Browns Road Site 30 (52-2-1644)

This art and artefact shelter site is located 250m past the small fork in the creek and 100m up from it on the northern side. It is on the seventh tributary of the Wongawilli Creek on the eastern side. The shelter is a long narrow sandstone overhang that was formed by block fall cavernous weathering and water erosion. The overhang measures 11 x 2.7 x 1.7 m and the living area is 1 x 1 m in size. There is a medium yellow brown sand floor deposit trapped by roof collapse at the front of the shelter 15 to 20 cm deep. Art within the shelter is 1 charcoal outline and infill of a human figure on one panel 150 x 40 cm in size. The original survey recorded 1 quartz bipolar flake located on the drip line.

The shelter is in poor condition, there is significant water seepage across the lip of the shelter and across the shelter walls and floor. There are black and white leeching marks on the surfaces and algae are growing on the surfaces. There is evidence of wombat movement across the shelter floor, including a hole at the back of the shelter. The art is in very poor condition.

Browns Road Site 31 (52-2-1645)

The art shelter site is located under the second ridgeline up from the eastern tributary to Wongawilli Creek on the northern side and about 150 m up from the junction of two smaller creeks. The sandstone overhang measures 8 x 2 x 1.8 m in size and the living area is 3 x 1 m in size (Plate 58). The floor deposit is grey loamy sand 20 cm deep formed from shelter weathering and slope wash. The original recording of this site recorded 1 charcoal outline and infill of a kangaroo motif and two charcoal indeterminates. During this current survey one of the indeterminate motifs was not located.

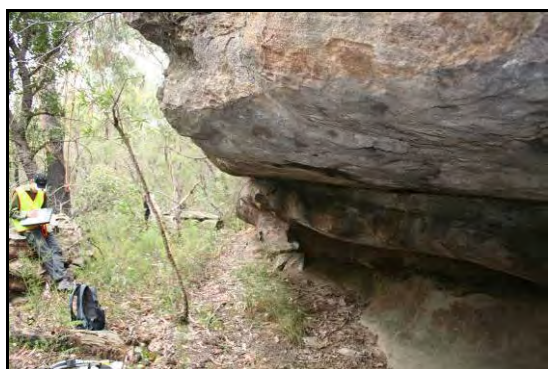


Plate 58: sandstone overhang, site 52-2-1645.

Plate 59: fallen artwork from site 52-2-1645.

The art is in very poor condition, there has been extreme exfoliation and part of the art has fallen off the shelter wall (Plate 59). The surfaces of the shelter also have evidence of lichen and calcification, and the shelter has animals inhabiting it.

Browns Road Site 32 (52-2-1646)

This art shelter site is located 200 m south east of the junction of the 8th eastern tributary of Wongawilli Creek. The site is under the second top ledge. The sandstone overhang measures 18 x 4 x 2.8 m in size and the living area is 8 x 2 m (Plate 60). The site was formed by block fall and cavernous weathering. The floor deposit is yellow orange loamy sand up to 10 cm deep, although most of the floor is rocky and the deposit is less than 2 to 3 cm deep. During the original recording of the suite a number of art motifs were identified within the shelter. The rear wall contains: 10 red ochre hand imprints which included 5 right hands and 2 left hands ranging in size from small to large; 1 red ochre child's left hand stencil; 1 red ochre adult hand stencil; 1 child red ochre hand stencil; 1 charcoal outline kangaroo; 1 charcoal outline bat; 3 charcoal outline possums in a frieze; 5 charcoal indeterminates; 2 charcoal outline and infill indeterminates; 2 charcoal outline frontal human figure; 1 charcoal outline and infill kangaroo and 2 charcoal outline fishes (Plate 61).



Plate 60: sandstone overhang and floor deposit, **Plate 61:** Charcoal fish motifs site 52-2-1646. site 52-2-1646

The art is in good condition. The shelter has water seepage over lip of shelter and heavy water down the face of the shelter, across the roof and at the centre of the shelter. Ferns, moss and white mould is growing on the surfaces of the shelter. The shelter is suffering continued cavernous weathering and exfoliation.

Browns Road Site 20 (52-2-1647)

This artefact shelter site is located in a large sandstone overhang located on the top ridgeline at the end of a point above Wongawilli Creek. The sandstone overhand measures 10 x 4 x 4 m in size and the living area is 8 x 4 m. The floor deposit is red cream sand 10 cm deep. The floor also has block and smaller sandstone rocks that have fallen from the roof (Plate 62). There is no artwork within this shelter but a number of artefacts have been located. The artefacts include a complete basalt flake, a complete quartz flake, a quartz core and an agate core (Plate 63).



Plate 62: interior of artefact and shelter site 52-2-1647. **Plate 63:** artefacts from site 52-2-1647.

The site is in good condition. The shelter is cavernously weathered but is very dry.

Upper Avon 34 (52-2-1770)

This artefact shelter site is located 300 m west of fire road 6A from a point 1km north of Nemma Irig on the lowest sandstone outcrop cliff line. The shelter is situated on the edge of a

swamp at the head of the second eastern tributary to Native Dog Creek. The sandstone overhang measures 12 x 2 x 2 m and faces south east, the small living area measures 1 x 1 x 1 m in size (Plate 64). The floor deposit is yellow loamy sand to a depth of 30 cm and formed by the weathering of the shelter. During the original survey 2 artefacts were located on the drip line, one grey multiplatform core and 1 quartz bipolar core. During the current survey the silcrete core was relocated on the drip line, however it is quite waterworn, the other quartz core was no relocated but a number of un-diagnostic quartz flakes were identified.

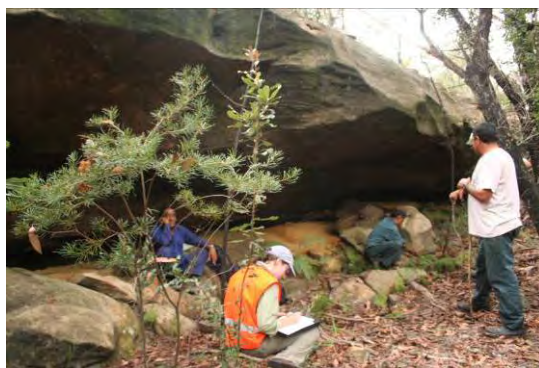


Plate 64: shelter and artefact site 52-2-1770.

The shelter has significant water seepage over the lip of the shelter which has damaged the artefact located on the drip line. Lichen grows on the shelter surfaces and there are wombat diggings in the shelter floor.

Upper Avon 35 (52-2-1771)

This artefact shelter site is on the eastern side of the Native Dog Creek on a small inlet on the store water. It is about 10m above the stored water. The sandstone overhang of the site is 15 x 4.5 x 3.5 m and the living area is 4 x 1 m. The shelter was formed by block fall. The floor deposit is 30 cm deep and is yellow-grey loamy sand formed by cavernous weathering. During the original recording of the site seven artefacts were located. During the current survey nine artefacts were located, these were as follows: 1 quartzite scraper, 1 quartz core, 2 mudstone flakes, 1 quartzite flake, 1 mudstone core, 1 petrified wood flake, 1 quartz flake and red ochre. Four artefacts that were recorded in the original survey were not relocated; these are 1 fossilised wood core, 2 mudstone flakes and 1 quartz flake.

The site is in good condition, there is continued cavernous weathering of the shelter, and the deposit has been disturbed by wombats.

Upper Avon 36 (52-2-1772)

This art and artefact shelter site is a large cliff face that faces east south east on the north side of the last eastern tributary of Native Dog Creek. The sandstone overhang is 29.6 x 5.5 x 7.5 m in size with a living area 12 x 1 m in size (Plate 65). The shelter was formed by block fall and cavernous weathering. The floor deposit is medium grey brown sandy soil approximately 10 to 20 cm deep, which has been formed by weathering. The floor of the eastern part of the

shelter is covered with loose rock whilst the western part of the floor has the sandy deposit. Art recorded within the shelter across two panels each 2 x 10 m includes: 1 charcoal outline and striped infill from human figure with hands up (Plate 66), 1 charcoal outline and infill kangaroo motif, 1 charcoal infill male frontal human figure with arms down, 1 charcoal outline frontal male human figure with arms up and red ochre infill and charcoal criss-cross infill, 1 charcoal outline and infill bird motif, 1 charcoal outline and infill of a human figure with hair and tools. All the faces in the motifs have eyes and due to the large surfaces the artwork is very large.



Plate 65: sandstone overhang of art and artefact shelter site 52-2-1772.

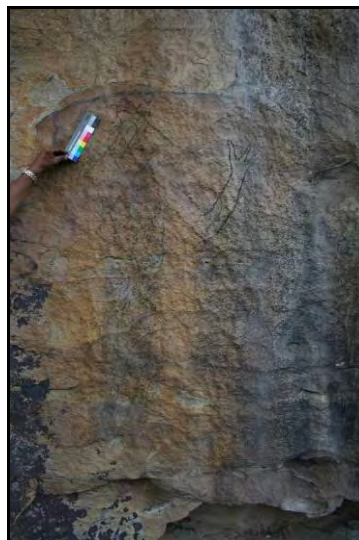


Plate 66: charcoal human motif with raised hand in site 52-2-1772.

A number of artefacts were located within the shelter these include: a broken volcanic flake, a silcrete fragment, a silcrete flake, 2 complete quartz flakes and 2 broken quartz flakes, 1 broken chert flake and 1 crystal quartz flake. During the current survey a silcrete microlith back blade and 4 quartz flakes were not relocated.

This site is in fair to poor condition, there is water seepage on the surfaces of the shelter which have left stains. The surfaces have silcreted but areas of the surface have considerable charcoal loss. Algae and lichen grow on the surfaces. The shelter is exposed to elements such as wind and rain.

Upper Avon 37 (52-2-1773)

This artefact shelter site is a small cavern in a section of steep continuous sandstone cliff line about 100m above the stored water on the eastern side of Native Dog Creek and about 1km west of 6A fire road. The sandstone overhang measures 4 x 3 x 1.8 m in size with a 1 x 1 m living area. The floor deposit is cream yellow sand to a depth of 5cm formed by the weathering of the shelter. In the original recording of the site 1 grey silcrete flake was identified on the drip line. During the current survey the artefact could not be re-located.

The cavern is very weathered and the deposit has been disturbed by wombat diggings.

Upper Avon 38 (52-2-1774)

This art shelter site is located 50m above the stored water below a small waterfall on a little side creek on the eastern side of Native Dog Creek and about 1km west of 6A fire road. The sandstone overhang measures 12 x 3 x 3 m in size formed by cavernous weathering, the living area is 3 x 2 m in size. The floor deposit is yellow loamy sand 50cm deep caused by shelter weathering. Five charcoal indeterminate motifs are located on the rear wall.

The art is in poor condition and the shelter suffers from exfoliation. The floor deposit is undisturbed.

Dendrobium 1 (52-2-2208)

This shelter site with a deposit is located east of fire road 6A in the Cordeaux Catchment Area, between Cordeaux Dam and Avon Dam. The site comprises a long narrow and high shelter formed primarily by block fall. The shelter is situated at the north end of a cliff line which is approximately 7 m high, it is formed by laterally bedded sandstone; there is a large softer bed at the join of the roof and back wall. The roof is cracked along the bedding and at right angles to the bedding. The shelter measures 14.5 x 2.9 x 1.8 m and faces south east (Plate 67). The floor deposit is medium grey sandy deposit up to nearly 1m deep. During the original survey 3 artefacts were located at the north end of the shelter; these were 2 milky quartz flakes and 1 grey chert flat. During the current survey a total of 5 artefacts were located, 2 complete and one broken quartz flakes, one quartz split cobble and 1 broken silcrete flake (Plate 68). The site was assessed during the original survey to have moderate potential to be larger than the recorded area, to contain more artefacts and to have *in situ* archaeological material.



Plate 67: sandstone overhang, site 52-2-2208



Plate 68: artefacts from site 52-2-2208

The site is in good condition, the deep floor deposit is undisturbed. The shelter is subject to continuous weathering, there is a crack in the roof and lichen and yellow micro-organisms are growing on the roof.

