Mt Arthur Coal

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Appendix E – Aboriginal and Non-Indigenous Cultural Heritage Assessment

Aboriginal & Non-Indigenous Cultural Heritage Assessment

Mt Arthur Coal Open Cut Modification

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Prepared for:

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Name	Signature	Date
Gillian Goode	G. S. Goode	29.01.2013

Executive Summary

RPS Australia East Pty Ltd (RPS) has been commissioned by Hunter Valley Energy Coal (HVEC) (a wholly owned subsidiary of BHP Billiton) to prepare an Aboriginal and Non-Indigenous Cultural Heritage Assessment (CHA) for an extension to the Mt Arthur Coal Mine. The Aboriginal and Non-Indigenous CHA will be included as part of an Environmental Assessment to support an application to modify the Mt Arthur Consolidation Project Approval (DA 09_0062 granted on 24 September 2010) under section 75W of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act). The Mt Arthur Coal Open Cut Modification (the Modification) would provide a four year extension to the life of the current consent, extending it from 2022 until 2026.

The open cut is approved with a mining rate of up to 32 million tonnes per annum. The proposed Modification would include:

- a four year continuation of the open cut mine life from 2022 to 2026 at the currently approved rate of 32 million tonnes per annum
- an increase in open cut disturbance areas;
- use of the conveyor corridor for overburden emplacement;
- duplication of the existing rail loop;
- an increase in the maximum number of train movements per day from 24 to 38;
- the relocation of the load point for the overland conveyor which delivers coal to Macquarie Generation's Bayswater Power Station;
- the relocation and upgrade of the explosives storage, magazine and associated facilities; and
- the construction of additional offices and a control room and a small extension to the run-of-mine coal stockpile footprint.

The Modification disturbance area includes the rail loop area, the overburden emplacement area and the additional open cut area. The proposed disturbance area for the Modification includes some areas that are within the approved Mt Arthur Consolidation Project disturbance boundary. These areas have been the subject of extensive previous archaeological survey and assessment and have existing approval for disturbance. Therefore, the focus of this assessment is on those areas that are outside of the approved disturbance area.

This CHA has been prepared to meet the Director-General's requirements for the application by HVEC for the section 75W Modification. The report considers the environmental and archaeological context of the region, search results of the Aboriginal Heritage Information Management System (AHIMS) database, the provision of a predictive model, comments from the Aboriginal community regarding cultural heritage significance and the results of the archaeological and cultural surveys of the Modification area which were undertaken in April 2012.

The Modification area was divided into four separate survey units for the field surveys. Survey units were based on landform and location and included flood plain, creek banks, lower slope, mid slope and upper slope areas. Survey Unit 1, the rail loop, comprises low rolling hills intersected by Ramrod Creek and minor tributaries. Survey Unit 2 consists of the northern and eastern moderate to very steep outer slopes of Mount Arthur and incised valleys and depressions associated with low order tributaries of Quarry Creek and Whites Creek. Survey Unit 3, situated near the conveyor area, encompasses Saddlers Creek and tributaries in an incised valley to the east of Mount Arthur. Survey Unit 4 is composed of the lower and mid slopes associated with a minor tributary of Whites Creek in an area of rolling hills to the west of Mount Arthur, close to the intersection of Denman Road and Edderton Road.

The Modification area has been disturbed by previous farming practices including, but not limited to, extensive land clearing, installation of fence lines, dams and pipelines, livestock grazing, formed tracks, dirt access roads and fire trails. Some areas have also previously been disturbed by activities areas associated with the historic rail line construction.

Consultation with Aboriginal stakeholders for the Modification was undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents, 2010* (NSW Department of Environment, Climate Change and Water, 2010a) and the *Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (NSW Department of Environment and Conservation, 2005). An archaeological and cultural heritage field survey was conducted in April 2012 by RPS Senior Archaeologist Gillian Goode and RPS Archaeologist Ali Byrne, in partnership with representatives from a number of Aboriginal stakeholder groups.

Desktop study revealed that a number of major archaeological field surveys had previously been undertaken in the area, including AECOM (2009a), Dyall (1980), RPS (2011a), South East Archaeology (1999; 2004) and Umwelt (2007; 2008a; 2008b). These studies identify a number of sites in both the local and regional area.

A search of the AHIMS database revealed that there were 301 previously recorded sites in the Modification area and surrounds. These included 294 artefact sites (isolated finds and artefact scatters), three potential archaeological deposits (PADs), two possible scarred trees and two grinding grooves. Of these only 27 were actually in or near the Modification area, including 25 artefact sites, one PAD and a grinding groove site. The subsequent Aboriginal archaeological and cultural heritage survey identified 28 new sites within the Modification area including 15 artefact scatters, 12 isolated find sites and one PAD.

During the course of the April 2012 Aboriginal cultural heritage field survey, sites previously identified within the Modification area were groundtruthed. In addition, any newly identified sites were recorded and a site card was generated for each of these sites for inclusion in the AHIMS database. Where additional loci associated with existing recorded sites were identified the information was recorded and amended site card information was submitted to the NSW Office of Environment and Heritage (OEH) to be added to the AHIMS database. The majority of sites within the Modification area were identified on the mid and lower slope areas of the rolling hills, in close proximity to creek lines.

Proposed mitigation measures and management recommendations are discussed below.

The following management recommendations have been formulated taking into consideration the significance of Aboriginal heritage as well as potential impacts and have been prepared in accordance with the relevant legislation.

Aboriginal Cultural Heritage

Recommendation 1

It is recommended that the Aboriginal objects remain *in situ* unless impact to them is unavoidable. Many of the Aboriginal objects described in this report are located in proposed open cut or overburden emplacement disturbance areas. These objects would be managed in accordance with Recommendation 2.

Recommendation 2

Aboriginal objects that are at risk of harm by the proposed surface disturbance works will be salvaged in accordance with the Mt Arthur Coal Aboriginal Heritage Management Plan (AHMP).

Recommendation 3

Following the completion of analyses and reporting, all salvaged Aboriginal objects shall be transferred to the temporary Keeping Place in the proposed Thomas Mitchell Drive Offset Area (TMDOA), in consultation with the relevant Aboriginal Community Stakeholders (ACS) in accordance with the Mt Arthur Coal AHMP (or other location determined in consultation with ACS group representatives).

Recommendation 4

The location of all new Aboriginal cultural heritage sites identified by this study should be included in the HVEC environmental management framework for the Mt Arthur Coal Mine, so that all relevant staff members are aware that these areas will require management.

Recommendation 5

Grinding groove site AHIMS 37-2-0111 is likely to be impacted by the proposed section 75W Modification works. It is proposed that an attempt be made to salvage the sandstone block containing the grinding grooves and subsequently to relocate it to the Mount Arthur Conservation Area (or other location determined in consultation with ACS group representatives).

Recommendation 6

Prior to salvage, sample test pitting be undertaken at sites PAD A with artefact scatter and AS20 to AS25 to determine the need for subsurface salvage.

In General during the course of Mt Arthur Coal Mine works

Recommendation 7

If unregistered Aboriginal objects are identified in the Modification area, they should be managed in accordance with management measures for similar site/artefact types previously identified within the Modification area or across the wider Mt Arthur Coal Mine area, in consultation with relevant ACS and in accordance with the Mt Arthur Coal AHMP (BHP Billiton 2012: 17-18).

Recommendation 8

In the event that skeletal remains are uncovered, work must cease immediately in that area and in accordance with the Mt Arthur Coal AHMP, HVEC will need to contact the NSW Police to determine if the remains are Aboriginal. Work may not recommence at the location until the OEH is notified and a management plan is developed in consultation with ACS. Recording and archaeological reporting of Aboriginal ancestral remains must be undertaken, or supervised, by suitably qualified persons.

Recommendation 9

All relevant HVEC staff should be made aware of their statutory obligations for heritage under NSW *National Parks and Wildlife Act 1974* and the NSW *Heritage Act 1977*, which may be implemented as part of the induction program. If during the course of site works significant European cultural heritage material is uncovered, work should cease in that area immediately. OEH should be notified and works only recommence when an appropriate and approved management strategy instigated.

Recommendation 10

Protection of the Restricted Site:

Nominated staff member Sarah Bailey of Mt Arthur Coal has been briefed by a local elder as to the location of a site on Mt Arthur Coal Mine land which has particular Aboriginal cultural sensitivity. Information on this site has been 'restricted' to the nominated member of Mt Arthur Coal (Sarah Bailey) and thus will be referred to as a 'restricted site'. Information on the nature and location of this site has been withheld in accordance with its Aboriginal cultural sensitivity. With consent of the elder, it can be confirmed, however, that the site is **NOT** within the boundaries of the Modification area.

ACS would like a protocol enacted within Mt Arthur Coal management to ensure:

- The very high importance of the site is acknowledged.
- Mapping or location marking of the site does NOT occur.
- The site remains protected in perpetuity.
- The ongoing knowledge of its location exists with appropriate Mt Arthur Coal staff to ensure its ongoing protection.
- That this knowledge is verbally passed on to an appropriate staff member in the event of the knowledge holder leaving the company.

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1 Introduction

RPS Australia East Pty Ltd (RPS) has been commissioned by Hunter Valley Energy Coal (HVEC) (a wholly owned subsidiary of BHP Billiton) to prepare an Aboriginal and Non-Indigenous Cultural Heritage Assessment (CHA) for an extension to the Mt Arthur Coal Mine. The Aboriginal and Non-Indigenous CHA will be included as part of an application for modification to the Mt Arthur Consolidation Project (the Consolidation Project) Approval (PA 09_0062 granted on 24 September 2010) under section 75W of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act). The Mt Arthur Coal Open Cut Modification (the Modification) would provide a four year extension to the life of the current consent, extending it until 2026.

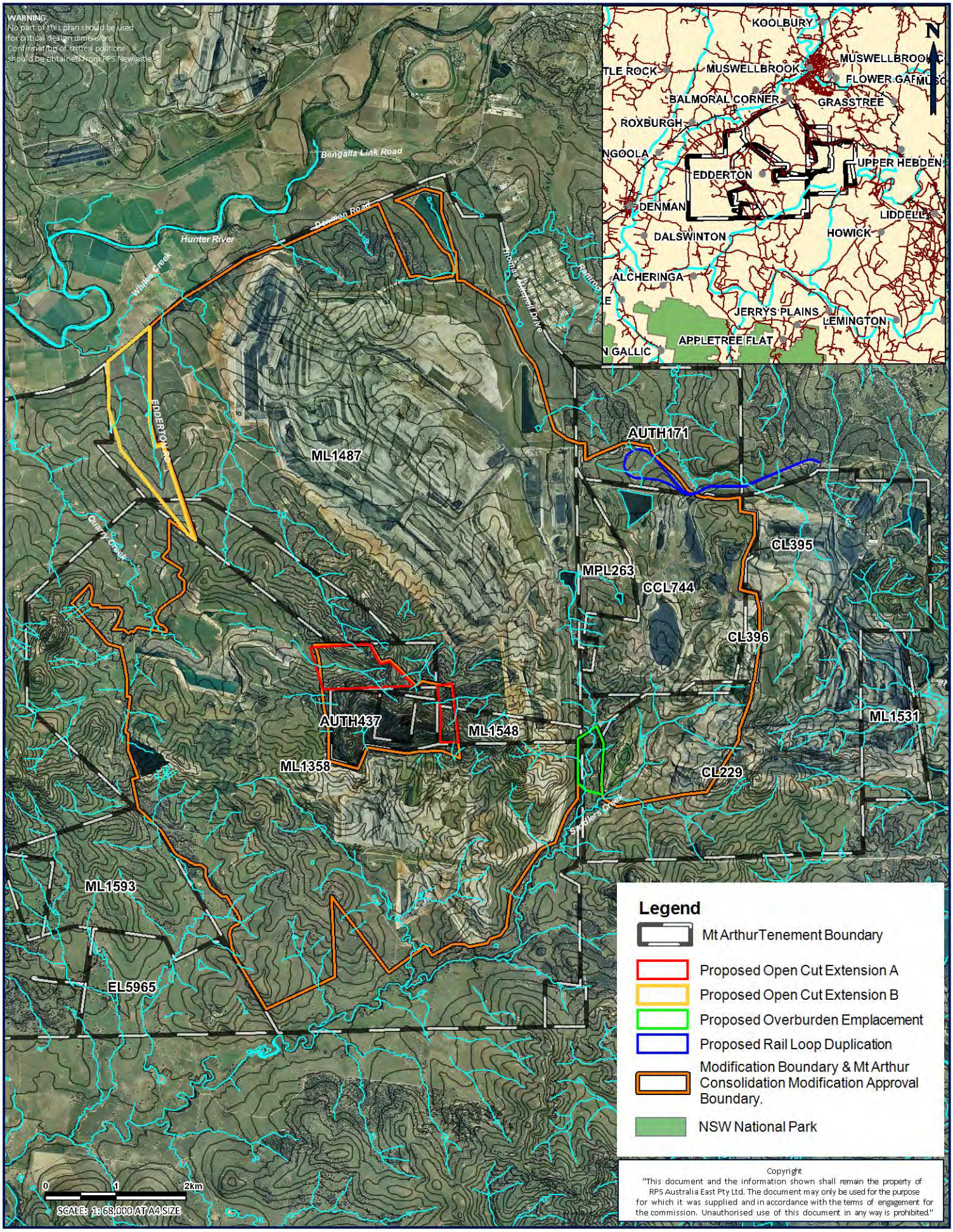
This report has considered the environmental and archaeological context of the Modification area, developed a predictive model and reported on the results of an archaeological survey of the Modification area.

Management recommendations have been formulated with consideration to the archaeological and cultural significance of Aboriginal heritage and potential impacts of the works and have been prepared in accordance with the relevant legislation.

1.1 The Modification Area

The Mt Arthur Coal Mine is situated approximately 5 kilometres (km) to the south west of Muswellbrook, in the Muswellbrook Local Government Area (LGA). The Modification area includes locations to the south of the current open cut mine, to the south west and adjacent to Thomas Mitchell Drive, and to the south east of the junction of Edderton Road and Denman Road (Figure 1-1). The area surrounding the Modification area consists predominantly of low rolling hills with tributaries of a number of creek lines that ultimately flow into the Hunter River and an area of lower outer slopes of Mount Arthur itself.

The proposed disturbance area for the Modification includes some areas that are within the approved Consolidation Project disturbance boundary. These areas have been the subject of extensive previous archaeological survey and assessment. Therefore, the focus of this assessment is on those areas that are outside of the currently approved disturbance areas shown on Figure 1-1.



TITLE:	FIGURE 1-1: MODIFICATION AREA	LOCATION:	MT ARTHUR COAL MINE	DATUM:	(GDA 94)	DATE:	4/03/2012
				PROJECTION:	MGA ZONE 56	PURPOSE:	HERITAGE

LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Mapping Database\MapInfo Work...\110833-1\Report Figures
VERSION (PLAN BY)C A4(GG-AB-NW)

CLIENT: BHP
JOB REF: 110833-1

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RPS

1.2 Background

HVEC owns and operates the Mt Arthur Coal Mine, an open cut coal mine located approximately 5 km south west of Muswellbrook in the Hunter Valley of NSW. The Mt Arthur Coal Mine is adjacent to pastoral lands and other mining operations. Open cut mining has been conducted at Mt Arthur Coal Mine since the early 1960s. In 2010, planning approval was received for the Consolidation Project which provides for open cut mine production of 32 million tonnes per annum (Mtpa), with a maximum production from both open cut and underground operations of 36 Mtpa.

Since the approval was granted, HVEC has undertaken further detailed mine and infrastructure planning which has identified opportunities to further improve the mine's operational efficiency. As such, HVEC plans to submit a modification to the Consolidation Project Approval under section 75W of the EP&A Act. The Modification will include:

- a four year continuation of the open cut mine life from 2022 to 2026 at the currently approved maximum rate of 32 Mtpa;
- an increase in the open cut disturbance areas;
- use of the existing conveyor corridor for overburden placement;
- duplication of the existing rail loop;
- an increase in the maximum number of train movements per day from 24 to 38;
- the relocation of the load point for the overload coal conveyor which delivers coal to Macquarie Generation's Bayswater Power Station;
- the relocation and upgrade of the explosives storage, magazine and associated facilities; and
- construction of additional offices and a control room and a small extension to the run-of-mine coal stockpile footprint.

This assessment is for inclusion in the Environmental Assessment (EA) for the Modification.

1.3 Director-General's Requirements

The Director-General Requirements issued for the Modification specify that the following assessments must be undertaken for the Modification:

- *An Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:*
  - *Demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures; and*
  - *Outline any proposed impact mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures);and*
- *A Historic heritage assessment (including archaeology) which must:*
  - *Include a statement of heritage impact (including significance assessment) for any State significant or locally significant heritage items; and*
  - *Outline any proposed mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures);*

Through their agency comments (input into the Director-General's Requirements), the NSW Environmental Protection Authority (Office of Environment and Heritage [OEH]) also commented that:

The EIS [Environmental Impact Statement] must address and document the information requirements set out in the draft "Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation" (Department of Environment and Conservation [DEC] 2005).

The EIS must include surveys by suitably qualified archaeological consultants in consultation with all of the local Aboriginal knowledge holders.

The EIS should identify the nature and extent of impacts on Aboriginal cultural heritage values across the project area and clearly articulate strategies proposed to avoid/minimise these impacts. If impacts are proposed as part of the final development, clear justification for such impacts should be provided.

The EIS must assess and document the archaeological and Aboriginal significance of the sites Aboriginal cultural heritage values.

The EIS must describe the actions that will be taken to avoid or mitigate impacts of the project on Aboriginal cultural heritage values. This must include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented. Any proposed methodology for investigation should reflect best practice standards set by OEH (2010) in the "Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales".

The EIS must provide documentary evidence to demonstrate that effective community consultation with Aboriginal communities has been undertaken in assessing impacts, developing protection and mitigation options and making final recommendations. OEH supports broad-based Aboriginal community consultation and as a guide OEH's "Aboriginal cultural heritage consultation requirements for proponents 2010" provides a useful model to follow.

If impacts on Aboriginal cultural heritage values are proposed as part of final development an assessment of the proposed impacts in the context of 'inter generational equity' and cumulative impacts must be undertaken. This assessment must examine both cultural and archaeological perspectives equally at both the local and regional levels, with consideration given to the site level and broader landscape level.

This CHA identifies heritage places and cultural values within the Modification area, provides an assessment of the potential impacts to these heritage places and cultural values and outlines recommendations to mitigate and manage the potential impacts of the Modification.

This assessment has been undertaken in accordance with the following guidelines and advisory documents:

- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW – Part 6 of the *National Parks and Wildlife Act 1974* (NP&W Act).
- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (ACHCRs) – Part 6 of the NP&W Act (NSW Department of Environment, Climate Change and Water [DECCW] 2010a).
- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (Code of Practice) (DECCW 2010b).
- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005)

- The Burra Charter – The Australia International Council on Monuments and Sites (ICOMOS) Charter for Places of Cultural Significance (Australia ICOMOS 1999).
- Aboriginal Cultural Heritage: Standards and Guidelines Kit (NSW Department of Environment and Climate Change 1997).
- Ask First; A Guide to Respecting Indigenous Heritage Places and Values (Australian Heritage Commission 2002).
- NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects (Minerals Council 2010).

1.4 Legislative Context

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommends that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

Aboriginal heritage (places, sites and objects) in NSW is protected by the NP&W Act, which is overseen by the OEH. In some cases, Aboriginal heritage may also be protected under the NSW *Heritage Act 1977*, which is overseen by the NSW Heritage Branch of the OEH. The EP&A Act, along with other environmental planning instruments, requires the investigation and assessment of Aboriginal heritage as part of the development approval process. For Crown land, provisions under the NSW *Aboriginal Land Rights Act (1983)* and the Commonwealth *Native Title Act 1993* (overseen by the NSW *Office of the Registrar of the Aboriginal Land Rights Act 1983*) may also apply.

1.4.1 National Parks and Wildlife Act (as amended) 1974

The primary state legislation relating to Aboriginal cultural heritage in NSW is the NP&W Act.

The NSW Government is working toward standalone legislation to protect Aboriginal cultural heritage which will be a significant reform for NSW. The first stage of this work has been completed and includes significant changes to existing legislation.

Changes to the NSW National Parks and Wildlife Service (NPWS) legislation made effective on 1 October 2010 include:

- increased penalties for Aboriginal heritage offences, in some cases from $22,000 to up to $1.1 million in the case of companies who do not comply with the legislation;
- ensuring companies or individuals cannot claim ‘no knowledge’ in cases of serious harm to Aboriginal heritage places and objects by creating new strict liability offences under the NP&W Act;
- introducing remediation provisions to ensure people who illegally harm significant Aboriginal sites are forced to repair the damage, without need for a court order; and
- unification of Aboriginal heritage permits into a single, more flexible permit and strengthened offences around breaches of Aboriginal heritage permit conditions.

1.4.2 Heritage Act 1977

Historical archaeological relics, buildings, structures, archaeological deposits and features are protected under the *Heritage Act 1977* (as amended 1999) and may be identified on the State Heritage Register or by an active Interim Heritage Order in which they are protected under the *Heritage Act 1977*, and may require approvals or excavation permits from the NSW Heritage Branch.

1.4.3 Environmental Planning and Assessment Act 1979

This EP&A Act regulates a system of environmental planning and assessment for NSW. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage. Assessment documents prepared to meet the requirements of the EP&A Act should address Aboriginal heritage, and planning documents such as Local Environment Plans (LEP) and Regional Environmental Plans (REP).

1.4.4 Aboriginal Land Rights Act 1983

The purpose of this legislation is to provide land rights for Aboriginal people within NSW and to establish Local Aboriginal Land Councils. The land able to be claimed by Aboriginal Land Councils on behalf of Aboriginal people is certain Crown land that (s36):

(a) Is able to be lawfully sold, leased, reserved or dedicated;

(b) Is not lawfully used or occupied;

(c) Will not, or not likely, in the opinion of the Crown Lands minister, be needed for residential purposes;

(d) Will not, or not likely, be needed for public purposes;

(e) Does not comprise land under determination by a claim for native title;

(f) Is not the subject of an approved determination under native title.

Claims for land are by application to the Office of the Registrar, *Aboriginal Land Rights Act 1983*.

1.4.5 Native Title Act 1993

The Commonwealth Government enacted the *Native Title Act 1993* to formally recognise and protect native title rights in Australia following the decision of the High Court of Australia in Mabo & Ors v Queensland (No. 2) (1992) 175 CLR 1 (“Mabo”).

Although there is a presumption of native title in any area where an Aboriginal community or group can establish a traditional or customary connection with that area, there are a number of ways that native title is taken to have been extinguished. For example, land that was designated as having freehold title prior to 1 January 1994 extinguishes native title, as does any commercial, agricultural, pastoral or residential lease. Land that has been utilised for the construction or establishment of public works also extinguishes any native title rights and interests for as long as they are used for that purpose. Other land tenure, such as mining leases (MLs) may be subject to native title, depending on when the lease was granted.

1.5 Authorship and Acknowledgements

This report was prepared by Ali Byrne, RPS Archaeologist with assistance from Gillian Goode, RPS Senior Archaeologist and reviewed by Tessa Boer-Mah, RPS Cultural Heritage Manager Newcastle.

The study team acknowledges the assistance in preparing this report of various organisations and individuals and the registered Aboriginal community stakeholders (ACS) participating in the CHA.

1.6 Terms and Abbreviations

Abbreviation	Description
ACHCRs	*Aboriginal Cultural Heritage Consultation Requirements for Proponents* were released by the DECCW (2010a) on 12 April, 2010. These consultation requirements are triggered for assessments under Part 3A for the EP&A Act, or if an Aboriginal Heritage Impact Permit is required under part 4 or 5 of the EP&A Act, or if archaeological investigations are required in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b).
ACS	Aboriginal Community Stakeholders
AHIMS	Aboriginal Heritage Information Management System
ACHMP	Aboriginal Cultural Heritage Management Plan
ATU	Archaeological Terrain Units
BP	Before present (as in years before present)
cal. years BP	Calibrated years before present, indicates a radiocarbon date has been calibrated using the dendrochronology curves, making the date more accurate than an uncalibrated date
CHA	Cultural Heritage Assessment
DECCW	Department of Environment, Climate Change and Water
DGPS	Differential Global Positioning System
EA	Environmental Assessment
EoI	Expression of Interest
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GSV	Ground Surface Visibility
HVEC	Hunter Valley Energy Coal
LEP	Local Environment Plan
LGA	Local Government Area
MAN	Northern Open Cut
ML	Mining Lease
NPWS	National Parks & Wildlife Service
NP&W Act	*National Parks & Wildlife Act 1974*
OEH	Office of Environment and Heritage
PA	Project Approval
PAD	Potential Archaeological Deposit
REP	Regional Environmental Plan

Abbreviation	Description
SU	Survey Unit
TMDOA	Thomas Mitchell Drive Offset Area
WLALC	Wanaruah Aboriginal Land Council

2 Aboriginal Consultation

The purpose of Aboriginal community consultation is to provide an opportunity for the relevant Aboriginal stakeholders to have input into the heritage management process. The OEH encourages consultation with Aboriginal people for matters relating to Aboriginal heritage.

HVEC is applying for modification to an existing approval under section 75W of the EP&A Act for the Mt Arthur Coal Mine. As such, Aboriginal consultation is required to be undertaken in accordance with the ACHCRs (DECCW 2010a; 2010b).

Prior to the release of the DECCW's 2010 consultation guidelines (DECCW 2010a), guidance on community consultation was specified in the NP&W Act: Part 6 Approvals – Interim Community Consultation Requirements for Applicants (DEC 2004). One of the key differences between the 2004 and 2010 consultation guidelines is that the 2004 guidelines require Aboriginal stakeholders who register after the specified registration closing period to be included in the Draft CHA review stage. As discussed below, a number of stakeholder groups registered after the specified registration closing period, however were included in all steps of the assessment from that point forward, including review of the proposed methodology, field work and discussions regarding cultural significance.

The ACHCRs include a four stage Aboriginal consultation process which stipulates specific timeframes for components of each stage.

Stage 1 requires that Aboriginal people who hold cultural information are identified, notified and invited to register an expression of interest (EoI) in the assessment. This identification process should draw on reasonable sources of information including:

- the Office of the Registrar (*Aboriginal Land Rights Act 1983*);
- the relevant OEH Environment Protection Regulation Group Regional Office;
- the Local Aboriginal Land Council(s);
- the National Native Title Tribunal;
- the Native Title Services Corporation Limited;
- the relevant Catchment Management Authority and the relevant local council(s).

The identification process should also include an advertisement placed in a local newspaper circulating in the general location of the Modification area (refer to Appendix 1). Aboriginal organisations and/or individuals identified should be notified of the Modification and invited to register an EoI for Aboriginal consultation (Table 2-1). Once a list of Aboriginal stakeholders has been compiled from the EoI process, they need to be consulted in accordance with stages 2, 3 and 4 of the ACHCRs.

Stages 2 and 3 require the preparation of information about the proposed Modification and the gathering of information about cultural significance. These stages include the provision of a proposed assessment methodology to the registered Aboriginal stakeholders for their review.

Stage 4 requires that the CHA be provided to the registered ACS for review and comment. This CHA presents information about cultural significance including relevant comments received from the Aboriginal community during consultation, as well as comments received during the April 2012 fieldwork for the Modification area. Additional culturally significant comments received in response to the draft CHA are included in this report.

