# NUNDAH BANK THIRD TRACK

## Environmental Assessment

### Volume 2 Technical Paper 1


UHVA
Upper Hunter Valley Alliance

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# Technical paper 1

Indigenous heritage

BIOSIS
RESEARCH

# Nundah Bank Third Track: Aboriginal Cultural Heritage Assessment

Report to:

KMH Environmental

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# DOCUMENT CONTROL SHEET

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**Government Departments**

- Kashana Cohen-McMeekin, Receptionist/Search Coordinator (National Native Title Tribunal)
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# ABBREVIATIONS AND DEFINITIONS

| | |
|---|---|
| < | Less than |
| > | Greater than |
| ACHIAR | Aboriginal Cultural Heritage Impact Assessment Report |
| AHIMS | Aboriginal Heritage Information Management System |
| ARTC | Australian Rail Track Corporation |
| CHL | Commonwealth Heritage List |
| CHMSP | Conservation Heritage Management Sub Plan |
| CMA | Catchment Management Authority |
| CoB | Close of Business |
| DA | Determining Authority |
| DECCW | Department of Environment, Climate Change and Water (previously the Department of Environment and Climate Change (DECC) and Department of Environment and Conservation (DEC) |
| DEWHA | Department of Environment, Water, Heritage and Arts |
| DoP | Department of Planning |
| Downside | The side of the track on which trains travel away from Sydney |
| DEWHA | Department of Environment, Water, Heritage and Arts |
| EA | Environmental Assessment |
| EPA | *Environment Planning and Assessment Act 1979* |
| EPRG | Environmental Protection and Regulation Group |
| ESC | Effective Survey Coverage |
| GDA | Geocentric Datum of Australia |
| GPS | Global Positioning System |
| GSV | Ground Surface Visibility |
| Ha | Hectare |
| ICOMOS | International Council on Monuments and Sites |
| km | Kilometre |
| LALC | Local Aboriginal Land Council |
| LEP | Local Environmental Plan |
| Level crossing | A crossing provided at grade (the same level) across the rail tracks |
| LGA | Local Government Area |
| m | Metre |
| MGA | Map Grid of Australia |
| Mtpa | Million tonnes per annum |
| NHL | National Heritage List |
| NPW | National Parks and Wildlife |
| NPWS | National Parks and Wildlife Service |
| NTSCORP | Native Title Services Corporation |
| NSW | New South Wales |
| Overbridge | A bridge over railway line or road |
| PCEMP | Project Construction Environmental Management Plan |
| PEA | Preliminary Environmental Assessment |
| RNE | Register of the National Estate |
| SEPP Major Development | *State Environmental Planning Policy (Major Development) 2005* |
| SEPP Infrastructure | *State Environmental Planning Policy (Infrastructure) 2007* |

| | |
|---|---|
| SHI | State Heritage Inventory |
| SHR | State Heritage Register |
| Upside | The side of the track on which trains travel to from Sydney |
| UHVA | Upper Hunter Valley Alliance |

# EXECUTIVE SUMMARY

The Australian Rail Track Corporation (ARTC) proposes to construct a third track and ancillary infrastructure at Nundah Bank, Singleton Local Government Area (LGA), NSW. KMH Environmental, on behalf of the Upper Hunter Valley Alliance (UHVA), is preparing an Environmental Assessment (EA) for the development, which is being assessed under Part 3A of the *EP&A Act 1979*.

Biosis Research with the assistance of the Aboriginal community conducted a full Aboriginal Cultural Heritage Impact Assessment (ACHIA) of the proposed development, and this assessment will constitute the heritage component of the EA.

The ARTC is consulting with the Aboriginal community regarding the heritage management of the project.

The Part 3A DEC ((now DECCW) 2005: 4) 'Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation' stipulate that consultation with the Aboriginal community should follow the 'Interim Community Consultation Requirements for Applicants (DEC (now DECCW) 2004)'. On 12 April 2010, however, these consultation guidelines were replaced by the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

With due diligence consultation for this project has followed both consultation guidelines:

- 'Interim Community Consultation Requirements for Applicants (DEC (now DECCW) 2004)'
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

Apart from added steps introduced with the new consultation guidelines, one of the significant differences between these two consultation guidelines was an additional week review time for the Aboriginal parties for both the methodology and draft cultural heritage assessment report. With due diligence, the longer review period time was applied for this project.

A search of statutory and non-statutory registers, planning instruments and heritage management documents was conducted to identify listed Aboriginal cultural heritage sites relevant to the Project Area. The Aboriginal Heritage Information Management System (AHIMS) listed one site within the Project Area (however, the coordinates for this site were determined to be erroneous from the relevant heritage assessment with the site actually outside the Project Area) and eight sites within the immediate vicinity (within 100 m) of the Project Area.