Dendrobium 2 (52-2-2209)

This art shelter site is located on the top sandstone cliff line situated on a small ledge 2 m from the slope. From fire road 6A walk north east along the southwest spur crest to the northern point. The shelter is under the cliff line. The shelter is a long narrow and high shelter formed by rock fall, 300 m from the nearest creek (Plate 69). The shelter measures 7.5 x 1.4 x 7 m in size. There is no deposit on the floor, just exfoliated chunks of sandstone. The art located within the shelter comprises one panel 1 x 1 m in size with a charcoal infill and outline indeterminate motif (Plate 70).



Plate 69: Art shelter site 52-2-2209



Plate 70: Art with infill motif in site 52-2-2209

The art is in poor condition. There is no water seepage on the surfaces of the shelter, however the site is exposed to the elements such as wind and rain.

Dendrobium 3 (52-2-2219)

This art shelter site is located approximately 300 m to the east of fire road 6C situated west of Cordeaux Dam. The site is on a break of slope on a spur situated on a bisected sandstone plateau. The shelter has been formed by block fall and has a west south-westerly aspect, the sandstone overhang measures 10.8 x 3 x 2.3 m (Plate 71). The floor deposit is medium yellow brown sand and loam to a depth of 5 to 15 cm. One panel 2 x 1 m in size depicts the art within the shelter, which is one charcoal indeterminate motif (Plate 72).



Plate 71: sandstone overhang of site 52-2-2219

Plate 72: charcoal motif within site 52-2-2219

The art is in very poor condition. It is very faded and the motifs are unrecognisable. Lichen, algae and mould are growing across the surface of the shelter.

Site 1 – DB1 (52-2-2229)

This art shelter site is a small sandstone overhang situated on the lowest sandstone outcropping cliff line adjacent and to the Wongawilli tributary and west of Wongawilli Creek. The shelter has been formed by block fall and cavernous weathering there is one horizontal bedding plane evident at the base of the roof. The shelter measures 4.5 x 2 x 1.2 m in size. The deposit is medium yellow sand to a depth of 5 and 20 cm. The floor slopes and has a number of sandstone rocks present. The rock fall and the deposit have been formed by cavernous weathering and exfoliation. The art consists of a charcoal outline and infill indeterminate on the back roof panel.

The art is in very poor condition due to the chemical weathering of the site, particularly the roof. Approximately 95 % of the original hardened surface has eroded. The remnant art is present on approximately 10% of the remnant case hardened surface.

Dendrobium 7 (52-2-2248)

This art shelter site can be located from a point 50m north of the rain gauge on fire road 6A, proceed west along seismic line track a distance of approximately 900 m. The site is located approximately 80m north of the seismic line track and immediately south of an unnamed creek that flows into Avon Dam. The shelter consists of a long, narrow sandstone overhang situated on the mid to lowest cliff line outcrop (Plate 73). The shelter was formed by blockfall and weathering with one major horizontal bedding plane with minor vertical cracking. There is some minor rock fall on the shelter floor. The shelter measures 18 x 1.9 x 1.9 m in size. The floor deposit is medium yellow brown sand of a depth between 5 and 15 cm. The art within the shelter depicts 1 charcoal outline and infill indeterminate motif (Plate 74). One broken quartz flake was identified; however it was too difficult to determine if it was an actual artefact.



Plate 73: sandstone overhang of site 52-2-2248

Plate 74: charcoal motif within site 52-2-2248

The art is in poor condition, lichen and yellow mould are growing on the shelter surfaces and over some of the art. The shelter is subject to the elements such as wind and rain.

Dendrobium 8 (52-2-3088)

This art shelter site can be located from a point 50 m north of the rain gauge on fire road 6A, proceed west along seismic line track a distance of approximately 850 m. The site is located approximately 80m north of the seismic line track and immediately south of an unnamed creek that flows into Avon Dam. The shelter was formed by block fall and cavernous weathering. The floor deposit is medium yellow sand approximately 5 to 10 cm deep. There is rock fall around the front of the shelter (Plate 75). The art within the shelter comprise one charcoal infill indeterminate motif on a panel 200 x 500 cm in size (Plate 76).



Plate 75: sandstone overhang of site 52-2-3088

Plate 76: charcoal motif within site 52-2-3088

The art is in poor condition. The shelter is exposed to the elements wind and rain and the surfaces have black and white mould, lichen and water leeching.

DM1

This shelter with art site is situated on the upper slopes of a broad open ridgeline that faces north. The small shelter has been cavernously weathered to a scalloped form (Plate 77). The site comprises four charcoal infill and outline animal motifs, resembling possums or gliders. Whilst at the site Shaun Suddery suggested similar figures were often referred to as “flying foxes” (Plate 78). Two of the figures appear to be joined at the tail. Historic graffiti was also

present in the shelter, on a separate panel 40cm from the figurative art. The graffiti was of the initials “JF” and “EF” and a very faint date, possibly “1946” although it is not preserved well enough to discern with certainty.

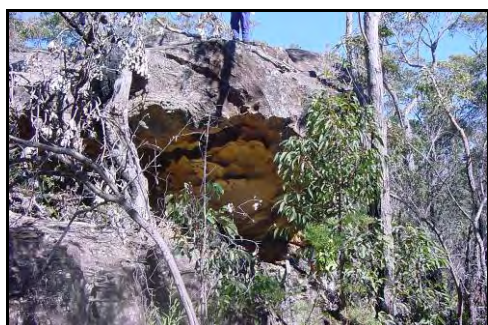


Plate 77: Sandstone overhang at site DM1



Plate 78: Charcoal motifs at site DM1

The shelter walls were in good condition, with very little exfoliation, no major faulting and apparently little active chemical weathering. However the charcoal figures were in varying conditions of preservation, with two being quite clear, and two others being very faint. Nevertheless, the figures were clearly visible, meaning they are in a relatively good condition.

DM2

This shelter with deposit site is situated on the upper slopes of a significant ridgeline. The shelter has a northerly aspect. The floor was flat, with a thin mobile layer of loose sandy soil covering the surface, with dark brown humic sandy soil exposed in some places below this (Plate 79). The flat floor area measured approximately 3 m deep by 9m wide. Two artefactual pieces of stone on the surface of the shelter floor. The shelter was formed by a very tall cliffline, with the roof 2 m high above the floor. No large cobbles were present in the sandstone forming the overhang. No art was visible on the shelter walls.

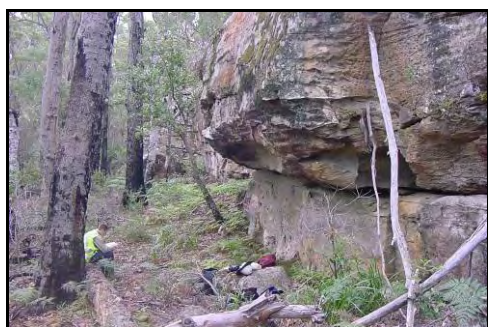


Plate 79: Cliff line overhang at site DM 2



Plate 80: Quartz artefacts located at DM 2

The artefacts consisted of a large broken quartz cobble with water worn cortex, and a small quartz flake also with water rolled cortex (Plate 80). No art is present at this site as it is exposed to the elements and covered in moss and other micro-organism growth. The cliff line shelter is in a stable condition.

DM9

This isolated artefact site is situated on a moderate mid-slope ridge line, on the now eroded and lagged bank of Cordeaux Dam, below usual waterline. The soils comprise grey gravelly silt with laterite and sand patches present on surface. Vegetation is sparse, sawn tree stumps are abundant. One single chert broken flake was identified.

Newly Recorded Aboriginal Archaeological Sites

The following site records results from the most recent survey assessment work completed by Biosis Research (2007) within Dendrobium Area 3.

DM10

This shelter with deposit site is situated on the bottom of a steep cliff line on one of the Wongawilli drainage lines. It is situated at the end of the cliff line 80 m east of the junction of the drainage and Wongawilli Creek. It is a moderate sized shelter that has been formed by cavernous weathering and measures 8.5 x 3.2 x 1.8 m (Plate 81), and has a living floor area of 6 x 2 m (Plan 1). The shelter faces south, south west and is only 30 metres from the edge of the drainage channel. No art is present due to damp conditions in the drainage line gully and the poor surface present in the shelter.

The deposit within the living area comprises medium grey brown loamy sand, is coarse in texture and quite damp. The surface has been partially disturbed by wombat movement, particularly towards the rear of the shelter. The depth of the deposit is estimated to be between 5 and 20 cm across the living floor. One quartz cobble and one broken black, chert flake were identified in the drip line of the shelter (Plate 82).

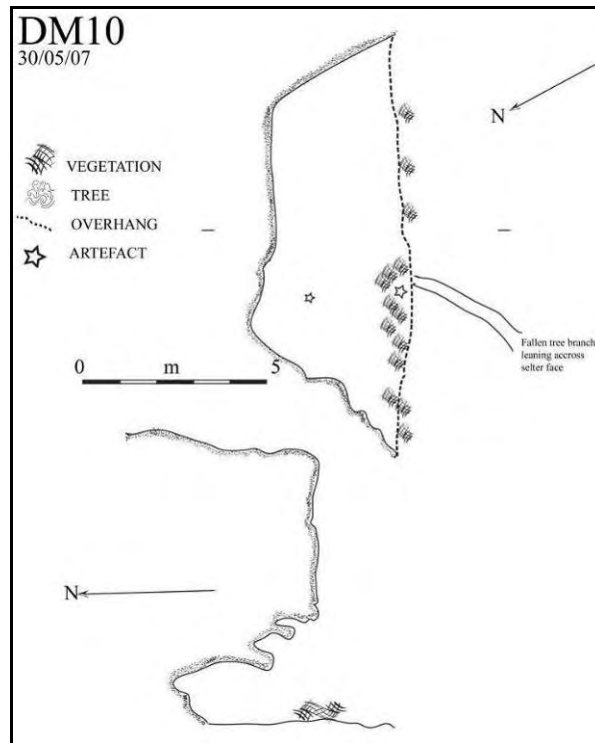


Plate 81: Moderate overhang at site DM 10



Plate 82: Stone artefacts at site DM 10

Some horizontal bedding planes are present. The floor of the shelter does not contain any sandstone block fall. There is significant water seepage over the lip of the shelter and some seepage is also evident at the rear of the shelter. The surface of the shelter is covered in lichen and other micro-organisms.



Plan 1: Plan and profile of newly recorded site DM 10

DM12

This shelter with art and deposit is situated on the upper slopes of the ridgeline that overlooks Sandy Creek valley to the north. The sandstone overhang is located on a discontinuous outcrop that is quite long and narrow, and has been formed by block fall and cavernous weathering. The shelter faces north east and measures 14 x 2.5 x 2.2 m (Plate 83), with a large, but narrow living area measuring approximately 2 x 10 m (Plan 2). The site is at least 300 m from east of the closest drainage feature and 500 m south east of Sandy Creek.



Plate 83: narrow sandstone shelter at site DM 12



Plate 84: Scatter of stone artefacts at site DM 12

The floor of the shelter is undisturbed and consists of open sandstone along the back of the shelter and medium yellow grey brown sand along the front part of the shelter. This deposit is quite shallow, no more than 10 cm. On the margin of the sandstone and the sandy deposit were numerous stone artefacts. These included 1 silcrete core, 1 quartz tool, and several

quartz, quartzite, chert, silcrete, mudstone, petrified wood complete and broken flakes (Plate 84). A number of these flakes contained cortex that indicated they were once part of small pebbles and cobbles.

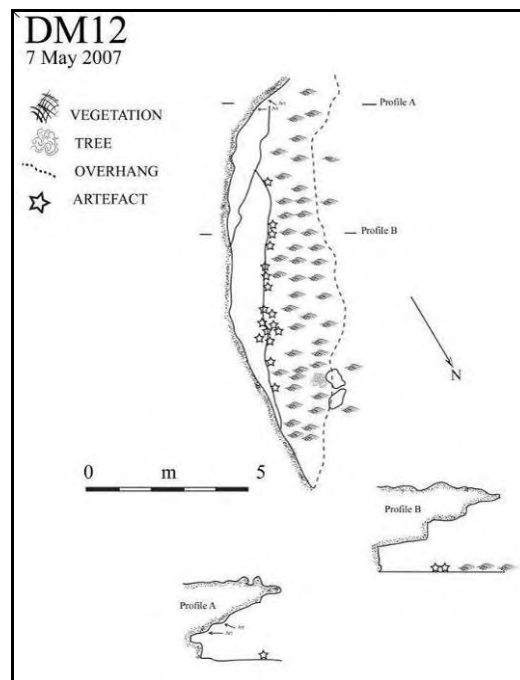
At the very southern end of the shelter, two white hand stencils, both of which are children's hands, both of them appear to be the left hand (Plate 85, Plate 86).