Table 2-1: Recipients of the EoI letters

Organisation	Name of Representative	Date EoI Sent
Aboriginal Native Title Elders Consultants	Margaret Matthews	06/02/2012
Aliera French Trading	Aliera French	06/02/2012
Black Creek Aboriginal Corporation	Tracey White	06/02/2012
Bullem Bullem	Lloyd Mathews	06/02/2012
Cacatua Culture Consultants	Donna Sampson	06/02/2012
Carrawonga Consultants	Justin Matthews	06/02/2012
Culturally Aware	Tracey Skene	06/02/2012
DFTV Enterprises	Derrick Vale Senior	06/02/2012
Deslee Talbott Consultants	Deslee Matthews	06/02/2012
Gidawaa Walang & Barkuma Neighbourhood Centre Inc.	Debbie Dacey - Sullivan	06/02/2012
Giwirr Consultants	Michele Stair	06/02/2012
Hunter Traditional Owner	Paulette Ryan	06/02/2012
Hunter Valley Aboriginal Corporation	Ellaine Freihaut	06/02/2012
Hunter Valley Cultural Consultants	Christine Matthews	06/02/2012
Hunter Valley Cultural Surveying	Luke Hickey	06/02/2012
Hunter Valley Natural and Cultural Resources	David French	06/02/2012
Indigenous Outcomes	Robert Smith	06/02/2012
Jarban and Mugrebea	Les Atkinson	06/02/2012
Jeff Matthews	Jeff Mathews	06/02/2012
Kawul Cultural Services	Vicky Slater	06/02/2012
Kayaway Eco Cultural & Heritage Services	Mark Hickey	06/02/2012
Lower Hunter Wonnarua Council Inc	Lea-Anne Ball & Uncle Tommy Miller	06/02/2012
Lower Wonnaruah Tribal Consultancy Pty Ltd	Barry Anderson	06/02/2012
Mingga Consultants	Clifford Matthews	06/02/2012
Mooki Plains Management	Stephen Matthews	06/02/2012
Mooki Plains Management	Les Field	06/02/2012
Muswellbrook Cultural Consultants	Brian Horton	06/02/2012
Ngarramang-Kuri Aboriginal Culture & Heritage Group	Abie Wright	06/02/2012
Roger Noel Matthews	Roger Matthews	06/02/2012
Scott Smith	Scott Smith	06/02/2012
St Clair Singleton Aborginal Corporation	Cultural Heritage Officer	06/02/2012
T & G Culture Consultants	Leigh Griffiths	06/02/2012
Ungooroo Aborginal Corporation	Alan Paget & Sarah Hill	06/02/2012
Ungooroo Cultural & Community Services	Rhonda Ward	06/02/2012
Upper Hunter Heritage Consultants	Melissa & Darrel Matthews	06/02/2012
Upper Hunter Wonnarua Council Inc.	Rhoda Perry	06/02/2012
Valley Culture	Larry Van Vliet	06/02/2012
Wanaruah Custodians	Reginald Eveleigh	06/02/2012
WLALC	Noel Downs	06/02/2012
Wattaka Wonnarua Cultural Consultancy Service	Des Hickey	06/02/2012

Organisation	Name of Representative	Date EoI Sent
Widescope Indigenous Group Pty Ltd	Steven Hickey	06/02/2012
Wonn1 Contracting	Arthur Fletcher	06/02/2012
Wonnarua Culture Heritage	Gordon Griffiths	06/02/2012
Wonnarua Nation Aboriginal Corporation	Laurie Perry	06/02/2012
Wonnaruah Elders Council	Uncle Tommy Miller	06/02/2012
Tocomwall	Scott Franks	06/02/2012
Yinarr Cultural Services	Kathleen Kinchela	06/02/2012

Letters were sent on 20 January 2012 to the Coffs Harbour OEH Environment Protection Regulation Group Regional Office, the Wanaruah Local Aboriginal Land Council (WLALC), the Registrar of Aboriginal Owners, the Native Title Tribunal, Native Title Services Corporation Limited, the Muswellbrook Shire Council and the Hunter-Central Rivers Catchment Management Authority requesting the identification of interested Aboriginal groups. As a result of contacting these organisations, the following ACS groups were identified as potentially having an interest in the Modification area (Table 2-1):

In response to the EoI letters sent on 6 February 2012 and advertisements placed in the Hunter Valley News on 1 February 2012 and in the Singleton Argus and the Muswellbrook Chronicle on 3 February 2012, the following ACS registered their interest in the project (Table 2-2). Responses were due by 20 February 2012.

Table 2-2: ACS Who Registered their Interest

Organisation	Name of Representative	Date of Registration (due 20/02/12)
Deslee Talbott Consultants	Deslee Matthews	02/02/2012
Roger Noel Matthews	Roger Matthews	02/02/2012
Yinarr Cultural Services	Kathleen Kinchela	06/02/2012
Breeza Plains Cultural Heritage Consultants	Terry Matthews	06/02/2012
Wattaka Wonnarua Cultural Consultancy Service	Des Hickey	07/02/2012
Bunda Consultants	Tammy Knox	07/02/2012
Name withheld A[1]	Name withheld A[1]	07/02/2012
Cheryl Moodie Consultants	Cheryl Moodie	07/02/2012
Carrawonga Consultants	Justin Matthews	07/02/2012
Mingga Consultants	Clifford Matthews	07/02/2012
Gomery Cultural Consultants	David Horton	07/02/2012
Ungooroo Aboriginal Corporation	Allan Paget & Annette Dunstan	08/02/2012
Jarban and Mugrebea	Les Atkinson	08/02/2012
Hunter Valley Aboriginal Corporation	Ellaine Freihaut	08/02/2012
Kayaway Eco Cultural & Heritage Services	Mark Hickey	08/02/2012
Tocomwall	Scott Franks	08/02/2012
Upper Hunter Heritage Consultants	Darrel & Melissa Matthews	08/02/2012
Name withheld B[1]	Name withheld B[1]	09/02/2012
Name withheld C[1]	Name withheld C[1]	09/02/2012
Cacatua Culture Consultants	Donna Sampson	09/02/2012
Culturally Aware	Tracey Skene	09/02/2012

Organisation	Name of Representative	Date of Registration (due 20/02/12)
Wonnarua Nation Aboriginal Corporation	Laurie Perry	13/02/2012
Scott Smith	Scott Smith	14/02/2012
Lower Hunter Wonnarua Council Inc	Tom Miller & Dean Miller	15/02/2012
Gidawaa Walang & Barkuma Neighbourhood Centre Inc	Ann Hickey	16/02/2012
Name withheld D[1]	Name withheld D[1]	16/02/2012
Mooki Plains Management	Stephen Matthews	16/02/2012
Muswellbrook Cultural Consultants	Brian Horton	17/02/2012
Bawurra	Kevin Sampson	17/02/2012
Widescope Indigenous Group Pty Ltd	Steven Hickey	20/02/2012
Aliera French Trading	Aliera French	20/02/2012
Kawul Cultural Services	Vicky Slater	20/02/2012
DFTV Enterprises	Derrick Vale Senior	20/2/2012
Kauwul Pty Ltd trading as Wonn1 Contracting	Arthur Fletcher	21/02/2012
Valley Culture[2]	Elizabeth Howard	22/2/2012
Upper Hunter Wonnarua Council[2]	Rhoda Perry	22/2/2012
Hunter Traditional Owner[2]	Paulette Ryan	05/03/2012
Aboriginal Native Title Consultants[2]	John & Margaret Matthews	14/03/2012
WLALC[2]	Noel Downs	14/03/2012
Warragil Cultural Services[2]	Aaron Slater	22/03/2012
T & G Culture Consultants[2]	Leigh Griffiths	11/04/2012

[1] In accordance with section 4.1.5 of the ACHCRs these stakeholder groups requested that their names remain confidential.

[2] These stakeholder groups registered after the closing date, however, were included in all steps of the consultation process (after their registration) for completeness and in accordance with the DEC 2004 consultation guidelines.

Information regarding the proposed heritage assessment methodology and strategy for collecting information on cultural heritage significance was provided in writing to all registered ACS groups on 23 February 2012. As part of the assessment methodology, copies of OEH site cards relevant to the Modification area were provided on disc and were taken onsite during the course of the survey works.

Twenty-two Aboriginal stakeholder groups provided a response to the proposed methodology (Table 2-3). Agreement to the proposed methodology was received from 18 of the groups. Further comment was received from the remaining four groups, Wonnarua Nation Aboriginal Corporation, Tocomwall, WLALC and the Hunter Valley Aboriginal Corporation. An additional group the Lower Hunter Wonnarua Council Incorporated provided written comments in April 2012.

Table 2-3: ACS Responses to Assessment Methodology Information

Organisation	Name of Representative	Date of Comment
Name withheld A[1]	Name withheld A[1]	27/02/2012
Gidawaa Walang & Barkuma Neighbourhood Centre Inc	Annie Hickey	02/03/2012
Gomery Cultural Consultants	David Horton	08/03/2012
Culturally Aware	Tracey Skene	13/03/2012
Cacatua Culture Consultants	Donna Sampson	19/03/2012
Deslee Talbott Consultants	Deslee Matthews	26/03/2012
Roger Noel Matthews	Roger Matthews	26/03/2012
Jarban and Mugrebea	Les Atkinson	26/03/2012
Muswellbrook Cultural Consultants	Brian Horton	26/03/2012
Bawurra	Kevin Sampson	26/03/2012
Hunter Traditional Owner	Paulette Ryan	26/03/2012
Aboriginal Native Title Consultants	John & Margaret Matthews	26/03/2012
Widescope Indigenous Group Pty Ltd	Steven Hickey	26/03/2012
Aliera French Trading	Aliera French	26/03/2012
Name withheld C[1]	Name withheld C[1]	26/03/2012
Wonnarua Culture Heritage	Gordon Griffiths	27/03/2012
Wonnarua Nation Aboriginal Corporation	Laurie Perry	27/03/2012
Breeza Plains Cultural Heritage Consultants	Terry Matthews	27/03/2012
Tocomwall	Scott Franks	28/03/2012
WLALC	Noel Downs	28/03/2012
Hunter Valley Aboriginal Corporation	Rhonda Griffiths	29/03/2012
Bunda Consultants	Tammy Knox	30/03/2012

[1] In accordance with section 4.1.5 of the ACHCRs these stakeholder groups requested that their names remain confidential.

In preparation for the commencement of fieldwork, letters were sent out on 12 March 2012 to all registered groups requesting required paperwork and confirmation of capability for survey. Participation by Aboriginal stakeholders in the Mt Arthur Coal Mine field surveys was determined by the responses received to the EoI letter, the methodology and the request for paperwork required for the field. Eighteen groups, divided into six per day, were invited to participate in the original three days of scheduled field work (Tuesday 10, Wednesday 11 and Thursday 12 April 2012). A further four days were required for the completion of the field work (Thursday 19 April 2012, Friday 20 April 2012, Monday 23 April 2012, and Tuesday 24 April 2012).

RPS sent out invitations to these groups by mail, email, fax and telephone. The following Aboriginal stakeholders attended the field survey investigation of the Modification area on Tuesday 10, Wednesday 11 and Thursday 12 April 2012 (Table 2-4) and on Thursday 19, Friday 20, Monday 23 and Tuesday 24 April 2012 (Table 2-5). All registered Aboriginal stakeholders were invited to participate in the surveys; however, not all stakeholders were available to attend.

Table 2-4: ACS Field Survey Participants 10, 11 & 12 April 2012

Organisation	Name of Representative	Date attended
Deslee Talbott Consultants	Deslee Matthews	10/04/2012
Breeza Plains Cultural Heritage Consultants	Terry Matthews	10/04/2012
Gomery Cultural Consultants	David Horton	10/04/2012
Roger Noel Matthews	Cory Matthews	10/04/2012
Yinarr Cultural Services	Kay Bartholomew	10/04/2012
Name withheld B[1]	Name withheld B[1]	11/04/2012
Name withheld C[1]	Name withheld C[1]	11/04/2012
Cacatua Culture Consultants	Adam Sampson	11/04/2012
Hunter Valley Aboriginal Corporation	Rhonda Griffiths	11/04/2012
Aliera French Trading	Aliera French	12/04/2012
Kawul Cultural Services	Kerrie Slater	12/04/2012
Widescope Indigenous Group	Steven Hickey	12/04/2012

[1] In accordance with section 4.1.5 of the ACHCRs these stakeholder groups requested that their names remain confidential.

Table 2-5: ACS Field Survey Participants 19, 20, 23 & 24 April 2012

Organisation	Name of Representative	Date attended
Aliera French Trading	Aliera French	19/04/2012
DFTV Enterprises	Derrick Vale	19/04/2012
Yinarr Cultural Services	Taine Davison	20/04/2012
Name withheld C[1]	Name withheld C[1]	20/04/2012
Cacatua Culture Consultants	Kelly Griffiths	20/04/2012
Gomery Cultural Consultants	David Horton	23/04/2012
Hunter Valley Aboriginal Corporation	Rhonda Griffiths	23/04/2012
Kawul Cultural Services	Kerrie Slater	23/04/2012
Deslee Talbott Consultants	Deslee Matthews	24/04/2012
Breeza Plains Cultural Heritage Consultants	Terry Matthews	24/04/2012
Name withheld B[1]	Name withheld B[1]	24/04/2012

[1] In accordance with section 4.1.5 of the ACHCRs these stakeholder groups requested that their names remain confidential.

In accordance with the ACHCRs, a draft CHA was provided on 8 August 2012 to all registered stakeholders listed in Table 2-2 for their review and comment. Thirteen registered Aboriginal groups provided a response to the draft report before the extended deadline date of 12 September 2012 (Table 2-6). Of these, 11 stated that they were in support of the content and recommendations in the CHA. Further comments were received from the remaining two groups, Tocomwall and Wonn1/Kauwul, which are addressed below.

Table 2-6: ACS Responses to Draft CHA Report

Organisation	Name of Representative	Date responded
Wonn1, Entity of Kauwul	Suzie Worth	5/09/2012
Name Withheld C	Name Withheld	7/09/2012
Kawul Cultural Services	Vicky Slater	7/09/2012
Wonnarua Nation Aboriginal Corporation	Laurie Perry	7/09/2012
Muswellbrook Cultural Consultants	Brian Horton	7/09/2012
Name Withheld D	Name Withheld	7/09/2012
Gidawaa Walang	Ann Hickey	7/09/2012
Lower Hunter Wonnarua Council Inc	Tom Miller	7/09/2012
Cacatua Culture Consultants	Donna Sampson	7/09/2012
Breeza Plains Cultural Heritage Consultants	Terry Matthews	7/09/2012
Deslee Talbott Consultants	Deslee Talbot	7/09/2012
Warragil Cultural Services	Aaron Slater	7/09/2012
Tocomwall	Scott Franks	10/09/2012

Scott Franks of Tocomwall stated that he had already declared his position on the project in his response to the methodology and that he was against any proposed works which would affect a significant Aboriginal heritage site for which Mr Franks is the knowledge holder. This site was discussed between Mr Franks and Sarah Bailey of Mt Arthur Coal and it was established that this site is outside the proposed Modification area.

Suzie Worth on behalf of Arthur Fletcher of Wonn1, Entity of Kauwul, stated they Kauwul had concerns regarding the location of the proposed offset area. While the offset area is a separate matter from the Modification area which is the focus of this report, the issue was raised during the Information Session held on 30 August 2012 by the Aboriginal community representatives present and it was agreed that further consultation regarding the offset area would be undertaken with the Aboriginal stakeholder groups. The extra recommendation proposed by Ms Worth is also addressed in *Recommendation 7* which refers to the procedures outlined in the AHMP (BHP Billiton 2012:17-18).

Copies of all written comments from the Aboriginal community to date are provided in Appendix 2 and a consultation log in Appendix 3.

3 Environmental Context

An understanding of environmental context is important for the predictive modelling and interpretation of Aboriginal sites. The local environment provided natural resources for Aboriginal people, such as stone (for manufacturing stone tools), food and medicines, wood and bark (for implements such as shields, spears, canoes, bowls and shelters), in addition to areas for camping and other activities. The nature of Aboriginal occupation and resource procurement is related to the local environment, and it therefore needs to be considered as part of the CHA process.

3.1 Geology

Aboriginal people often made stone tools using siliceous, metamorphic or igneous rocks, and therefore understanding the local geology can provide important information regarding resources in the Modification area. The nature of stone exploitation by Aboriginal people depends on the characteristics of the source, for example whether it outcrops on the surface (a primary source), or whether it occurs as gravels (a secondary source) (Doelman, Torrence *et al*. 2008).

Most of the Modification area is characterised by the Late Permian Singleton Supergroup which is part of the Permian Singleton Coal Measures (sandstone, shale, mudstone, conglomerate and coal seams) (NSW Department of Mines 1969). The surface geology of the Modification area is predominantly the Wittingham Coal Measures (Denman Formation and Saltwater Creek Formation) in the east, and the Maitland Group (Mulbring Siltstone and Branxton Formation) and Greta Coal Measures (Rowan Formation and Skeletar Formation) in the west. The Denman and Saltwater Creek Formations consist of coal seams and claystone, tuff, siltstone, sandstone, conglomerate and sandstone siltstone laminite. The Maitland Group generally consists of siltstone, claystone, sandstone and conglomerate and the Greta Coal Measures are characterised by coal seams, siltstone, sandstone, pellet claystone and chert (Geoscience Australia 2001).

Generally the late Permian Wollombi Coal Measures overlie the Wittingham Coal Measures, which in turn overlie the mid to early Permian Maitland Group. The Maitland Group overlies the early Permian Greta Coal Measures which are underlain by the Dalwood Group. These strata layers form the Singleton Super Group. There is evidence of volcanic activity in the area including felsic volcanics, fault lines and a number of dykes are evident in the area (Sniffin, McIlveen *et al*. 1988).

The presence of sandstone in the Modification area is important for Aboriginal occupation as sandstone was commonly used for grinding stone artefacts. Overhangs and caves in sandstone cliffs and boulders below the cliff line were sometimes used for shelter. Rock engravings and grinding grooves may be found in areas of exposed sandstone and sandstone outcrops particularly along creek beds. Raw materials in the local area including silcrete, indurated mudstone and silicified tuff, as well as chert, basalt, rhyolite and petrified wood were commonly used by Aboriginal people for manufacturing flaked stone tools. The softer shales and claystones are highly susceptible to water erosion processes and are generally unsuitable for the manufacture of stone tools.

3.2 Soils

The predominant soil landscape in the immediate Modification area is the Liddell Soil Landscape, covering undulating low hills. The Liddell soil landscape is characterised by yellow soloths and yellow solodic soils on slopes, and earthy and siliceous sands on siliceous parent rock. There are also some red soloths, red solodic soils and red podzolic soils (Kovac and Lawrie 1991:224-6).

The Bayswater soil landscape also forms a large proportion of the Modification area on undulating low hills south west of Muswellbrook. The main soils include yellow solodic soils on slopes with alluvial soils in drainage lines. Red, yellow and brown Podzolic soils also occur on slopes with some brown and yellow earths and prairie soils in drainage lines (Kovac and Lawrie 1991: 84-86).

Other soil landscapes associated with the Modification area include the Ogilvie and Roxburgh soil landscapes. The Ogilvie soils occur on steep hills and escarpments with cliffs formed by sandstone and conglomerate outcrops. The soils are mainly shallow loams and sands with some brown solodic soils on the lower parts of slopes. Siliceous sands and sandy earths occur in drainage lines on the lower slopes of Mount Arthur (Kovac and Lawrie 1991:304-305). The Roxburgh soil landscape covers undulating low hills and undulating hills. Yellow podzolic soils occur on upper to mid slopes with red solodic soils on more rounded hills (Kovac and Lawrie 1991:349-350).

The Modification area is characterised by duplex soils with clear to sharp horizon boundaries. The A horizon soils are generally moderately deep therefore the potential for stratified archaeological material to be present is possible. Where B Horizon soils are exposed they are generally severely eroded and have been affected by water runoff and sheet wash erosion; the A horizon soils can be redeposited in the lower slope areas on a previously eroded B horizon (Kovac and Lawrie 1991:449). Artefacts may occur *in situ* within the moderately deep A horizon soils or on the surface of exposed B Horizon soils.

3.3 Topography and Hydrology

The Modification area is situated in the Central Lowlands topographic zone (Kovac and Lawrie 1991:13) and is generally characterised by mid to lower slope landform units and undulating hills associated with Mount Arthur. Elevation is generally 20 to 330 metres (m) Australian Height Datum (AHD) with slope lengths averaging 1200 m AHD. Local relief is between 40 to 120 m AHD. The Hunter River lies 500 m to 1 km to the north of the Modification area. A number of creeks and their tributaries run through or close to the Modification area including Saddlers Creek, Ramrod Creek, Whites Creek and Quarry Creek. Stream orders within the Modification area are generally low. Such drainage areas typically consist of colluvium and alluvial deposits. Moderate to extensive erosion is common throughout the area (Kovac and Lawrie 1991).

3.4 Climate

Approximately 18,000 years ago, climatic conditions began to alter which affected the movement and behaviour of past populations within their environs. During this time, notably at the start of the Holocene (more than 11,000 years ago), the melting of the ice sheets in the Northern Hemisphere and Antarctica caused the sea levels to rise, with a corresponding increase in rainfall and temperature. The change in climatic conditions reached its peak about 6,000 years ago (Short 2000:19-21). Up until 1,500 years ago, temperatures decreased slightly, stabilising about 1,000 years ago to temperatures similar to those currently experienced. Consequently, the climate in the locality of the study area for the past 1,000 years would be much the same as present day, providing a year round habitable environment.

3.5 Flora and Fauna

The historic settlement of the Hunter Valley included modification of the original vegetation communities, particularly through clearing for pastoral land uses. According to vegetation mapping for the Modification (Hunter ECO 2012), the following vegetation communities occur within the Modification area:

- Derived Native Grassland;
- Derived Native Grassland, with Cooba Wattle Regrowth;
- Derived Native Grassland, derived from Box-Gum Woodland;

- *Typha* Dominated Drainage Line;
- Central Hunter Box - Ironbark Woodland;
- Blakely's Red Gum Woodland;
- Upper Hunter Hills Box – Ironbark – Red Gum Woodland;
- Central Hunter Box – Ironbark Woodland Wybong Slaty Box Variant;
- Hunter Lowlands Red Gum Forest;
- Central Hunter Ironbark – Spotted Gum – Grey Box Forest; and
- Weeping Myall Woodland.

The large array of resource plant species available in the area indicates that the region could have also supported a rich variety of fauna species (NPWS 2003) which Aboriginal people may have used for sustenance, tools, and clothing. In the past these vegetation communities would likely have supported a range of fauna such as macropods, koalas, possums, gliders and a range of reptile and bird species. Evidence for the consumption of such faunal species has been recovered from Aboriginal archaeological excavations in the Sydney basin region (Attenbrow 2006:72-73).

3.6 Synthesis

A review of the environmental context of the region indicates that the probability of identifying sites in the Modification area is moderate to high. The geology underlying the Modification area would have provided raw materials suitable for the manufacture and maintenance of stone tools and the proximity to the Hunter River, Saddlers Creek and other tributaries suggests that the area would have been largely suitable for occupation.

The previous disturbances in the area include farming related practices such as clearing, grazing and slashing; mine related activities included vehicle and machinery transport; and the placement of utilities such as electricity and sewerage lines. Despite these modifications to the land, the soil landscape suggests that the Modification area has the potential to contain *in situ* subsurface artefact deposits where the soils remain deep. Where the soils have eroded, the possibility of finding artefact scatters and isolated finds remains high. Additionally, the vegetation (where not completely cleared) may possibly contain scarred trees.

Overview of the environmental context indicates that there would have been an abundance of food and raw material sources available in the Modification area. Such resource availability indicates that the area would have been a favourable area for Aboriginal occupation.

4 Aboriginal Heritage Context

The Aboriginal heritage assessment process requires that the significance of Aboriginal sites is assessed within a Modification area. Cultural significance is gathered by way of consultation with the Aboriginal community. In order to develop a predictive model for Aboriginal cultural heritage in the Modification area, it is important that the local and regional context to be taken into account. Historical records also provide additional information for the interpretation of archaeological sites.

4.1 Historic Records of Aboriginal Occupation

It is necessary to acknowledge that early historical documents were produced for a number of reasons and may contain inaccuracies and/or bias in their reporting of events or other aspects of Aboriginal culture (L'Oste-Brown, Godwin *et al*. 1998). Nonetheless, some historical documents provide important information and insights into local Aboriginal customs and material culture at the time of non-Indigenous settlement and occupation of the region.

In the late nineteenth century a number of writers described the Aboriginal peoples of the Hunter Valley. J W Fawcett (1898:152) described the "Wonnah-ruah [*sic*]" tribal district as that area drained by the Hunter River and its tributaries which covered some 2,000 square miles. He estimated the population in 1848 to have numbered between 500-600 people and provides details of some of their customs and dialect. This estimate of the population is similar to that reported by Robert Miller (1886:352) who quotes an informant from the Hunter River district who estimated the Wonnarua population in 1841 to be around 500 individuals. Miller also noted that by 1886 the population was almost extinct (Miller 1886:353).

According to Moore (1970:28) the Wonnarua territory was bounded by the Worimi who occupied the estuarine Hunter River and coastal land in the east, the Gamilaroi to the south west, the Gewegal to the north west and the Darkinjung to the south.

4.1.1 Aboriginal Implements

Fawcett (1898:152) provided a detailed description of the Wonnarua weapons and implements including the spear, woomera or throwing stick, shield, boomerang (both returning and non-returning), tomahawk or hatchet, flint knife, chip of flint or shell for skinning animals, club, yam stick for digging, bags of plaited swamp grass, wooden bowls, nets for catching fish and bark canoes.

4.1.2 Food and Useful Plants

Miller (1886:352) recorded that kangaroos, emus and reptiles were used as sources of protein and described how a variety of roots, most importantly that of the water lily, were roasted and eaten. Fawcett (1898:152) stated that wallabies, bandicoots, kangaroo rats, opossums [*sic*], rats, snakes, lizards, fish, shellfish, caterpillars, grubs, larvae of wasps, other insects and birds were used by the Aboriginal people as food resources.

W.J. Needham (1981) conducted interviews and research which resulted in a comprehensive study of Aboriginal sites in the Cessnock - Wollombi area. He describes *Xanthorrhea australis* (grass tree), which is found in the Muswellbrook area, as being an important resource (Needham 1981). Various parts of the grass tree were useful to make spear shafts, for sealing cracks in canoes and for securing stone tips in hunting spears (Needham 1981). It was also used to produce fire when two pieces of the dried flower stem were rubbed together (Needham 1981).

4.1.3 Campsites and Shelters

J.W. Fawcett (1898:152) described the preferred campsites of the "Wonnah-ruah [*sic*]" tribal district in the Hunter River catchment area as being located close to fresh water and food resources. A vantage ground was also favourable as a precaution against attacks on the camp.

The materials used to construct the campsites and shelters were made from organic matter which is highly unlikely to have been preserved in the archaeological record.

Fawcett (1898:153) also provided a description of the huts constructed for shelter. These huts were generally erected using forked sticks planted in the ground with straight sticks laid in the forks and covered over with sheets of bark sourced from local trees.

4.1.4 Clothing

Summer weather and the milder days of autumn and spring required little in the way of protective clothing; winter however, saw the use of animal skins for both clothing and as blankets (Heath n.d.:43). Miller (1886:352) describes Aboriginal people using possum skin cloaks with an ornamental nautilus shell suspended around the neck on a string.

4.1.5 Burials and Post Contact Phase

There are various reports concerning burial practices of Aboriginal people (Threlkeld in Gunson 1974). Burials appeared to be the most common form of internment with a well-documented preference for burials in sandy or loose soils, most likely resulting from the ease of digging a grave (Threlkeld in Gunson 1974).

4.2 Regional Archaeological Heritage Context

Archaeological evidence suggests that Aboriginal occupation of the Hunter Valley region began at least 35,000 years ago (Koettig 1987). Additional chronological evidence was recovered from the Hunter Valley's north east mountains for which the following dates were assigned 34,580 ± 650 (Beta-17009), > 20,000 (Beta-20056) and 13,020 ± 360 years before present (BP) (Beta-17271) (Koettig 1987, as cited in Attenbrow 2006). Kuskie (2000:215) identified artefacts at Wollombi Brook located in a clay horizon that have been dated to between 18,000 and 30,000 years before present (BP).

Koettig and Hughes (1983) excavated a hearth on an alluvial terrace at Glennies Creek, which is approximately 30 km south of the Modification area, where the radiocarbon-dated charcoal and geomorphological evidence provided a date of between 10,000 to 13,000 years BP. These archaeological sites show that the Hunter Valley region was occupied during the Pleistocene, dated up to 11,000 years ago (Short 2000); the rarity of Pleistocene sites means that when found they generally contain significant archaeological/scientific information as well as demonstrating the long occupation of Aboriginal people in the region.

The majority of Aboriginal sites in the region, however, are dated to the more recent Holocene (< 11,000 years ago). This may reflect Aboriginal occupation patterns, but may also be influenced by the inaccessibility of potential coastal Pleistocene sites which were inundated when sea levels rose and reached present levels approximately 6000 years ago (Mulvaney and Kamminga 1999:223). Evidence for Holocene Aboriginal occupation has been recovered from Bobadeen (7,760 calibrated [cal.] years BP), as well as Milbrodale (1,420 cal. years BP) and Sandy Hollow (1,310 cal. years BP) (Moore 1970:58).

Ongoing archaeological investigations in the Hunter Valley have provided a basis for the development of predictive models of site distribution within this region. Studies completed throughout the Hunter Valley have

demonstrated that open artefact scatters are common in the area, with large open sites generally located in proximity to large creeks that provided a more reliable source of potable water, with smaller open sites distributed through a variety of landforms including large and small creeks, slopes and crests.