The survey was conducted from 6 to 10 September 2010. Light was adequate during the entire survey. The survey parties included:

- Wayne French, Yarrawalk Enterprises
- Sarah Jane Hall, Wanaruah Local Aboriginal Land Council
- Allen Paget, Ungoorooo Aboriginal Corporation
- Lachlan Sweeney, ARTC

- Two Railcorp Protection Officers
- Pamela Kottaras and Dominic Brady (Biosis Research)

The overall effectiveness of the survey for assessing the location, nature and extent of Aboriginal archaeological sites was considered low due to poor surface visibility predominantly as a consequence of vegetation cover and the low amount of exposures. The main types of exposures present were grassed vehicle tracks, dam walls, tree plantings and erosional exposures.

The field survey identified 17 previously undocumented Aboriginal cultural heritage sites within the Project Area and one in the immediate vicinity. All 18 sites were assessed to be of low scientific significance at local and regional levels

Sites with archaeological (scientific) value were considered more likely to occur within the Project Area in the immediate vicinity of Station Creek (within 100 m) on relatively undisturbed parts of the valley floor. The sensitivity of these parts of the Project Area have been classified as *moderate*.

Strategies to manage Aboriginal cultural heritage relevant to the Project Area have been developed based on archaeological (significance) and influenced by:

- Predicted impacts to Aboriginal cultural heritage
- The planning approvals framework
- Current best conservation practise considered to include:
    - Ethos of the Australia ICOMOS Burra Charter
    - 'Standards Manual for Archaeological Practise in Aboriginal Heritage Management', a companion document of the 'Aboriginal Cultural Heritage Standards and Guidelines Kit' (NPWS (now DECCW) 2007)

Prior to any impacts occurring within the Project Area, the following is recommended:

***1. Continued consultation with the registered Aboriginal parties***

The ARTC continue to consult with the Aboriginal parties about the management of Aboriginal cultural heritage sites within the Project Area throughout the life of the project as per the Aboriginal cultural heritage consultation requirements for proponents 2010.

***2. Development of a Conservation Heritage Management Sub Plan***

A Conservation Heritage Management Sub Plan (CHMSP) should be developed for the project should it be approved. The CHMSP would provide an overarching framework to guide the management of Aboriginal cultural heritage relating to the Project Area during the life of the project and to also accommodate future ARTC operations, including maintenance, associated with the Project Area after this time. The CHMSP should be developed in consultation with the Aboriginal parties and include the management strategies developed here.

***3. Conservation opportunities through avoidance***

Where possible, impacts from the proposed development should avoid:

- All documented Aboriginal cultural heritage sites
- The zone of moderate (archaeological) sensitivity, which is associated with the main site compound, identified in this report

Protective measures to protect sites that can be avoided during construction should be implemented. Such measures might include the erection of fencing an approximate 10 m buffer around the sites where practical. The buffer can be reduced if the site is physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information. The long term management of these sites should be addressed in the CHMSP.

***4. Further archaeological work***

*Aboriginal cultural heritage sites*

- Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties

*Zone of low (archaeological) sensitivity*

- No further archaeological work is recommended within the zone of low Aboriginal (archaeological) sensitivity identified in this report with the exception of the identification of sites of an unanticipated nature.

*Additional areas*

Further cultural heritage assessment, including survey, will be required for areas incorporated into the Project Area not considered in this assessment.

***5. Ongoing management***

The management of Aboriginal cultural heritage should be considered at all stages of the project – before, during and after all development activities. Detailed management steps should be outlined in the CHMSP.

***6. Unanticipated Aboriginal sites***

Should Aboriginal cultural heritage of an unanticipated nature be identified during any time in the life of the project, works should cease in the vicinity of the find and the project archaeologist contacted to assess the find. Should the unanticipated nature of the find be confirmed, the Aboriginal parties should be notified.

***7. Discovery of human remains***

If any suspected human remains are discovered during any activity works, all activity in the vicinity must cease immediately. The remains must be left in place and protected from harm or damage. The following list describes the immediate actions that must be taken in instances where identified or suspected human remains are discovered. Any such discovery at the activity area must follow these steps:

- The find will be reported to the NSW Police and State Coroner
- KMH Environmental and the ARTC will be notified of the find
- Aboriginal stakeholders will be notified of the find
- DECCW NSW will be notified of the find
- If the skeletal remains are confirmed to be of Aboriginal ancestral origin, an appropriate management strategy will be developed in consultation with the Aboriginal parties
- The find will be recorded in accordance with the *National Parks and Wildlife Act 1974* (NSW) and the NSW NPWS Aboriginal Cultural Heritage Standards and Guidelines Kit (1997)
- The construction management plan (see below) will be amended to include the newly discovered Aboriginal ancestral remains in the management regime established by the plan

***8. Project Construction Environmental Management Plan***

Incorporate the site-specific recommendations in Table 25 into the Project Construction Environmental Management Plan (PCEMP) prepared for this project.