Plate 85: First child white hand stencil at site DM 12

Plate 86: Second white hand stencil at site DM 12

The narrow overhang has been formed by block fall and cavernous weathering. It has a number of horizontal bedding planes and has been subject to chemical weathering and exposure to the elements. During wetter months, a significance amount of seepage appears to flow over the lip of the shelter, causing lichen and black micro-organisms growth that subsequently dries out and bakes with exposure (Plate 86). Within the overhang, no seepage occurs across the rear wall, however there are no suitable surfaces for art. No seepage occurs where the art is situated, and this end of the shelter is not subject to seepage or micro-organism growth.



Plan 2: Plan and profile of newly recorded site DM 12

Overall, the condition of the site is considered to good where the existing art occurs and the floor of the shelter appears to be undisturbed.

DM13

This shelter (cliff) with deposit is situated on the bottom cliff line on a significant ridgeline on the northern side of Sandy Creek. It is situated in the centre of a large, high sandstone cliff line, 150 m from the creek channel. The cliff line is large, and continuous, and has been formed by block fall. It would not be considered a typical shelter, but does have a narrow roof line. This section of the cliff line measures 23 x 5.6 x 3.5 m in size (Plate 87), and a living floor of 3 x 10 m (Plate 88), although the cliff line does continue further to the north east and south west (Plan 3). No art is present along this cliff line as the conditions are very damp and surfaces of the sandstone are unsuitable.

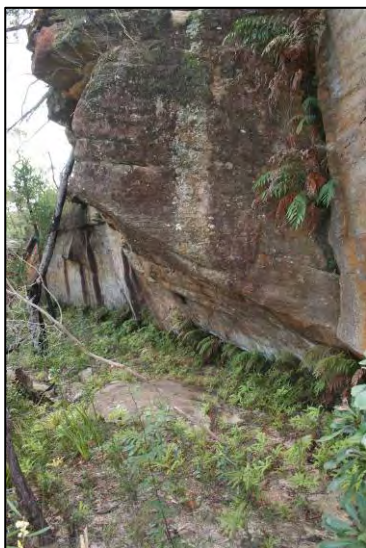


Plate 87: Steep cliff line overhang at site DM 13



Plate 88: High shelter roof at site DM 13

The deposit within the living area consists of yellow brown sand that is quite coarse in texture. It is estimated to be between 30 and 40 cm deep across the living floor. The surface of the floor has been partly disturbed by wombat diggings, as there is a wombat hole situated at the centre base of the cliff line (Plate 89). A small number of stone artefacts were exposed on the spoil from the wombat hole. These included one silcrete scraper, 3 quartz flakes and one petrified wood flake fragment (Plate 90).

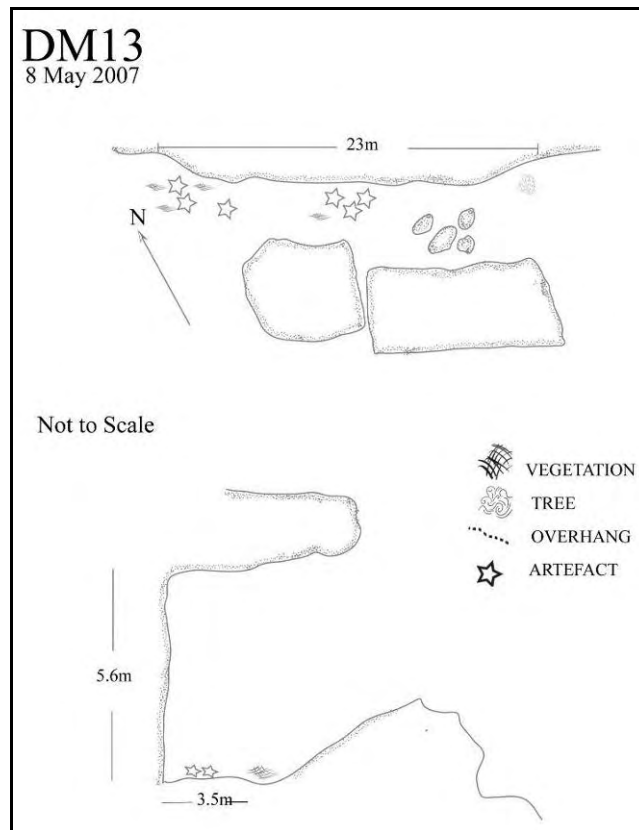


Plate 89: Yellow sand deposit at site DM 13



Plate 90: Stone artefacts recorded at site DM 13

No major bedding planes at this section of the cliff line. There is one horizontal plane where the narrow roof meets the top of the cliff line. Major sandstone block fall has occurred at the front of the shelter, reducing the size of the liveable area. No water seepage was evident although the surface of the cliff line does contain some lichen and micro-organism growth. Small ferns are growing from some cracks and in the drip line along the front of the shelter.



Plan 3: Plan and profile of newly recorded site DM 13

DM14

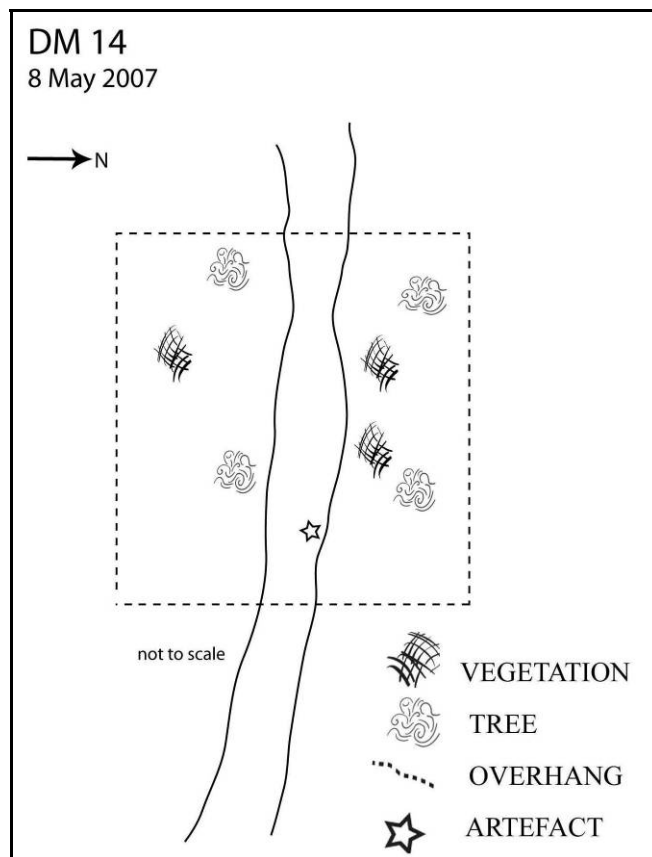
This isolated artefact occurrence is situated in the centre of Fire Trail 6C, north of the intersection of Fire Trail 6C and the access track to the 66kV overhead power line, east of the site (Plate 91; Plan 4). The site comprises a single broken mudstone artefact (Plate 92).



Plate 91: View north along Fire Trail 6C across site DM14

Plate 92: Single mudstone flake at site DM 14

Fire Trail 6C is a well used fire trail that consists of medium yellow brown sand. The sand on the track is from continual use, erosion and maintenance.



Plan 4: Plan and profile of newly recorded site DM 14

No other stone artefacts could be found along this section of the fire trail.

DM15

This shelter with art site is situated on the mid slopes of a ridgeline above one of the major Wongawilli tributaries. The small sandstone shelter is located on a discontinuous sandstone outcrop and has been formed by block fall and cavernous weathering. The shelter faces south, within damp woodland vegetation. The overhang measures 6.5 x 1.5 x 1.9 m (Plate 93), with a very limited living floor area of approximately 2 x 2 m (Plan 5). The overhang is approximately 200 m north of the major Wongawilli tributary, and 400 m east of Wongawilli Creek.

The art comprises a single solid charcoal anthropomorphic or possibly bat figure on a small panel measuring 30 x 50 cm (Plate 94). It is situated at the western end of the overhang and has been preserved by a thin silica skin. It is also one of the only remaining areas across the surface of the overhang that has not been exfoliated.



Plate 93: Small outcrop at site DM 15

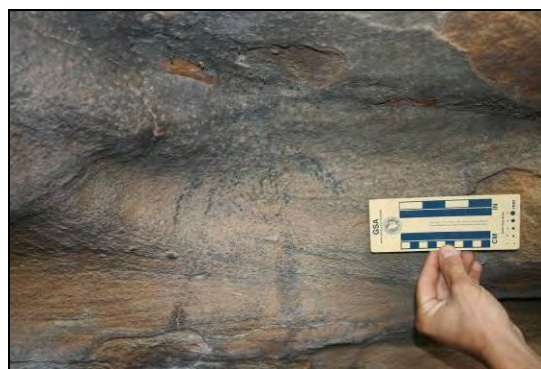
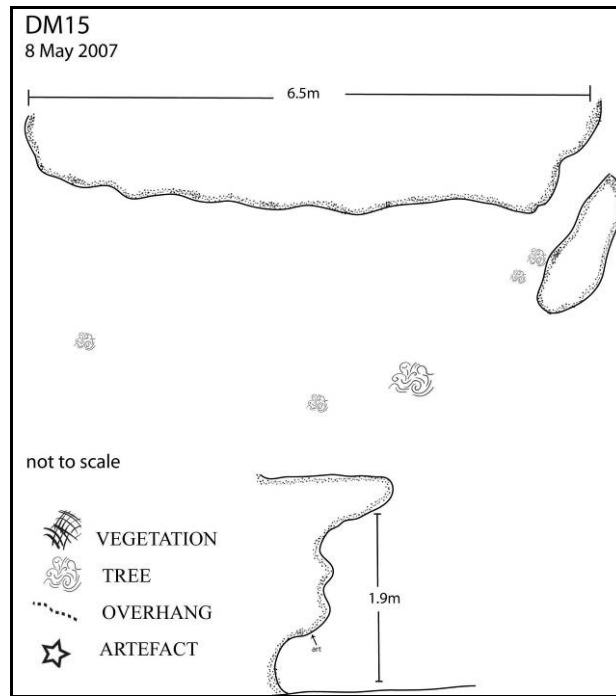


Plate 94: Single solid charcoal motif at site DM 15

The limited living space on the floor of the shelter consists of medium yellow grey brown sand, estimated to be 40 cm deep. No stone artefacts could be identified however.

The conditions within the shelter are quite damp, and as a consequence large sections are subject to micro-organism growth and seepage is also evident. The shelter appears to have been subject to extreme exfoliation, and it is most likely that this is as a result of bushfire activity. The weathering processes within this shelter site are continuous and it is likely that this figure will also eventually exfoliate from the surface of the overhang. At present, the site is stable.



Plan 5: Plan and profile of newly recorded site DM 15

DM16

This shelter with art site is situated on the mid to upper valley slopes of a ridgeline that extends east to Wongawilli Creek. The sandstone cliff line on which the overhang is situated is quite steep and only accessible to the east of the site. It is a large, sandstone overhang that has been formed by block fall and cavernous weathering (Plan 6). The shelter faces south, in relatively dry open woodland conditions. The site measures 12.5 x 2 x 4 m (Plate 95), with a moderate living floor area of approximately 1.5 x 10 m (Plate 96). The shelter faces an open, gradual slope, 250m north to the nearest Wongawilli tributary.