Certain typological temporal markers such as backed blades and eloueras are present within the Hunter Valley assemblages. Whilst these provide only a gross indication of time scale, based on the age of the soils and the presence of backed artefacts, the majority of sites in the Hunter Valley are considered to date to the late Holocene period.

The majority of archaeological sites for the Muswellbrook area are dated within the Holocene period (between 11,000 BP and present time). Wheeler (2006:5) believed the large number of sites in the area which date to this period is the result of increased Aboriginal populations and 'intensification' of site usage during the Holocene. Alternately, the high frequency of recorded sites dating to the Holocene in the Muswellbrook LGA may be due to the rise in sea levels around 6,000 BP erasing evidence of older sites located on the coastal margins.

4.2.1 Regional Archaeological Studies

Using colonial records Brayshaw (1986) conducted extensive research of the landscape and the known Aboriginal communities in the broader Hunter Valley area. Although the ethnographic literature refers to ceremonial grounds and carved trees, these represent only a small portion of the sites which would have occurred in the Hunter Valley. Camp sites would have occurred more commonly but little is recorded regarding the locations of such sites. The literature does indicate that in the Hunter Valley, as elsewhere, Aboriginal numbers were quickly and greatly reduced by European diseases.

Brayshaw's research into the ethnographic records also showed the distinction between the material culture and goods manufactured in inland and coastal areas, dependent on the resources available. The exchange of goods between inland and coastal inhabitants was also evident. Bark was probably the most commonly utilised raw material, associated with the construction of huts, canoes, cords, nets, drinking vessels, baskets, shields, clubs, boomerangs and spears. Being an organic material, very few such artefacts survive today. Scarred Trees, carved trees, burial sites, ceremonial or Bora Grounds, cave paintings, rock engravings, axe grinding grooves, quarries and wells have all been recorded in the Hunter region. The distribution of these sites would generally have been reliant on environmental and cultural factors such as resource availability.

The colonial records describe the Hunter Valley as having tall cedar trees in the Patersons and Wallis Plains, in addition to lagoons, silted flood channels and open swamps. The clearance of the vine forests below Maitland changed the landscape dramatically. The Hunter Valley region was prone to both drought and flooding.

Surveys undertaken in the surrounding areas include, but are not limited to, those by Hughes (1981), (Davidson, James *et al*. 1993), Appleton (1994), McDonald (1997), HLA Envirosciences Pty Ltd (2002), McCardle Cultural Heritage (2005; 2007; 2008), RPS (2011a) and RPS (2011b).

4.3 Local Archaeological Heritage Context

The local Aboriginal heritage context provides a review of previous archaeological work conducted in the local landscape, identifies whether Aboriginal sites have been previously identified in the Modification area (using the Aboriginal Heritage Information Management System [AHIMS] database), and informs the predictive model of Aboriginal sites for the Modification area. The review of previous archaeological work includes relevant local research publications as well as archaeological consultancy reports. Two types of archaeological investigation are generally undertaken; excavation and survey. Archaeological excavations can provide high resolution data regarding specific sites, such as the dates or chronology of Aboriginal occupation and information on stone tool technology (such as reduction sequences, raw material use, tool production, use wear and retouch).

Archaeological surveys generally cover wider areas than excavations and can provide important information on the spatial distribution of sites. The detection of sites during survey can be influenced by the amount of disturbance or erosion and therefore sensitivity mapping is sometimes also required to interpret survey results. The local Aboriginal heritage context also provides a framework for assessing local significance.

4.3.1 Local Archaeological Studies

A number of archaeological surveys have been undertaken in the Hunter Valley, including some in areas relevant to the Modification area. The investigations most pertinent to the current Modification area are summarised below. The information from the previous work will assist with predictive modelling by identifying potential archaeological sites and allowing for planning and management recommendations to be formulated with confidence. In addition to those archaeological studies summarised below, several other relevant studies were reviewed and their findings considered as part of this Aboriginal and Non-Indigenous CHA. These additional studies included: Dyall (1977), Hughes and Koettig (1985), Hiscock and Koettig (1985a; 1985b) Perry (1998) and Umwelt (2006).

Dyall (1980) Report on Aboriginal Relics from Mt Arthur North Coal Lease, Muswellbrook. Report to NSW NPWS.

The survey took a total of four days, and included:

- interviewing residents of the area in search of reports of any oral traditions, discoveries of burials, marked trees, axe-sharpening grooves and implements;
- undertaking pedestrian field surveys along all major creeks and many tributaries;
- further pedestrian investigations along the flood plain of the Hunter River; and
- investigation of the sides and summit ridges of Mount Arthur in search of rock shelters with evidence of occupation (Dyall 1980:2).

The interviews revealed information pertaining to sources of basalt for making axes, axe grinding grooves and burials, but all were in locations outside the MAN Lease. The field survey identified four ‘open air campsites’ at locations along creeks, consisting of stone artefacts (sites with between 20 and 100 flakes per 1,000 square metres (m²). Low densities of artefacts were also identified (1 per 50 m). Almost no artefacts were identified in the upper 2 km of each creek. Implements identified during the survey included Bondi points, geometric microliths, edge-ground axes, flaked basalt hand axes and Bulga knives. Two grinding groove sites were also identified; one with two heavily weathered grooves together with an additional groove on the same fine grained sandstone boulder (AHIMS #37-2-0110) and AHIMS #37-2-0111 which was described as two grooves on a narrow sandstone horizon on the slopes of Mount Arthur (Dyall 1980: 3).

Raw materials included basalt, rhyolite, occurring as cobbles and small boulders on slopes and creek beds, chert and less commonly, quartz, quartzite and fossilised wood.

Dyall determined that the sites identified during the survey were not exceptional for the Singleton-Muswellbrook area. Samples from two of the sites were taken to the Australian Museum. Dyall recommended that further study should be undertaken into areas to the south and east of MAN, but that further examination of the sites within the lease would probably not be necessary. There were no records found within the lease of Aboriginal art, sacred sites or burials.

Dyall (1981) Report on Aboriginal Relics from Mt Arthur South Coal Lease, Muswellbrook. Report to NSW NPWS.

Dyall prepared a report for the development of an open cut mine on the Mt Arthur South lease. Dyall surveyed the area over a period of four days, inspecting side creeks, ridges and ploughed paddocks. Dyall included the results of previous works he had done in the area between 1976 and 1981, along Saddler's and Saltwater Creeks. Interviews were also conducted with the landowners in the area, in search of anecdotal information regarding Aboriginal sites (Dyall 1981:4).

Twenty-four 'open campsites' were identified on the lease, all associated with creeks. Two such camp sites were recorded as having over 500 artefacts, with a third predicted to contain similar quantities if examined subsequent to cultivation. All along the creeks, occasional artefacts were identified, sometimes as far back as their sources. Dyall surmised that such artefacts are the product of "processing" activities such as the collection or butchering of food. No evidence of stratification was found at any of the campsites (Dyall 1981: 5). No other site types were identified during the survey.

Implements identified during the survey included *"the usual flake-and-blade types"* as well as microlithic backed blades, edge-ground implements (generally basalt), choppers (generally basalt), grinding slabs and mullers (sandstone) and Bulga knives (limestone) (Dyall 1981:5-6).

Dyall recommended that, as some of the artefacts identified had not been previously found in the Hunter Valley, further investigation be conducted into the Aboriginal sites located on the lease (Dyall 1981: 8).

South East Archaeology Pty Ltd (1999) An Aboriginal Archaeological Assessment of the Proposed Mt Arthur North Coal Mine, near Muswellbrook, Hunter Valley, NSW. Volume A. A report to Dames and Moore. The Mount Arthur North Coal Project EIS Appendix L, April 2000, URS.

South East Archaeology Pty Ltd was commissioned by Dames & Moore, on behalf of Coal Operations Australia Pty Ltd, to undertake an archaeological assessment of Aboriginal heritage as part of an EIS to be submitted in support of applications for development consent and a ML over the MAN exploration area. The MAN study area was located from 3 to 12 km south of Muswellbrook in the Hunter Valley of NSW. South East Archaeology Pty Ltd developed a predictive model of site location for the study area based on information from previous surveys, known site locations in the region, information about traditional Aboriginal land use patterns, information from the local Aboriginal community and environmental factors.

A field survey was then undertaken with the following objectives: identification of the nature and distribution of heritage items throughout the study area, particularly in relation to environmental variables (landform unit, slope, distance to water, type of watercourse, geology and soils) and using the individual artefact as the basic unit of analysis; identification of types of stone used; identification of heat treated stone; identification of types of artefacts present and their nature; identification of stone knapping floors; identification of hearths; identification of heat treatment pits; identification of activities represented by the heritage evidence; assessment of implications for regional models of occupation; assessment of the research potential of recorded sites and locations of potential heritage; assessment of the integrity of potential deposits and the effects of natural processes in the evidence; and comparison of the evidence within a regional context (South East Archaeology Pty Ltd 1999:63-64).

In order to address the objectives of the survey and the desired outcome of the Wonnarua Tribal Council, a survey strategy was developed based on specific requirements regarding coverage and sampling strategy (South East Archaeology Pty Ltd 1999: 65-66). The survey strategy involved:

- Division of the entire study area into 'archaeological terrain units' ATUs being combinations of environmental variables which relate to Aboriginal usage of the area.
- Designation of individual 'archaeological survey areas' that consist of an ATU that is bounded on all sides by different ATUs. Multiple 'survey areas' located separately in the study area may be part of one ATU. A unique reference number was assigned to ach 'survey area' after the recorders initials and a sequential number.
- Recording different types of surface exposure as separate components within each archaeological survey area and identifying each component with a sequential number after the survey area number.
- Completion of a 'survey recording form' for each archaeological survey area inspected, recording relevant details.
- For each Aboriginal site identified completion of an 'Aboriginal heritage site recording form'. Regardless of the visible extent of artefacts, the boundaries of the survey area would define an Aboriginal site. Within one survey area, locations of spatially separated archaeological evidence would be recorded as 'loci', within the one Aboriginal site. Artefacts/features clearly associated and occurring as a discrete event (eg. a knapping floor) would also be recorded as separate loci.
- Completion of a 'lithic item recording form' for the stone artefacts, including details about provenance, stone material, artefact type, size class, cortex and other relevant attributes (particularly for implements). Where more than 100 artefacts were identified within a site locus, a summary count of artefact types by stone material could be completed on a separate 'artefact summary recording form'.
- Using 1:2,000 topographical maps to record the location of survey areas and identified Aboriginal sites.
- Assigning a two person team to each archaeological survey area, comprising an archaeologist and an Aboriginal community representative.
- Employment of pedestrian survey for surface exposures and also to sample areas of ground with low visibility. Only samples of those surfaces inspected in such a manner as to reliably enable the detection of heritage evidence were recorded.
- Completion of inspection of one survey area before beginning a new survey area.
- On average to survey from 30 to 50 hectares (ha) per team per day, with allowances made depending on factors such as higher or lower visibility.
- Defining as 'modified' areas of largely disturbed ground, in which the potential for archaeological evidence to exist is negligible. Further assessment was not undertaken in those areas.

The survey of the MAN study area obtained coverage of every ATU and every survey area within a terrain unit, covering approximately 37 square kilometres (km²). It was found that valley flats had the greatest potential for artefact densities to occur, supporting the hypothesis that occupation was generally along watercourses. Evidence also supported the hypothesis that densities increased with increased orders of watercourse. Higher than expected densities of artefacts were identified on simple slopes and densities were lower than expected on ridge crests and spur crests. Artefacts were widely distributed along these units nevertheless and such evidence suggests that while they may have been used to some extent, they were not frequently used for major activity (South East Archaeology Pty Ltd 1999: 88). Overall, the artefact densities were found to be relatively low across the study area. However the distribution of artefacts was found to be almost continuous and all of the environmental variables examined contained at least some stone artefacts.

A total of 17,330 artefacts, divided into 294 sites, were identified during the survey, 15,970 of which were recorded in detail. Twenty-six knapping floors were identified. A total of 15 stone material types were identified, with silcrete and tuff being divided in four sub-types each, dependent on colour. Silcrete was found to be the most commonly identified raw material amongst the artefacts identified, with a count of 8,148. Indurated rhyolitic tuff was the second most common stone type, followed by porcellanite, chert, quartz, acid volcanic, other volcanic, quartzite, banded rhyolite, porphyritic rhyolite, chalcedony, petrified wood, siltstone, sandstone and ochre.

A total of 37 different artefact types were recorded within the study area. Flakes were counted at 5,653 (35.4%) and were the most commonly identified type. There were also flaked pieces (15.1%), flaked portions (proximal 7.3%, medial 4.2%, distal 6.5%), microblades (4.2%), microblade portions (proximal 3.6%, medial 3.4%, distal 2.8%), microblade cores (2%) and cores (3.7%). The fourth most common type identified were lithic fragments (6.8%) but it was not possible to classify all as artefactual. Other types in much lower frequencies included bondi points, bondi point portions, microliths, thumbnail scraper, split pebble, ochre, hammerstone, ground-edge axe, flaked axe/axe blank, elouera, chopper/pebble chopper, bipolar flakes, bipolar cores, backed segment and anvil. Artefact size was measured by size class and ranged from class 1 (<10 millimetres) to class 50 (500-510 millimetres).

South East Archaeology Pty Ltd (1999) considered that the dominance of flakes, flaked portions and flaked pieces indicated that the majority of evidence related to general or non-specific knapping activities and that this evidence was indicative of casual, opportunistic behaviour, meeting requirements for stone tools on an ‘as needed’ basis. The presence of larger items indicated procurement from sources within the study area. It also tended to indicate that rationing of stone material was not a priority of the knappers.

It was noted that there was a high probability that the integrity of the Aboriginal archaeological evidence within the MAN study area had been affected to some extent by human or natural post-depositional processes. It was considered that many sites or potential deposits were of sufficient integrity to be of research value. South East Archaeology Pty Ltd recommended that consent to destroy and permit to salvage be obtained from the NPWS for all identified artefacts within the proposed impact zone. The establishment of Aboriginal heritage conservation zones outside of the proposed impact areas was also recommended.

South East Archaeology Pty Ltd (2004) Salvage of Aboriginal Heritage Sites in the Mt Arthur North Coal Mine Lease, Hunter Valley, NSW. Report to BHP Billiton.

South East Archaeology Pty Ltd was commissioned by a subsidiary company of BHP Billiton (Bayswater Colliery Company Pty Ltd), to undertake archaeological salvage excavation and collection of artefacts from a number of Aboriginal sites within the Mt Arthur North Coal ML area. A cultural salvage by the Upper Hunter Wonnarua Council was to be carried out under a section 90 Consent and Permit to Salvage (#SZ347), issued by the NPWS. A separate Excavation Permit (#SZ346) was issued by the NPWS to South East Archaeology Pty Ltd to permit the programme of scientific salvage.

A total of 283 recorded Aboriginal heritage sites were predicted as likely to be wholly or partially impacted by mine works during the 21 year mining period. A salvage programme was undertaken in order to mitigate the impacts of the mining proposal on the identified Aboriginal heritage sites and conserve and manage the cultural and scientific values of the sites to the satisfaction of the Upper Hunter Wonnarua Council and the NPWS.

It included two distinct strategies: 1) salvage of Aboriginal heritage evidence primarily to satisfy the requirements of the Upper Hunter Wonnarua Council, by mitigating impacts of the proposed development on the cultural values of the objects/sites and conserving a portion of the heritage evidence for future generations; and 2) salvage of Aboriginal heritage evidence primarily to satisfy the requirements of the NPWS by mitigating impacts of the proposed development on the archaeological (scientific) values of the sites. Strategy 1 was achieved by way of a cultural salvage undertaken by Upper Hunter Wonnarua Council. Strategy 2 was a scientific salvage by South East Archaeology Pty Ltd (2004: 14).

During the course of the investigation an Aboriginal burial was uncovered adjacent to Whites Creek (Donlon and Kuskie 2003). No summary is provided for this report as the contents of the report are restricted. After consultation with NPWS and the Aboriginal stakeholders, a course of action was agreed upon involving section 90 consent (#SZ353) and investigation of the burial. After partial excavation, the remains were studied *in situ* before being reburied according to the wishes of the Aboriginal community. After the discovery of the burial, permission was granted by NPWS in the form of a variation to excavation permit #SZ346 for grader scrapes and artefact collection to occur extensively along Whites Creek. This work was undertaken in order to determine whether there were any more burials in the area. A limited number of artefacts were collected and reported on (South East Archaeology Pty Ltd 2004:273).

A sampling strategy was devised in order to obtain the relevant information and therefore properly address the research aims. A predictive model of occupation and the results of the field survey (South East Archaeology Pty Ltd 1999) were used to formulate the proposed sampling strategy. The MAN area was subdivided into broad zones based on hypothetical patterns of occupation and smaller environmental/cultural contexts to account for the potential variation in archaeological evidence between different contexts.

The main occupation zones included the Zone A: Hunter River, B: Whites Creek Valley Flat, C: Major Tributary of Whites Creek Valley Flat, D: Major Ridgeline Connecting Mount Arthur and Hunter River, E: Major Ridgeline Connecting Mount Arthur and Whites Creek Valley Flat, F: Macleans Hill and G: Mount Arthur. Of these, the sampling strategy was primarily confined to Whites Creek Valley Flat (Zone B) and Major Ridgeline Connecting Mount Arthur and the Hunter River (Zone D), as they were the most relevant to the study area.

Three main modes of collection formed the basis for the MAN salvage (South East Archaeology Pty Ltd 2004: 313):

(1) surface scrapes for testing and final salvage (ranging in length from 50m to 1,280 m) and along Whites Creek to examine and identify if further burials were present;

(2) broad open area hand excavations in elongated trenches (minimum 40 m x 2 m, excavated in 0.25 m² units and 0.1 m thick spits, with some localised expansions in three of the six areas); and

(3) localised hand excavations within the surface scrapes, where features of potential significance were identified (ranging from 1 to 48 m² in area).

In total, 32,866 stone artefacts were recovered during the course of the salvage from MAN. Of these, 5,238 artefacts were collected during the surface scrapes, 11,239 during the broad area excavations and 16,389 during the localised hand excavations. Sixteen different types of stone material were identified amongst the assemblage with silcrete making up 59.4 percent (%) of the total and tuff accounting for 19.4%. The next most common types were porcellanite, quartz, petrified wood, and volcanic 1. The assemblage also included quartzite, volcanics, chert, chalcedony, basalt, ochre, sandstone and glass. A small number of artefacts were classified as being of an uncertain stone material (South East Archaeology Pty Ltd 2004: 313).

Forty-three types of artefacts were identified during the analysis of artefacts from MAN. Unretouched/ unused complete flakes and unretouched/unused portions of flakes accounted for 83.2% of the combined MAN assemblage. Lithic fragments accounted for 10.6% of the total artefact count. Thirty-seven backing flakes were identified and 471 backed artefacts (including portions), of which 88 were symmetrically shaped, geometric microliths and three were large wedge-shaped eloueras. Ten of the backed artefacts also showed signs of macroscopic wear (South East Archaeology Pty Ltd 2004: 314). A number of different types of cores were also identified including bipolar cores, microblade cores, flaked river pebbles and cobbles (pebble cores) and 'nondescript cores'. Additionally, there was one anvil, four grindstone fragments, 34 hammerstones, 16 edge-ground hatchet heads and four pestles. Two fragments of ochre were also found.

Post-depositional impacts can occur including disturbance by land surface disturbances, bioturbation, erosion/deposition and weathering. In the 1800s, settlers extensively cleared the landscape of the Hunter Valley including the Mount Arthur area. A portion of the MAN assemblage also exhibited effects from heating of the artefacts, which may have been caused by the burning out of tree stumps by settlers, bushfires or may have been a result of controlled heating by Aboriginal people. It was determined that deliberate heating was likely to have occurred in relation to a portion of the silcrete artefacts, while unintentional heating was inferred for the other portion of silcrete items as well as artefacts of other stone materials (South East Archaeology Pty Ltd 2004: 426).

Broad site patterning revealed that areas of substantially higher density were localised and relatively discrete and were interspersed by significantly lower artefact densities. The distribution of specific stone types when examined reveals the same pattern. The results were indicative of intact horizontal spatial patterning and minimal post-depositional lateral movement (South East Archaeology Pty Ltd 2004: 395-402).

Radiometric dating was also undertaken. It was considered that there had been at least four episodes of occupation at MAN over the past 1400 years, with the earliest dated occupation site being a stone-lined hearth (max. age 1,350 cal. years BP to 95.4% probability). Dated occupation included the period just prior to and possibly contemporaneously with non-indigenous occupation, and is supported by ethnohistorical accounts and a glass artefact present in the assemblage.

The traditional Aboriginal burial and associated evidence demonstrated that virtually right up until the time of non-indigenous settlement of the upper Hunter Valley in the early 1800s, Aboriginal people were practising a traditional lifestyle in the MAN area (South East Archaeology Pty Ltd 2004: 468-9).

Several important points were taken from the heritage evidence salvaged from MAN (South East Archaeology Pty Ltd 2004: 474-482). The stone artefact distribution within the six broad area excavations was examined to assess site integrity, including the horizontal and vertical distribution of artefacts at identified activity areas. It was demonstrated that considerable vertical mixing of the excavated deposit had occurred (probably due largely to bioturbation) but that limited post-depositional lateral movement had occurred. It was considered that horizontal distribution of artefacts was largely intact. Also the effects of tree growth and bioturbation processes on vertical integrity are far from universal and localised areas may remain relatively unaffected.

It can be inferred from the results, particularly comparison of the Whites Creek with the Ridge to Hunter sites, that the proximity to the Hunter River was less of a factor influencing the assemblage than the proximity of Whites Creek. The Whites Creek surface scrapes and excavations contained much higher frequencies of background discard, higher frequencies of focused activity areas, a greater range and quantity of activities and where activity areas were present they represented substantially more intense activity and involve a greater range stone materials, than the surface scrapes and excavations along the Ridge from Mount Arthur to the Hunter River (South East Archaeology Pty Ltd 2004: 628).

Umwelt (2007) Aboriginal Archaeological Assessment – South Pit Extension Project Mt Arthur Coal.

Umwelt was commissioned by Mt Arthur Coal to prepare an EA to support the development application for an extension to the MAN South Pit into the Bayswater No. 3 ML. New disturbance areas resulting from the proposed development would include an additional South Pit coal extraction area (including topsoil stockpile areas), additional main haul roads and a service corridor to provide safe access around working areas such as highwalls). The proposed disturbance area totalled approximately 330 ha, 50 ha of which were modified terrain such as roads and dams. Aboriginal consultation was undertaken for the duration of the project and the survey was undertaken in 2005. Umwelt's survey area was limited to areas which South East Archaeology Pty Ltd (1999) had not previously surveyed. In order to make their results comparable, Umwelt modelled their survey strategy on South East Archaeology Pty Ltd's survey strategy.

The survey strategy included:

- The definition of ATUs based on those used by South East Archaeology Pty Ltd.
- The division of the entire study area into such ATUs based on landform and environmental variables.
- Basing each archaeological survey area on one ATU and mapping precise survey transects.
- The assignation of a unique reference number to each survey transect based on the recorders initials and a sequential number.
- Recording of different types of surface exposure such as vehicle tracks and erosion separately, using a sequential number relating to the survey area number, to match South East Archaeology Pty Ltd's (1999) separate components.
- Using the approach designed by South East Archaeology Pty Ltd (1999), artefact locations were recorded as site loci, which were defined as "spatially separated locations of heritage evidence within a survey area" (South East Archaeology Pty Ltd 1999:65 in Umwelt 2007). This separation would also occur for discrete events within a survey area, such as knapping floors. Site loci and transect data were given different labels.
- The use of survey recording forms for each archaeological survey area inspected and details about the environment were recorded such as natural resources, soil, geology, disturbance, visibility and erosion.
- Filling out a site recording form for each Aboriginal site identified, with a separate Aboriginal heritage recording form used for each locus.
- Detailed recording of Aboriginal sites of less than 10 artefacts using a recording form which included

details about provenance, stone material, artefact type, size class, cortex and other relevant attributes. Umwelt determined that larger sites would need to undergo more detailed recording during salvage work.

- Summary counts of raw material and artefact type for all sites. Field maps of artefact distribution were produced and photographs taken of flagged artefacts.

The Umwelt survey identified seven new archaeological sites and one previously recorded site was groundtruthed. Some site loci were recorded outside the South Pit Extension area. Site loci were also identified south of the formal study area within 60 m of Saddlers Creek during the field work. These were determined not to be under threat of impact by the proposed works at that time.

Sites were generally located on 'very gentle' and 'gentle slope' ATUs associated with the 'gentle drainage depression' terrain unit. Most sites were within 50 m of a drainage depression. The greatest range of archaeological raw materials and artefact types were located in site JF/MJS5 'gentle drainage depression' archaeological terrain unit. Evidence of Aboriginal occupation was greatest toward the southern section of Saddler's Creek, and focused on tributaries and lower slopes associated with the second order watercourse. As the survey progressed further south towards the boundary of the South Pit Extension area, the number of artefacts and frequency of sites with large assemblages increased, demonstrating that artefact scatters are more likely to be located close to more permanent water. The most common site type recorded was artefact scatters and these were most commonly found in areas disturbed by erosion, considered by Umwelt to be associated with pastoral activities. Mudstone was the most common raw material identified in artefact assemblages. Areas of low visibility such as the 'ridge crest-gentle' terrain unit had no archaeological evidence identified during the survey, although the predictive model formulated by Umwelt had indicated that archaeological evidence could potentially be identified there. The predictive model had also indicated that in modified terrain and 'moderate to steep simple slopes' and 'moderate to steep drainage depressions' there would be a low frequency of archaeological evidence. This was found to concur with the findings of the survey.

Aboriginal and scientific significance was assessed as low or low to moderate, except for site JF/MJS5 Drainage Depression Gentle (including AHIMS #37-2-0762, 37-2-0761 and 37-2-0760), which was assessed as having high cultural significance for the Aboriginal community and moderate to high scientific significance (an overall rating of high). It was recommended that where possible, sites be conserved or salvaged prior to the commencement of works.

Umwelt (2008b) Mt Arthur Underground Project Aboriginal Archaeological Assessment.

Umwelt was commissioned to prepare an Aboriginal archaeological assessment as a part of the EA for the proposed Mt Arthur Underground Project. The underground coal mine was to be developed in the Bayswater No. 3 ML and the adjacent exploration licence 5965. Coverage by the archaeological inspection included coverage of all watercourses, particularly Saddlers Creek and its tributaries, representative coverage of all landforms similar to the pedestrian survey undertaken by South East Archaeology Pty Ltd (1999) for the Mt Arthur North (MAN) ML and large exposures such as tracks which would provide good ground surface visibility (GSV). The survey and site recording criteria used by South East Archaeology Pty Ltd (1999) were used in the Umwelt survey in order to produce comparable results.

GSV was high in the eastern sections of the survey area, due to recent bushfires, resulting in higher detection rates for archaeological materials in these areas. On the slope landform elements in the western section of the survey area, visibility was considerably lower due to dense vegetation and grass cover. The majority of sites located during the survey were artefact scatters and isolated finds. Boundaries of artefact sites were defined by identified exposures where material evidence of Aboriginal occupation was on the ground surface, with the addition of areas of Potential Archaeological Deposits (PADs) associated with the

identified artefacts. In total, 77 sites were identified in the survey area, of which there were 46 artefact scatters, 30 isolated finds and one scarred tree.

Mudstone was the most common raw material, followed by silcrete and other raw materials including quartzite, quartz, porcellanite, petrified wood, jasper, chert, basalt, chalcedony, tuff, siltstone and sandstone. Flakes were the most commonly identified artefact type, with a variety of other types identified such as cores, microliths, thumbnail scrapers, blades, backed blades including Bondi points, ground axes, hammerstones, a grindstone, horseshoe cores, a sandstone anvil and an ochre cake.

Umwelt's findings were in keeping with the predictive model formed by previous works in the area. The majority of site types were artefact scatters located less than 50 m from high order watercourses. The level to very gentle drainage depression archaeological terrain unit and gentle drainage depression archaeological terrain unit have high artefact densities, and a diversity of different artefact types were considered to be the areas with the highest research potential for subsurface investigation due to their level of integrity. The moderate to steep drainage depression archaeological terrain unit was considered to have moderate archaeological significance as sites within these units were found to have less integrity. The moderate to steep simple slope archaeological terrain unit was defined as having low archaeological significance due to the low density and sparse nature of artefact scatters and lack of integrity. The level to very gentle and gentle simple slope ATUs generally had low numbers of sites unless directly associated with major watercourses. The modified terrain unit was considered to have low archaeological significance and research potential due to poor integrity.