Table 1: Specific recommendations for the development components

| **Sites** | **Notes** |
|---|---|
| *Aboriginal cultural heritage sites within the Project Area* | |
| Third track and associated infrastructure impact area | |
| NBTT01 (site card pending)<br>NBTT02 (site card pending)<br>NBTT03 (site card pending)<br>NBTT04 (site card pending)<br>NBTT05 (site card pending)<br>NBTT06 (site card pending)<br>NBTT07 (site card pending)<br>NBTT08 (site card pending)<br>NBTT09 (site card pending)<br>NBTT10 (site card pending) | • All sites within the third track and associated infrastructure impact area should be avoided where possible<br>• Protective measure to protect sites that can be avoided should be implemented. Such measures include the erection of fencing an approximate 10 m buffer around the site where practical. The buffer can be reduced if the site is physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information.<br>• Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties |
| Low sensitivity (archaeological) zone (see Figures 10a, b, c, d and e and 11a, b, c, d and e) | No further archaeological work required within the zone of low sensitivity (archaeological) identified within this report. |
| Rixs Creek Lane extension impact area | |
| RCLE01 (site card pending)<br>RCLE03 (site card pending) | • All sites within the third track and associated infrastructure impact area should be avoided where possible<br>• Protective measure to protect sites that can be avoided should be implemented. Such measures include the erection of fencing an approximate 10 m buffer around the site where practical. The buffer can be reduced if the site is physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information.<br>• Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project |

| | |
|---|---|
| | Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties. |
| Low sensitivity (archaeological) zone (see Figures 10a, b, c, d and e and 11a, b, c, d and e) | No further archaeological work required within the zone of low sensitivity (archaeological) identified within this report. |
| <u>Satellite Compound (downside) impact area</u> | |
| SC01 (site card pending) | • All sites within the Satellite Compound (Downside) impact area should be avoided where possible<br>• Protective measure to protect sites that can be avoided should be implemented. Such measures include the erection of fencing an approximate 10 m buffer around the site where practical. The buffer can be reduced if the site is physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information.<br>• Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties |
| Low sensitivity (archaeological) zone (see Figures 10a, b, c, d and e and 11a, b, c, d and e) | No further archaeological work required within the zone of low sensitivity (archaeological) identified within this report. |
| *Aboriginal cultural heritage sites in the immediate vicinity of the Project Area* | |
| RCLE02 (site card pending) | These sites are outside the Project Area. There are to be no impacts outside the Project Area. |
| Integra 31 (I31) (37-3-0886) | |
| 36; (37-3-0157) | |
| GCC26;Camberwell; (37-3-0088) | |
| GCC25;Camberwell; (37-3-0087) | |
| Rixs Creek (Singleton) (37-6-0239) | |
| SC/73 (37-6-1206) | |
| Site SC/74 (37-6-1207) | |
| Site SC/75 (37-6-1208) | |

# CONTENTS

# 1.0 INTRODUCTION

## 1.1 Project Background

The Australian Rail Track Corporation proposes to construct a third track and ancillary infrastructure at Nundah Bank, Singleton Local Government Area (LGA), NSW. The ARTC has applied to the NSW Minister for Planning for project approval under Part 3A of the *Environmental Planning and Assessment (EP&A) Act 1979*.

The proposed works have been declared a Major Project (MP number: 10_0094) under State Environmental Planning Policy (SEPP) Major Development 2005, as they constitute a development for railway lines associated with mining or freight with a capital investment in excess of 30 million dollars. The Minister for Planning is the Determining Authority (DA) for all projects assessed under Part 3A of the *EP&A Act 1979*.

The application was supported by a Preliminary Environmental Assessment (PEA) Report, prepared by KMH Environmental, on behalf of the Upper Hunter Valley Alliance (UHVA). The PEA included information about the proposed development, its potential environmental impacts and a proposed scope for the subsequent environmental assessment.

KMH Environmental, on behalf of the UHVA, is preparing an Environmental Assessment (EA) for the development. Under Section 75F of the EP&A Act, the Director General of the Department of Planning (DoP) is to issue *Director General's Requirements* which determine the matters to be considered in the Environmental Assessment. *Director General's Requirements* for the project were issued on 27 July 2010 and include matters pertaining to Aboriginal cultural heritage values.

Biosis Research with the assistance of the Aboriginal community will assist KMH Environmental's preparation of the EA by conducting a full Aboriginal Cultural Heritage Impact Assessment (ACHIA) of the proposed development route, and this assessment will constitute the heritage component of the EA.

## 1.2 Purpose and scope of this report

This report was prepared in order to address the *Directory General's Requirements* for the project that relate to Aboriginal cultural heritage values relevant to the Project Area. These requirements involve the consideration of:

"Indigenous heritage, objects, places of significance, nature and landscape values of the site and surrounding area, taking into account the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005)"* (MP number: 10-0094).