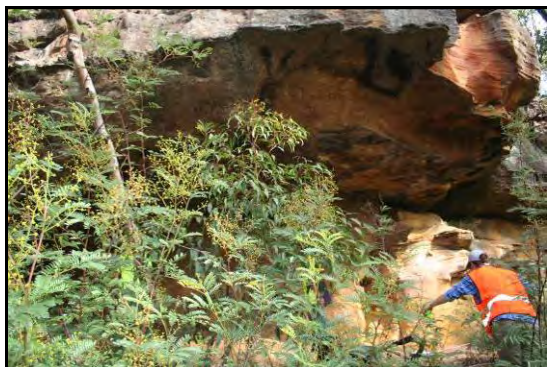


Plate 95: Overhang at site DM 16



Plate 96: View along overhang at DM 16, facing east

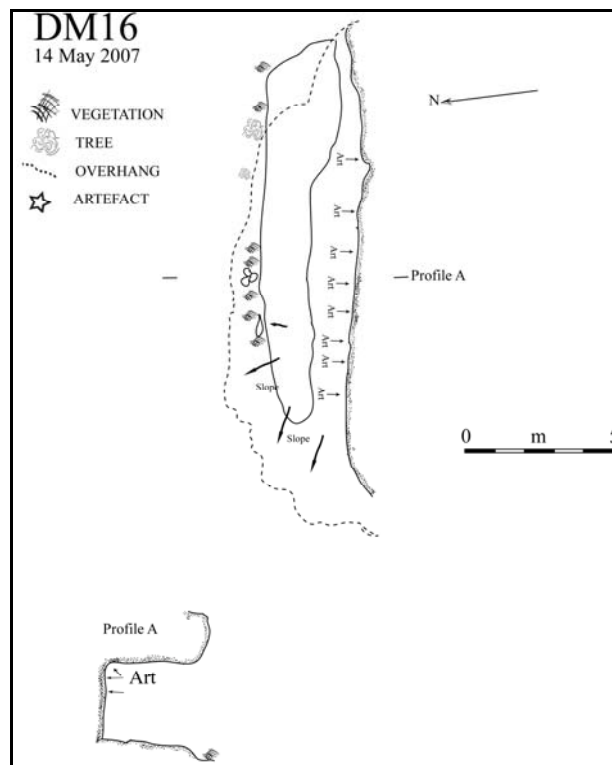
The shelter contains a high number of art motifs, many of which are now indistinguishable. The art is situated along the full length of the shelter, and is location on two panels that run parallel to one another. The art comprises 6 charcoal outline with red infill wombats (Plate 97), 2 charcoal outline and infill macropods, 1 white ochre hand stencil (Plate 98), 4 charcoal outline and infill bats, 6 charcoal outline and infill indeterminate, 1 charcoal outline indeterminate, 1 red ochre outline and infill indeterminate and 1 charcoal outline and red ochre infill indeterminate motifs.



Plate 97: One of the outline and infill wombats at site DM 16

Plate 98: White hand stencil in centre of shot at site DM 16

There is a large living floor, although minor block fall and accumulation of weathered sandstone create a slope within this area. Along the shelter there is probably a liveable area of 8 x 2 m. The deposit consists of undisturbed medium yellow sand between 5 and 30 cm deep. No stone artefacts were identified on the surface however.



Plan 6: Plan and profile of newly recorded site DM 16

The solid cliff line has been formed by block fall and minor weathering processes. There are no major bedding planes, although there are two vertical weathering cracks at the north eastern end. A number of horizontal small quartz pebble lenses run the full length of the shelter. Some chemical weathering processes and minor exfoliation is occurring across the roof, and upper sections of the rear wall. Some of the exfoliation is affecting some of the art.

No significant water seepage is occurring over the lip of the shelter, although some water is running down the eastern side of the shelter and washing across the floor along the rear of the outcrop. Some black micro-organism growth and leeching is evident across parts of the roof.

The overall condition of the overhang is quite good, although weathering and exfoliation are processes that will continue to affect the surface of the shelter and art.

DM17

This site comprises a shelter with deposit, situated on the upper sandstone cliff line of the Wongawilli Creek valley. It is a moderate overhang located along a large, continuous cliff line that has been formed by block fall and subsequent weathering, above a very steep drop-off to the nearby creek. The overhang measures 13 x 3.5 x 1.5 m (Plate 99), and has a flat open living space of approximately 9 x 2 m in size (Plan 7). No art was identified within the shelter.



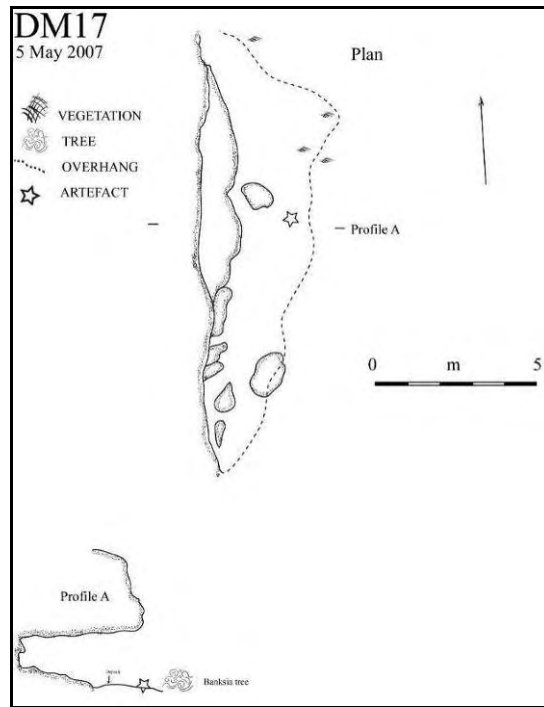
Plate 99: Weathered overhang at site DM 17



Plate 100: Quartz core located at site DM 17

The living area deposit consisted of fine yellow grey sand, estimated to be between 10 and 15 cm deep. No disturbance was evident across the floor of the shelter. One quartz core was recovered from the centre of the living floor (Plate 100). No further stone material was identified. The deposit remains undisturbed and is in good condition.

The overhang has been subject to significant chemical weathering. Almost all surfaces were affected by lichen, mould, micro-organism growth and leeching. If any art is present it is no longer visible. Some water seepage occurs over the lip of the shelter, however, no seepage was evident across the rear wall of the shelter. The shelter has two horizontal bedding planes and no cracks were evident.



Plan 7: Plan and profile of newly recorded site DM 17

DM18

This shelter with art site is situated on the mid lower western slopes of the Wongawilli Creek, northern of a junction between a major drainage line and the creek. The overhang is located on a moderate cliff line and has been formed by block fall and cavernous weathering. The shelter faces east towards Wongawilli Creek and measures 12 x 4 x 2 m (Plate 101), and has a limited living floor of approximately 3 x 2 m (Plan 8). The overhang is only 50 metres from the drainage line and 100 m from the creek.



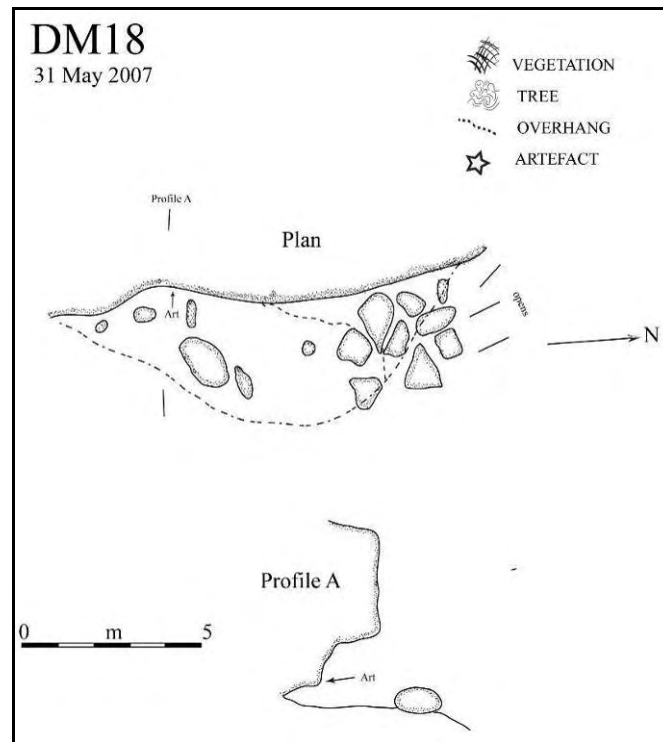
Plate 101: Small exposed overhang at site DM 18



Plate 102: Faded charcoal outline motif at site DM 18

The art comprises a single charcoal outline indeterminate motif on a small panel measuring 1.2 x 30 cm (Plate 102). The art is extremely faded and covered by white mineral efflorescence. The site is relatively dry despite its location between a drainage line and the creek.

The deposit within the shelter is limited due to block fall. It comprises grey brown medium grained sand that is approximately 20 cm deep. The surface of the deposit appears to have been disturbed by animal movement. No stone artefacts were identified.



Plan 8: Plan and profile of newly recorded site DM 18

The overhang contains several cracks and joints, with softer eroding stone lenses along the bedding planes at the rear of the shelter. Much of the surface of the overhang consists of case hardened exfoliating and weathering surfaces.

DM19

This shelter with art site is situated close to site DM18 on a small, low cavernously weathered overhang on the mid lower western slopes of the Wongawilli Creek, northern of a junction between a major drainage line and the creek. The overhang is located on a moderate cliff line and has been formed by block fall and cavernous weathering. The shelter faces east towards Wongawilli Creek and measures 7.5 x 2 x 1 m (Plate 103), and has a limited living floor of approximately 1 x 2 m. The overhang is only 80 metres from the drainage line and 100 m from the creek.



Plate 103: Small weathered cavern at site DM 19



Plate 104: Charcoal macropod at site DM 19

This small overhang contains one charcoal outline macropod motif on the centre of the rear wall. The art is located on one small panel measuring 1.6 x 0.8 m in size (Plate 104). The panel is exposed and extremely weathered.

The deposit within the overhang is limited as it is quite small. It consists of fine yellow sand that is no more than 10 cm deep. No stone artefacts were identified.

The low sandstone overhang is relatively dry and contains no obvious bedding planes or cracks. The surface of the shelter is subject to continuous weathering and exfoliation processes. The top and edges of the overhang appear to suffer from water seepage, presumably during wetter months. Overall, the site is in a degraded condition.

DM20

This small shelter with art is situated on the mid slopes of a moderate ridgeline, 300 m east of Fire Trail 6C and 200 m north of the drainage line. The small sandstone overhang has been formed by block fall and cavernous weathering, and is situated in a small continuous cliff line. The shelter faces north towards a Sandy Creek drainage line and measures 5 x 2.5 x 2 m (Plate 105; Plan 9), and comprises a small, flat living area approximately 3 x 2 m in size (Plate 106).



Plate 105: Small overhang at site DM 20, southeast



Plate 106: Lower cavern contains art at site DM 20

The art comprises charcoal outline and infill indeterminate motifs across the rear wall of the small cavern (Plate 107), and 1 anthropomorph on the edge of the cavern (Plate 108). The majority of the art cannot be distinguished.

The deposit consists of medium grey brown sand estimated to be no more than 20 cm deep. No stone artefacts were identified on the floor of the shelter.

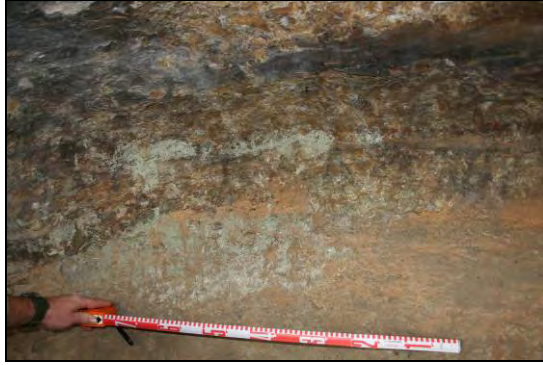
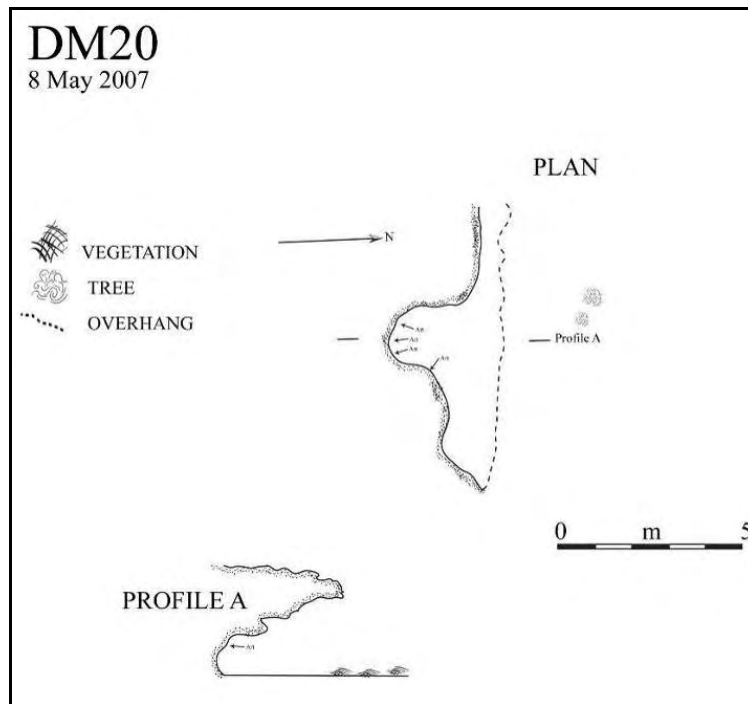


Plate 107: Indeterminate charcoal outline motifs



Plate 108: Partial charcoal outline anthropomorph

The motifs are in poor condition due to extensive water seepage, leeching and micro-organism growth. The small cavern in which they are situated is also subject to continuous weathering processes, although no major cracks or bedding planes are present within the small cavern. Some horizontal bedding planes are present in the larger overhang in which the small cavern is located. Overall, the site is in a degraded condition.