AECOM (2009a) Aboriginal Archaeology and Cultural Heritage Impact Assessment, Mt Arthur Coal (Appendix K of the Consolidated Project EA).

AECOM prepared an Aboriginal archaeology and cultural heritage impact assessment for the Consolidation Project, in which all existing planning approvals were to be consolidated into one planning approval. The study consisted of two components – all previously surveyed areas within the existing six planning approvals, and three areas that had not previously been surveyed consisting of an 86 ha area to the north of Mount Arthur, a 495 ha area east of Thomas Mitchell Drive (Offset survey area) and a 37 ha area proposed as an alternative alignment for the northern end of Edderton Road.

The level of disturbance within the Offset survey area was assessed as low. Erosional forces at some sites were considered by AECOM (2009a:90) to be less destructive than in other areas. AECOM considered that the density of the artefact scatters in the Offset survey area showed that the area may have been favourable for occupation and that there may be the potential for these areas to contain subsurface archaeological deposits. A total of 67 new sites were identified within the Offset survey area (AECOM 2009a:69). Seven previously registered sites were groundtruthed. The sites were predominantly located in the southern and eastern areas of the Ramrod Creek catchment and comprised mainly artefact scatters and isolated finds, consisting mostly cores and flakes, but also including some backed blades and a hatchet head. Extensive silcrete raw material was identified at some sites. The Offset survey area contained two scarred trees in the eastern part of the survey area over a kilometre from Ramrod Creek.

AECOM revisited AHIMS Site #37-2-2559 and confirmed that the site should be taken off the AHIMS register as it was deemed not to be a site (AECOM 2009a:68). The Thomas Mitchell Drive Offset Area (TMDOA) was generally considered to have significant Aboriginal cultural heritage value because of the continuous archaeological deposit along the upper part of Ramrod Creek. AECOM noted that sites were most often located along gentle drainage depressions or on the terraces or banks of Ramrod Creek.

This CHA was included as a part of an EA produced by Hansen Bailey, which describes the consultation undertaken with the Hunter Valley ACS (Hansen Bailey 2009).

AECOM (2009b) Salvage of Aboriginal Heritage Sites, Mt Arthur Coal, Hunter Valley, NSW.

AECOM was engaged by Mt Arthur Coal to conduct a surface salvage of a 330 ha area in October 2008. The study area was located 12 km south of Muswellbrook and mining operations bordered the area. The salvage works were implemented to mitigate the loss of Aboriginal cultural heritage due to the extension of the South Pit at the Mt Arthur Coal Mine. The salvage was conducted in nine ATUs which consisted of nine landforms. Works undertaken during the salvage included the surface collection of the following sites: AHIMS #37-2-1590 (CC81), #37-2-1587 (CC65), #37-2-1589 (CC76, #37-2-1591 (CC84), #37-2-1592 (CC91), #37-2-1593 (CC92), #37-2-1594 (CC93), #37-2-1727 (PK93), #37-2-1730 (PK100), #37-2-1731 (PK101), #37-2-1732 (PK102), #37-2-1733 (PK107), #37-2-1734 (PK108), #37-2-1735 (PK109), #37-2-1736 (PK110), JF/MJS1, JF/MJS2, JF/MJS3, JF/MJS4, JF/MJS5, JF/MJS6, JF/MJS7 and JF/MJS8; and any artefacts within the remainder of the South Pit Extension Area that had been exposed by erosion.

The salvage was undertaken with the Upper Hunter Aboriginal Community. Six hundred and nineteen artefacts were collected in seven of the ATUs. The highest concentrations of artefacts were salvaged near Saddlers Creek. All salvaged artefacts were compiled in a database and compared to the survey results from the work undertaken by South East Archaeology Pty Ltd (1999). Indurated mudstone and silcrete were the most common materials for the manufacture of stone artefacts. AECOM concluded that the occupation and land use fitted that of the Upper Hunter Valley model. Blade production, retouched flakes and reduced cores are common in the Upper Hunter Valley and these were found during the salvage.

BHP Billiton HVEC (2011) Macleans Hill Cultural Heritage Management Plan.

This Interim Management Plan is a staged management plan designed to meet the requirements of the Consolidation PA 09_0062 and to facilitate the management of Aboriginal Cultural Heritage and Aboriginal Archaeology in the Macleans Hill area in advance of mining. The approval is supported by the Consolidation Project the EA (Hansen Bailey 2009). Schedule 3, Condition 45 of PA 09_0062 requires the preparation of a Heritage Management Plan to facilitate both the salvage and protection of Aboriginal sites and ongoing protection of European heritage structures. An extensive list of commitments and mitigation measures were specified in the EA to be implemented by Mt Arthur Coal as part of the Project to conserve Aboriginal heritage. Some but not all of these were addressed in the Interim Management Plan. The objectives of the Macleans Hill Cultural Heritage Management Plan are:

- to mitigate the impacts of the extension of operations into the Macleans Hill mining area of the Mt Arthur Coal Consolidation Project on Aboriginal Heritage;
- to comply with the requirements of the NP&W Act;
- to continue the active partnership between the Aboriginal community and BHP Billiton in the management of cultural heritage, with input from DECCW where required;
- to achieve cultural heritage management outcomes which are satisfactory to the local Aboriginal community; and

- to further advance the ongoing full and open communication and consultation between the Aboriginal community and BHP Billiton.

Consultation with the Aboriginal community was undertaken in accordance with the ACHCRs and copies of the draft Interim Heritage Management Plan were sent out to the OEH and the 26 registered Aboriginal stakeholder groups.

A search of the AHIMS database showed that there were 18 Aboriginal sites within Mine Extension Area 1 (the Macleans Hill mining area). The details of these sites were sourced from AECOM (2009a). The salvage program was designed to allow for the recovery of a sample of surface artefact material, and to provide for their long-term curation incorporating the following components: salvage of surface artefacts, recording of recovered artefacts and the temporary storage of recovered materials in a Keeping Place.

The Keeping Place would be in the proposed TMDOA. Further details on the Keeping Place were to be provided in the overall Heritage Management Plan. The interim document was designed to meet the requirements of PA 09_0062 for the Macleans Hill mining area. The conclusion stated that the full Heritage Management Plan was being developed to meet all the requirements of the Project Approval.

RPS (2011b) Salvage of Aboriginal Artefacts at Macleans Hill.

RPS was engaged by GSS Environmental Pty Ltd on behalf of HVEC to undertake the salvage of Aboriginal artefacts at Macleans Hill, Mt Arthur Coal Mine. The salvage was undertaken in accordance with the Macleans Hill Cultural Heritage Management Plan (BHP Billiton 2011). Nineteen artefact sites were salvaged over a period of two days. At seven of these sites, no artefacts could be identified and a total of 306 artefacts were salvaged from the remaining 12 sites. Mudstone and silcrete were the most common raw material type, with chert and quartz also present and low quantities of quartzite, volcanics and dolerite. While the artefacts collected were for the most part complete or broken flakes, other artefact types present included two hatchet heads, a blade-core flake, a rounded quartzite pebble conjectured by the participating ACS in the salvage works to be a cylcon, a quartzite hammerstone and a mudstone flake-core. Subsequent to the completion of the salvage, Aboriginal site impact recording forms were submitted to the OEH, declaring all sites salvaged to be 'not a site'.

BHP Billiton (2012) Aboriginal Heritage Management Plan.

This AHMP was prepared to meet the requirements of the NSW Department of Planning and Infrastructure PA 09_0062 and 06_0091. The AHMP was designed to mitigate the impacts of the Mt Arthur Coal operations on Aboriginal heritage. During the EA, Aboriginal stakeholder groups and the OEH were consulted in accordance with the *Draft Guidelines for Aboriginal Cultural Impact Assessment Consultation* (DEC 2005) and *Interim Community Consultation Requirements for Applicants* (DEC 2004). During the development of the AHMP, consultation was undertaken in accordance with the ACHCRs.

In order to offset the proposed impacts to cultural heritage within the areas previously allocated as temporary Heritage Management Zones in the Mt Arthur North EIS, a large tract of land was designated on the north side of Thomas Mitchell Drive, known as the proposed TMDOA. The TMDOA is larger in size, has a better representation of landforms, a larger number of sites and is removed from the Mining activity. A commitment was made to establish a Keeping Place for the salvaged archaeological sites in consultation with the Aboriginal stakeholder groups.

The AHMP includes provisions for monitoring of significant archaeological sites, such as grinding grooves and scarred trees. Annual visual inspections of grinding grooves are to be carried out for the life of the mine. This annual inspection is to check for potential impacts to the site which will be recorded in detail. After survey work, scarred trees are to be fenced and the areas managed appropriately. A GIS database was kept for the management of sites. The AHMP includes provisions for an archaeological salvage programme including surface collection, recording of salvaged artefacts (including raw material, technological type, implement type, weight, and maximum dimension) and temporary storage in the designated Keeping Place.

The AHMP also details procedures following salvage for designating areas as 'cleared for site disturbance'; for the placement of and access to the Keeping Place for salvaged artefacts; and for the discovery of previously unknown sites and human skeletal remains.

4.3.2 Aboriginal Heritage Information Management System

A search of the AHIMS database was undertaken on 8 February 2012 using five separate sets of co-ordinates, in order to effectively cover the Modification area and its environs. These were:

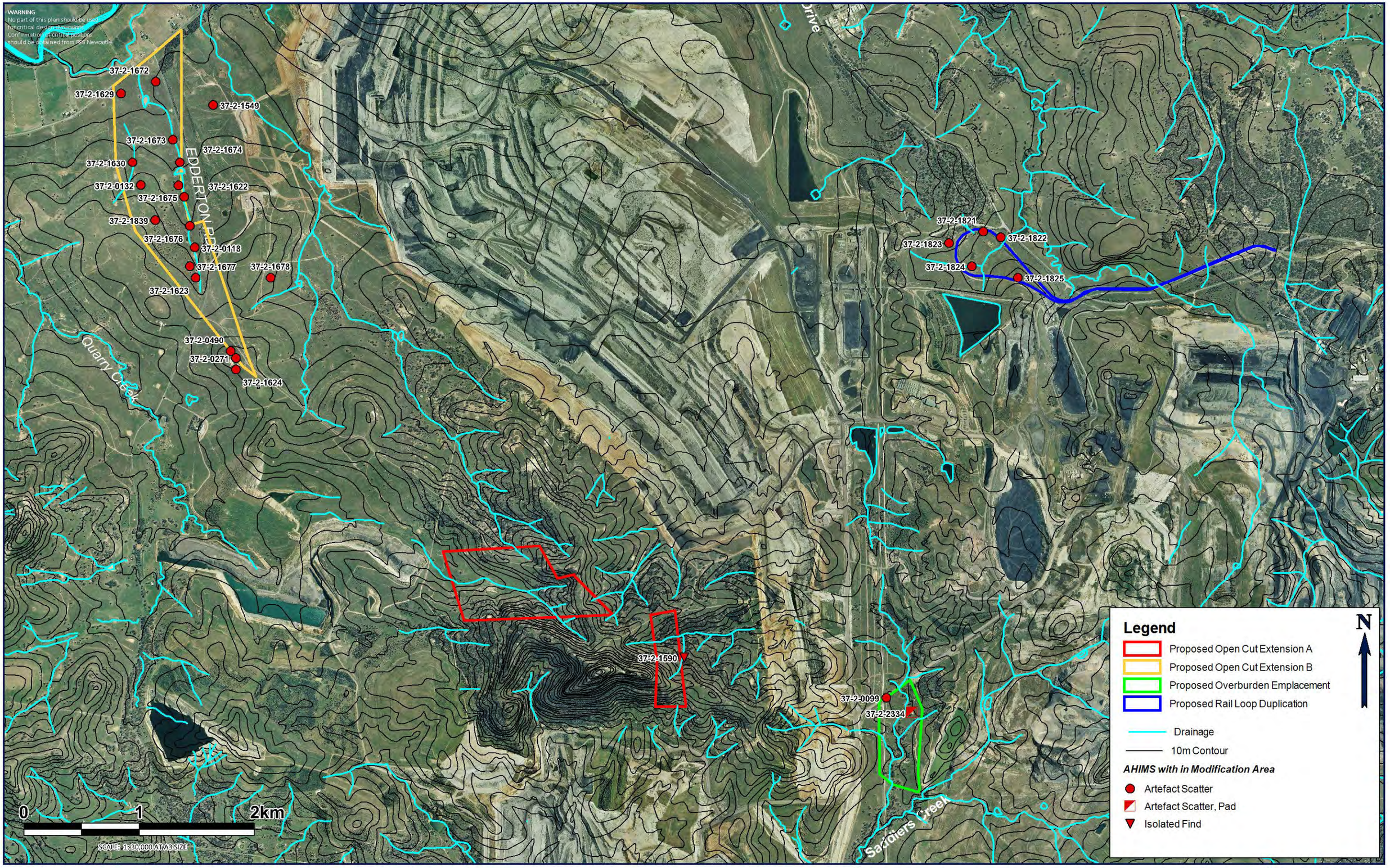
- Polygon 1 Zone 56 Eastings 301450-304404 and Northings 6420433-6421218;
- Polygon 2 Zone 56 Eastings 300517-301958 and Northings 6416098-6419490;
- Polygon 3a Zone 56 Eastings 296698-298606 and Northings 6416098-6419490;
- Polygon 3b Zone 56 Eastings 298606-300514 and Northings 6416098-6419490; and
- Polygon 4 Zone 56 Eastings 293786-296968 to Northings 6418300-6423053.

These searches (refer Appendix 4) revealed that there were 301 registered sites altogether within search parameters of the five polygons (Table 4-1). The AHIMS results showed that the recorded site types occurring in this area were artefact sites including artefact scatters and isolated finds (294), PAD (3), possible scarred tree (2) and grinding grooves (2). Such numbers demonstrate that artefacts are by far the most commonly identified site type in the area.

Table 4-1: Summary of AHIMS Results Ordered by Site Types and Frequency

Site Type	Frequency	Percent
Artefact Scatter	268	89.04%
Isolated Find	26	8.64%
Possible Scarred Tree	2	0.66%
PAD	3	1.00%
Grinding Groove	2	0.66%
Total	**301**	**100%**

Of the 301 sites identified in the AHIMS search, only 27 were actually within the Modification area boundaries or in the immediate surrounds (Figure 4-1; Table 4-2). These included artefact sites (25), grinding groove (1) (refer Section 6.4) and PAD (1). The AHIMS results were reviewed against the relevant previous studies undertaken in the area and the findings were correlated.



TITLE: FIGURE 4-1: AHIMS SITES WITHIN THE MODIFICATION AREA

LOCATION: MT ARTHUR COAL MINE

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 31/01/2013
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Mapping Database\MapInfo Work...\110833-1\Report Figures
VERSION (PLAN BY): E A3 (GG-AB-NW)

CLIENT: BHP
JOB REF: 110833-1

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

Table 4-2: Summary of AHIMS Results Ordered by Site Types and Frequency within the Immediate Modification Area and Immediate Surrounds

Site Type	Frequency	Percent
Artefact Scatter	25	93%
Isolated Find	0	0%
Possible Scarred Tree	0	0%
PAD	1	3.45%
Grinding Groove	1	3.45%
Total	**27**	**100%**

A full glossary of Aboriginal site types is available in Appendix 5.

Stone artefacts are generally found in flat or gently sloping open regions, and on level, well-drained land features near watercourses. Scar trees are usually found in close proximity to water or on easily accessible slopes.

In the regional area, artefact scatters and isolated finds make up the majority of site types. Scarred trees and grinding grooves have also been recorded in the region but most of these sites are not within the Modification area with no potential impacts from the Modification, and therefore are not assessed further. Grinding grooves are often found on large open and relatively flat areas of sandstone shelving and outcrops in close proximity to water, such as the exposed sandstone along rivers and other tributary drainage lines and swamps.

The results of the AHIMS database searches show that the area would most likely have been used for camping and resource procurement, particularly with relation to the Hunter River, Muscle Creek, Quarry Creek, Saddlers Creek and Whites Creek. The Modification area is characterised by gently sloping toe slopes, moderately sloping foot slopes and undulating hills.

4.4 Predictive Model for Archaeology in the Modification Area

A predictive model is created to give an indication of Aboriginal sites likely to occur within the Modification area. It draws on the review of the existing information from the regional and local archaeological context and the environmental context. The predictive model is necessary to formulate appropriate field methodologies in addition to providing information for the assessment of archaeological significance.

There are a number of factors which influence Aboriginal occupation of an area. These include essential subsistence resources such as food (flora and fauna) and fresh water. Additionally, floral and faunal resources were used for clothing, medicines, shelter and baskets and shields. Raw stone materials were utilised for the manufacture of tools and weapons. Ridges, flat elevated areas and rock shelters would have been favoured as places for occupation. Cultural or spiritual sites, such as corroboree sites, mythological places and initiation sites, may have been associated with certain landforms or specific sites or areas in the landscape.

4.5 Site Predictions

The following site predictions for the Modification area have been made on the basis of the environmental context, available historic observations of Aboriginal people in the region, archaeological studies and analysis of the AHIMS data.

4.5.1 Site Type

The Modification area is located inland in an area which has been extensively farmed and mined. On the basis of the AHIMS data and the information available from previous archaeological investigations, it is considered that artefact sites (scatters and isolated finds) would be the most likely site type to be present in the Modification area.

4.5.2 Site Locations

The majority of artefact scatters and isolated finds in the vicinity of the Modification area have previously been identified within 50 m of a watercourse. This indicates that the locations in the Modification area with the highest potential to contain artefact sites would be those near watercourses or drainage lines, generally above the floodplain. Previous archaeological models have also stated that ridgelines in the area may also have a high likelihood of containing archaeological sites, though this has not proved to be the case at Mount Arthur. Grinding grooves are likely to occur in areas of sandstone outcrop along creek lines. Extensive surveys undertaken in the Mount Arthur area have identified three grinding groove sites all of which were in sandstone outcrops in creek lines.

4.5.3 Site Contents

A review of previous archaeological investigations in the local area indicated that artefact scatters and isolated finds generally comprise flaked stone artefacts manufactured predominantly from silcrete and mudstone/silicified tuff, with minor representations of tuff, quartz and quartzite and occasionally basalt, chert, chalcedony, petrified wood and felsic volcanics. It was therefore predicted that sites with artefacts within the Modification area would be characterised by flaked stone tools, cores and flakes largely manufactured from mudstone and silcrete.

4.5.4 Site Condition

Due to the effects of previous land use, such as extensive clearing, sheet wash erosion, grazing livestock and previous farming practices, it was predicted that the area would be unlikely to contain any deep sub-surface archaeological deposits and that any deposits present may not retain spatial or stratigraphic integrity.

5 Non-Indigenous Heritage Context

5.1 Historical overview

In 1797, with the discovery of coal in Newcastle and the Hunter Valley, the first contact between Aboriginal and non-Aboriginal people in the Hunter Valley began. Permanent settlement of the Hunter Valley was established in 1804 with a penal colony for the convicts who had been deemed unsuitable to remain in Sydney (generally re-offenders). While the Lower Hunter was developed on a foundation of industrial production the Upper Hunter maintained a predominantly agrarian purpose.

Outside of the early coal mining operations in Newcastle, the chief reason for exploration and settlement in the Lower Hunter Region was that of 'Cedar Getting'. Up until 1820, the region was referred to as The Cedar Grounds (Wood 1972). The definition of cedar encompassed several different species including red cedar, rosewood, pine, flooded gum and iron bark. Rosewood had not been found anywhere else in the colony at the time and was considered a luxury timber favoured for its pleasant fragrance and used predominantly for fine furniture.

During the early 1800s, both Benjamin Singleton and John Howe saw the advantages to be gained by navigating a route between the Hawkesbury catchment and the Hunter Valley. Howe was an important figure in the early exploration and settlement of the Hunter Valley and was one of the first to recognise the suitability of the land for agricultural use, declaring the narrow floodplain between Aberdeen and Patrick's Plains to be *"..the finest sheep land I have seen since I left England... the grass on the low ground is equal to a meadow in England"* (Wood 1972). After the success of Singleton and Howe in navigating the route between Windsor and the Hunter, Major Morisset had feared that this would lead to use of the route by convicts to escape the Newcastle penal colony. Morisset's fear was justified as the number of convicts deserting the colony rose sharply in the following months (Wood 1972).

During his tenure, Governor Macquarie had been adamant that NSW would remain a penal colony, with extremely limited scope for private enterprise. It is therefore significant that in 1821, upon returning from a farewell trip to the Hunter Region he made what was referred to as 'His decided Opinion' that "*The fertility of the soil and the facilities afforded by Water Carriage, that country generally on the banks of the Hunter River is meriting attention as peculiarly adapted for the purpose of pasturage and agriculture*" (Civil Department 1821). With the change from Macquarie to Governor Brisbane on 1 December 1821, a dramatic shift in the direction of the colony of NSW was to occur. Brisbane was specifically tasked with 'encouraging new settlers with sufficient capital to develop land to pastoral and agricultural production'. This shift marked the first real attempts to establish a stable agrarian settlement in the Upper Hunter region. Land grants boomed during this period, upon his departure, Macquarie had made promises of land totalling over 400,000 acres (Wood 1972).

To facilitate the growth of the Hunter Region's agricultural land, in 1825, Heneage Finch was sent to survey a suitable route to lay down what would become one of NSW's most incredible built structures, The Great Northern Road. Governor Darling approved the project and it began work in 1826. The road was laboured upon by convict road gangs who endured some of the most appalling conditions ever imposed upon Australian convicts. Travelling from the Hawkesbury River near Sydney through to the Upper Hunter, past Warkworth, The road was hailed as 'The finest improvement in the colony…' (Karskens 1985).

In January 1863, the *Real Property Act 1862* was introduced and many larger leases were divided into smaller lots. This was the beginning of the dairy industry of the Hunter Valley, which was subsequently strengthened by the completion of the Hawkesbury River Railway Bridge in 1888 (Weir and Phillips 2007:4). Until World War II, dairy farming, timber felling and grazing remained the most dominant industries in the Upper Hunter.

5.2 Local history

5.2.1 Muswellbrook

Thomas Mitchell in 1831 described the Hunter as an open sclerophyll forest with grassy glades. With a number of early observers commenting on the abundant kangaroo, possums, birds, lizards and snakes (Moore 1970:28). The rivers were also plentiful with fish and shellfish with Dangar recording mounds of shell, the remains of shellfish meals on the banks of Muscle Brook (Wood 1972:44). European interest in this area had started with the first land grant in 1821 to Sarah and Elizabeth Jenkins on the south bank of present day Muscle Creek approximately 5 km east of what is now the township of Muswellbrook. The alluvial plains of the Hunter River attracted many more settlers and in 1833 Surveyor Dixon was instructed to prepare a plan for a village reserve on the junction of Muscle Creek and the Hunter River. In 1834 the first town allotments were offered for sale in 'Musclebrook' or 'Muscle Brook'. In 1835 Sir Francis Forbes, the NSW Chief Justice was given leave to purchase 10,000 acres in addition to 2,560 acres provided as part of his Civil Servants grant. This granted portion extended from the Hunter River along the left bank of Muscle Creek, the area now known as South Muswellbrook (Wood 1972: 71).

5.3 Historic Registers

Historic registers are used to record items of significance at the national, state and local government level. There are no items within the Modification area registered on the Australian Heritage Database, the NSW Heritage Inventory, the Hunter REP or the Muswellbrook LEP, 2009 but there are a number of registered sites within the greater Muswellbrook area.

5.3.1 Australian Heritage Database

The Australian Heritage Database incorporates: the National Heritage List; the Register of the National Estate and the Commonwealth Heritage List.

The National Heritage List is now the lead statutory document for the protection of heritage places considered to have national importance. This list comprises Aboriginal, natural and historic places that are of outstanding national heritage significance to Australia. Listed places are protected under the NSW *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are no items in the Muswellbrook LGA on the National Heritage List.

Prior to this the Register of the National Estate was the primary document. While the Register of the National Estate still exists it is now frozen and from 2012 will no longer have statutory status. The Minister is required to consider the Register when making some decisions under the EPBC Act. The Register of the National Estate includes 33 heritage sites in the Muswellbrook LGA.

The Commonwealth Heritage List comprises natural, Aboriginal and historic heritage places owned or controlled by the Commonwealth. Places on this list are also protected under the EPBC Act. One item in the Muswellbrook LGA is listed on the Commonwealth Heritage List.

A comprehensive listing of the results of the historic registers searches can be found in Appendix 6.

5.3.2 The NSW Heritage Inventory

The NSW Heritage Inventory lists items at the NSW (state) level and/or at the local level. Items of state significance are registered by the NSW Heritage Council under the NSW *Heritage Act 1977*. Those items are listed on the State Heritage Register as being under an Interim Heritage Order or protected under section 136 of the NSW *Heritage Act 1977*.

The NSW Heritage Inventory also includes some heritage places of heritage significance within a LGA. These places are listed by local council under their LEP and additionally may be included on the NSW Heritage Inventory database.

There are seven items listed under the NSW *Heritage Act 1977* and 80 items listed by Local Government and state agencies for the Muswellbrook area (Table 5-1). None are situated in the Modification area.