## 1.3 Project Area

The Project Area is located within the suburbs of Glennies Creek, Obanvale, Rixs Creek, and Camberwell, Singleton LGA, Parish of Pitt Town, County of Cumberland (Figure 1). The Project Area is also located in the Nundah Bank locality, which lies between the towns of Singleton and Camberwell and the Upper Hunter 1 region of the ARTC's lease area.

The proposed third track route specifically is located between Integral Coal and Rixs Creek mines approximately 245 km north of Sydney by rail, and would occupy approximately 1.4 ha of land on the upside of the existing Northern Line (Figures 2 and 3).

The Project Area includes the following real lots over which the proposed third track route extends (Table 2):

| Owner of property | Lot | DP | Approximate area (ha) |
|---|---|---|---|
| Four Mile Pty Ltd | 238 | 829334 | 2.4 |
| Four Mile Pty Ltd | 236 | 829334 | 0.5 |
| Four Mile Pty Ltd | 83 | 752442 | 3.1 |
| Four Mile Pty Ltd | 94 | 752442 | 0.02 |
| Four Mile Pty Ltd | 150 | 752442 | 1.1 |
| Four Mile Pty Ltd | 235 | 752455 | 0.2 |
| Four Mile Pty Ltd | 239 | 829334 | 1.5 |
| Four Mile Pty Ltd | 1 | 1139094 | 2.9 |
| State Rail Authority | 1 | 441840 | 0.2 |
| State Rail Authority | 2 | 449423 | 0.1 |
| RHA Pastoral Pty Ltd | 235 | 829334 | 1.1 |
| RHA Pastoral Pty Ltd (Leased to Integra Pty Ltd) | 237 | 829334 | 5.5 |
| RHA Pastoral Pty Ltd (Leased to Integra Pty Ltd) | 22 | 752442 | 1.2 |
| RHA Pastoral Pty Ltd (Leased to Integra Pty Ltd) | 22 | 752442 | 0.9 |

Table 2: Allotments over which the proposed third track route extends

The concept design and exact location of this infrastructure is being explored presently. Further details will be provided as soon as they become available.

## 1.4 Proposal

The ARTC propose to construct a third track and ancillary infrastructure.

Coal is Australia's largest export commodity and contributes significantly to State and Federal revenue. In 2008-09, over 91 million tonnes of coal was exported from the Port of Newcastle, making it the world's largest export coal port.

The Hunter Valley rail network plays a crucial role in transporting passengers and freight from Muswellbrook to Newcastle. Key among these is coal freight destined for overseas markets. Current industry forecasts indicate that an export coal volume of 191 million tonnes is required from the Port of Newcastle in 2018. To achieve this volume, train headways south of Whittingham Junction will need to be reduced to around eight minutes. Between the Port of Newcastle and Muswellbrook, there are sections of track where trains must climb steep grades resulting in the minimum headway between trains being greater than desired. One of these is the section of track at Nundah Bank where current headways are approximately 16.5 minutes.

Without intervention by the ARTC, the headway of trains travelling up Nundah Bank will jeopardise the performance of the Hunter Valley rail network and constrain the efficient delivery of coal exports to the port by the third quarter of 2012. The reduction of headways on Nundah Bank is therefore necessary to alleviate this constraint and to fully harness the benefits of the other capital improvement projects currently in planning and already implemented by the ARTC in the Hunter Valley.

The Proposal would increase the operational capacity of the rail corridor at Nundah Bank and improve the efficiency and flexibility of train operations in this area.

A new third track would allow two trains to be on the bank at the same time on separate tracks without the risk of one train needing to come to a halt because of the other. If a train were to stall on the bank, the third track would allow the bank to continue to function and provide greater operational flexibility to recover from a disruption.

**Development Components**

Key components of the proposal include:

- Construction and operation of approximately 4 kilometres of new single track at grade on the up side of the existing up main
- Reconditioning of the existing up main to facilitate sharing of traffic between the new up relief (third track) and up main
- Upgrades to Camberwell Junction to provide two new crossovers and two new turnouts to the existing balloon loop
- Construction of new vehicular maintenance access tracks adjacent to the proposed third track on both the up and down sides
- Decommissioning of the existing signalling system and installation of new signals
- Permanent acquisition of approximately 19 hectares of land for the third track and maintenance access roads as well as approximately 37 hectares for construction purposes
- Approximately 120,000 cubic metres of earthworks for track formation, maintenance access tracks, drainage and minor structures
- Construction of temporary ancillary infrastructure such as construction compounds, haul roads, sedimentation basins and stockpile sites
- Services and utilities adjustments

**Construction of site compounds, access tracks and haul roads**

Site compounds would be established to provide facilities to support construction activities. A primary compound would be constructed in the rail corridor on the upside adjoining Middle Falbrook Road. A satellite compound (also referred to as the secondary compound) would be situated within the existing rail corridor on the downside (Figure 2 and 3).