Plan 9: Plan and profile of newly recorded site DM 20

DM21

This site is a shelter with art and archaeological deposit. The shelter is situated on the end of a small sandstone spur, and is right next to a swamp, at the same level as the swamp (Plate 109). The shelter is cavernously weathered, and has a wide but low entrance that opens out to a large cavern. There is some seepage present on the shelter walls and roof, and the shelter is slightly damp. Green lichen and mould growth cover the majority of the shelter's inside surface (Plate 110, Plate 112). The shelter measures 9 x 3.5 x 2 m (Plan 10).



Plate 109: General view of DM21



Plate 110: Inside view of DM21

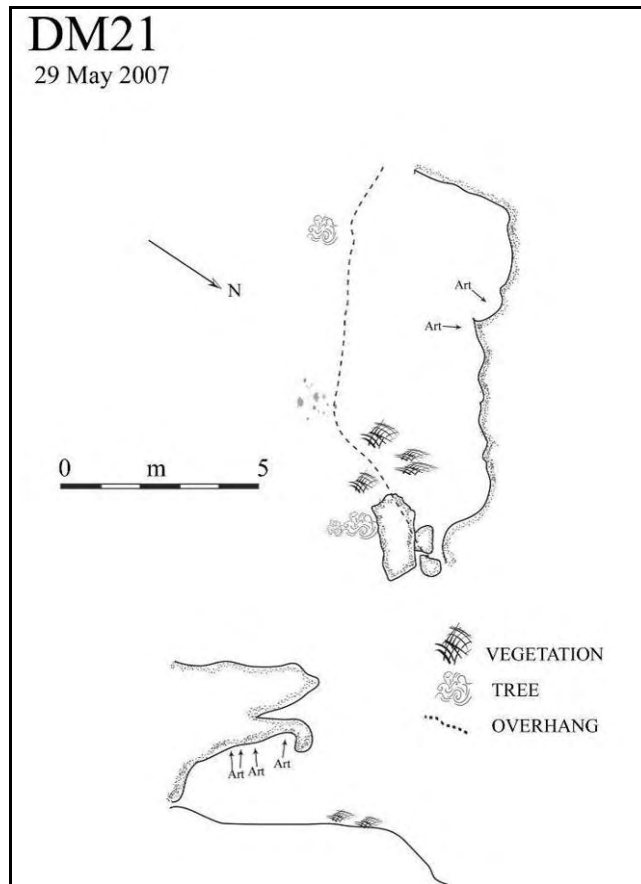
The art at this shelter consists of at least 10 red ochre stencils, a single white clay hand print, scratching associated with one set of stencils, and indeterminate charcoal motifs that are obscured by lichen and mould (Plate 111). There were 7 flaked stone artefacts recorded on the floor of the shelter, and the site has a good archaeological deposit, estimated to be at least 20 cm deep.



Plate 111: Stencils, print, scratching and charcoal motifs on roof of DM21



Plate 112: Mould and lichen growth at DM21



Plan 10: Plan and profile of newly recorded site DM 21

DM22

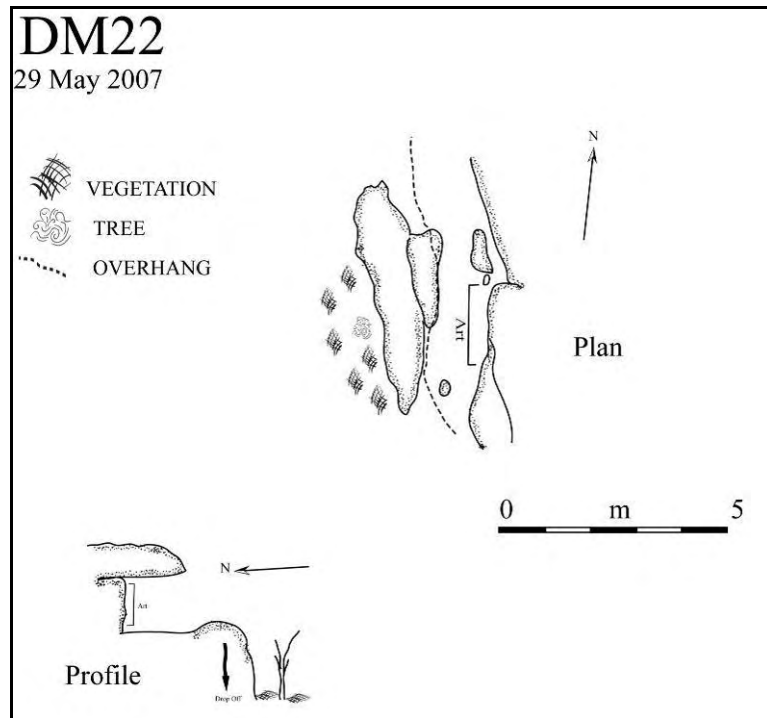
This site is a shelter with art. The shelter has been formed by a combination of block fall and cavernous weathering, and measures 7.5 x 1.5 x 1.5 m (Plate 113; Plan 11). The art consists of one charcoal partial anthropomorphic figure, and one indeterminate charcoal motif (Plate 114).



Plate 113: General view of site DM22



Plate 114: Partial charcoal anthropomorphic figure at DM22



Plan 11: Plan and profile of newly recorded site DM 22

DM23

This site is a shelter with archaeological deposit, located directly below the Sandy Creek waterfall, near where Fire Road 6C crosses Sandy Creek. The shelter measures 80 x 30 x 8m and has been formed by block fall on a large scale (Plan 12; Plan 13), with most of the shelter floor forming a steep slope and being strewn with very large angular boulders (Plate 115). However, the western end of the shelter contains approximately 20 m of reasonably flat floor, which has a well developed, though very damp deposit, of red soil (Plate 116). There were 6 artefacts, including cores and a retouched flake, located in the drip line and eroded parts of the deposit (Plate 117, Plate 118).



Plate 115: Roof fall at DM23



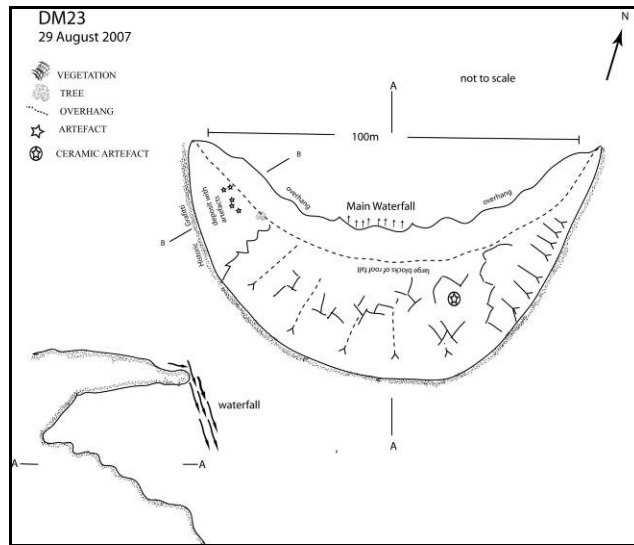
Plate 116: Archaeological deposit at DM23



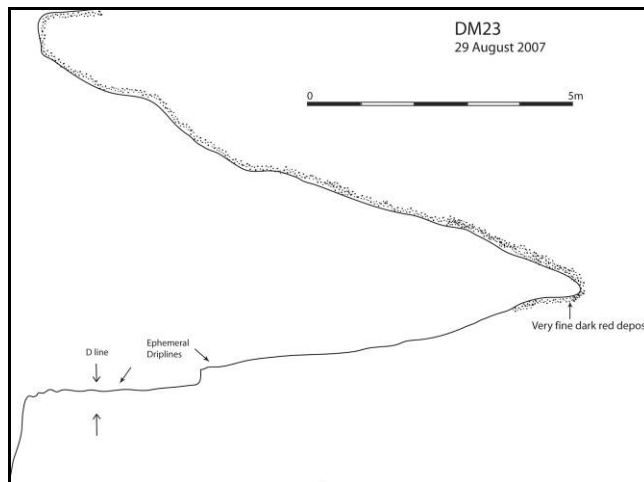
Plate 117: Artefacts at DM23.



Plate 118: Core at DM23.



Plan 12: Plan of newly recorded site DM 23



Plan 13: Profile of newly recorded site DM 23

APPENDIX 3: STATEMENTS OF ARCHAEOLOGICAL (SCIENTIFIC) SIGNIFICANCE FOR ALL ABORIGINAL SITES WITHIN DENDROBIUM AREA 3

Statements of Archaeological Significance

The following section provides statements of significance for all Aboriginal archaeological sites situated within Dendrobium Area 3 Study Area. The significance of each site follows the assessment process outlined in Section 2.3.3. This includes a statement of significance based on the categories defined in the Burra Charter. These categories include social, historic, scientific, aesthetic and cultural landscape values. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category will also be proposed. The determination of cultural landscape value will be 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 scientific significance and cultural significance of each site will be summarised below.

Dendrobium Area 3A

Browns Road Site 20 (52-2-1647)

This is a shelter with archaeological deposit, with 4 artefacts present on the surface of the deposit. The shelter is a large, dry shelter with a good sized potential living area. Shelters with deposit and artefacts are a common site type, so the site has low rarity value. The site has some representative and low value under the general considerations criteria.

Significance: **LOW**

Browns Road Site 32 (52-2-1646)

This site is a shelter with art that includes 10 red ochre hand stencils and 17 charcoal motifs including macropods, anthropomorphic figures, possums, fish, bats and indeterminate motifs. The presence of a diversity of motifs in good condition provides an assemblage of high representational value, and of some rarity. The high numbers of both stencils and motifs contribute to a strong sense of place at the site, giving it high aesthetic value.

Significance: **HIGH**

Browns Road Site 33 (52-2-0458)

This site is a shelter with art is located on a small upper ridgeline on a small outcrop of sandstone. The small to moderate overhang contains 6 charcoal outline indeterminate motifs on three separate panels. The art is in poor condition, and deteriorated since originally being recorded due to natural weathering processes. It is a common site type and representative of

other such sites within the region. The living floor is moderate in size and has some research potential. The site has limited aesthetic values and no historical associations.

Significance: **LOW**

Sandy Creek Road 21 (52-2-0273)

This is a shelter with art and deposit. The deposit consists of a dark sandy loam, with 5 artefacts present on the shelter floor surface. The art is charcoal outline and infill anthropomorphic figures, one of which has large eyes. The art is in a moderate state of preservation, although anthropomorphic figures with eyes are relatively rare, and have representative value. The deposit has some potential to contain informative archaeological assemblages.

Significance: **LOW**

Sandy Creek Road 22 (52-2-0274)

This is a shelter with art. The art consists of three indeterminate charcoal outline motifs, on two panels. The art is in poor condition being exposed to direct sunlight. The site is a poorly preserved example of the most common site type, with no exceptional characteristics.