Table 5-1: Items Listed on the NSW Heritage Inventory

Name of Item	Address	Level of Significance
Eatons Group Hotel and St Vincent De Paul Group	178, 180-188 Bridge Street, Muswellbrook	NSW Heritage Act 1977
Edinglassie	Denman Road, Muswellbrook	NSW Heritage Act 1977
Loxton House	142-144 Bridge Street, Muswellbrook	NSW Heritage Act 1977
Muswellbrook District Hospital - Brentwood	Doyle Street, Muswellbrook	NSW Heritage Act 1977
Muswellbrook Railway Station and yard group	Main Northern Railway, Muswellbrook	NSW Heritage Act 1977
St Albans Anglican Church	Hunter's Terrace, Muswellbrook	NSW Heritage Act 1977
Weidmann Cottage	132 Bridge Street, Muswellbrook	NSW Heritage Act 1977
Anne Hassall Real Estate	7 Sydney Street, Muswellbrook	Local Government
Atherstone	5 Sowerby Street, Muswellbrook	NSW Government Gazette
Atherstone	5-7 Sowerby Street, Muswellbrook	Local Government
Balmoral	Denman Road, Muswellbrook	NSW Government Gazette
Balmoral	310 Denman Road, Muswellbrook	Local Government
Barber Shop	5 Sydney Street, Muswellbrook	NSW Government Gazette
Birralee	Brecht Street, Muswellbrook	NSW Government Gazette
Birralee	33 Brentwood Street (cnr Brecht Street), Muswellbrook	Local Government
Bridge Gang Main Entrance Depot	Bell Street, Muswellbrook	Local Government
Brighton Villa	12 Hunter Street, Muswellbrook	NSW Government Gazette
Brighton Villa	12 Hunter's Terrace, Muswellbrook	Local Government
Campbell & Co Store, Former	Muswellbrook	NSW Government Gazette
Eatons Group	164-166, 172, 174, 178, 180 and 188 Bridge Street, Muswellbrook	NSW Government Gazette
Edinglassie	710 Denman Road, Muswellbrook	Local Government

Name of Item	Address	Level of Significance
Farrells Auto One	5 Maitland Street, Muswellbrook	Local Government
Former St Johns Presbyterian Church	106 Hill Street (cnr Sowerby Street), Muswellbrook	Local Government
Franklins Mall and Colonial Arcade	Bridge Street, Muswellbrook	Local Government
Gelston	409 Sandy Creek Road, Muswellbrook	Local Government
Grass Tree Road Bridge	Grass Tree Road, Muswellbrook	Local Government
Hennor	Maitland Road, Muswellbrook	NSW Government Gazette
Hennor	3 Lorne Street, Muswellbrook	Local Government
Hospital, former	37 Sowerby Street	NSW Government Gazette
Item	27 Brovic Street, Muswellbrook	NSW Government Gazette
Item	15 Hunter's Terrace, Muswellbrook	NSW Government Gazette
Item demolished - 1991	45 Bridge Street (cnr Brook Street), Muswellbrook	Local Government
Kayuga Bridge over Hunter River	Kayuga Road, Muswellbrook	State Government Agency
Koobahla Villa	Cook Street, Muswellbrook	NSW Government Gazette
Koombahla Villa	23 Cook Street (cnr Carl Street), Muswellbrook	Local Government
Loxton House	142-144 Bridge Street (cnr Hill Street), Muswellbrook	Local Government
Masonic Hall	Muswellbrook	NSW Government Gazette
Muswellbrook Ambulance	Market, William Streets, Muswellbrook	State Government Agencies
Muswellbrook Brick Works	Off Common Road/Coal Road, Muswellbrook	Local Government
Muswellbrook Bridge	Kayuga Road, Muswellbrook	NSW Government Gazette
Muswellbrook Conservation Area	Muswellbrook	NSW Government Gazette
Muswellbrook Masonic Hall, AMP C.D. Cooke Pty Ltd	75 Bridge Street, Muswellbrook	Local Government
Muswellbrook Police Station	William Street, Muswellbrook	Local Government
Muswellbrook Police Station, former	26 William Street, Muswellbrook	State Government Agencies
Muswellbrook Post Office	7 Bridge Street, Muswellbrook	Local Government
Muswellbrook Railway Precinct	Market Street, Muswellbrook	State Government Agencies
Muswellbrook Railway Station	Market Street, Muswellbrook	NSW Government Gazette
Muswellbrook Railway Station	Market Street, Muswellbrook	Local Government
Negoa Homestead	Kayuga Road, Muswellbrook	NSW Government Gazette
Oak Dairy Fresh Foods Factory	Off Hunter Street, Muswellbrook	Local Government
Orion Energy Centre	34 Bridge Street, Muswellbrook	Local Government
Overdene	Bengalla Road, Muswellbrook	NSW Government Gazette

Name of Item	Address	Level of Significance
Overdene	79 Bengalla Road, Muswellbrook	Local Government
Police Station	William Street, Muswellbrook	NSW Government Gazette
Post Office	Muswellbrook	NSW Government Gazette
Presbyterian Manse	106 Hill Street, Muswellbrook	NSW Government Gazette
Railway Depot	Victoria Street, Muswellbrook	NSW Government Gazette
Railway Hotel	10-14 Market Street, Muswellbrook	Local Government
Residence	178 Bridge Street, Muswellbrook	Local Government
Residence	33-37 Sowerby Street, Muswellbrook	Local Government
Rous Lench	710 Denman Road, Muswellbrook	Local Government
Royal Hotel, former	1 Sydney Street, Muswellbrook	NSW Government Gazette
Shop Façade	34 Bridge Street, Muswellbrook	NSW Government Gazette
Shop Front	Muswellbrook	Local Government
St Albans Precinct	Brovic Street, Muswellbrook	NSW Government Gazette
St Albans Precinct	Hunter Terrace, Muswellbrook	NSW Government Gazette
St Albans	Brook Street, Muswellbrook	Local Government
St Albans Anglican Church	Brook Street (cnr Hunter's Terrace), Muswellbrook	Local Government
St Heliers	McCulleys Gap Road, Muswellbrook	Local Government
St Heliers	70 St Heliers Road, Muswellbrook	Local Government
St James Catholic School	Tindale Street, Muswellbrook	Local Government
St James Roman Catholic Church	4 Brook Street, Muswellbrook	Local Government
St James Roman Catholic Church and surrounds	Brook Street, Muswellbrook	NSW Government Gazette
St James Roman Catholic Presbytery	4 Sowerby Street, Muswellbrook	Local Government
St John's Presbyterian Church Precinct	Hill Street, Muswellbrook	NSW Government Gazette
St Mary's School Skelletar	Tindale Street, Muswellbrook	NSW Government Gazette
St Vincent De Paul Centre	174-176 Bridge Street, Muswellbrook	Local Government
Stone Bridge	Grass Tree Road, Muswellbrook	NSW Government Gazette
The Old Tea House and Gift Shop	208 Bridge Road, Muswellbrook	Local Government
Timber Cottage	129 Hill Street, Muswellbrook	Local Government
Two Storey Shop	7-11 Sydney Street, Muswellbrook	NSW Government Gazette
Uniting Church	Muswellbrook	NSW Government Gazette
Upper Hunter Parish Trinity Uniting Church	110 Bridge Street, Muswellbrook	Local Government
Veterinary Hospital	14-15 Aberdeen Street (cnr New England Highway), Muswellbrook	Local Government
Weidmann Cottage	132-134 Bridge Street, Muswellbrook	Local Government
Yvonne Boyle Real Estate	1-3 Sydney Street, Muswellbrook	Local Government

5.3.3 Local Government Heritage Registers

Items of significance at the local government level are included in the LEPs and REPs as Heritage Schedules. These are a list of European and some Aboriginal items which have been listed with council as having heritage value.

A search of the Muswellbrook LEP, 2009 has indicated that there are 117 items listed for the entire Muswellbrook LGA (Table 5-2), but only 83 items are located within a 10 km radius of the Modification area. There are no items listed in the Modification area.

Table 5-2: Items Listed in the Muswellbrook LEP within 10 km of the Modification Area, 2009

Item Name	Address	Heritage Listing
Keys Family Private Cemetery	Bengalla Road, Bengalla	Local
Bengalla Homestead	183 Bengalla Road, Bengalla	Local
Dalmar Stud	690 Bengalla Road, Bengalla	Local
Overdene	79 Overdene Road, Bengalla	Local
Blunt's Butter Factory	179 Overdene Road, Bengalla	Local
Fairview	Hebden Road, Liddell	Local
Hillcrest	311 Hebden Road, Liddell	Local
Railway Depot (Roundhouse)	Bell Street, Muswellbrook	Local
Muswellbrook Cemetery	Bowman and Brecht Streets, Muswellbrook	Local
St James Roman Catholic Church	Brook Street, Muswellbrook	Local
Roman Catholic Convent	Brook Street, Muswellbrook	Local
Kerb and guttering	Brook Street (Bridge Street to railway line), Muswellbrook	Local
St Albans Anglican Rectory	Corner Hunter's Terrace and Brook Street, Muswellbrook	Local
Muswellbrook Infants School	Dolahenty Street (cnr King Street), Muswellbrook	Local
St John's Presbyterian Church	Hill Street, Muswellbrook	Local
Former St John's Presbyterian Church	Hill Street, Muswellbrook	Local
Oak Milk Factory	Hunter Street, Muswellbrook	Local
Kayuga Bridge	Kayuga Road, Muswellbrook	State
Muswellbrook High School	King Street, Muswellbrook	
Railway Station	Market Street, Muswellbrook	State
Railway Signal Box	Market Street, Muswellbrook	State
Simpson Park and Reserve	Market Street (Sydney Street), Muswellbrook	Local
Stone Bridge	Muscle Creek Road, Muswellbrook	Local
Kerb and guttering	Sydney Street (Maitland Street to Haydon Street)	Local
Fitzgerald/Olympic Park Gates	Wilkinson Avenue, Muswellbrook	Local

Item Name	Address	Heritage Listing
Police Station	William Street, Muswellbrook	Local
Former Butter Factory	14-15 Aberdeen Street, Muswellbrook	Local
Armitage House	2 Armitage Avenue, Muswellbrook	Local
Birralee	33 Brentwood Street, Muswellbrook	Local
Royal Hotel	10-16 Bridge Street, Muswellbrook	Local
Billiards Building	36-40 Bridge Street, Muswellbrook	Local
National Australia Bank Building	46-50 Bridge Street, Muswellbrook	Local
Loxton House	140-142 Bridge Street, Muswellbrook	State
Eatons Group St Vincent De Paul Society	174-176 Bridge Street, Muswellbrook	State
Eatons Hotel	182-184 Bridge Street, Muswellbrook	State
Taskers Pharmacy	26 Bridge Street, Muswellbrook	Local
Edward Higgens Building	30-32 Bridge Street, Muswellbrook	Local
School of Arts/Town Hall	3 Bridge Street, Muswellbrook	Local
Post Office	7 Bridge Street, Muswellbrook	Local
Former Picture Theatre	17 Bridge Street, Muswellbrook	Local
Westpac Bank Building	19 Bridge Street, Muswellbrook	Local
Shop Front	34 Bridge Street, Muswellbrook	Local
Former Campbell's and Co Store	52 Bridge Street, Muswellbrook	Local
Campbell's Corner	60 Bridge Street, Muswellbrook	Local
Masonic Lodge	75 Bridge Street, Muswellbrook	Local
Uniting Church	110 Bridge Street, Muswellbrook	Local
Weidmann Cottage	126 Bridge Street, Muswellbrook	State
Eaton's Group Shop Building	172 Bridge Street, Muswellbrook	State
Eaton's Group House	178 Bridge Street, Muswellbrook	State
Kildonan	208 Bridge Street, Muswellbrook	Local
St Albans Anglican Church	20 Brook Street, Muswellbrook	State
Koombahla Villa	23 Cook Street, Muswellbrook	Local
Yammanie	307 Denman Road, Muswellbrook	Local
Balmoral	310 Denman Road, Muswellbrook	Local
Edinglassie	710 Denman Road, Muswellbrook	State
Rous Lench	710 Denman Road, Muswellbrook	State
Beer Homestead	721 Edderton Road, Muswellbrook	Local
Belmont	721 Edderton Road, Muswellbrook	Local
Edderton Homestead	1477 Edderton Road, Muswellbrook	Local
Plashett Homestead	1477 Edderton Road, Muswellbrook	Local

Item Name	Address	Heritage Listing
Skellatar (St Mary's Catholic School)	17 Fitzgerald Avenue, Muswellbrook	Local
Minch's Wine Shop	18 Foley Street, Muswellbrook	Local
Former Presbyterian Manse	106 Hill Street, Muswellbrook	Local
Timber Cottage	129 Hill Street, Muswellbrook	Local
House	9-11 Hunter's Terrace, Muswellbrook	Local
Brighton Villa	12 Hunter Terrace, Muswellbrook	Local
St Albans Sunday School	15 Hunter Terrace, Muswellbrook	Local
Hennor	18-20 Maitland Street, Muswellbrook	Local
Railway Hotel	10-14 Market Street, Muswellbrook	Local
Muswellbrook Hotel	46 Market Street, Muswellbrook	Local
House	5 Midanga Avenue, Muswellbrook	Local
Gelston	409 Sandy Creek Road, Muswellbrook	Local
Lime Kiln – "E.I.E.I.O"	540 Sandy Creek Road, Muswellbrook	Local
St James Roman Catholic Presbytery	4 Sowerby Street, Muswellbrook	Local
Atherstone	5 Sowerby Street, Muswellbrook	Local
Former Hospital	37 Sowerby Street, Muswellbrook	Local
St Heliers	70 St Heliers Road, Muswellbrook	Local
Former Royal Hotel	1 Sydney Street, Muswellbrook	Local
Former Barber Shop	7 Sydney Street, Muswellbrook	Local
Prince of Wales Tavern	28-30 Sydney Street, Muswellbrook	Local
Valley Hotel/Motel	33 Sydney Street, Muswellbrook	Local
Shamrock Hotel	30 William Street, Muswellbrook	Local
Muswellbrook Brick Works	Muswellbrook Common, Muswellbrook	Local

A search of the Hunter REP has indicated that there are 209 items listed at state, regional and local level for the entire Hunter Valley region, in addition to a large number of sites "requiring further investigation" and two Conservation areas (the Denman Conservation area and the Muswellbrook Conservation area). Only 33 items are located within a 10 km radius of the Modification area (Table 5-3). None of the listed items are in the Modification area.

Table 5-3: Items Listed in the Hunter REP within 10 km of the Modification Area

Item Name	Address	Heritage Listing
Keys Family Private Cemetery	Bengalla Road, Bengalla	Regional
St Albans Precinct	Brook Street and Hunter Terrace, Muswellbrook	Regional
Eatons Group	164-166, 172, 174, 178, 180-188 Bridge Street, Muswellbrook	Regional
Loxton House	142 Bridge Street, Muswellbrook	Regional
Weidmann Cottage	132 Bridge Street, Muswellbrook	Regional
Birralee	Brentwood and Brecht Streets, Muswellbrook	Regional
St James Church	Brook Street, Muswellbrook	Regional
Balmoral	Denman Road, Muswellbrook	Regional
Edinglassie	Denman Road, Muswellbrook	Regional
Rouse-Lench	Denman Road, Muswellbrook	Regional
St Johns Precinct	Hill Street, Muswellbrook	Regional
Presbyterian Manse	106 Hill Street, Muswellbrook	Regional
Muswellbrook Bridge	Kayuga Road, Muswellbrook	Regional
Negoa Homestead	Kayuga Road, Muswellbrook	Regional
Atherstone	5 Sowerby Street, Muswellbrook	Regional
St Marys School	Tindale Street, Muswellbrook	Regional
St Heliers	McCulleys Gap Road, Muswellbrook	Regional
Post Office	Bridge Street, Muswellbrook	Local
Masonic Hall	75 Bridge Street, Muswellbrook	Local
Methodist Church	Bridge Street, Muswellbrook	Local
Former Campbell & Co Store	54 Bridge Street, Muswellbrook	Local
Shop Front	34 Bridge Street, Muswellbrook	Local
Koobahla Villa	Cook and Carl Streets, Muswellbrook	Local
Stone Bridge	Grass Tree Road, Muswellbrook	Local
Brighton Villa	12 Hunter Terrace, Muswellbrook	Local
Hennor	Lorne and Maitland Roads, Muswellbrook	Local
Railway Station	Market Street, Muswellbrook	Local
Former Hospital	37 Sowerby Street, Muswellbrook	Local
Barber Shop	5 Sydney Street, Muswellbrook	Local
Former Royal Hotel	1 Sydney Street, Muswellbrook	Local
Railway Depot	Victoria Street, Muswellbrook	Local
Police Station	William Street, Muswellbrook	Local
Overdene	Bengalla Road, Muswellbrook	Local

5.4 Discussion

Research of the various heritage databases has shown that there are a large number of historic heritage items listed in the Muswellbrook area, but none within the boundaries of the Modification area itself. This desktop study of the locations of the heritage items has determined that they are positioned in such a way that they will not be affected by proposed works.

The remains of a stockyard and post and rail fence were reported in the Consolidation Project heritage assessment (AECOM 2009). These items are located within the Modification area and were inspected as part of this assessment. Due to their poor condition, these items were assessed as having no heritage or conservation significance. Further discussion regarding the stockyard and post and rail fence is provided in Appendix 7.

5.5 Conclusion

It is considered that the Modification area is well removed from any items of non-indigenous heritage significance and therefore the proposed works will have no impact upon any listed heritage items.

6 Aboriginal Archaeological Field Survey

6.1 Survey Methodology

This heritage assessment has been undertaken in accordance with OEH guidelines for survey reporting in the *Code of Practice of Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) and included the following components:

- documentation of survey coverage;
- documentation of results; and
- documentation of significance of sites/areas to the Aboriginal community.

6.1.1 Survey Aims

The survey was undertaken in order to identify Aboriginal archaeological sites in the Modification area including groundtruthing sites previously recorded within the Modification area and to record new sites. This included determining the visible extent of artefact scatter sites. The survey methodology was formulated with these aims in mind and focused on landforms associated with previously identified sites, exposed ground surfaces and targeting the various landforms and vegetated areas within the Modification area.

6.1.2 Field Methods

The survey was conducted on foot (pedestrian) with teams walking 5 to 10 m transects over landforms associated with previously identified sites. The area surveyed was recorded in survey units with each survey unit mapped and recorded in accordance with landforms, Modification area boundaries, impact area boundaries, changes in survey conditions (such as visibility or ground surface exposure) and/or other relevant considerations.

The mapping of survey units was undertaken on the basis of global positioning system recorded data and with reference to aerial and topographic information. The recording of survey units was undertaken using representative digital photographs and field notes which included observations of soils, ground surface exposure and visibility, vegetation cover, rock outcrops, levels of ground surface disturbance and erosion. Artefact sites were recorded using a differential global positioning system (DGPS); artefact clusters or groups were recorded as separate loci.

The field notes provide a basis for the reporting of survey coverage and calculating survey effectiveness as presented in the survey results section. It is required that any new Aboriginal sites identified are recorded and submitted for registration on the AHIMS database. Such recording involves the documentation of the material traces of past Aboriginal land use, including the spatial extent of sites and any other obvious physical boundaries.

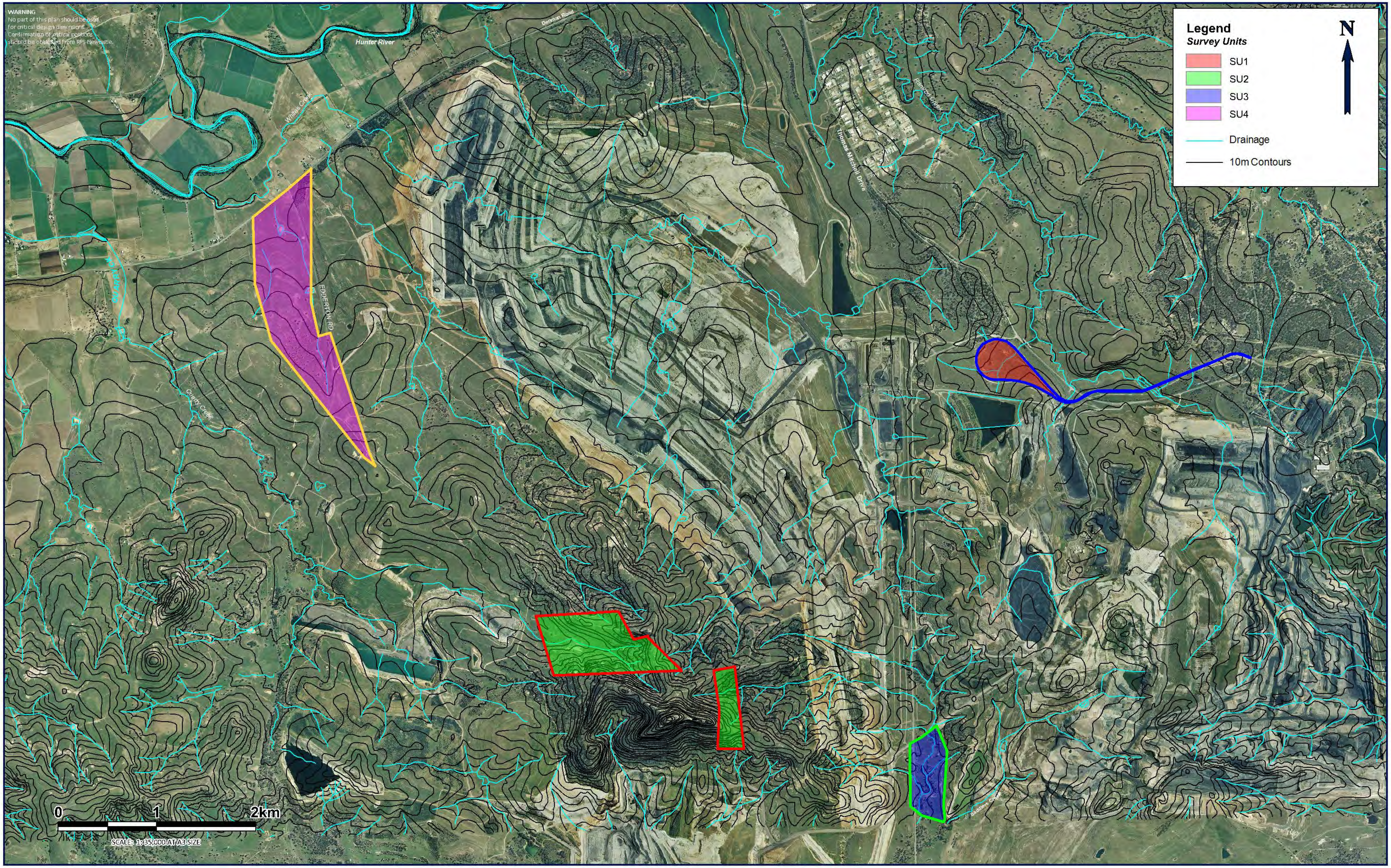
Aboriginal cultural sites identified by Aboriginal stakeholders may not always involve material traces and boundaries of such sites need to be mapped on the basis of information provided by the Aboriginal stakeholders. Aboriginal sites and objects identified in the field were recorded by DGPS and mapped accordingly.

6.2 Survey Units

Archaeological and Aboriginal cultural heritage field survey was conducted by Senior Archaeologist Gillian Goode, Archaeologist Ali Byrne and Graduate Archaeologist Jeremy Hill, of RPS, in partnership with representatives from Aliera French Trading, DFTV Enterprises, Deslee Talbott Consultants, Breeza Plains Cultural Heritage Consultants, Gomery Cultural Consultants, Roger Noel Matthews, Yinarr Cultural Services, Ngarramang-Kuri Aboriginal Culture & Heritage Group, Myland Culture & Heritage Group, Cacatua Culture Consultants, Hunter Valley Aboriginal Corporation, Kawul Cultural Services and Widescope Indigenous Group. Some other stakeholders who requested that their details be withheld also assisted. The team was also accompanied by a safety escort supplied by HVEC. The surveys were undertaken on Tuesday 10 April, Wednesday 11 April, Thursday 12 April, Thursday 19 April, Friday 20 April, Monday 23 April and Tuesday 24 April 2012.

Survey units were described for each survey area. In particular, exposure and GSV were reported to ensure comparability of survey results between different areas of the local landscape and to contextualise survey results. Areas with high visibility and exposure were found to have extensive land surface disturbance, generating higher quantities of exposed archaeological material that was not *in situ*. Conversely, areas with low visibility and exposure, particularly due to undisturbed native vegetation coverage, are generally more intact landscapes and thus more likely to contain *in situ* archaeological deposits. Such sites can be difficult to identify due to the low visibility.

The Modification area was divided into survey units according to both landform and location. Four survey units were identified in the Modification area (SU1 to SU4) – refer Figure 6-1. Ground surface exposure and GSV were recorded and analysed for each survey unit. GSV was recorded as a percentage range (refer Table 6-1) and sample fractions for the survey units were also calculated as shown in Table 6-2. A summary of the Aboriginal cultural heritage sites identified in the Modification area is shown in Table 6-3. Site cards for recorded sites have been provided previously with the methodology and will be provided in Appendix 8. Site co-ordinates were recorded with a hand held DGPS.



TITLE: FIGURE 6-1: PROPOSED MODIFICATION AREA WITH SURVEY UNITS

LOCATION: MT ARTHUR COAL MINE

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 4/12/2012
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Map Database\MapInfo Work..s\110833-1\Report Figures
VERSION (PLAN BY): C A3 (GG-AB-NW)

CLIENT: BHP
JOB REF: 110833-1

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Table 6-1: GSV Rating

GSV Rating	Description
0 – 9%	Heavy vegetation with scrub foliage, debris cover and/or dense tree cover. Ground surface not clearly visible.
10 – 29%	Moderate level of vegetation, scrub or tree cover. Small patches of soil surface visible resulting from animal tracks, erosion or blowouts. Patches of ground surface visible.
30 – 49%	Moderate levels of vegetation, scrub and/or tree cover. Moderate sized patches of soil surface visible possibly associated with animal tracks, walking tracks and erosion surfaces. Moderate to small patches across a larger section of the Modification area.
50 – 59%	Moderate to low level of vegetation, tree and/or scrub. Greater amounts of areas of ground surface visible in the form of erosion scalds, recent ploughing, grading or clearing.
60 – 79%	Low levels of vegetation and scrub cover. High incidence of ground surface visible due to recent or past land–use practices such as ploughing, grading and mining. Moderate level of GSV due to sheet wash erosion, erosion scalds and erosion scours.
80 – 100%	Very low to nonexistent levels of vegetation and scrub cover. High incidence of ground surface visible due to past or recent land use practices, such as ploughing, grading and mining. Extensive erosion such as rill erosion, gilgai, sheet wash, erosion scours and scalds.

Table 6-2: Survey Coverage Data

Survey Unit	Survey Unit Area (m^2)	Visibility (%) GSV Rating	Exposure (%)	Effective Coverage Area (m^2)	Effective Coverage (%)
1	219,580	40	20	175,664	80
2	826,321	40	40	413,161	50
3	288,054	60	50	144,027	50
4	118,788	20	40	83,152	70

Table 6-3: Landform Summary

Landform	Landform Area (m^2)	Area Effectively Surveyed (m^2)	Percent of Landform Effectively Surveyed (%)	Number of Sites
Ramrod Creek tributary and lower slopes	219,580	175,664	80	5
Slopes of Mount Arthur	826,321	413,161	50	8
Saddlers Creek, steeply incised valley	288,054	144,027	50	8
Rolling Hills North West of Mount Arthur, tributary of Whites Creek	118,788	83,152	70	33

Survey Unit 1 – Proposed Rail Loop Duplication

Survey Unit 1 (refer Figure 6-2) focused on the pre-existing rail loop adjacent to Thomas Mitchell Drive, including the area on the inside of the loop, a narrow corridor around the outside of the loop and along the rail line to the second crossing at Thomas Mitchell Drive. The rail loop and line were in a generally lower slope area. The rail line had been raised to cross Ramrod Creek. Two other unnamed tributaries were associated with the survey unit. The north western and south eastern sections of the rail loop slope descended to a natural depression in the centre which was associated with the drainage line. The ground on the inside and outside of the rail tracks was highly disturbed by the construction of the embankment for the tracks, placement of ballast and fills and uses by track maintenance vehicles. Culverts have been positioned to direct the flow of Ramrod Creek and the drainage line. Vegetation primarily consisted of grass and low shrubs.

It was considered that there was low potential for any additional artefact sites to occur in the area enclosed by the rail loop survey unit, due to the nature of the previous disturbances. Although the landform is in close proximity to Ramrod Creek (which crosses the rail line within the survey area) the area was highly disturbed and it was considered that the slopes around the creek and tributaries were unlikely to contain *in situ* archaeological deposits. Figure 6-2 shows Survey Unit 1 with previously recorded sites and additional identified artefact loci associated with these sites.

AHIMS #37-2-1821 was recorded as being an artefact scatter of 65 artefacts located in a drainage depression; although the coordinates on the site card placed the site about 150 m to the north of the drainage line on a south east facing slope. The artefacts were in one locus in a total area surveyed of 14,400 m². Raw materials were predominantly silcrete and tuff and artefacts were mostly flakes and cores. During the course of the survey an extensive artefact scatter was identified (AS1), numbering 40 artefacts including 21 mudstone flakes, 2 mudstone cores, 6 quartz flakes and one quartz core, 6 silcrete flakes, 2 basalt flakes, one tuff flake and a some glass pieces in one locus. The groundtruthing of this site showed that the scatter was the locus for AHIMS site #37-2-1821 identified by South East Archaeology Pty Ltd in 1999. This site was located in a drainage depression which had been exposed to sheet wash and rill erosion (Plate 1).

AHIMS #37-2-1822 was recorded in 1999. It was described as an artefact scatter of 83 artefacts in five separate loci within an area surveyed of 21,400 m². The site was described on the site card as being situated in a drainage depression on a gentle slope. Raw materials were most commonly silcrete and tuff with artefact types dominated by flakes but also including lithic fragments, flaked portions, flaked pieces and cores. The area recorded in 1999 by South East Archaeology Pty Ltd which lay on a north facing slope was inspected but the location of the original recorded artefact scatter site could not be identified when groundtruthed due to the extensive grass cover, the amount of water in the low lying area and the uneven terrain. There were a number of loci of AHIMS #37-2-1822 within the Modification area.

WARNING
No part of this plan should be used for critical design purposes. Confirmation of service locations should be obtained from RPS Newcastle

Legend

SU1 Proposed Rail Loop Duplication
SU2 Proposed Open Cut Extension A
SU4 Proposed Open Cut Extension B
SU3 Proposed Overburden Emplacement
Drainage
10m Contour

AHIMS Sites

37-2-1821
37-2-1822
37-2-1823
37-2-1824
37-2-1825

South East Archaeology Loci

37-2-1821
37-2-1822
37-2-1823
37-2-1824
37-2-1825

RPS Loci

37-2-1821
37-2-1823
37-2-1824
37-2-1825

N

Mine Access Road
37-2-1821
37-2-1822
37-2-1823
AS2
AS1
IF1
AS3
37-2-1824
AS4
37-2-1825
TEARPOT CK

0 250 500m
SCALE: 1: 8,500 AT A3 SIZE

Legend
Survey Units
SU1

TITLE: FIGURE 6-2: SURVEY UNIT 1
PROPOSED RAIL LOOP DUPLICATION

LOCATION: MT ARTHUR COAL MINE

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 4/12/2012
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Mapping Database\MapInfo Workspaces \110833-1\Report Figures
VERSION (PLAN BY): C A3 (GG-AB-NW)

CLIENT: BHP
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AHIMS #37-2-1823 was recorded in 1999. It was described as an artefact scatter of six artefacts in three separate loci within an area surveyed of 65,700 m². The artefacts were situated on a simple slope with a south easterly aspect. The artefacts recorded were predominantly flakes and the most common material types were tuff and quartz. During the course of the survey an artefact scatter was identified on an embankment adjacent to the train tracks, on a modified simple slope facing south east (AS2). The scatter was separated into two loci. The artefacts included three mudstone flakes, three quartz flakes and a silcrete flake. The scatter was considered to form two new loci of the previously recorded AHIMS site #37-2-1823 (Plate 2).