Haul roads would be constructed on both sides of the corridor, parallel to the existing tracks, to enable construction traffic to move independently on either side without the need for a rail crossing.

Necessary strengthening works would be undertaken at the location of the wooden bridge over Station Creek on Middle Falbrook Road to ensure construction traffic can safely cross Station Creek.

Services and utilities adjustments would be undertaken as necessary.

**Development related landscape impacts**

The construction of the proposed development would include the following landscape impacts:

- Bulk earthworks of approximately 55,000 m² of materials and associated stockpiles, primarily associated with the widening of existing rail cuttings to accommodate the proposed new track, but also minor structures and drainage
- The installation of new signals would involve trenching and laying conduits and pits
- Stripping of vegetation and topsoil
- Grading

The anticipated vehicles associated with the proposed development activities that would be driving throughout the Project Area would include concrete truck(s), front end loader(s), cranes (various types and sizes, including a hydraulic mobile crane), excavators (various sizes), semi trailer/tipper(s), 'Hi-rail' vehicle(s), backhoe(s), dump truck(s), bulldozer(s) and cars.

## 1.5 Planning Approvals

This project will be assessed under the *EPA Act 1979* (NSW).

## 1.6 Aboriginal Cultural Heritage

### 1.6.1 General Description

According to Allen and O'Connell (2003), Aboriginal people have inhabited the Australian continent for the last 50,000 years, and the NSW area, according to Bowler et al (2003), for over 42,000 years. These dates are subject to continued revision as further evidence of Aboriginal cultural heritage is discovered and as more research of this evidence is conducted.

It is not appropriate for the authors to comment on the significance Aboriginal people place on their material culture and the natural landscape. It is the opinion of the authors however, that Aboriginal people consistently place great significance on any physical remains of their past.

With this preface Aboriginal cultural heritage broadly refers to things that relate to Aboriginal culture and hold cultural meaning and significance to Aboriginal people (DEC 2005: 1; DECCW 2010: 3). There is an understanding in Aboriginal culture that everything is interconnected. In essence Aboriginal cultural heritage can be viewed as potentially encompassing any part of the physical and/or intangible landscape, that is, 'Country' (also see DEC (now DECCW) 2005: 1; DECCW 2010: 3).

Aboriginal peoples interpretation of cultural value is based on their "traditions, observance, lore, customs, beliefs and history" (DEC (now DECCW) 2005: 1; DECCW 2010: 3). The things associated with Aboriginal cultural heritage are continually / actively being defined by Aboriginal people (also see DEC (now DECCW) 2005: 1; DECCW 2010: 3). These things can be associated with traditional, historical or contemporary Aboriginal culture (also see DEC (now DECCW) 2005: 1;3; DECCW 2010: 3).

### 1.6.2 Tangible Aboriginal Cultural Heritage

Three categories of tangible Aboriginal cultural heritage may be defined:

- Things that have been clearly modified by Aboriginal people
- Things that may have been modified by Aboriginal people but no discernable traces of that activity remain
- Things never physically modified by Aboriginal people (who were not the Dreamtime Ancestors associated with shaping those things)

Specific examples would include (Table 3):

Table 3: Categories of tangible Aboriginal cultural heritage and specific examples

| | | |
|---|---|---|
| **Things observably modified by Aboriginal people** | | |
| Objects | Specific examples | Animals, modified trees, art, grinding grooves, stone, wood or shell artefacts, earth mounds, fish traps, habitation structures, stone arrangements, quarries |
| Places | | Massacre or Ceremonial sites with material evidence |
| **Things modified by Aboriginal people but no discernable traces of that activity remain** | | |
| Objects | Specific examples | A cultural scar on a tree that has since grown over the scar |
| Places | | Massacre or Ceremonial sites with material evidence; rock walls previous covered by art that has since washed away |
| **Things never physically modified by Aboriginal people (who were not the Dreamtime Ancestors associated with shaping those things)** | | |
| Objects | Specific examples | Animals, for example, totems |
| Places | | Dreaming sites |

### 1.6.3 Intangible Aboriginal Cultural Heritage

Examples of intangible Aboriginal cultural heritage would include memories of stories and 'ways of doing', which would include language and ceremonies (DEC (now DECCW) 2005: 1; DECCW 2010: 3).

### 1.6.4 Statutory

Currently Aboriginal cultural heritage, as statutorily defined by the *National Parks and Wildlife Act 1974*, consists of objects and places.