Significance: **LOW**

Sandy Creek Road 25 (52-5-0277)

This is a shelter with art and archaeological deposit. The archaeological deposit consisted of a single quartz artefact on the surface of the shelter deposit, which is shallow yellow sand, of low potential. The art at the shelter is an assemblage of 9 red ochre hand stencils in poor-moderate condition. Shelters with high stencil counts are relatively uncommon, giving the site moderate rarity and representative value.

Significance: **MODERATE**

Sandy Creek Road 26 (52-2-0278)

This is a shelter with art. The art consists of a single indeterminate charcoal outline motif, situated in a chemically weathered alcove. The art is in very poor condition, apparently being weathered by both water leeching and exposure. The site is a poorly preserved example of the most common site type, with no exceptional characteristics.

Significance: **LOW**

Sandy Creek Road 28 (52-2-2043)

This site is a stone artefact site that occurs on Fire Road 6C, near the Sandy Creek crossing. The site is heavily disturbed from the vehicle track. Approximately 40 artefacts have been recorded from the site, and it is likely that there is archaeological deposit in the undisturbed areas adjacent to the vehicle track. The site has some representational and rarity value as stone artefact sites are not common in the region.

Significance: **MODERATE**

SCA Special Area Fire Trail 6C (52-2-3052)

This site is a stone artefact site that occurs on Fire Road 6C. The site is heavily disturbed from the vehicle track. Approximately 10 artefacts have been recorded from the site, and it is likely that there is archaeological deposit in the undisturbed areas adjacent to the vehicle track. The site has some representational and rarity value as stone artefact sites are not common in the region.

Significance: **LOW**

DM13 (new record)

This is a shelter with deposit, with five artefacts recorded on the surface of the deposit. The site is an example of a common site type. The deposit is partially disturbed from animal digging / burrowing, and is a medium-coarse yellow sand. The site has low representative value, and no other notable features.

Significance: **LOW**

DM14 (new record)

This site is a single stone artefact site that occurs on Fire Road 6C. The site is heavily disturbed from the vehicle track, and contains only the single artefact. Given the artefact's location it is unlikely that there is archaeological deposit in the undisturbed areas adjacent to the vehicle track. The site has little representational and rarity value as isolated finds can and do occur virtually anywhere, in any landscape.

Significance: **LOW**

DM15 (new record)

This shelter with art contains a single, reasonably well preserved anthropomorphic, or possibly bat / flying fox motif. The shelter and art is an example of the most common type of site in the region. As a well preserved motif the site has some representative value, however it has no other outstanding characteristics or values.

Significance: **LOW**

DM20 (new record)

This shelter with art contains a row of charcoal outline and infill indeterminate motifs and a partial outline anthropomorphic motif, all located in a small alcove at the back of the shelter. The art is in poor condition, and an example of the most common art type present in the area. The site and small art assemblage has some representational value, but contains no outstanding characteristics.

Significance: **LOW**

DM23 (new record)

This site is a shelter with deposit, located beneath the Sandy Creek waterfall. The site is a massive cavern with cascading water falling across the front of the shelter, giving it a strong aesthetic. The shelter contains a dark brown, damp loamy deposit at its western end, otherwise the floor consists of large, angular boulders of block fall, making a rugged, steeply sloping floor. Four artefacts were located in the drip line associated with the deposit. The deposit is slumping and eroded from water rilling, and possibly historical use of the shelter, which contains a lot of graffiti. Whilst impressively large, the shelter is very damp, and whilst there was a reasonable area of deposit only a few artefacts were located here, despite heavy erosion, suggesting the deposit may be of limited potential. Nevertheless, large areas of deposit are rare, as are large overhangs giving rarity and representational value to this site.

Significance: **MODERATE**

Dendrobium Area 3B

Dendrobium 1 (52-2-2208)

This site is a shelter with archaeological deposit. There were 5 artefacts recorded on the surface of the deposit, which is a medium grey sandy deposit, estimated to be 1m deep. The deposit is undisturbed. The site is an example of a common site type, has some representative value and moderate value under the general criterion.

Significance: **LOW**

Dendrobium 2 (52-2-2209)

This shelter with art contains a single charcoal outline and infill motif. The art is in poor condition because it is exposed to the weather. This site and the charcoal art is a poorly preserved example of the most common site and art type, with no exceptional characteristics or features that suggest representative value.

Significance: **LOW**

Dendrobium 6 (52-2-2246)

This site is a single stone artefact site on a non-maintained bush track. The site has some disturbance from the vehicle track, and contains only the single artefact. There is some potential for further artefacts to be present. The site has little representational and rarity value as isolated finds can and do occur virtually anywhere and in any landscape.

Significance: **LOW**

Dendrobium 7 (52-2-2248)

This is a shelter with art. The art consists of a single indeterminate charcoal outline and infill motif. The art is in poor condition due to lichen and mould growth on the art panel. This site is a poorly preserved example of the most common site and art type, with no remarkable characteristics.

Significance: **LOW**

Dendrobium 8 (52-2-3088)

This is a shelter with art. The art consists of a single indeterminate solid charcoal motif. The art is in poor condition due to white mould and lichen growth, water seepage and exposure to sunlight and the weather on the art panel. This site is a poorly preserved example of the most common site and art type, with no remarkable characteristics.

Significance: **LOW**

DM2 (new record)

This site is a single stone artefact site on a non-maintained bush track. The site has some disturbance from the vehicle track, and contains only the single artefact. There is some potential for further artefacts to be present. The site has little representational and rarity value as isolated finds can and do occur virtually anywhere and in any landscape.

Significance: **LOW**

DM16 (new record)

This site is a shelter with art. The shelter contains over twenty animal and indeterminate motifs, including clearly recognisable charcoal outline wombats with bi-chrome infill. The shelter is dry and the art is in generally good condition, although some portions of the panel have been affected by water seepage, micro-organism growth, leeching and some exfoliation. The diversity of art and technique at the shelter give it some rarity value, and high representative value. This large shelter and the large art panel with a high number of motifs

provide a strong aesthetic. The shelter has a yellow, fine sandy deposit, but no surface artefacts were recorded. The site has high value against the general criteria, having good research potential.

Significance: **HIGH**

DM17 (new record)

This site is a shelter with archaeological deposit. There was a single artefact recorded on the surface of the deposit, which is a yellow-grey fine sandy deposit, estimated to be no greater than 15cm deep. The deposit is undisturbed. The site is an example of a common site type, has some representative value and moderate value under the general criterion.

Significance: **LOW**

DM21 (new record)

This shelter with art contains red ochre hand stencils in good condition; white clay prints, scratched motifs and charcoal motifs in poor condition. The range and superposition of art in the shelter is uncommon for the area, and the preservation of several styles and techniques in a single shelter gives the site high representative value, and high research potential. The site also has archaeological deposit. The location of the shelter next to a swamp, and the striking nature of the well preserved stencils give the site a strong sense of place and high aesthetic and landscape values.

Significance: **HIGH**

DM22 (new record)

This is a shelter with art. The art is located on a single panel on the rear wall and consists of a partial human motif with eyes and two indeterminate motifs. The art is all charcoal outline, and in poor condition, with lichen and mould growing on the shelter surfaces. The site is an example of a common site type, with poorly preserved features: it has low rarity, representative and general value.

Significance: **LOW**

Donald Castle Creek 1 (52-2-1562)

This is a shelter with art. The art is located on a single panel on the rear wall and consists of a single charcoal outline and infill frontal human motif, and a single indeterminate charcoal motif. The art is in poor condition with lichen growing on the shelter surfaces. The site is an example of a common site type, with poorly preserved features: it has low rarity, representative and general value.

Significance: **LOW**

Browns Road Site 7 (52-2-1622)

This is a shelter with deposit. There were 5 surface artefacts recorded at this site. The deposit is a grey loamy sand estimated to be around 30cm deep, and disturbed by slope wash. The site is a typical example of a common site type, and has no remarkable features or characteristics.

Significance: **LOW**

Browns Road Site 8 (52-2-1623)

This is a shelter with deposit. There was a single surface artefact recorded in the drip line at this site. The deposit is light brown coloured loamy sand. The site is a typical example of a common site type, and has no remarkable features or characteristics.

Significance: **LOW**

Browns Road Site 11 (52-2-1626)

This is a shelter with art, containing 6 indeterminate charcoal motifs and a single outline and infill charcoal eel. The art is in a fair to poor condition. The site is an example of the most common type of site and art in the study area, but it does contain a moderate number of motifs. While it has low rarity value, the well preserved eel motif provides some representative value to the site. The site has low value against the general criterion, as it has a limited number of mostly unidentifiable motifs.

Significance: **LOW**

Browns Road Site 12 (52-2-1627)

This site is a shelter with art. The site is a large, low roofed overhang with 2 art panels that contain 10 charcoal outline and infill motifs. The shelter is dry, and the charcoal art is generally in good condition being protected from direct sunlight. The motifs include a frontal human, a single eel, and a range of indeterminate figurative motifs and shapes. The site is a well preserved example of a common site type and common site features, affording low rarity value and moderate representative value. The site has some value against the general criterion.

Significance: **MODERATE**

Browns Road Site 13 (52-2-1628)

This is a shelter with art, with an excellent vista over a swamp and drainage line, giving it some aesthetic value. The art assemblage contains 9 charcoal outline and infill motifs and a single white clay outline and charcoal infill bird. The remaining charcoal motifs are all indeterminate save for a single macropod. The art is poorly preserved, due to seepage, lichen

growth, mould and white organism growth and chemical weathering, The site is an example of a common site type in very poor condition, and has no remarkable features or characteristics.

Significance: **LOW**

Upper Avon 35 (52-2-1771)

This site is a shelter with archaeological deposit, situated just above the high water level of Lake Avon. The site had 9 artefacts recorded on the deposit surface, and the undisturbed yellow-grey loamy deposit is estimated to be about 30cm deep. The site has a relatively high number of surface artefacts, suggesting a potentially rich deposit and affording value under the general criteria. Shelters with deposit are not rare, the site has some representative value as it has one of the larger surface assemblages of stone artefacts in the area.

Significance: **MODERATE**

Upper Avon 36 (52-2-1772)

This shelter site has both art and archaeological deposit. The deposit consists of 5 stone artefacts on the deposit surface, suggesting some potential for further material in the grey-brown sandy loam deposit, which is undisturbed and estimated to be 20cm deep. The art assemblage is on two panels, and contains 6 recognisable motifs including charcoal outline and infill anthropomorphic figures, charcoal outline and infill macropod and bird, charcoal outline and infill anthropomorphic figure with hair and material culture items. All motifs are large, and have eyes. The art is in poor condition with stains evidencing water seepage. Nevertheless, 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.

Significance: **HIGH**

Upper Avon 37 (52-2-1773)

This site is a shelter with archaeological deposit. The site had 1 artefact recorded on the deposit surface. The deposit is a cream coloured loam, and is disturbed by animal digging. The deposit is estimated to be no more than 5cm deep, suggesting limited potential for further or informative archaeological material, and low value under the general criteria. The site has low rarity and representative values, as it is neither rare nor has notable features.

Significance: **LOW**

Upper Avon 38 (52-2-1774)

This site is a shelter with art. The art consists of 5 indeterminate charcoal motifs, which are in poor condition. The art panels and shelter on the whole, are actively exfoliating. Whilst it has

multiple motifs, this site and art is a poorly preserved example of the most common site and art type, with no remarkable characteristics under either the representativeness criterion, or the general criterion.

Significance: **LOW**

Upper Avon 39 (52-2-1775)

This site is a shelter with archaeological deposit. Artefacts recorded on the surface of the deposit included a broken edge ground axe. The deposit was gray loamy sand, estimated to be 50cm deep. The deposit was disturbed by wombat burrowing. The site is a common site type, and has little representative value, and no exceptional characteristics under the general criterion.

Significance: **LOW**

Upper Avon 40 (52-2-1776)

This site is a shelter with art and archaeological deposit. The site contains 4 charcoal indeterminate motifs and a single red ochre hand stencil. There were 5 stone artefacts recorded on the shelter floor. The art is in very poor condition, and severely flaked. The site has both common art and stone artefact components so does not have rarity value, but does have some representative value. The site has some value under the general criterion.

Significance: **LOW**

Upper Avon 41 (52-2-1777)

This site is a shelter with archaeological deposit. There were 5 stone artefacts recorded in the drip line of the deposit. The deposit has been disturbed by wombat burrowing, and was estimated to be 50cm deep. The site is a typical example of a common site type, having low rarity and representational values. The site has limited value under the general criterion.