AHIMS #37-2-1824 was recorded as a scatter of two artefacts in one locus situated in a drainage depression. The total area of the landform unit was calculated as 19,700 m². The artefacts were recorded as a flake and a flake portion, one of silcrete and one of tuff. The groundtruthing of this site identified an artefact scatter on an erosion scour with a south east aspect, in a drainage depression (AS3). The artefact scatter consisted of two quartz flakes. There were also a number of pieces of broken glass. The site was considered to be an additional locus of the previously recorded site AHIMS #37-2-1824 (Plate 3).

AHIMS #37-2-1825 was described on the site card as being located on a simple slope and had a northerly aspect. The site consisted of 73 artefacts in one locus, with the total area of the landform unit at 261,400 m². Artefact types included flakes, flake portions and lithic fragments, predominantly composed of tuff. During the groundtruthing site inspection one isolated find (IF1) and an artefact scatter (AS4) were identified. The isolated find, a grey silcrete flake, was situated in long grass near the base of a simple slope facing north. The artefact scatter was identified in long grass on the crest of the same simple slope but facing to the north east. The scatter consisted of one mudstone, one silcrete and one chert flake. Both the isolated find and the artefact scatter were considered to be additional loci of site AHIMS #37-2-1825 (Plate 4).

No new sites were recorded during the field survey in Survey Unit 1. All amendments of the additional loci to AHIMS registered sites #37-2-1821, #37-2-1822, #37-2-1823, #37-2-1824 and #37-2-1825 will be submitted to the OEH in order for the supplementary information to be updated onto the AHIMS database.

Survey Unit 2 – Proposed Open Cut Extension A

This survey unit was composed of the northern and eastern slopes of Mount Arthur, including associated steeply incised valleys and depressions (Figure 6-3). The slopes varied in incline from moderate to steep and very steep. The moderate slopes were vegetated by pasture grasses and scattered shrubs and trees; the steep slopes, where less clearing had occurred, were generally covered by eucalypts, shrubs and native grasses; and the very steep slopes had grass trees, low shrubs and native grasses.

WARNING
No part of this plan should be used for critical design dimension. Confirmation of critical positions should be obtained from RPS Newcastle

Legend

- SU1 Proposed Rail Loop Duplication
- SU2 Proposed Open Cut Extension A
- SU4 Proposed Open Cut Extension B
- SU3 Proposed Overburden Emplacement

AHIMS Site

- 37-2-1590

South East Archaeology Loci

- 37-2-1590

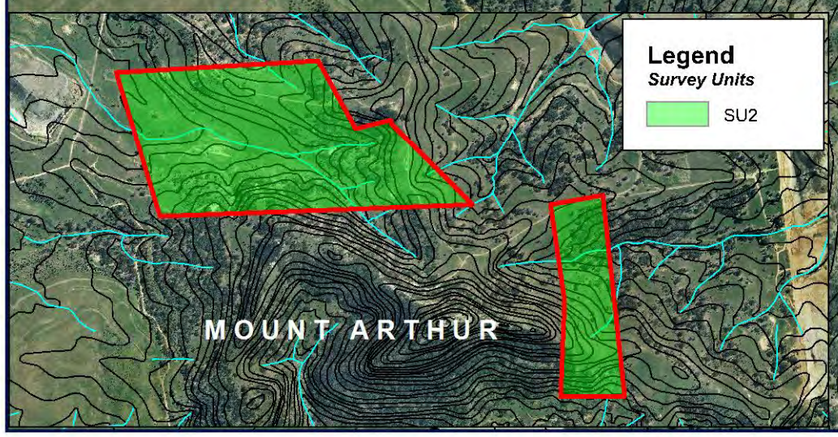
- Drainage
- 10m Contour

RPS Sites

- IF15
- IF2b
- IF2GG
- IF3b
- IF3GG
- IF4b
- IF5b
- IF6b

N

IF15
IF2GG
IF3GG
IF3b
IF2b
IF4b
IF6b
IF5b
37-2-1590
37-2-1590



0 250 500m

SCALE: 1:8,500 AT A3 SIZE

TITLE: FIGURE 6-3: SURVEY UNIT 2 PROPOSED OPEN CUT EXTENSION

LOCATION: MT ARTHUR COAL MINE

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 4/12/2012
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Mapping Database\MapInfo Work...\110833-1\Report Figures
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Sandstone boulders and cobbles occurred on the lower slopes of Survey Unit 2 and sandstone outcrops were evident further up slope in the steeper inclines and along drainage areas at the base of the eastern slopes. No grinding grooves were identified along any of the creek lines within the area surveyed, but a previously recorded grinding groove site was located in close proximity to the study area (AHIMS #37-2-0111) which had been originally recorded by Dyall in 1980. There were no rock shelters in the sandstone outcrops on the upper slopes. On the northern slopes in the lower areas, mudstone cobbles were also observed but the mudstone was friable and was considered unsuitable for knapping.

Creek lines in Survey Unit 2 were of low order being first and second order streams. The slopes on either side of these low order creeks were relatively steeply sloping. There was extensive erosion in the areas that had been disturbed by previous farming practices including disturbances relating to dam construction, fence lines, formed access tracks, power line easements, erosion and previous mine works. Survey Unit 2 comprised highly disturbed lower slope areas and upper slopes which were extremely steep and difficult to access due to the sandstone outcrops, large boulders, scree and thick vegetation. It was considered that it was unlikely that the area would contain *in situ* archaeological deposits.

Eight artefact sites were identified within this survey unit and all were isolated finds: IF2GG mudstone flake (Plate 5); IF3GG, a mudstone flake (Plate 6); IF2b, a chert core (Plate 7); IF3b, a chert flake (Plate 8); IF4b, a chert flake (Plate 9); IF5b, a basalt core (Plate 10); IF6b, a mudstone core (Plate 10); and IF15, a silcrete flake (Plate 11). The artefacts were generally located mid slope in eroded areas near ephemeral drainage lines. All these isolated finds were considered to form newly identified sites as there were no previously registered artefact sites within Survey Unit 2. Site cards were generated for these sites and submitted for inclusion on the AHIMS database. No artefact was found at the previously recorded isolated find site AHIMS #37-2-1590 during the course of this survey.

Survey Unit 3 – Proposed Overburden Emplacement

Survey Unit 3 included Saddlers Creek and tributaries in an incised valley to the east of Mount Arthur (refer Figure 6-4). The area has been highly disturbed as a result of mine related activity including the placement of a conveyor, an electricity easement, access tracks for vehicles, a haul road, a large nearby dam and general vegetation clearing. There were also disturbances resulting from previous farming practices including fencing and grazing of livestock. Erosion caused by sheet wash and rill erosion along Saddlers Creek was also evident. It was considered that despite the disturbances, the area had moderate potential to contain artefacts due to the presence of Saddlers Creek and the moderate slopes either side. Figure 6-4 shows Survey Unit 3 with archaeological sites identified during survey.

WARNING
No part of this map should be used for critical design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle

Legend

- SU1 Proposed Rail Loop Duplication
- SU2 Proposed Open Cut Extension A
- SU4 Proposed Open Cut Extension B
- SU3 Proposed Overburden Emplacement
- 10m Contour
- Drainage

AHIMS Sites

- 37-2-0099
- 37-2-2334

RPS Sites

- AS10
- AS11
- AS12
- AS13
- AS14
- IF60
- AS8

N

37-2-0099
37-2-2334
IF60
AS14
AS10
AS8
AS13
AS11
AS9

0 250 500m

SCALE : 1:4,500 AT A3 SIZE

Legend
Survey Units
SU3

Creek

TITLE: FIGURE 6-4: SURVEY UNIT 3 PROPOSED OVERBURDEN EMPLACEMENT
LOCATION: MT ARTHUR COAL MINE
DATUM: (GDA 94)
PROJECTION: MGA ZONE 56
DATE: 4/12/2012
PURPOSE: HERITAGE
LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Mapping Database\MapInfo Work...\110833-1\Report Figures
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Two previously recorded sites were located within the survey unit, AHIMS #37-2-0099 and #37-2-2334 close to the haul road and were to have been salvaged as part of South Pit salvage works. Due to issues of access the area near to #37-2-0099 could not be groundtruthed – the site was very close to the haul road and this area had been fenced off for safety reasons. AHIMS #37-2-0099 was described as being situated on the north bank of Saddlers Creek, eroding out of gravelly soil close to a vehicular crossing of the creek. Artefacts identified included 45 'implements' (including a hammerstone, scrapers and blades), 22 cores and 342 waste flakes. The raw materials of these items were not specified. The actual location of site #37-2-2334 (also identified by the recorder as S4) could not be identified due to discrepancies between the mapping and the description of the site on the site card. The site was described as an artefact scatter with PAD located in a drainage channel. However the point on the map provided did not correlate with the co-ordinates provided or position in relation to a drainage line. It is possible that the site may be associated with either AS12 or AS13 but there was no corroborating evidence to confirm that. Eight new artefact sites were identified in this survey unit: AS8, AS9, AS10, AS11, AS12, AS13, AS14 and IF60.

AS8 (Plate 12) was situated on the mid slope of a partially destroyed ridgeline (now a dam area). The extensive artefact scatter was associated with a long erosion scour adjacent to a contour bank facing west. The site was divided into six loci. Locus 1 was composed of five mudstone flakes, one quartz flake and one quartz core. Locus 2 included two quartz flakes, one quartzite flake, one mudstone flake and one chert flake. Locus 3 consisted of two mudstone flakes, two quartz flakes and one silcrete core. Locus 4 included two mudstone flakes, one quartz flake and one silcrete flake. Locus 5 was composed of four quartz flakes, three silcrete flakes and a mudstone flake. Locus 6 comprised two mudstone flakes, two silcrete flakes, two quartz flakes and one basalt flake. The soils between Locus 4 and Locus 5 exhibited two distinct soil types. Those associated with Loci 1 to 4 were red clays and those with Loci 5 to 6 were weathered mottled clays.

AS9 (Plate 13) was located in a large eroded area on the eastern bank of Saddlers Creek, with a north westerly aspect. Grass cover varied between 30% and 80% in the six loci identified. Locus 1 was on an ant's nest and consisted of one grey silcrete flake. Locus 2 included one grey mudstone flake fragment. Locus 3 included six silcrete flakes, one mudstone flake, one quartz flake and one quartz core. Locus 4 had the highest density of artefacts with six mudstone flakes, five quartz flakes, three silcrete flakes and one chert flake. Locus 5 included a single silcrete angular fragment and Locus 6 consisted of four mudstone flakes and one silcrete flake.

AS10 (Plate 14) was on the surface of an ants nest on an alluvial deposit in the braided channel of Saddlers Creek. The area was thickly vegetated with long grasses and patches of regrowth trees. The slope of the site had a north east to easterly aspect, with visibility limited to the eroded area around the ant's nest. The site included one chert flake, one silcrete flake and one basalt flake.

Sites AS11 (Plate 15) and AS12 (Plate 16) were located on the surface of heavily eroded B horizon soils on opposite sides of Saddlers Creek; AS11 on the west and AS12 on the east. Both sites were located on a hillside covered in rills. AS11 included 15 mudstone flakes, four silcrete flakes, four quartz flakes and two chert flakes. AS12 included six mudstone flakes, one mudstone core and one silcrete flake.

Site AS13 (Plate 17) was located on an old farm track less than 100 m east of the coal conveyor and approximately 200 m to the south of AS14. The area had poor GSV and exposure due to the presence of tall grass, shrubs and eucalypt trees. AS13 comprised four silcrete flakes, two quartz flakes, one quartz core, two mudstone flakes and one mudstone core.

AS14 (Plate 18) was situated on an old farm track immediately to the east of the coal conveyor, at a break in slope. Vegetation was predominantly thick grasses with tall shrubs and trees. Visibility was limited due to the overgrown grass. The site was divided into three loci. Locus 1 was composed of five mudstone flakes, three silcrete flakes, one quartz flake, one quartz core and one chert flake. Locus 2 consisted of two quartz flakes and Locus 3 included five silcrete flakes, one silcrete core, one mudstone flake and one mudstone core.

IF60 (Plate 19) was situated in an erosion scour on the western bank of Saddlers Creek with a south east facing aspect. The area was vegetated predominantly by grasses with some young stands of trees nearby. The site consisted of a single tuff flake.

Site cards were generated for these eight new artefact sites: AS8, AS9, AS10, AS11, AS12, AS13, AS14 and IF60 and the site cards submitted to the OEH for inclusion on the AHIMS database.

Survey Unit 4 – Proposed Open Cut Extension B

The survey unit was situated to the south of Denman Road and was bisected along the eastern section by Edderton Road in the rolling hills north west of Mount Arthur. On the western side of Edderton Road, Survey Unit 4 comprised a generally north east facing mid and lower sloped area above a first order creekline which was an unnamed tributary of Whites Creek. A number of other low order tributaries traverse the survey unit. The part of the survey unit on the eastern side of Edderton Road was characterised by a low lying saddle and adjacent gently to moderately sloping area above an ephemeral drainage line.

This entire area had been subject to previous farming practices which included fencing, dam construction works, land clearing, erosion control works, access tracks and the grazing of livestock. In particular the eastern side of Edderton Road had high levels of disturbance from vehicles, fencing works and the placement of an electricity easement running north south through the Modification area. Such disturbances caused the extensive removal of top soils throughout the area. Exposures were predominantly erosion scalds in the mid slope region, and erosion scours in the lower sloped areas close to the drainage lines. Sheet wash and water runoff were extensive throughout the survey unit, although regrowth was evident across the paddocks which had helped to stabilise the exposed B horizon soils. In spite of extensive land clearing there were a number of larger trees which were inspected for evidence of cultural scarring. No trees considered to be culturally modified were observed in Survey Unit 4. Vegetation was predominantly pasture grasses and small copses of young casuarina trees.

Numerous sites had previously been registered in or near the area, most of which were recorded in 1999 by South East Archaeology Pty Ltd. These were groundtruthed where possible, and any new loci recorded and the additional information was submitted to the OEH for inclusion on the AHIMS database. There were a large number of new and previously recorded artefact sites identified in this survey unit (shown in Figure 6-5).

Survey was also undertaken to the west of Edderton Road, in the central paddock. The area consisted of a simple slope above an ephemeral drainage line with a generally north east facing aspect. During the 1999 survey work undertaken by South East Archaeology Pty Ltd, an extensive site was recorded in Survey Unit 4, AHIMS Site #37-2-1839. This site was recorded as having a total of 109 artefacts spread across eight separate loci distributed across a simple slope. Groundtruthing of the area showed that the landform was a low lying extended spur between two drainage lines. These eight loci were distributed throughout the paddock and continued north into the next paddock. The artefacts were recorded on the site card as being predominantly flakes and flake portions with cores and flaked pieces also present.

WARNING
No part of this plan should be used for critical design dimensions. Confirmation of critical locations should be obtained from RPS Newcastle.

Legend

- Proposed Open Cut Extension A
- Proposed Open Cut Extension B
- Proposed Overburden Emplacement
- Proposed Rail Loop Duplication
- 10m Contour
- Drainage

RPS Loci

- 37-2-1623
- 37-2-1624
- 37-2-1630
- 37-2-1678
- 37-2-1839
- AS20
- AS21
- AS22
- AS23
- AS24
- AS25
- AS36
- AS52
- IF35
- IF8
- PAD A

AHIMS Sites

- 37-2-0118
- 37-2-0132
- 37-2-0490
- 37-2-1622
- 37-2-1623
- 37-2-1624
- 37-2-1629
- 37-2-1630
- 37-2-1672
- 37-2-1673
- 37-2-1674
- 37-2-1675
- 37-2-1676
- 37-2-1677
- 37-2-1678
- 37-2-1839
- 37-2-1549

South East Archaeology Loci

- 37-2-1549
- 37-2-1622
- 37-2-1623
- 37-2-1624
- 37-2-1629
- 37-2-1630
- 37-2-1672
- 37-2-1673
- 37-2-1674
- 37-2-1676
- 37-2-1677
- 37-2-1678
- 37-2-1839

N

EDDERTON RD

0 0.5 1km

SCALE : 1: 4,500 AT A3 SIZE

Legend
Survey Units
- SU4

TITLE: FIGURE 6-5: SURVEY UNIT 4
PROPOSED OPEN CUT EXTENSION

LOCATION: MT ARTHUR COAL MINE

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 4/12/2012
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Mapping Database\MapInfo Work...\110833-1\Report Figures
VERSION (PLAN BY): D A3 (GG-AB-NW)

CLIENT: BHP
JOB REF: 110833-1

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Within the area surveyed there were a number of new sites recorded including eight artefact scatters, three isolated finds and a PAD. A number of sites were identified which were within previously recorded loci of AHIMS Site #37-2-1839 or were extensions of such loci.

The first artefact scatter identified, AS2GG, consisted of artefacts in four adjacent erosion scalds within 50 m of each other (Plate 20). The site was characterised by thick pasture grasses and areas of erosion scalds in which the artefacts were identified on the surface of B horizon soils. Artefacts identified at this site included 12 silcrete flakes, two silcrete cores and one quartzite flake. It was determined that AS2GG was situated wholly within a previously recorded locus of AHIMS Site #37-2-1839.

AS3GG was situated on exposed B horizon soils with some redeposited A horizon (Plate 21). Visibility at the site was limited by grass cover, although a large ant's nest provided good ground surface exposure. Artefacts identified included four silcrete flakes, one silcrete core and one mudstone flake. It was determined that AS3GG was located within the same previously identified locus as AS2GG, a part of site AHIMS Site #37-2-1839.

Artefact scatter site AS4GG was identified in a small erosion scour near several large eucalypts (Plate 22). It included a pink chert flake and a yellow silcrete flake. Long pasture grasses were present all around, limiting ground surface exposure to an area of 2 m². It was considered that AS4GG was a small additional locus of site AHIMS Site #37-2-1839.

The location of AS5 was characterised by long pasture grasses with the only ground surface exposure being on and around an ant's nest (Plate 23). Artefacts identified included 11 silcrete flakes and one mudstone flake. Site AS5 was considered to form an additional locus of AHIMS Site #37-2-1839.

AS6 was located along a contour bank near an old house site (Plate 24). The artefacts lay on the surface of eroded soils surrounded by grasses with one mature tree nearby. The ground surface exposure ranged from approximately 50% up to 90%. The site comprised seven silcrete flakes, six silcrete cores, one tuff flake and one petrified wood core. AS6 was considered to be an extension of an existing locus which covered the same contour bank but on the northern side of the fence line. As such, AS6 forms a part of the site AHIMS Site #37-2-1839. The site was considered to be of interest due to the presence of red silcrete cobbles observed eroding out of the B horizon soils, suggesting that the area may have been a procurement site.

AS7 was positioned, along another eroded contour bank on a gentle lower slope above the creek line, south west of AS50 (Plate 25). The artefacts were distributed almost continuously for approximately 100 m with visibility up to 70%, limited in areas by the presence of grass. AS7 was composed of silcrete artefacts including 39 flakes, 17 cores, a core scraper and a flake scraper. As with AS6, site AS7 was an extension of a previously recorded locus of AHIMS Site #37-2-1839.

Site IF7b, a pink silcrete flake, was situated on a small erosion scald amongst thick pasture grasses. IF7b was considered to form an additional locus of AHIMS Site #37-2-1839 (Plate 26).

In addition to these newly identified loci (and extensions to loci) of the previously recorded AHIMS Site #37-2-1839, further groundtruthing was undertaken at the DGPS point provided on the site card for AHIMS Site #37-2-1839, where several artefacts were identified, including two silcrete flakes and one mudstone flake. These artefacts were identified on a large erosion scour adjacent to the southern fence of the paddock.

Two new sites were also identified. One was an isolated find near an ephemeral drainage line. Site IF8, a mudstone flake, was situated on a small erosion scald on a completely overgrown farm track, just inside the western Modification area boundary (Plate 27).

The second site was an artefact scatter with potential for subsurface archaeological deposit (PAD A) (Plate 28). The artefacts identified on the surface included a large number of silcrete flakes and cores eroding out of the soil. The site was vegetated by young casuarinas and marked by a large dead eucalyptus tree. Subsurface disturbances appeared to have been minimal and many artefacts remained partially buried. It was determined that the site should be recorded as a PAD, as it was evident that an *in situ* deposit was likely to exist subsurface.

Previously recorded AHIMS Site #37-2-0132, registered in 1981, was groundtruthed. The artefact scatter was recorded as being situated in an eroded gully on open grazing land, above a small dam. It consisted of two chert flakes and two chert cores. Unfortunately due to limited visibility resulting from long grasses the site could not be identified during the survey.

Previously recorded AHIMS Sites #37-2-1622, #37-2-1674, #37-2-1675 and 37-2-1676 were all situated along the eastern boundary of the survey unit and were associated with the drainage line. AHIMS Site #37-2-1622 was described as 13 artefacts located in five separate loci including flaked pieces, flake portions, flakes and a core, manufactured from silcrete. AHIMS Site #37-2-1674 was a single microblade portion made of tuff. A total of six artefacts in one locus were identified at AHIMS Site #37-2-1675, including microblade portions, flakes and flake portions, manufactured from silcrete. AHIMS Site #37-2-1676 consisted of three artefacts in a single locus, including cores and a flaked piece of silcrete, tuff and chert. Unfortunately due to the vegetation cover, the sites could not be groundtruthed.

The area adjacent to that previously surveyed was the southernmost part of Survey Unit 4 on the western side of Edderton Road and it was surveyed in rainy conditions. This area contained another locus of site AHIMS Site #37-2-1839. An extension to this locus was recorded and six new artefact scatters were identified. AHIMS Site #37-2-1677, AHIMS Site #37-2-0118 and AHIMS Site #37-2-1623 were also groundtruthed, with an additional locus identified for AHIMS Site #37-2-1623.

AS20 was located on north east facing slope to the west of a low order tributary of Whites Creek (Plate 29). The artefact scatter was predominantly on the surface of B horizon soils but visibility was limited by pasture grasses. Artefacts identified at the site included eight silcrete flakes and two mudstone flakes, separated into two loci. The artefacts were located on an ants nest and on the surface of an erosion scour. It appeared that the artefacts may have been eroding out of the soils immediately to the west of the erosion scald and as such an *in situ* deposit may exist subsurface.

AS21 was located on a north east facing mid-bank with artefacts scattered almost continuously across an area of approximately 120 m and was made up of six loci (Plate 30). These loci extended along a terrace area above a break in slope. Locus 1 had six silcrete flakes; Locus 2 had one silcrete flake; Locus 3 had three silcrete flakes and one mudstone flake; Locus 4 had two silcrete flakes; Locus 5 had only one artefact which was a quartz flake; Locus 6 comprised one heated chert flake with 40% cortex and one large yellow silcrete flake scraper. The extended artefact scatter was situated approximately 80 m from the ephemeral drainage line to the east. It appeared that the artefacts may have been eroding out of the soils immediately to the west of the erosion scald and as such an *in situ* deposit may exist subsurface.

AS22 was made up of two loci (Plate 31). The artefact scatter was situated on the surface of the B Horizon soils. Locus 1 was made up of seven silcrete flakes, two silcrete angular fragments and two mudstone flakes. Locus 2 contained two silcrete flakes, two silcrete cores, one mudstone flake and one petrified wood flake. It appeared that the artefacts may have been eroding out of the soils immediately to the west of the erosion scald and as such an *in situ* deposit may exist subsurface.

AS23 was on an east facing slope and was a yellow mudstone flake scraper with retouch and a silcrete flake (Plate 32). A first order ephemeral drainage line was located more than 150 m down slope to the east of

AS23. It appeared that the artefacts may have been eroding out of the soils immediately to the west of the erosion scald and as such an *in situ* deposit may exist subsurface.

AS24 was a small artefact scatter of three artefacts, all silcrete flakes (Plate 33). The slope was gently inclined to the north east and the scatter was located directly to the south of AS25. The artefact scatter was located 130 m to the west of a first order ephemeral stream. It appeared that the artefacts may have been eroding out of the soils immediately to the west of the erosion scald and as such an *in situ* deposit may exist subsurface.

AS25 was an artefact scatter of approximately 31 artefacts in a single locus (Plate 34). The site extends for approximately 60 m along a north east facing slope and is more than 300 m to the west of an ephemeral drainage line. It includes several ants' nests distributed across an erosion scour caused by sheet wash erosion. The artefacts were located on the surface of clayey B horizon soils and included 18 silcrete flakes, eight silcrete flake scrapers, four silcrete cores and one petrified wood flake scraper. It appeared that the artefacts may have been eroding out of the soils immediately to the west of the erosion scald and as such an *in situ* deposit may exist subsurface.

AS26, numbering four artefacts, was located on a gently inclined north east facing slope (Plate 35). The scatter was situated on a disused farm track adjacent to a fence running east to west and is approximately 400 m west of a first order ephemeral drainage line. The site was situated in an eroded area that was subject to water runoff and artefacts were found on the surface of the clayey B horizon soils. This artefact scatter lay to the north west of AS25. Artefacts identified included a mudstone flake, silcrete flakes and a yellow silcrete flake scraper with retouch. As discussed above, during the 1999 survey work undertaken by South East Archaeology Pty Ltd, an extensive site was recorded in this survey unit, AHIMS Site #37-2-1839. It was determined that AS26 was an extension to a pre-existing locus recorded as part of AHIMS Site #37-2-1839 on an extended spur between two drainage lines.

AHIMS Site #37-2-1677 was recorded as 100 artefacts distributed across six separate loci. This site was situated in a drainage line with the total site area totalling 15,400 m². Artefacts were listed as flaked pieces, core fragments, flakes, flake portions, microblades and microblade portions, all manufactured from silcrete. Due to vegetation cover and the boggy ground, the extent of the site could not be identified during the survey.

AHIMS Site #37-2-1623 was recorded as 100 artefacts separated into six loci within an area totalling 27,100 m². The landform was described as a simple slope with a north facing aspect, less than 50 m from a drainage line. The artefact types recorded included flake portions, flakes and flake pieces. Material types identified were silcrete and tuff.

AS27 was recorded as an additional locus of AHIMS Site #37-2-1623 and contained a number of artefacts including flakes and cores made of silcrete. The scatter was situated in an erosion scour on the western bank of the drainage line.

Scarring on a nearby tree was inspected but was considered not to be a culturally modified tree by the ACS present. It was considered that the scarring was more characteristic of a torn limb having occurred sometime in the past.

On the eastern side of Edderton Road, two sites were found to be associated with AHIMS Site #37-2-1678, two with AHIMS Site #37-2-1624 and three with AHIMS Site #37-2-1623. Although two loci of AHIMS #37-2-1549 had been identified previously on the eastern side of Edderton Road due to the extremely long grass the artefacts were not visible.

On the western side of Edderton Road, five artefact scatters and one isolated find were recorded in the northernmost section. As expected due to the nature of the site recording, four of these sites were found to be associated with AHIMS #37-2-1839. One was found to be associated with #37-2-1630. Groundtruthing was also undertaken unsuccessfully at a further five sites on the western side of Edderton Road, AHIMS Sites #37-2-0271, #37-2-0490, #37-2-1673, #37-2-1629 and #37-2-1672.

Mt Arthur Coal RPS IF31 was located in a wooded area between two fences, adjacent to and east of Edderton Rd (Plate 36). The artefact was a silcrete flake. The small exposure where the artefact was identified revealed loamy A horizon soils. Visibility was generally very limited by the grass and screen of young trees including casuarinas and eucalypts which had been planted along the road side.

AHIMS #37-2-1678 was described on the site card as a total of 88 artefacts located within six separate loci across a landform totalling approximately 1.44 km² in area. The site was situated on a simple slope with a north facing aspect. Artefacts recorded were flakes, flake portions, flaked pieces, lithic fragments, microblade cores and microblade portions. Stone materials were silcrete and tuff.

AS33 was situated on a simple slope along an old farm track with areas of exposed ground surface showing shallow A horizon soils on B horizon clays (Plate 37). There were also several ants' nests along the track. The slope had a generally north aspect, with the scatter and associated track transecting the slope east to west. The scatter included two artefacts, a red silcrete flake and a red mudstone flake. IF34 was approximately 45 m from AS33 on the same track (Plate 38). The artefact was a quartz flake. It was considered that AS33 and IF34 formed two additional loci within AHIMS #37-2-1678.