Aboriginal objects are defined as:

"*any deposit, object or material evidence…relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains*"

Aboriginal places are defined as a place that is or was of special Aboriginal cultural significance. Places are declared under section 84 of the *NPW Act 1974.*

### 1.6.5 Values

In general Aboriginal cultural heritage is valued by Aboriginal people as it is used to define their identity as both individuals and as part of a group (also see DEC (now DECCW) 2005: 1; 3; DECCW 2010: iii). More specifically is it used:

- To provide a :
    - "connection and sense of belonging to Country" (DECCW 2010: iii)
    - Link between the present and the past (DEC (now DECCW) 2005: 2-3; and DECCW 2010: 3)
- As a learning tool to teach Aboriginal culture to younger Aboriginal generations and the general public (DECCW 2010: 3)

- As further evidence of Aboriginal occupation prior to European settlement for people who do not understand the scale to which Aboriginal people occupied the continent (also see DECC (now DECCW) 2010: 1; DECCW 2010: 3).

## 1.7 Aboriginal Community Consultation

The ARTC is consulting with the Aboriginal community regarding the heritage management of the project.

The Part 3A DEC (now DECCW) 2005: 4 'Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation' stipulate that consultation with the Aboriginal community should follow the 'Interim Community Consultation Requirements for Applicants (DEC (now DECCW) 2004)'. On 12 April 2010, however, these consultation guidelines were replaced by the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

With due diligence consultation for this project has followed both consultation guidelines:

- 'Interim Community Consultation Requirements for Applicants (DEC (now DECCW) 2004)'
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

Apart from added steps introduced with the new consultation guidelines, one of the significant differences between these two consultation guidelines was an additional week review time for the Aboriginal parties for both the methodology and draft cultural heritage assessment report. With due diligence, the longer review period time was applied for this project.

On 29 June 2010 Biosis Research requested, from a number of government bodies, contact details for Aboriginal people and/or groups that may have an interest in the Project Area and may hold knowledge to determine the cultural significance of any Aboriginal cultural heritage within the Project Area. These bodies included:

- Planning and Aboriginal Heritage Section, DECCW NSW (North East)
- Wanaruah LALC
- Office of the Registrar, *Aboriginal Land Rights Act 1983* (NSW)
- National Native Title Tribunal
- Native Title Services Corporation Limited (NTSCORP Limited)
- Singleton Council
- Hunter-Central Rivers Catchment Management Authority (CMA)

Responses were received in writing from the Office of the Registrar, National Native Title Tribunal, Wanaruah LALC, and DECCW. Contact details for a number of Aboriginal groups were provided.

On 7 and 13 July 2010 Biosis Research wrote to these groups and invited Aboriginal knowledge holders to register an interest in corresponding with KMH Environmental/Biosis Research about the cultural heritage management of the project. Registrations from those groups notified on 7 July were received until Close of Business (CoB) July 22 2010, and registrations from those groups notified on 13 July were received until CoB 28 July 2010.

Biosis Research also publically invited registrations from Aboriginal knowledge holders by placing a notice in the Hunter Valley News (published 7 July 2010) – a paper with distributional coverage of the Project Area. Registrations from those responding to the notice were received until Close of Business (CoB) 21 July 2010.

The following Aboriginal organisations registered their interest (these groups are hereafter referred to as 'Aboriginal Parties'):

- Kayaway Eco Cultural & Heritage Services
- Cacatua Culture Consultants
- Carrawonga Consultants
- Gidawaa Walang Cultural Heritage Consultancy
- Lower Hunter Wonnarua Council Incorporated
- Ungoorooo Aboriginal Corporation
- Ungooroo Cultural and Community Services Incorporated
- Tracey Skene, Wonnarua Person and Traditional Owner
- Wanaruah LALC
- Wattaka Wonnaraua CCS
- Wonnarua Nation Aboriginal Corporation
- Yarrawalk Enterprises
- Yinarr Cultural Services

The registration of all parties was formally acknowledged by Biosis Research on 21 and 27 July 2010. At these times Biosis Research also requested parties to nominate or confirm spokesperson(s) for the project and sought their specific privacy wishes concerning the provision of their contact details to both the DECCW and the LALC.

A search conducted (July 2010) by the Office of the Registrar *Aboriginal Land Rights Act 1983 (NSW)* listed no Aboriginal Owners with land within the Project Area. A search conducted (July 2010) by the National Native Title Tribunal listed no Registered Native Title Claims, Unregistered Claimant Applications or Registered Indigenous Land Use Agreements within the Project Area.

On 28 July Biosis Research provided the Aboriginal parties an Information Pack containing details about the proposed development works and the proposed Aboriginal cultural heritage assessment process and methodology for this project.

Responses were received from Wattaka Wonnaraua and Ungooroo Cultural and Community Services Incorporated, stating that they agreed with the proposed assessment process and methodology. No other responses were received.

The draft report was provided to all registered Aboriginal parties on the 23 November for their review and comment, with comments due by 21 December. Comment was received in writing from Gidawaa Walang Cultural Heritage Consultancy and verbal comments from Cacatua Culture Consultants, stating that they both were supportive of the recommendations of the report, with

Cacatua Culture Consultants stating that they believed every effort to protect Aboriginal culture was being made.