Significance: **LOW**

Site 1 – DB – 1 (52-2-2229)

This is a shelter with art. The art consists of a single indeterminate charcoal outline and infill motif on the rear shelter wall. The art is in very poor condition due to chemical weathering. This site is a poorly preserved example of the most common site type, with no remarkable characteristics.

Significance: **LOW**

Dendrobium Area 3C

Browns Road Site 17 (52-2-1632)

This is a shelter with art. The art panel is a floorless concavity or alcove formed by chemical / cavernous weathering. The art consists of charcoal outline motifs, including 2 indeterminate, 1 animal and the head of a bird with eyes. The art is in fair to poor condition, and the alcove is actively weathering. Whilst it has multiple motifs, the art is a fair-poorly preserved example of the most common site and art type. The clear bird's head with eyes has representative value, but otherwise there are no remarkable characteristics under the general criterion.

Significance: **LOW**

Browns Road Site 18 (52-2-1633)

This site is a shelter with art. The art consists of two indeterminate charcoal motifs and one frontal male human figure on two panels, one on the roof and one on the rear wall. The art is in poor condition. Whilst it has multiple motifs, this site and art is a poorly preserved example of the most common site and art type, with no remarkable characteristics under either the representativeness criterion, or the general criterion.

Significance: **LOW**

Browns Road Site 19 (52-2-1634)

This is a shelter with art that contains two charcoal outline macropod motifs. The art is in poor condition, and one motif of a macropod that was originally recorded appears to have weathered away. The art is in poor to very poor condition. This site and art is a poorly preserved example of the most common site and art type, with no remarkable characteristics under either the representativeness criterion, or the general criterion.

Significance: **LOW**

Donald Castle Creek 2 (52-2-1563)

This is an axe grinding groove. The single groove is located on a rock bar within the water flow of Donald Castle Creek. The site has some rarity value as axe grinding grooves are not common in the study area. The site has low value against the representational and general criteria, as it contains only a single groove with limited information potential.

Significance: **LOW**

Donald Castle Creek 3 (52-2-1564)

This site is two axe grinding grooves. The grooves are located on a rock bar within the water flow of Donald Castle Creek. The site has some rarity value as axe grinding grooves are not

common in the study area. The site has low value against the representational and general criteria, as it contains only a single groove with limited information potential.

Significance: **LOW**

Donald Castle Creek 30 (52-2-1591)

This is a shelter with art. The shelter has a negligible living area, but contains an assemblage of 15 charcoal outline and infill motifs in fair to poor condition. The motifs include indeterminate, macropods, possible birds and a frontal woman motif. The site has moderate value under the representative and general criteria as an assemblage of charcoal art in better-than-average condition, although the motifs represented are not rare. The number and density of motifs at the site provides some aesthetic value.

Significance: **MODERATE**

Sandy Creek Road 2 (52-2-0019, 52-2-0544, 52-2-0753)

This site is a shelter with art and deposit, situated on the north facing cavernously weathered overhang beneath a large open sandstone outcrop on top of a prominent ridge. The medium sized overhang contains 2 white hand stencils, one red hand stencil, a charcoal outline and infill bat or human figure, and one charcoal outline indeterminate. The art is in poor condition as it is faded. This site, in particular the white hand stencils, is considered to be not uncommon, however is considered to have moderate rarity and moderate representational value. A small number of stone artefacts have been identified, and although the living floor is not large, it has low to moderate research potential. There are no historical values associated with this site. The site is situated on the edge of an open sandstone platform which is situated on the highest point of the ridgeline. While the site itself has limited aesthetic value, the associated location is considered to have moderate to high aesthetic values.

Significance: **MODERATE**

Sandy Creek Site 3 (52-3-0751)

This shelter with art site is situated on the upper scarp at the end of prominent ridgeline. It consists of two weathered caverns that contain a number of charcoal motifs, including snakes and indeterminate figurative motifs and red ochre hand stencils. The art is in poor condition and continues to deteriorate from natural processes. The motifs types at this site however have high rarity value as many are different to other shelter art within the region. The unique motifs, and general range of art, although in poor condition afford the site moderate representative values. There is limited deposit at the site and overall the site is considered to have low research potential. The rock outcrop on which the shelter is located can be seen from the valley to the north and has an impressive vista, giving the site moderate to high aesthetic values. The site does not have any historic values or associations.

Significance: **HIGH**

Sandy Creek Site 4 (52-3-0750)

This shelter with art site is situated on the upper scarp at the end of prominent ridgeline, near Sandy Creek Site 3. The site contains several red ochre hand stencils, in poor condition. Red ochre hand stencils are not uncommon, giving the site some rarity value. Otherwise the site has no distinctive values under either the representativeness or general criteria.

Significance: **LOW**

Sandy Creek Road 23 (52-2-0275)

This is a shelter with art. When originally recorded the art was located in a cavernously weathered alcove, and consisted of indeterminate charcoal lines. The art could not be re-identified suggesting it has deteriorated completely. The site is an example of the most common type of site in the study area, and has low value against the rarity, representative and general criteria.

Significance: **LOW**

Sandy Creek Road 24 (52-2-0276)

This is a shelter with art and archaeological deposit. The deposit is identified by 5 artefacts on the surface. The deposit is an undisturbed grey loamy sand estimated to be no more than 30cm deep, suggesting some potential for further remains. The art was originally recorded as 2 indeterminate red ochre motifs, but the art could not be re-identified suggesting it has deteriorated completely. While red ochre art is not relatively common, the condition of the art means it has very low rarity, representative and general value. Archaeological deposit is common, and the deposit and artefacts display no outstanding attributes.

Significance: **LOW**

Sandy Creek Stone Arrangement (52-2-0535)

This possible stone arrangement is situated on a prominent ridgeline on an open flat sandstone platform. The site comprises 8 obvious piles of stone that make a lop-sided octagonal shape. The stone arrangement is in good condition although a number of stone piles are spread and are crumbling. This is exceptionally rare for this region and not well represented. There is however some question about if the site is in fact of indigenous origin. Possibly it is a marker or geo-rectification reference point from the more recent historical period. Until the site can be conclusively determined to be non-Aboriginal in origin the site must be considered to have high heritage value.

Significance: **HIGH**

Dendrobium 3 (52-2-2248)

This is a shelter with art. The art is located on the rear wall and roof of the shelter, and consists of indeterminate charcoal lines. The charcoal art is in poor condition. The site is an example of the most common type of site in the study area, and has low value against the rarity, representative and general criteria.

Significance: **LOW**

DM1 (new record)

This is a shelter with art. The shelter is a cavernously weathered overhang with a stone floor. The art is located on a single panel, and is a row of four solid animal motifs, probably gliders. The art is notable for the regularity of the motifs however they are very poorly preserved. The site is an example of the most common type of site in the study area, and has value against the rarity and general values. The site and art has some representative value, but does not contain any highly characteristic or noteworthy features.

Significance: **LOW**

DM9 (new record)

This is a stone artefact site located on the foreshore of Lake Cordeaux. The artefact is exposed on an eroded and lagged surface caused by water inundation and wave action. There were no other artefacts in the vicinity of the site, and none are likely to be present. The site has little representational and rarity value as isolated finds can and do occur virtually anywhere, in any landscape.

Significance: **LOW**

DM10 (new record)

This is a shelter with archaeological deposit. The drip line of the deposit contained 2 artefacts. The deposit is medium grey-brown loamy coarse sand, estimated to be no deeper than 20cm. The shelter is low and damp, indicating it probably was not utilised much in the past. This suggests limited potential for further or informative archaeological material, and low value under the general criteria. The site has low rarity and representative values, as it is neither rare nor has notable features or characteristics.

Significance: **LOW**

DM18 (new record)

This is a shelter with art. The art is located on a single panel, and is an indeterminate charcoal line motif. The motif is very poorly preserved, with a white micro-organism growth covering large parts of the panel and shelter. The site is an example of the most common type of site in

the study area in poor condition, and has low value against the rarity, representative and general criteria.

Significance: **LOW**

DM19 (new record)

This is a shelter with art. The shelter has a white mineral covering much of it, including the art panel with the art on top of the mineral efflorescence. The art is a single charcoal outline motif, being a bandicoot or macropod. The motif is in good condition. The site is a well preserved example of the most common type of site and art in the study area, and has low value against the rarity and general values. The site and art has some representative value, but does not contain any highly characteristic or noteworthy features.

Significance: **LOW**

Sites outside the impact area

Browns Road Site 29 (52-2-1643)

This shelter site has both art and archaeological deposit. Although only small in area the grey-brown sandy loam deposit, is undisturbed and estimated to be 20cm deep. The art assemblage contains over 30 recognisable motifs including charcoal outline and infill, white, red and yellow ochre and scratching. In many instances individual motifs combine several media and application techniques. Motifs include male and female human, anthropomorphic figures, and eels. The art is in generally excellent condition, and all motifs are readily recognised. The large assemblage of excellently preserved motifs, with multiple techniques gives the site high rarity and representational value, and the site has very strong values against the general criteria. The high numbers of large, well preserved motifs, many of which represent human figures, in the relatively open shelter afford a strong sense of place, giving the site the highest possible values against the aesthetic criterion.

Significance: **HIGH**

Browns Road Site 30 (52-2-1644)

This is a shelter with art. The art is located on a single panel, and is a partial charcoal outline and infill profile anthropomorphic motif. The motif is poorly preserved, with chemical erosion having removed half of the motif. The site is a poorly preserved example of the most common type of site in the study area, and has low value against the rarity, representative and general criteria.

Significance: **LOW**

Browns Road Site 31 (52-2-1645)

This is a shelter with art. The art is located on the shelter roof and consists of a single outline and infill macropod, and two indeterminate motifs. The art is all charcoal. The art panels and art is in very poor condition, with surface exfoliation of the shelter having partially removed a motif. The site is a poorly preserved example of the most common type of site in the study area, and has low value against the rarity, representative and general criteria.

Significance: **LOW**

Sandy Creek Road 16 (52-2-0268)

This site is a single axe grinding groove. The single groove is located on a rock outcrop of a tributary of Sandy Creek. The site has some rarity value as axe grinding grooves are not common in the study area. The site has low value against the representational and general criteria, as it contains only a single groove with limited information potential.

Significance: **LOW**

Sandy Creek Road 17 (52-2-0269)

This is a shelter with art. The art is comprised of four motifs, including 1 faded red ochre anthropomorphic figure; 1 indeterminate red ochre motif; and two charcoal indeterminate outline motifs. The art is all in very poor condition, with exfoliation and mould being present in the shelter. Whilst it contains both red ochre and charcoal motifs the site is nevertheless a poorly preserved example of the most common type of site in the study area, and has low value against the rarity, representative and general criteria.

Significance: **LOW**

Sandy Creek Road 19 (52-2-0271)

This is a shelter with art. The art is located on a single panel and consists of two motifs: a partial charcoal frontal anthropomorphic motif with large eyes; and a single indeterminate charcoal line motif. The art is in poor condition with the panel exposed to the elements. The presence of a frontal human figure with large eyes is characteristic of the local area, giving the site some representative value, but due to the poor preservation of the art the site has low value against the rarity and general criteria.

Significance: **LOW**

Sandy Creek Road 20 (52-2-0272)

This is a shelter with art. The art consists of one partial charcoal outline anthropomorphic figure, one charcoal indeterminate figure and a red ochre frontal anthropomorphic figure with arms raised and holding a boomerang. The charcoal art is in poor condition, the ochre

anthropomorphic figure while faded is in reasonably good condition. There is some exfoliation of the shelter but otherwise the art surfaces are stable. Anthropomorphic figures with material culture items are uncommon, especially in infill red ochre giving this site high rarity value and moderate representative values. The site has moderate value when considered against the general criteria, as it presents a single occurrence of an unusual and potentially informative motif, both in style and technique.

Significance: **MODERATE**

Upper Avon 34 (52-2-1770)

This is a shelter with archaeological deposit. The deposit contained 1 artefact. The deposit is medium yellow sand, estimated to be 15 cm deep. The shelter is damp, and the deposit has been impacted by wombat burrowing. The low number of artefacts on the shelter floor, and estimated shallow deposit suggest it has only low value under the general criteria. The site has low rarity and representative values, as it is neither rare nor has notable features or characteristics.