IF35 was located on an ant's nest situated on a break in slope with a north east aspect. Visibility was limited to eroded areas on a disused farm track. The isolated find was a red mudstone flake. The site was adjacent to a dirt access road.

AS36 was located approximately 60 m from IF35, on a gently to moderately sloping hillside (Plate 39). The artefacts were on the surface of an ants nest which formed part of an erosion scar remaining along a disused farm track. Vegetation in the area was generally limited to long pasture grasses and weeds. Artefacts identified at AS36 included a silcrete flake and a silcrete flake fragment. This site was located adjacent to a dirt access road.

AHIMS #37-2-1624 was recorded as being on a ridge crest. Ten artefacts were recorded within one locus over a total area of 5,600 m². Artefact types were predominantly flake portions manufactured from silcrete and tuff.

AHIMS #37-2-0490 was recorded as an artefact scatter situated in a moderately sloping hilltop in grassland. This site was recorded in the AHIMS extensive search as having the same co-ordinates as #37-2-0271, which was described on the site card as situated on a moderate slope with an easterly aspect west of a creek and also on the flat beside the creek. It is unclear whether the sites are in fact the same or if the co-ordinates of one have been recorded inaccurately.

AS37 was positioned on an erosion scald which is part of a series of scalds traversing a south facing slope (Plate 40). The site was on the outer edge of the Modification area. Vegetation in the general area consisted of grasses and weeds with previous extensive tree clearing. While visibility was excellent in the eroded areas, visibility amongst the grasses was near nil. The artefacts identified at the site include ten silcrete flakes, one silcrete angular fragment, four mudstone flakes, two petrified wood angular fragments and a basalt flake. It was determined that AS37 formed an additional locus of AHIMS #37-2-1624. AHIMS #37-2-0490 and #37-2-0271 were also noted within 200 m of AS37.

AS38 was located on the edge of an erosion scour, approximately 100 m to the south of AS37 (Plate 41). The vegetation comprised long pasture grasses and weeds, effectively limiting visibility solely to eroded areas where the ground surface was exposed. The site contained two mudstone flakes and one basalt flake. It was determined that, as with AS37, the site formed an additional locus of #37-2-1624.

AHIMS #37-2-1623, as described previously, was recorded as 100 artefacts separated into six loci within an area totalling 27,100 m². The landform was described as a simple slope with a north facing aspect, less than 50 m from a drainage line. The artefact types recorded included flake portions, flakes and flake pieces. Raw materials identified were silcrete and tuff. In addition to the locus identified previously; a further three loci were identified on the eastern side of Edderton Road.

AS39 consisted of two silcrete flakes, one quartz flake and one basalt flake (Plate 42). The GSV and exposure were high as the area held a large erosion scour. The vegetation was predominantly pasture grasses with some small shrubs and trees also present. AS39 was considered to be an additional locus of AHIMS #37-2-1623.

AS40 was located on an erosion scour and is approximately 50 m from AS39 (Plate 43). The sites are situated in the same lower slope area approximately 40 m east of the ephemeral drainage line which runs through the study area. GSV and exposure were limited by thick pasture grasses. The site contained three silcrete flakes and one chert flake. AS40 was considered to be an additional locus of #37-2-1623.

IF41 was located in a paddock on a lower slope approximately 80 m east of the ephemeral drainage line and 30 m south west of a dam (Plate 44). Soils were generally shallow A horizon loamy soils. Vegetation was mostly pasture grasses and weeds, with some young trees and small shrubs. The artefact, a chert flake, was located on very gently sloping to level ground with an overall westerly aspect. The isolated find was considered to be an additional locus of site #37-2-1623.

As discussed above, during the 1999 survey work undertaken by South East Archaeology Pty Ltd, an extensive site was recorded in this survey unit, AHIMS #37-2-1839. AS50 was located along a contour bank which was largely eroded due to water runoff (Plate 45).

The contour bank was situated between two ephemeral drainage lines. Vegetation in the area included pasture grasses and noxious weeds and soils were generally B horizon clays with shallow re-deposited A horizon soils. The scatter included approximately 50 silcrete flakes, 29 silcrete cores, three silcrete scrapers, two mudstone cylcons and one quartzite flake. AS50 is considered to be an extension of a previously recorded locus of site AHIMS #37-2-1839.

AHIMS #37-2-1630 was also previously registered within Survey Unit 4. It was originally described on the site card as an isolated find within a single locus, situated in a drainage line. The artefact was a silcrete flake portion. AS51 was located to the west of AS50 on the walls of a dam and associated with a drainage line (Plate 46). The scatter was identified on the exposed B horizon clays around the dam. The site consisted of four silcrete scrapers and one silcrete core. AS51 is considered to form an additional locus of site #37-2-1630, as it was situated within the same drainage depression.

AS52 was located to the west of AS50 and AS51, on the opposite side of the westernmost drainage line (Plate 47). It comprised one large silcrete flake and one large silcrete core. The area was vegetated by grass and visibility was limited. AS52 was considered to be a new site, despite its proximity to AS50, AS51 and AS53, as it was situated on a different landform from all three.

AS53 was located to the north of AS51, on the same slope as AS50 and also on a contour bank (Plate 48). The area was vegetated by long grasses and weeds, although the contour bank had large tracts of exposed B horizon soils exposed due to erosion control works and water runoff. Artefacts identified at the site

included four silcrete flakes and one silcrete core scraper. It was considered that AS53 formed an additional locus of AHIMS #37-2-1839.

AS55 was positioned to the south west of AS7, between two contour banks. The artefact identified was a silcrete flake scraper and was situated in long grass (Plate 49). The site was situated on the same landform as AS50 and AS53 and as such was considered to form an additional locus of site #37-2-1839.

Another three previously registered sites were situated in the area surveyed, AHIMS Sites #37-2-1673, #37-2-1629 and #37-2-1672. AHIMS Site #37-2-1673 was recorded as six artefacts within one locus in a drainage depression, the landform having a total area of 4,500 m². Artefact types were most commonly flake portions, with flaked pieces and a core fragment also identified, all manufactured from tuff. Due to thick vegetation in the drainage line, the site could not be re-identified. AHIMS #37-2-1629 was situated on a flat area above a drainage line, with a north facing aspect. Four artefacts were originally recorded in a single locus in a total site area of 41,100 m². The artefacts were recorded as flake portions, a flaked piece and a flake, all manufactured from silcrete. Due to thick vegetation in the drainage line, the site could not be re-identified.

Site #37-2-1672 was described as a simple slope with a north west facing aspect, with an area totalling 52,800 m². The artefacts identified at the site numbered 18 and included flakes, core and flake portions, all of silcrete. Due to thick vegetation in the drainage line, the site could not be re-identified.

6.3 Survey Results

6.3.1 Aboriginal Sites and Archaeological Sensitivity

During the course of the April 2012 field surveys, the previously identified sites were groundtruthed and new sites were identified. While there were some sites which could not be re-identified, most were re-identified and found to be more extensive than previously recorded. This would most likely be a result of the effects of erosion processes. A number of sites were located on or very close to disused and used vehicle access ways. The majority of artefact sites in the area were on the surface of the B horizon soils and had been affected by sheet wash erosion, trampling by cattle and disturbed by the passage of vehicles. The area had also been heavily disturbed by previous farming practices. Most sites were found in close proximity to freshwater resources.

The Modification area was characterised by several different landforms. Survey Unit 1 comprised rolling low hills intersected by two tributaries of the nearby Ramrod Creek and a modified landform associated the building and use of the rail line and rail loop areas. Disturbances in Survey Unit 1 included the installation of the rail line and loop, the loading facilities, use of the area by vehicles and general tree vegetation clearing.

Survey Unit 2 included the moderate to steep mid slopes and steep to very steep upper slopes of Mount Arthur. In general disturbances were limited to tree clearing on the mid-slopes, fencing, dam construction works and vehicle tracks.

Survey Unit 3 consisted of a steeply incised valley and the creek banks of Saddlers Creek to the east of the Mount Arthur slopes. Large tracts of this landform have been modified as a result of mine works, although the survey unit itself was generally intact with surface disturbances including tree clearing, erosion, fencing and vehicle use.

Survey Unit 4 was the largest of the survey units and incorporated the rolling hills north west of Mount Arthur on both the east and west sides of a minor creek. The area showed evidence of disturbance associated with farm practices such as land clearing, dam construction works, fencing and slashing; vehicle use and; erosion

control works. Artefact sites in all survey units were most commonly situated on level to gently sloping lower slopes associated with creek lines.

Sites identified in the survey area are listed in Table 6-4 below.

Table 6-4: Summary of Sites, Locations Recorded in the Survey Area during the Field Surveys (GDA94/MGA, Zone 56)

AHIMS Site ID	Site Name	New Locus*	Zone 56 AGD/GDA	Eastings	Northings	Site Type	Survey Unit
37-2-0099	The Pimple; Drayton 2	-	AGD	300859	6416850	Artefact scatter	3
37-2-0118	Fairford 2	-	AGD	294840	6420762	Artefact scatter	4
37-2-0132	Fairford 6	-	AGD	294373	6421302	Artefact scatter	4
37-5-0271	Saltwater Creek 78	-	AGD	295200	6419800	Artefact scatter	4
37-5-0490	MAN91	-	AGD	295200	6419800	Artefact scatter	4
37-2-1549	CC2		AGD	295000	6422000	Artefact scatter	4
37-2-1590	CC81	-	GDA	299156	6417328	Isolated find	2
37-5-1622	LS1	-	AGD	294700	6421300	Artefact scatter	4
37-5-1629	MB1	-	AGD	294200	6422100	Artefact scatter	4
37-2-1672	PK1	-	AGD	294500	6422200	Artefact scatter	4
37-2-1673	PK2	-	AGD	294650	6421700	Artefact scatter	4
37-2-1674	PK3	-	AGD	294710	6421500	Artefact scatter	4
37-2-1675	PK4	-	AGD	294750	6421200	Artefact scatter	4
37-2-1676	PK6	-	AGD	294800	6420950	Artefact scatter	4
37-2-1677	PK7	-	AGD	294800	6420600	Artefact scatter	4
37-2-2334	Saddlers S4	-	GDA	301186	6416909	PAD	3
37-2-1821	RP82	AS1	GDA	301906	6420970	Artefact scatter	1
37-2-1822	RP84	-	AGD	301850	6420850	Artefact scatter	1
37-2-1823	RP86	AS2	GDA	301662	6421062	Artefact scatter	1
37-2-1824	RP94	AS3	GDA	302157	6420676	Artefact scatter	1
37-2-1825	RP98	AS4	GDA	302156	6420684	Artefact scatter	1
37-2-1825	RP98	IF1	GDA	302014	6420877	Isolated find	1
New site	IF2GG	-	GDA	297279	6417958	Isolated find	2
New site	IF3GG	-	GDA	297339	6417911	Isolated find	2
New site	IF2b	-	GDA	297751	6417908	Isolated find	2
New site	IF3b	-	GDA	297588	6417905	Isolated find	2
New site	IF4b	-	GDA	297578	6417868	Isolated find	2
New site	IF5b	-	GDA	298163	6417916	Isolated find	2
New site	IF6b	-	GDA	298095	6417939	Isolated find	2
37-2-1839	CC1	AS2GG	GDA	294510	6421407	Artefact scatter	4
37-2-1839	CC1	AS3GG	GDA	294539	6421269	Artefact scatter	4
37-2-1839	CC1	AS4GG	GDA	294731	6421307	Isolated find	4
37-2-1839	CC1	AS5	GDA	294407	6421331	Artefact scatter	4
37-2-1839	CC1	AS6	GDA	294700	6421445	Artefact scatter	4

AHIMS Site ID	Site Name	New Locus*	Zone 56 AGD/GDA	Eastings	Northings	Site Type	Survey Unit
37-2-1839	CC1	AS7	GDA	294696	6421617	Artefact scatter	4
37-2-1839	CC1	IF7b	GDA	294464	6421281	Isolated find	4
37-2-1839	CC1	AS26	GDA	294446	6421201	Artefact scatter	4
37-2-1839	CC1	AS50	GDA	294639	6421752	Artefact scatter	4
37-2-1839	CC1	AS53	GDA	294414	6421970	Artefact scatter	4
37-2-1839	CC1	AS55	GDA	294513	6421650	Artefact scatter	4
New site	IF8	-	GDA	294522	6421673	Isolated find	4
New site	PAD A	-	GDA	294425	6421540	PAD with artefact scatter	4
New site	AS8	-	GDA	301221	6416448	Artefact scatter	3
New site	AS9	-	GDA	301132	6416502	Artefact scatter	3
New site	AS10	-	GDA	301008	6416721	Artefact scatter	3
New site	AS11	-	GDA	301002	6416548	Artefact scatter	3
New site	AS12	-	GDA	301033	6416559	Artefact scatter	3
New site	AS13	-	GDA	300965	6416638	Artefact scatter	3
New site	AS14	-	GDA	300956	6416736	Artefact scatter	3
New site	IF15	-	GDA	297840	6418238	Isolated find	2
New site	AS20	-	GDA	294699	6420819	Artefact scatter	4
New site	AS21	-	GDA	294906	6420593	Artefact scatter	4
New site	AS22	-	GDA	294862	6420747	Artefact scatter	4
New site	AS23	-	GDA	294636	6420921	Artefact scatter	4
New site	AS24	-	GDA	294560	6421077	Artefact scatter	4
New site	AS25	-	GDA	294566	6421141	Artefact scatter	4
New site	IF31	-	GDA	295047	6420943	Isolated find	4
37-2-1678	PK8	AS33	GDA	295272	6420338	Artefact scatter	4
37-2-1678	PK8	IF34	GDA	295321	6420345	Isolated find	4
New site	IF35	-	GDA	295342	6420052	Isolated find	4
New site	AS36	-	GDA	295384	6420006	Artefact scatter	4
37-2-1624	LS7	AS37	GDA	295392	6419905	Artefact scatter	4
37-2-1624	LS7	AS38	GDA	295350	6419927	Artefact scatter	4
37-2-1623	LS5	AS27	GDA	294978	6420571	Artefact scatter	4
37-2-1623	LS5	AS39	GDA	295028	6420425	Artefact scatter	4
37-2-1623	LS5	AS40	GDA	295044	6420485	Artefact scatter	4
37-2-1623	LS5	IF41	GDA	295090	6420524	Isolated find	4
37-2-1630	MB2	AS51	GDA	294379	6421830	Artefact scatter	4
New site	AS52	-	GDA	294316	6421940	Artefact scatter	4
New site	IF60	-	GDA	301069	6416892	Artefact scatter	3

* South East Archaeology initially recorded Aboriginal sites encompassing a number of locations which contained artefacts. They called these locations loci (singular locus). Recent surveys by RPS have identified additional loci associated with the previously recorded South East Archaeology sites and are shown in column three of above table.

6.4 Discussion of Survey Results

Review of previous archaeological investigations in the region of the Modification area and Aboriginal site predictive modelling were used to interpret the regional archaeological record. The analysis of this data indicated that artefact scatters and isolated finds were the most likely site types to be present in the Modification area.

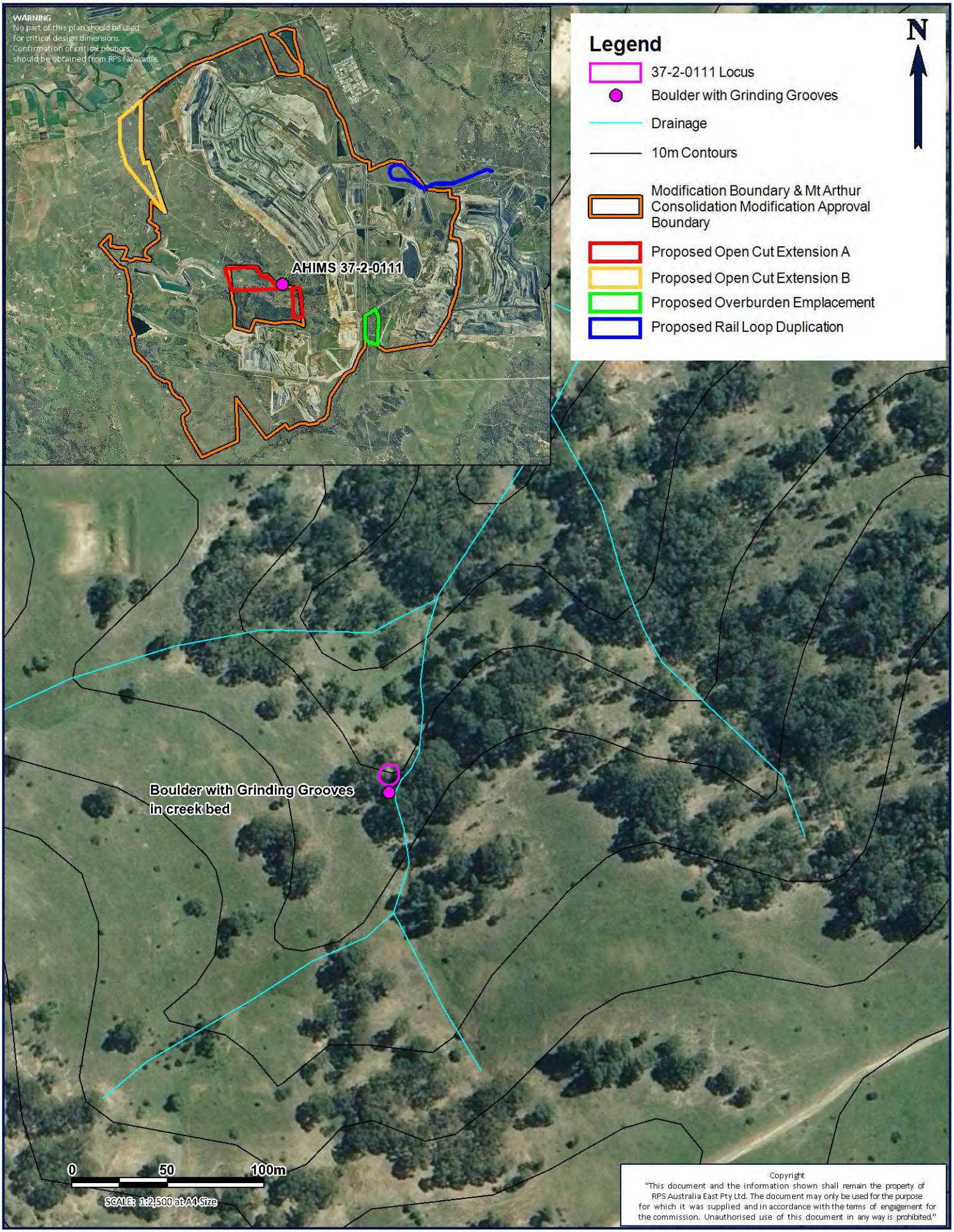
Research conducted for the Muswellbrook area prior to the field survey found that the area was rich in stone artefact sites, with previous archaeological information indicating that the dominant raw materials were mudstone and silcrete with minor occurrences of quartz, quartzite, basalt, chert, tuff, sandstone and felsic volcanics. This research also found that stone artefact sites were generally most likely to occur on level to very gently inclined lower slopes, in valley flats and within 50 m of high order streams. Other landforms with potential to contain artefacts included the crests of small hills and saddles.

Consideration of the existing land modifications in the Modification area and the results of the previous field surveys illustrated that the predicted connection between an artefact and its environment had been compromised in the highly disturbed parts of the Modification area such as tilled paddocks, dams, contour banks, easements and formed dirt tracks.

During the inspection of Survey Unit 4, it was determined that intact deposits may be present at PAD A, which appeared to have a small area of largely undisturbed soils with *in situ* deposit. The site contained a high density of surface artefacts and a number of artefacts could be seen eroding from the subsurface soils.

One grinding groove site, AHIMS #37-2-0111 (Plate 50), consisting of two grinding grooves, occurs within the study area for the Modification. The site was originally identified by Dyall (1981) and re-recorded during the AECOM (2009a) surveys for the Consolidation Project. The site is located within the approved Consolidation Project disturbance area; however, the site was proposed to be conserved as part of the Consolidation Project. The extension of the open cut pit for the Modification would disturb this site (Figure 6-6).

No culturally modified trees or rock shelters were identified in any of the survey units. The likelihood of locating modified trees was greatly reduced by the extensive vegetation clearing carried out in the past; however, all mature trees within the current Modification area were inspected although no cultural scars were identified. Upon inspection it was found that the majority of the sandstone sheets and boulders found in the Modification area, particularly the upper slopes of Survey Unit 2 at Mount Arthur, were of friable sandstone which would have been unsuitable for use in the manufacture and maintenance of stone tools. All creek beds and banks were inspected for evidence of grinding grooves but no new sites were identified during the course of the survey.



TITLE: FIGURE 6-6: GRINDING GROOVE LOCATION

LOCATION: MT ARTHUR COAL MINE

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 4/12/2012
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Mt Arthur Muswellbrook\Mt Arthur Mapping Database\MapInfo Workspaces\110833-1\Report Figures
VERSION (PLAN BY)B A4 (GG-NW)

CLIENT: BHP
JOB REF: 110833-1

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RPS

7 Significance Assessment

In order to develop appropriate heritage management outcomes, it is necessary for the significance of Aboriginal sites or areas of archaeological sensitivity to be assessed. Aboriginal heritage can be significant for cultural and/or scientific reasons. Aboriginal people are the best placed to assess cultural significance and are therefore consulted in the Aboriginal heritage management process. Scientific significance is assessed according to scientific criteria outlined in the OEH heritage guidelines.

7.1 Cultural Significance Criteria and Assessment

An assessment of cultural significance incorporates a range of values which may vary for different individual groups, and may relate to both the natural and cultural characteristics of places or sites. Cultural significance and Aboriginal cultural views can only be determined by the Aboriginal community using their own knowledge of the sites and their own value system.

Verbal comment by the majority of the ACS group representatives during the course of the field survey was that the Hunter Valley region is culturally significant to them. The following additional comments were received during the course of the consultation process:

- Tocomwall stated verbally that they were opposed to expansion of the mine as the area was culturally significant.
- The Lower Hunter Wonnarua Council Incorporated also stated in written response that the area is highly significant to the Wonnarua people.
- Jarban and Mugrebea suggested “a reconciliation approach to protect and preserve sites for future education of not only Aboriginal generations to come but also the wider community”.
- The WLALC noted that the Modification area is in close proximity to the song line with Mount Arthur as one of the guiding markers and that this area was the cross roads for travelling routes to the surrounding regions such as the Sydney Basin, Western Plains, the Northern Tablelands and possibly the Lithgow region. They also considered that it was in easy walking distance to a number of known ceremonial areas and that the area was well resourced in terms of food and water.

Additionally, it is understood that from 1826 onwards there had been a number of conflicts between Aboriginal people and early settlers in the region. A copy of written correspondence received is included in Appendix 2.

As the cultural significance is a criterion that only Aboriginal people can assess, a detailed appraisal of cultural significance for the Modification area has not been included as part of this study. However, response and comment on the Modification area was discussed with Aboriginal representatives during the April 2012 survey. The ACS present during the survey work stated that the artefact sites were of cultural significance in relation to other sites in the Mt Arthur Coal Mine area, particularly around Saddlers and Whites Creeks, but that they did not consider that the parts of the slopes of Mount Arthur within the Modification area had any additional specific cultural heritage significance. Due to the steepness of the slopes in this area it was considered less suitable for permanent occupation than those areas that were gently sloping and close to permanent water.

The ACS indicated that they were satisfied with the extent of the survey, the groundtruthing of the previously identified sites and the methodology used to record newly identified sites. In addition they expressed their wishes that any Aboriginal objects such as artefact scatters or isolated finds that might be at risk of harm from vehicles be protected with temporary barriers. It was also stated that all artefact sites within any proposed impact zones in the Modification area be salvaged prior to the commencement of such works. It was also requested that in addition to surface salvage works, subsurface investigation be undertaken in areas determined to have potential for *in situ* deposit to exist which were identified as PAD A, and the creek bank area near to AS20 to AS25 on the western bank of the tributary of Fairford Creek (refer Figure 6-5).

Artefacts salvaged from the Mt Arthur Coal Mine are to be stored in a designated Keeping Place which is proposed to be established in the TMDOA, as specified in the AHMP (BHP Billiton 2012) (or other location determined in consultation with ACS group representatives).

Further comments on social, historic association and aesthetic values will be included in the report following comments received from the Aboriginal community. They will also be included in the Aboriginal consultation log (refer Appendix 3) in the final report.

7.2 Archaeological Significance Criteria

Archaeological significance, also referred to as scientific significance, is determined by assessing an Aboriginal heritage area, site or object according to archaeological criteria. The assessment of scientific significance is used to develop appropriate heritage management and impact mitigation strategies. Criteria for archaeological significance have been developed in accordance with the principals of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (the Code of Practice) (DECCW 2010b), managed by the OEH. The Code of Practice (DECCW 2010b) requires significance assessment in accordance with the processes set out in The Burra Charter (Australia ICOMOS 1999).

Heritage significance is assessed according to the principals outlined in The Burra Charter (1999) and the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011). The Burra Charter is published by the Australian National Committee of the ICOMOS. In The Burra Charter (Australia ICOMOS 1999:12), heritage significance means the aesthetic, historic, scientific or social value for past, present or future generations. Under NSW NPWS Heritage Guidelines (Office of Environment and Heritage 2011:9), the assessment of value and significance must consider the aesthetic, historic, social and scientific value that the heritage item possesses.

This report has assessed the scientific significance of the sites in terms of their archaeological value. The cultural values of these sites (aesthetic, historic and social) are assessed by the Aboriginal stakeholders and will be included in the Aboriginal consultation letters for this report.

The following archaeological significance criteria have been used: rarity, representativeness, integrity, connectedness, complexity and research potential and are defined in Table 7-1.

Table 7-1: Scientific Significance Criteria

Criteria	Description
Rarity	This criterion examines the frequency of the identified site types with others previously recorded in the local or regional landscape.
Representativeness	All sites are representative of a site type, however, some sites may be in better condition, or demonstrate more clearly a particular site type. Representativeness is based on the understanding of extant sites in the local or regional landscape and the purpose of this criterion is to ensure a representative sample of sites is conserved for future generations.
Integrity	This refers to site intactness. A site with contextual integrity can provide information relating to chronology, social systems, tool technology, site formation processes, habitation, frequency of use as well as other occupation indicators. Moderate to high levels of disturbance will generally result in low integrity.
Connectedness	Relates to inter-site relationships, that is, whether a site can be linked to an archaeological complex or where sequence of activities can be discerned. For example, a quarry (stone extractions site), may be linked to an adjacent heat treatment pit and knapping floor, these sites thus could be linked as part of a stone tool production sequence.
Complexity	Refers to the contents of the site, such as, the variety and nature of features and/or of artefacts present. For example, rock art sites with many motifs may be ranked highly in terms of complexity, or artefact scatters with a wide variety of raw materials and/or or tool types may be more complex than surrounding sites.
Research Potential	This criterion is used to identify whether a site has the potential to contribute new information which may contribute to the interpretation of Aboriginal occupation in the area.

The scientific significance criteria are usually assessed on two scales: local and regional. In exceptional circumstances however, state significance may also be identified. Scientific significance criteria is assessed in three levels to which scores are assigned; low (score=1), moderate (score=2) and high (score=3).

A combination of these scores then provides an overall significance ranking of the site to be determined;

- Low significance = 6 to 10.
- Moderate significance = 11 to 14.
- High significance = 15 to 18.

7.3 Assessment of Archaeological Significance

The archaeological significance of the identified Aboriginal site has been assessed and is summarised in Table 7-2.