Comments were also received from the LALC outside of the comment period; however these comments have been considered in the report.

The LALC commented that the draft report appears to consider only the archaeological (scientific) values of the study area without considering the cultural values. Aboriginal people are the primary determiners of the cultural significance of their heritage sites. Comments received from registered Aboriginal parties did not address the cultural significance of sites identified within the Project Area and therefore an assessment of the cultural significance of the sites cannot be made. The LALC also made recommendations regarding management of sites within the Project Area, including an s.90 AHIP for surface collection of all sites identified within the project area, and sub-surface testing and salvage of sites at which sub-surface deposits may be present, also under an s.90 AHIP. However, this project is to be approved under Part 3A of the EP&A Act and therefore the requirement for AHIPs is "switched off". Written comments and the consultation log are included in Appendix 1.

### 1.7.1 Consideration of Comments on Draft Report

The following table (Table 4) presents the comments received from the registered Aboriginal parties, and Biosis Research's response to each.

Table 4: Consideration of registered Aboriginal party comments on draft report

| Group | Comment | Response |
|---|---|---|
| GWCHC (Written) | All cultural heritage sites within the project area are important | Noted and agreed |
| | Support the recommendations of the report, including conservation through avoidance | Noted |
| Cacatua CC (verbal) | Support the recommendation of the report | Noted |
| WLALC (Written – 25/1/11) | Draft report only appears to consider archaeological (scientific) values of the Project Area, not the importance of preserving the cultural integrity of the sites within their cultural landscape | Noted. Aboriginal people are the primary determinants of the cultural significance of their cultural heritage. Therefore, archaeologists cannot comment on the cultural significance of sites without input from registered Aboriginal stakeholders. As no specific comments regarding cultural significance of the Project Area were received, the cultural significance of the Project Area cannot be assessed.<br>Biosis Research also believes that conservation of identified sites through avoidance is the most appropriate way to maintain the cultural integrity of the sites within their cultural landscape |

| | | |
|---|---|---|
| | Does not believe that there will not be some level of impact to sites within the Project Area, regardless of whether they are fenced | Noted |
| | Recommends salvage of artefacts within Project Area under an s.90 AHIP, including sites on the border of the corridors | As this is a Part 3A project, s.90 AHIPs are not required to undertake salvage or surface collection. However, the approach of conservation through avoidance is considered appropriate to maintain the cultural integrity of sites within their cultural landscape, and collection of objects would lead to greater harm to the cultural landscape than avoidance. |
| | Recommends sub-surface testing and salvage of areas which may have sub-surface artefacts present, under an s.90 AHIP | See above |
| | Recommends temporary fencing and signage for sites outside the Project Area to ensure they are not impacted during construction | Noted |
| | Traditional stakeholders should determine the long-term management of any artefacts collected or salvaged | Noted |
| | Legislation awareness should be part of contractor inductions | Noted |
| | Stop work provisions | Noted – in accordance with the Biosis Research recommendations |

# 2.0 HERITAGE STATUS AND PLANNING DOCUMENTS

A search of statutory and non-statutory registers, planning instruments and heritage management documents was conducted to identify listed Aboriginal cultural heritage sites relevant to the Project Area. A description of the sources searched and the results are provided below.

## 2.1 Commonwealth registers

### 2.1.1 National Heritage Registers

Under *the Environmental Protection and Biodiversity Conservation (EPBC) Act* Amendments (No 88, 2003) two mechanisms have been created for protection of heritage places of National or Commonwealth significance. The National Heritage List (NHL) provides protection to places of cultural significance to the nation of Australia. The Commonwealth Heritage List (CHL) comprises natural, Aboriginal and historical heritage places owned and / or controlled by the Commonwealth and mostly includes places associated with defence, communications, customs and other government activities.

Nominations to these two lists are assessed by the Australian Heritage Council (AHC), which also administers the (now static) Register of the National Estate (RNE) (a list of places identified as having national estate values). Although there are no statutory constraints associated with listing on the CHL unless the listed place is owned by a Commonwealth agency, listing is an acknowledgment of the place's significance to the community.

| Application to the Project Area – National Heritage Registers |
|---|
| No Aboriginal places listed on the National Heritage List, Commonwealth Heritage List or Register of the National Estate were located within the Project Area (search conducted August 2010). |

## 2.2 State registers

### 2.2.1 National Parks and Wildlife Act Registers

The NSW Department of Environment, Climate Change and Water (DECCW) maintains a database of Aboriginal sites within NSW under the auspices of the NSW *National Parks and Wildlife Act 1974* (NPW Act). It is a legal requirement that Aboriginal objects and places in NSW are registered on the Aboriginal Heritage Information Management System (AHIMS) register when discovered. AHIMS only lists known Aboriginal sites that have been registered.

| Application to the Project Area – AHIMS Database |
|---|
| 152 Aboriginal sites listed on the AHIMS register were located within approximately 2 km of the Project Area. Nine sites were located within or in the immediate vicinity of the Project Area (search conducted August 2010) (Figures 4 and 5). |

### 2.2.2 Heritage Act Registers

The Heritage Branch, part of the NSW Department of Planning (DoP), maintains registers of identified heritage items that are of State or local significance to New South Wales.