Significance: **LOW**

DM12 (new record)

This site is a shelter with art and archaeological deposit. The art at the site consists of two children's hand stencils in white clay, each on a separate art panel. A total of twelve artefacts – including silcrete, quartz and petrified wood raw materials – were recorded on the shelter floor. The deposit is a medium grey-brown sand, estimated to be only 10 cm in depth. The well preserved hand stencils have obvious aesthetic value. The high number of artefacts and art have both rarity and representative value as children's white hand stencils are not common, nor are large assemblages of artefacts in shelters. The combination of features at the site gives it high value under the general criterion.

Significance: **HIGH**

APPENDIX 4: LEGISLATION

COMMONWEALTH LEGISLATION

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

In January 2004 the Commonwealth *Australian Heritage Commission Act 1975* was repealed and in its place amendments to the EPBC Act were made. The amendments were contained in three new pieces of Commonwealth Heritage Legislation. The three new Acts are the:

1. Environment and Heritage Legislation Amendment Act (No. 1) 2003 which:
 - (a) amends the Environment Protection and Biodiversity Conservation Act 1999 to include 'national heritage' as a new matter of National Environmental Significance and protects listed places to the fullest extent under the Constitution
 - (b) establishes the National Heritage List
 - (c) establishes the Commonwealth Heritage List
2. Australian Heritage Council Act 2003 which establishes a new heritage advisory body to the Minister for the Environment and Heritage, the Australian Heritage Council, and retains the Register of the National Estate.
3. Australian Heritage Council (Consequential and Transitional Provisions) Act 2003 which repeals the Australian Heritage Commission Act, amends various Acts as a consequence of this repeal and allows for the transition to the new heritage system.

Any place that has been nominated and assessed as having cultural heritage significance at a national level can be added to the National Heritage List.

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) an action requires approval from the Federal Environment Minister if the action will, or is likely to, have a significant impact on a matter of national environmental significance. Matters of national environmental significance relating to cultural heritage are:

- World Heritage Places, and
- National Heritage Places.

An action includes a project, development, undertaking, activity, or series of activities.

Actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land), and actions taken by the Commonwealth that are likely to have a significant impact on the environment anywhere in the world, may also require approval under the EPBC Act.

NATIVE TITLE ACT 1993

The Commonwealth Native Title Act establishes the principles and mechanisms for the preservation of Native Title for Aboriginal people.

Under Subdivision P of the Act, *Right to negotiate*, native title claimants can negotiate about some proposed developments over land and waters (known as 'Future Acts') if they have the right to negotiate. Claimants gain the right to negotiate if their native title claimant application satisfies the registration test conditions.

The right to negotiate applies over some proposed developments or activities that may affect native title. These are known as future acts under the Native Title Act 1993. Native title claimants only have the right to negotiate over certain types of future acts, such as mining. Activities such as exploration and prospecting on the land do not usually attract the right to negotiate.

The right to negotiate is not a right to stop projects going ahead — it is a right to have a say about how the development takes place. In some situations, the right to negotiate does not apply. In these circumstances, claimants may have the right to be notified, to be consulted, to object and to be heard by an independent umpire.

The right to negotiate is triggered when a government issues a notice to say that it intends to allow certain things to happen on land, such as granting a mining lease. This notice is called a 'section 29 notice'.

People who claim to hold native title in the area, but have not yet made a native title claimant application, have three months from the date given in the section 29 notice to file a claim if they want to have a say about the proposed development. To get the right to negotiate, the claim must be registered within a month after that.

If the right to negotiate applies, the government, the developer and the registered native title parties must negotiate 'in good faith' about the effect of the proposed development on the registered native title rights and interests of the claimants.

The parties can ask the National Native Title Tribunal to mediate during the negotiations.

If the negotiations do not result in an agreement the parties can ask the Tribunal (no sooner than six months after the notification date) to decide whether or not the future act should go ahead, or on what conditions it should go ahead.

The National Native Title Tribunal administers the future act processes under the Commonwealth legislation. The Tribunal's role includes mediating between parties, conducting inquiries and making decisions (called 'future act determinations') where parties can't reach agreements.

When the Tribunal receives a future act determination application, it must conduct an inquiry (an arbitration) in order to determine whether the future act can be done and if so whether any conditions should be imposed.

A member of the Tribunal (or a panel of three members) will be appointed to conduct the inquiry, and will initially hold a preliminary conference and set directions for the parties to provide submissions and evidence. Members who have mediated a particular matter are not usually appointed as inquiry members. Inquiry members conduct hearings, receive submissions and evidence from the parties and take into account matters set out in section 39 of the Native Title Act such as:

- the effect of the future act on the enjoyment by the native title party of their registered native title rights and interests; their way of life, culture and traditions; the development of their social, cultural and economic structures; their freedom of access to the land and freedom to conduct ceremonies and other cultural activities; and the effect of the future act on any area or site of particular (special) significance to the native title party;
- the interests, proposals, opinions or wishes of the native title party;
- the economic or other significance of the future act;
- the public interest; and
- the presence of any existing non-native title rights and interests and use of the land by other persons (for instance, pastoralists).

ABORIGINAL AND TORRES STRAIT ISLANDER HERITAGE PROTECTION ACT 1984

The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides protection for Aboriginal cultural property. Whereas the State Act provides legal protection for all the physical evidence of past Aboriginal occupation, the Commonwealth Act deals with Aboriginal cultural property in a wider sense. Such cultural property includes any places, objects and folklore that 'are of particular significance to Aboriginals in accordance with Aboriginal tradition'. There is no cut-off date and the Act may apply to contemporary Aboriginal cultural property as well as ancient sites.

PROTECTION OF MOVABLE CULTURAL HERITAGE ACT 1986

Australia's movable cultural heritage is protected at both Commonwealth and State levels. This web site only provides information on the Commonwealth laws.

In 1970 the United Nations Educational, Scientific and Cultural Organisation (UNESCO) adopted the UNESCO Convention on the Means of Prohibiting the Illicit Import, Export and Transfer of Ownership of Cultural Property. Australia ratified the convention by passing the *Protection of Movable Cultural Heritage Act 1986* (the Act), giving the 1970 Convention force in Australian law.

The Act regulates the export of Australia's significant cultural heritage objects. It is not intended to restrict normal and legitimate trade in cultural property and does not affect an individual's right to own or sell within Australia.

It implements a system of export permits for certain heritage objects defined by the Act as 'Australian protected objects'. Australian protected objects are objects which form part of the movable cultural heritage of Australia and which meet the criteria established under the National Cultural Heritage Control List. The Control List is located in the Regulations to the Act, and divides Australian protected objects into two classes:

- Class A objects which may not be exported
- Class B objects which may be exported if granted a permit under the Act.

A person wishing to export a Class B object is required to apply for a permit in writing. Applications are processed in accordance with the legislative process established under section 10 of the Act.

Certificates of Exemption, granted under section 12 of the Act, allow Australian protected objects that are currently overseas to be imported into Australia and subsequently re-exported. This includes Class A objects.

The Act also includes provisions that allow Australia to respond to an official request by a foreign government to return movable cultural heritage objects that have been illegally exported from their country of origin.

The *Protection of Movable Cultural Heritage Act 1986* is administered by the Minister for the Environment and Heritage. This responsibility was transferred from the Minister for Communication, Information Technology and the Arts in November 2001.

The Movable Cultural Heritage Unit in the Department of the Environment and Heritage provides the Secretariat to the National Cultural Heritage Committee

STATE LEGISLATION

NATIONAL PARKS AND WILDLIFE ACT 1974

The *National Parks and Wildlife Act 1974* provides for the protection of Aboriginal objects (sites, relics and cultural material) and Aboriginal places. Under the Act (S. 5), an Aboriginal object is defined as:

any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.

This includes individual artefacts, scatters of stone artefacts, rock art sites, ancient camp sites, human burials, scarred trees, and ruins and archaeological deposits associated with Aboriginal missions or reserves.

Aboriginal places (areas of cultural significance to the Aboriginal Community declared by the Minister) are protected under Section 84 of the Act.

Aboriginal objects (any material evidence of the Aboriginal occupation of NSW) are protected under Sections 86, 87 and 90 of the Act. Section 86 of the Act identifies that a person, other than the Director-General or a person authorised by the Director-General in that behalf, who:

(a) *disturbs or excavates any land, or causes any land to be disturbed or excavated, for the purpose of discovering an Aboriginal object*

is guilty of an offence under the NPW Act.

The *National Parks and Wildlife Act* requires that a permit from the Director General be obtained before archaeological fieldwork involving disturbance to an Aboriginal site is carried out. Consent is granted under section 87 and 90 of the Act. Queries and applications to excavate or disturb an Aboriginal archaeological site for purposes of archaeological fieldwork, should be directed to the relevant Planning and Aboriginal Section Manager at the appropriate Environment Protection and Regulation Branch office. For this study the relevant branch office is at Parramatta.

Section 91 of the Act requires the mandatory reporting of the discovery of Aboriginal objects, and establishes a mechanism for interim protection orders that may be used to protect objects. Identified Aboriginal objects and sites are registered with the NSW Department of Environment and Conservation (DEC) on the Aboriginal Heritage Information Management System (AHIMS). DEC administers *the National Parks and Wildlife Act 1974*.

HERITAGE ACT 1977

The *Heritage Act 1977* details statutory responsibilities for historic buildings and gardens, historic places and objects, historical archaeological sites, and historic shipwrecks. The Act is administered by the Heritage Council of New South Wales, through the NSW Heritage Office.

The aim of the Act is to conserve the 'environmental heritage' of the state, which includes items such as buildings, works, relics, moveable objects or precincts significant for historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. A 'Place' is defined as an area of land, with or without improvements and a 'Relic' is defined as any:

deposit, object or material evidence:

- (a) *which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
- (b) *which is 50 or more years old.*

An excavation permit is required for any works, excavations or activities, associated with an archaeological site. Excavation permits are issued by the Heritage Council of New South Wales in accordance with sections 60 or 140 of the *Heritage Act*.

It is an offence to disturb or excavate land to discover, expose or move a relic without obtaining a permit from the NSW Heritage Council.

139 Excavation permit required in certain cases

- (1) *A person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.*
- (2) *A person must not disturb or excavate any land on which the person has discovered or exposed a relic except in accordance with an excavation permit.*

Excavation permits are usually issued subject to a range of conditions that will relate to matters such as reporting requirements and artefact cataloguing, storage and curation. A permit may be required from the Heritage Council of NSW for works or activities associated with a registered place or object.

General queries about site issues and permit applications can be made to the archaeological officers at the Heritage Office. The contact details are:

NSW Heritage Office

3 Marist Place

PARRAMATTA NSW 2150

Ph: (02) 9873 8500

Fax: (02) 9873 8599

Consultation and discussion with the NSW Heritage Office should begin well before lodging an application for a permit to disturb or destroy a historical archaeological site.

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The *NSW Environmental Planning and Assessment Act* will have relevance for all development projects because it requires that environmental impacts are considered in land-use planning and decision making. The definition of 'environment impacts' includes impacts on the cultural heritage of the project area. The Act has three relevant parts: Part III, which governs the preparation of planning instruments; Part IV, which relates to development where consent is required under an environmental planning instrument (EPI); and Part V, which relates to activity where development consent is not required but some other government approval assessments are needed.

Under the Act, local government authorities and The Department of Infrastructure, Planning and Natural Resources (formerly Planning NSW) prepare local and regional environmental planning instruments (LEPs and REPs) to give statutory force to planning controls. These may incorporate specific provisions for conserving and managing archaeological sites.

Integrated Development Assessment (IDA) was introduced under the *Environmental Planning and Assessment Act* so that all matters affecting a development application would be considered by the consent authority in an integrated way.

Integrated Development is one which requires development consent as well as one or more approvals from different government agencies. Such agencies may include NSW DEC or the NSW Heritage Council. If a development is likely to impact a heritage item, the consent authority must refer it, to NSW DEC (for Indigenous objects) or the NSW Heritage Council (for sites listed on the State Heritage Register) prior to approval determination.

The Local Government Act 1993

Under the State Local Government Act, councils can prepare local approvals policies that set out specific matters for consideration in relation to applications to demolish, build or undertake works. Archaeological sites could be considerations under such policies.