Table 7-2: Assessed Levels of Significance for Aboriginal Sites

AHIMS Site ID	Site Name	Locus	Significance scale	Rarity	Representativeness	Integrity	Connectedness	Complexity	Research Potential	Overall Significance
37-2-0099	The Pimple; Drayton 2	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-0111	Grinding Grooves	-	Local	3	2	1	3	1	1	Moderate
			Regional	1	1	1	1	1	1	Low
37-2-0118	Fairford		Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-0132	Fairford 6	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-0271	MAN91	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-0490	MAN91		Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1549	CC2	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1590	CC81	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1622	LS1	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1629	MB1	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1672	PK1	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1673	PK2	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1674	PK3	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1675	PK4	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1676	PK6	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1677	PK7	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1822	RP84	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-2334	Saddler's S4	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1821	RP82	AS1	Local	1	2	2	2	2	1	Low
			Regional	1	1	1	1	1	1	Low

AHIMS Site ID	Site Name	Locus	Significance scale	Rarity	Representativeness	Integrity	Connectedness	Complexity	Research Potential	Overall Significance
37-2-1823	RP86	AS2	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1824	RP94	AS3	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1825	RP98	AS4	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1825	RP98	IF1	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF2GG	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF3GG	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF2b	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF3b	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF4b	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF5b	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF6b	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS2GG	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS3GG	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS4GG	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS5	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS6	Local	2	2	1	3	2	2	Moderate
			Regional	2	2	1	3	2	2	Low
37-2-1839	CC1	AS7	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	IF7b	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS26	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS50	Local	1	2	1	2	2	2	Low

AHIMS Site ID	Site Name	Locus	Significance scale	Rarity	Representativeness	Integrity	Connectedness	Complexity	Research Potential	Overall Significance
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS53	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1839	CC1	AS55	Local	1	1	1		1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF8	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	PAD A with artefact scatter	-	Local	2	3	3	3	2	3	High
			Regional	2	2	3	3	2	3	Moderate
New site	AS8	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS9	-	Local	1	2	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS10	-	Local	1	2	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS11	-	Local	2	2	1	3	2	2	Moderate
			Regional	1	1	1	1	1	1	Low
New site	AS12	-	Local	2	2	1	3	2	2	Moderate
			Regional	1	1	1	1	1	1	Low
New site	AS13	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS14	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF15	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS20	-	Local	2	3	1	3	3	2	Moderate
			Regional	1	1	1	1	1	1	Low
New site	AS21	-	Local	2	3	1	3	3	2	Moderate
			Regional	1	1	1	1	1	1	Low
New site	AS22	-	Local	2	3	1	3	3	2	Moderate
			Regional	1	1	1	1	1	1	Low
New site	AS23	-	Local	2	3	1	3	3	2	Moderate
			Regional	1	1	1	1	1	1	Low
New site	AS24	-	Local	2	3	1	3	3	2	Moderate
			Regional	1	1	1	1	1	1	Low
New site	AS25	-	Local	2	3	1	3	3	2	Moderate
			Regional	1	1	1	1	1	1	Low
37-2-1623	LS5	AS27	Local	2	2	1	3	2	2	Moderate
			Regional	1	1	1	1	1	1	Low

AHIMS Site ID	Site Name	Locus	Significance scale	Rarity	Representativeness	Integrity	Connectedness	Complexity	Research Potential	Overall Significance
New site	IF31	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1678	PK8	AS33	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1678	PK8	IF34	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	IF35	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS36	-	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1624	LS7	AS37	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1624	LS7	AS38	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1623	LS5	AS39	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1623	LS5	AS40	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1623	LS5	IF41	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
37-2-1630	MB2	AS51	Local	1	1	1	2	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS52	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low
New site	AS60	-	Local	1	1	1	1	1	1	Low
			Regional	1	1	1	1	1	1	Low

Several sites were given a rating of moderate including some loci of site #37-2-1839, a large site which contains hotspots of high density artefact scatters but was also largely disturbed by previous farming works. All the loci associated with this site were situated on the gently sloping simple slope above a tributary. Sites AS20, AS21, AS22, AS23, AS24, AS25 and AS27, though they have been recorded as separate sites, have all been rated as moderately significant in a local context as a result of their close relationship to each other and the likelihood that further artefacts may be found in the eroding banks of the creek line. These artefact scatters occurred along the length of the mid to upper bank of this tributary of Whites Creek. The artefacts were all found at the break in slope in an erosion profile. It is recommended that subsurface testing be undertaken along this creek bank to determine whether there is any subsurface deposit (refer Figure 6-5).

PAD A with artefact scatter (refer Figure 6-5) was identified as having the potential to contain *in situ* subsurface deposit. This was a result of the position of the site, the quantity of artefacts which could be seen eroding out of the soil and the undisturbed nature of the site. Artefacts identified at the site were almost solely manufactured from silcrete and there were a large number of yellow silcrete cobbles and pebbles

surrounding this area. It has been given a local significance rating of high and a regional significance rating of moderate. Sites with *in situ* silcrete raw material are important in the local area, as such the local significance rating of high relates to the Representativeness, Integrity, Connectedness and Research Potential of the site.

An additional area of red silcrete cobbles and pebbles was identified at site AS6. This silcrete deposit was highly disturbed, being located close to an old house site and therefore it is unlikely that there is any *in situ* deposit. It is probable that this site was used as a resource for silcrete procurement. Desktop research has shown that there were a number of artefacts scatters in the Mt Arthur Coal Mine area that contained an unusually high number of red silcrete artefacts. This site was attributed a scientific significance rating of moderate at both a local and regional level.

Two sites AS11 and AS12 were identified on either side of Saddlers Creek. The sites extended across the top of the bank and a large number of artefacts had eroded out of the B horizon soils and had washed downslope. Due to the proximity of the sites to permanent drinking water and the presence of available resources in the surrounding area, these sites were attributed a scientific significance rating of moderate at a local level and low at a regional level.

A grinding groove site (Figure 6-6) had been identified by Dyall in 1980 but the co-ordinates had placed the site on the mid slope area of an interlocking spur. The actual location for the two shallow grinding grooves was on a boulder in the creek line near the Modification area within proposed open cut mine extension area. Sandstone outcrop in the vicinity of the grinding grooves showed evidence of exfoliation and was severely weathered. The grinding grooves were ascribed a scientific significance rating of moderate at a local level and low at a regional level.

8 Impact Assessment and Mitigation

This section provides an assessment of the proposed project in relation to Aboriginal heritage. Conservation of Aboriginal sites and areas of archaeological sensitivity is the preferred heritage outcome. However, in most cases for open cut mining operations, other mitigation options must be developed as conservation becomes unfeasible as part of the proposed project.

Potential impacts of the Modification on Aboriginal cultural heritage include direct disturbances resulting from an increase in open cut disturbance areas, the use of the conveyor corridor for overburden emplacement, the duplication of the existing rail loop, the relocation of the load point for the overland conveyor which delivers to Macquarie Generations' Bayswater Power Station, the construction of additional offices and a control room and a small extension to the run-of-mine coal stockpile footprint. Vehicle movement in most of these areas would also contribute to potential disturbances.

The overall risk of harm to Aboriginal cultural heritage sites and Aboriginal objects is considered to be high in all proposed impact areas. As such it is recommended that salvage be undertaken in accordance with the AHMP. Table 8-1 lists all sites which will be impacted by the proposed works proceeding.

In addition to the salvage works, it is recommended to mitigate the loss of Aboriginal heritage sites a sample test pitting programme be undertaken at the following sites in order to determine the need for any subsurface salvage. These sites have been identified as AS20 to AS25 and PAD A with artefacts.

Table 8-1: Aboriginal Sites within the Proposed Modification Area which will be Impacted

Site ID Code	Site/Locus Name	Predicted impact to site
37-2-0099	The Pimple; Drayton 2	Site situated in proposed overburden emplacement area
37-2-0111	Grinding Grooves	Site situated near Modification area within proposed open cut mine extension area
37-2-0118	Fairford	Site situated within proposed open cut mine extension area
37-2-0132	Fairford 6	Site situated within proposed open cut mine extension area
37-2-0271	Saltwater Creek 78	Site situated within proposed open cut mine extension area
37-2-0490	MAN91	Site situated within proposed open cut mine extension area
37-2-1549	CC2	Site situated within proposed open cut mine extension area
37-2-1590	CC81	Site situated within proposed open cut mine extension area
37-2-1622	LS1	Site situated within proposed open cut mine extension area
37-2-1629	MB1	Site situated within proposed open cut mine extension area
37-2-1672	PK1	Site situated within proposed open cut mine extension area
37-2-1673	PK2	Site situated within proposed open cut mine extension area
37-2-1674	PK3	Site situated within proposed open cut mine extension area
37-2-1675	PK4	Site situated within proposed open cut mine extension area
37-2-1676	PK6	Site situated within proposed open cut mine extension area
37-2-1677	PK7	Site situated within proposed open cut mine extension area
37-2-1822	RP84	Site situated within proposed rail loop duplication area
37-2-2334	Saddlers S4	Site situated in proposed overburden emplacement area
37-2-1821	AS1	Site situated within proposed rail loop duplication area
37-2-1823	AS2	Site situated within proposed rail loop duplication area

Site ID Code	Site/Locus Name	Predicted impact to site
37-2-1824	AS3	Site situated within proposed rail loop duplication area
37-2-1825	AS4	Site situated within proposed rail loop duplication area
37-2-1825	IF1	Site situated within proposed rail loop duplication area
New site	IF2b	Site situated within proposed open cut mine extension area
New site	IF3b	Site situated within proposed open cut mine extension area
New site	IF4b	Site situated within proposed open cut mine extension area
New site	IF5b	Site situated within proposed open cut mine extension area
New site	IF6b	Site situated within proposed open cut mine extension area
New site	IF2	Site situated within proposed open cut mine extension area
New site	IF3	Site situated within proposed open cut mine extension area
37-2-1839	AS2	Site situated within proposed open cut mine extension area
37-2-1839	AS3	Site situated within proposed open cut mine extension area
37-2-1839	AS4	Site situated within proposed open cut mine extension area
37-2-1839	AS5	Site situated within proposed open cut mine extension area
37-2-1839	AS6	Site situated within proposed open cut mine extension area
37-2-1839	AS7	Site situated within proposed open cut mine extension area
37-2-1839	IF7b	Site situated within proposed open cut mine extension area
New site	IF8	Site situated in proposed overburden emplacement area
New site	PAD A	Site situated in proposed overburden emplacement area
New site	AS8	Site situated in proposed overburden emplacement area
New site	AS9	Site situated in proposed overburden emplacement area
New site	AS10	Site situated in proposed overburden emplacement area
New site	AS11	Site situated in proposed overburden emplacement area
New site	AS12	Site situated in proposed overburden emplacement area
New site	AS13	Site situated in proposed overburden emplacement area
New site	AS14	Site situated in proposed overburden emplacement area
New site	IF15	Site situated within proposed open cut mine extension area
New site	AS20	Site situated within proposed open cut mine extension area
New site	AS21	Site situated within proposed open cut mine extension area
New site	AS22	Site situated within proposed open cut mine extension area
New site	AS23	Site situated within proposed open cut mine extension area
New site	AS24	Site situated within proposed open cut mine extension area
New site	AS25	Site situated within proposed open cut mine extension area
37-2-1839	AS26	Site situated within proposed open cut mine extension area
37-2-1623	AS27	Site situated within proposed open cut mine extension area
New site	IF31	Site situated within proposed open cut mine extension area
37-2-1678	AS33	Site situated within proposed open cut mine extension area
37-2-1678	IF34	Site situated within proposed open cut mine extension area
New site	IF35	Site situated within proposed open cut mine extension area
New site	AS36	Site situated within proposed open cut mine extension area
37-2-1624	AS37	Site situated within proposed open cut mine extension area
37-2-1624	AS38	Site situated within proposed open cut mine extension area
37-2-1623	AS39	Site situated within proposed open cut mine extension area
37-2-1623	AS40	Site situated within proposed open cut mine extension area
37-2-1623	IF41	Site situated within proposed open cut mine extension area

Site ID Code	Site/Locus Name	Predicted impact to site
37-2-1839	AS50	Site situated within proposed open cut mine extension area
37-2-1630	AS51	Site situated within proposed open cut mine extension area
New site	AS52	Site situated within proposed open cut mine extension area
37-2-1839	AS53	Site situated within proposed open cut mine extension area
37-2-1839	AS55	Site situated within proposed open cut mine extension area
New site	IF60	Site situated in proposed overburden emplacement area

The identified risks to heritage as well as proposed conservation and mitigation strategies have been summarised in Table 8-2.

Table 8-2: Summary of Potential Impacts, Risks to Heritage and Mitigation Options

Impact	Risk to Heritage	Mitigation Option 1	Mitigation Option 2	Mitigation Option 3
Open Cut Mine	Direct disturbance/damage to Aboriginal objects and sites.	Move Aboriginal objects to approved Keeping Place.	NA	NA
Proposed Overburden Emplacement Area	Direct disturbance/ damage to Aboriginal objects and sites.	Move Aboriginal objects to approved Keeping Place.	NA	NA
Rail Loop Duplication	Direct disturbance/ damage to Aboriginal objects and sites.	Avoid where possible; ensure all relevant sites personnel are aware of site locations.	Cordon off site area or prevent vehicular access to site.	Move Aboriginal objects to an approved Keeping Place. Site awareness and sensitivity education programme.
Vehicle Movement	Direct disturbance/ damage to Aboriginal objects and sites.	Locate access routes within limit of existing approved disturbance areas where possible. Avoid where possible; ensure all relevant sites personnel are aware of site locations.	Cordon off site area or prevent vehicular access to site.	Move Aboriginal objects to an approved Keeping Place. Site awareness and sensitivity education programme.
Surface Infrastructure	Direct disturbance/ damage to Aboriginal objects and sites.	Locate required surface infrastructure within limit of existing approved disturbance areas. Avoid where possible; ensure all relevant sites personnel are aware of site locations.	Cordon off site area to prevent accidental damage.	Move Aboriginal objects to an approved Keeping Place. Site awareness and sensitivity education programme.
Vandalism	Direct disturbance/ damage to Aboriginal objects and sites.	Erect protective fencing to prevent unauthorised access; ensure all relevant sites personnel are aware of site locations.	Cordon off site area and block access route to restrict vehicular access to sites.	Site awareness and sensitivity education programme.

8.1 Principles of Ecologically Sustainable Development and Cumulative Impacts

The principles of ecologically sustainable development need to be considered under section 2A of the NPW Act. Inter-generational equity is part of these principles, which allows future generations to access the cultural and environmental diversity of the present generation. Inter-generational equity has been considered as part of the assessment of significance. State significant Aboriginal sites should be considered for blanket protection for future generations, as these sites have been assessed as having highest significance within NSW. No Aboriginal sites of state significance were identified in this assessment.

Cumulative impacts result from the combined impact of past and present actions. These actions may over time, and over a broad geographic area, have an additive effect and therefore must be considered. There are a number of coal mines to the south east of Mt Arthur Coal Mine but the area to the north and west is predominantly open farm land which is bounded by the mountain ranges of Wollemi National Park. The Hunter River, a high order stream, flows through this area and is fed by a number of major tributaries which would have provided a suitable environment for flora and fauna resources and drinking water in the regional area. Some of these areas remain relatively intact and as such there may be substantial numbers of Aboriginal sites in this region that are comparatively undisturbed.

It is considered that the Modification would not substantially increase cumulative impacts to Aboriginal heritage in the region in view of several factors. These are the scale of historic and ongoing land disturbance processes in the region, predominantly due to agricultural activities; the nature and extent of identified likely Aboriginal sites in the subject area; and the nature and scale of impacts associated with the Modification in an area that has already been highly disturbed from previous land use.

9 Conclusions and Recommendations

This report has considered the environmental, archaeological and scientific context of the Modification area, developed a predictive model, and reported on the results of an archaeological and cultural heritage survey of the Modification area in collaboration with the ACS. The following management recommendations have been formulated in consideration of the significance of the Aboriginal cultural heritage and Aboriginal objects, as well as potential impacts to these sites. The measures presented below are considered best practice in the mining industry. Their effectiveness and reliability is demonstrated by their continued use and inclusion in management plans and strategies developed in consultation with the Aboriginal community and to the satisfaction of government departments.

Aboriginal Cultural Heritage

Recommendation 1

It is recommended that the Aboriginal objects remain *in situ* unless impact is unavoidable. Many of the Aboriginal objects described in this report are located in proposed open cut or overburden emplacement disturbance areas. These objects would be managed in accordance with Recommendation 2.

Recommendation 2

Aboriginal objects that are at risk of harm by the proposed surface disturbance works will be salvaged in accordance with the Mt Arthur Coal AHMP.

Recommendation 3

Following the completion of analyses and reporting, all salvaged Aboriginal objects shall be transferred to the temporary Keeping Place in the proposed TMDOA, in consultation with the relevant ACS in accordance with the Mt Arthur Coal AHMP (or other location determined in consultation with ACS group representatives).

Recommendation 4

The location of all new Aboriginal cultural heritage sites identified by this study be included in the HVEC environment management framework for the Mt Arthur Coal Mine, so that all relevant staff members are aware that these areas will require management.

Recommendation 5

Grinding groove site AHIMS 37-2-0111 is likely to be impacted by the proposed section 75W Modification works. It is proposed that an attempt be made to salvage the sandstone block containing the grinding grooves and subsequently to relocate it to the Mount Arthur Conservation Area (or other location determined in consultation with ACS group representatives).

Recommendation 6

Prior to salvage, sample test pitting be undertaken at sites PAD A with artefact scatter and AS20 to AS25 to determine the need for any subsurface salvage.

In General during the course of Mt Arthur Coal Mine works

Recommendation 7

If unregistered Aboriginal objects are identified in the Modification area, they should be managed in accordance with the management measures for similar site/artefact types previously identified within the Modification area or across the wider Mt Arthur Coal Mine area, in consultation with the relevant ACS and in accordance with the AHMP (BHP Billiton 2012: 17-18).

Recommendation 8

In the event that skeletal remains are uncovered, work must cease immediately in that area and in accordance with the Mt Arthur Coal AHMP, HVEC will need to contact the NSW Police to determine if the remains are Aboriginal. Work may not recommence at the location until the OEH is notified and a management plan is developed in consultation with ACS. Recording and archaeological reporting of Aboriginal ancestral remains must be undertaken, or supervised, by suitably qualified persons.

Recommendation 9

All relevant HVEC staff should be made aware of their statutory obligations for heritage under the NP&W Act and the NSW *Heritage Act 1977*, which may be implemented as part of the induction program. If during the course of site works significant European cultural heritage material is uncovered, work should cease in that area immediately. OEH should be notified and works only recommence when an appropriate and approved management strategy is instigated.

Recommendation 10

Protection of Restricted Site:

Nominated staff member Sarah Bailey of Mt Arthur Coal has been briefed by a local elder as to the location of a site on Mt Arthur Coal Mine land which has particular Aboriginal cultural sensitivity. Information on this site has been 'restricted' to the nominated member of Mt Arthur Coal (Sarah Bailey) and thus will be referred to as a 'restricted site'. Information on the nature and location of this site has been withheld in accordance with its Aboriginal cultural sensitivity. With consent of the elder, it can be confirmed, however, that the site is **NOT** within the boundaries of the Modification area.

ACS would like a protocol enacted within Mt Arthur Coal management to ensure:

- The very high importance of the site is acknowledged.
- Mapping or location marking of the site does NOT occur.
- The site remains protected in perpetuity.
- The ongoing knowledge of its location exists with appropriate Mt Arthur Coal staff to ensure its ongoing protection.
- That this knowledge is verbally passed on to an appropriate staff member in the event of the knowledge holder leaving the company.

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11 Plates

Plate 1: AS1 view north showing portion of artefact scatter

Plate 2: AS2 view south west showing site on embankment

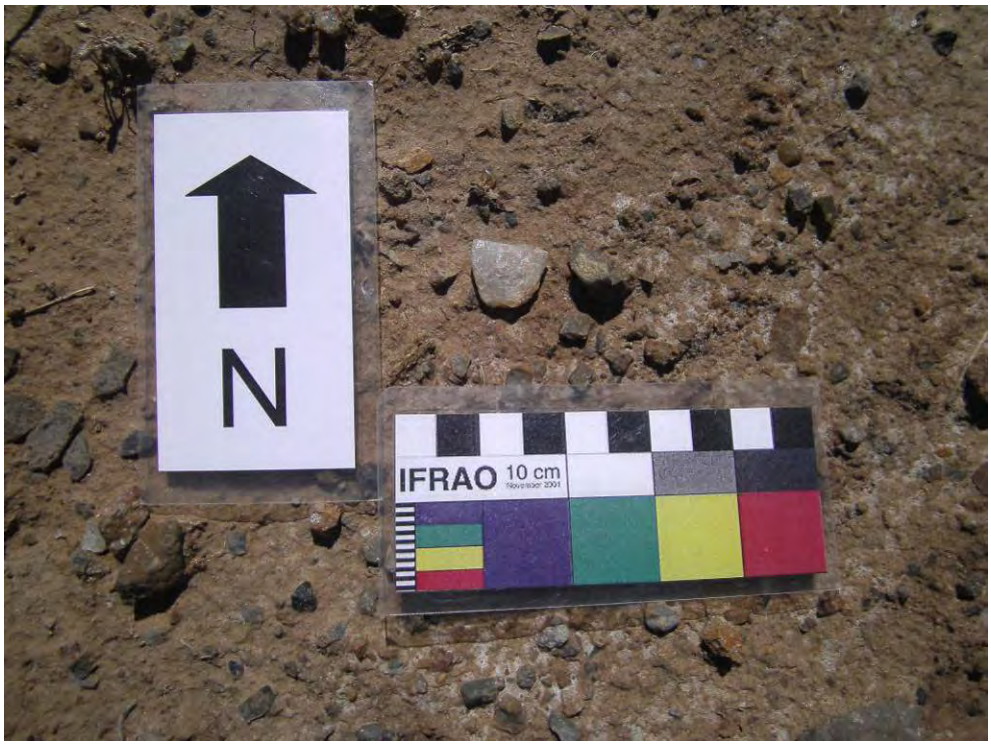

Plate 3: AS3 quartz bipolar flake

Plate 4: AS4 view north showing artefact scatter

Plate 5: IF2GG view west showing erosion scour and isolated find site

Plate 6: IF3GG view south west showing isolated find site

Plate 7: IF2b cream chert core

Plate 8: IF3b view east facing down slope toward site

Plate 9: IF4b view north showing spur and isolated find site

Plate 10: IF5b and IF6b view north west showing slope. IF5b is in the foreground and IF6b was identified further down the same slope

Plate 11: IF15 view north with site in foreground

Plate 12: AS8 view south east showing exposure with artefacts

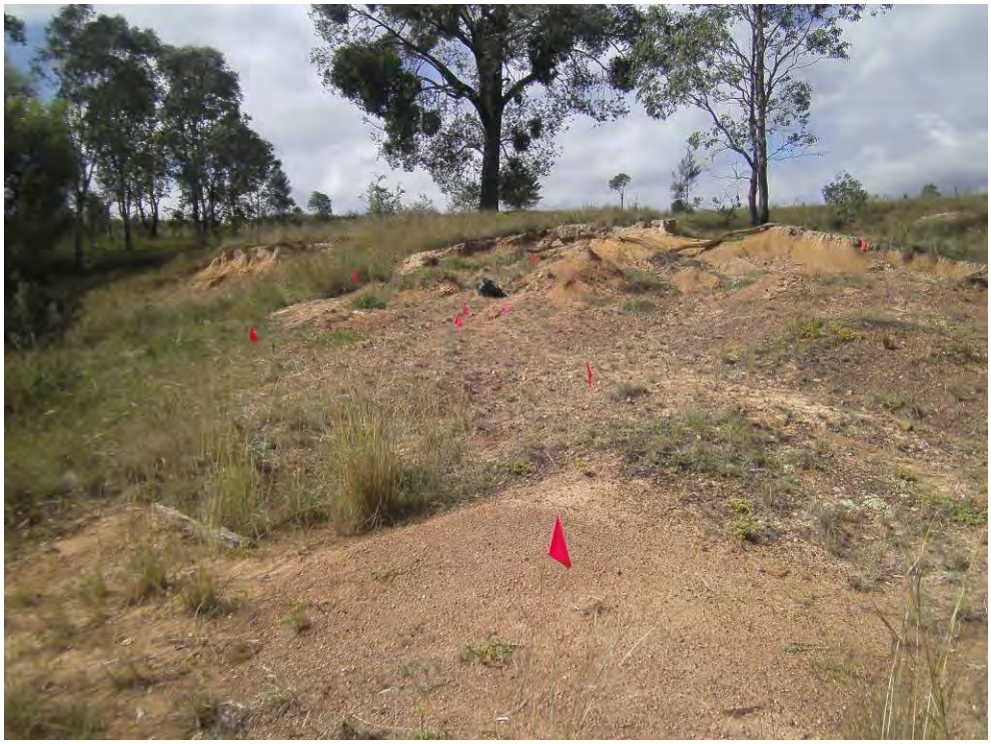

Plate 13: AS9 view north showing eroding creek bank with artefacts

Plate 14: AS10 view of ants' nest with artefacts

Plate 15: AS11 grey chert flake

Plate 16: AS12 view north showing eroding bank with artefacts

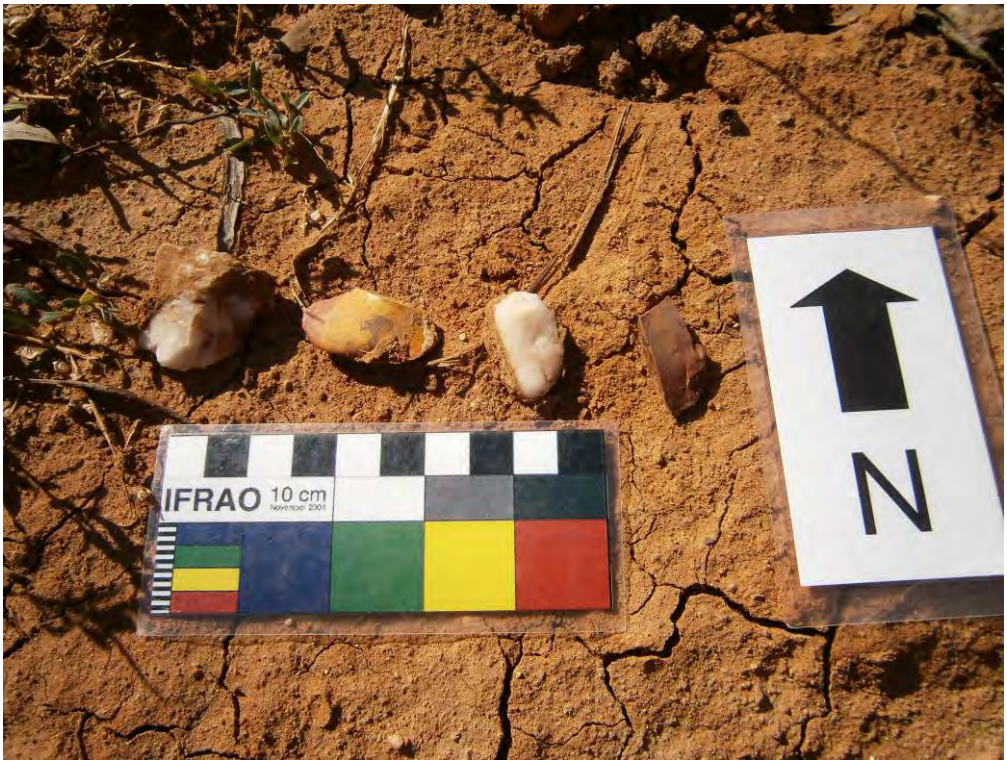

Plate 17: AS13 two milky quartz flakes and two mudstone flakes

Plate 18: AS14 view west showing vegetation at site

Plate 19: IF60 view of isolated find site on eroding land surface

Plate 20: AS2GG view north showing large exposure with artefacts

Plate 21: AS3GG view north showing site in grass

Plate 22: AS4GG isolated find pink chert flake

Plate 23: AS5 view north showing artefact scatter

Plate 24: AS6 view north showing artefact scatter near old house site

Plate 25: AS7 view north west showing ground cover

Plate 26: IF7b pink silcrete flake

Plate 27: IF8 view west to isolated find site to west of drainage line

Plate 28: View to north PAD A showing artefacts eroding out of soils

Plate 29: AS20 view north showing ant's nest with site

Plate 30: AS21 view north showing extent of artefact site

Plate 31: AS22 view north showing vegetation near site

Plate 32: AS23 view north showing site

Plate 33: AS24 view north showing site

Plate 34: AS25 view north east showing erosion at site

Plate 35: AS26 view north from site showing fence line

Plate 36: IF31 view north showing site

Plate 37: AS33 view north east showing site and slope

Plate 38: IF34 view north showing site and slope

Plate 39: AS36 view south east showing artefact scatter

Plate 40: AS37 view north east showing site

Plate 41: AS38 view north showing site

Plate 42: AS39 view north east showing site

Plate 43: AS40 site photo of AS40 view north east

Plate 44: IF41 view north showing site with dam in background

Plate 45: view to east showing AS50

Plate 46: view of formed bank of dam with artefacts at AS51

Plate 47: view to north showing AS52

Plate 48: AS53

Plate 49: view to north showing AS55 and edge of PAD A (top left of photo)

Plate 50: view of AHIMS#37-2-0111 Grinding Grooves