The State Heritage Register (SHR) contains items that have been assessed as being of State significance to New South Wales. Those items have been assessed through a formal process and are protected by the *Heritage Act 1977*.

The Heritage Branch maintains an inventory of items that are listed on statutory instruments other than the SHR. These instruments may include the heritage schedules of Local Environmental Plans (LEPs) or a State Government agency's Section 170 Heritage and Conservation Register. The SHI may repeat listings of items on the SHR but where an item is not listed on the SHR, its legal status and approvals framework is consistent with those for locally significant items.

If an item or place does not appear on either the SHR or SHI this does not necessarily mean that the item or place does not have heritage significance. Many items have not been assessed to determine their heritage significance or the data have not been yet transferred to the SHI. Items that appear on the SHR are protected by the *Heritage Act 1977*; their protection and/or management is defined by the instrument under which they are listed.

| Application to the Project Area – NSW State Heritage Register listings |
| --- |
| No Aboriginal cultural heritage items listed on the State Heritage Register are located within the Project Area (search conducted August 2010). |

| Application to the Project Area – NSW State Heritage inventory listings |
| --- |
| No Aboriginal cultural heritage items listed on the State Heritage Inventory are located within the Project Area (search conducted August 2010). |

### 2.2.3 National Native Title Tribunal Registers

The Commonwealth *Native Title Act* 1993 establishes the principles and mechanisms for the preservation of Native Title for Aboriginal people.

Under Subdivision P of the Act, *Right to negotiate*, native title claimants can negotiate about some proposed developments over land and waters (known as 'Future Acts') if they have the right to negotiate. Claimants gain the right to negotiate if their native title claimant application satisfies the registration test conditions.

The right to negotiate applies over some proposed developments or activities that may affect native title. Native title claimants only have the right to negotiate over certain types of future acts. The right to negotiate is not a right to stop projects going ahead - it is a right to have a say about how the development takes place. In some situations, the right to negotiate does not apply. In these circumstances, claimants may have the right to be notified, to be consulted, to object and to be heard by an independent umpire.

The National Native Title Tribunal records all Native Title claims within NSW, and the status of these claims. Native Title can only be established over land which does not have a scheduled interest, is not a freehold estate, does not have a commercial, pastoral, agricultural, residential or

community purposes lease over it, or a mining lease or any other land which has a lease for exclusive rights to the land.

| Application to the Project Area – National Native Title Tribunal Registers |
|---|
| A search of the National Native Title Register, the Register of Native Title Claims, and the Register of Indigenous Land Use Agreements was completed during July 2010. No lands determined to have native title, no registered native title claims or Indigenous land use agreements (ILUA) were located within the Project Area |

### 2.2.4 Environmental Planning and Assessment Act Registers

The *Environmental Planning and Assessment Act (EP&A Act) 1979* includes provisions for local government authorities to consider environmental impacts in land use planning and decision making. Such impacts are generally considered in relation to the planning provisions contained in Environmental Planning Instruments such as the relevant LEP or Regional Environmental Plan (REP).

Each Local Government Authority is required to create and maintain a LEP that includes Aboriginal and historical heritage items. Local Councils identify items that are of significance within their LGA, and these items are listed on heritage schedules in the local LEP and protected under the *EP&A Act 1979* as well as the *Heritage Act 1977* if the item is an historical archaeological site.

| Application to the Project Area – Singleton LEP 2010 Schedule 3 |
|---|
| No Aboriginal cultural heritage items listed on the *Singleton LEP 1996 Schedule 3* are located within the Project Area (search conducted August 2010). |

## 2.3 Heritage listings summary

A summary of the search results for Aboriginal cultural heritage listed on statutory and non-statutory registers, planning instruments and management documents within or in the immediate vicinity of the Project Area is provided (Table 5).

| Sources | Listed Aboriginal sites |
|---|---|
| Register of the National Estate | None |
| Commonwealth Heritage List | None |
| National Heritage List | None |
| AHIMS Database | Nine sites within and / or in the immediate vicinity of the Project Area |
| State Heritage Register | None |
| State Heritage Inventory | None |
| *Singleton LEP 1996 Schedule 3* | None |

Table 5: Search results for Aboriginal cultural heritage listed on statutory and non-statutory registers, planning instruments and management documents within or in the immediate vicinity of the Project Area

# 3.0 ENVIRONMENTAL CONTEXT

It is important to consider the local environment of the Project Area in any heritage assessment. Firstly the environment can influence human occupation and associated land use and consequently the distribution and character of cultural material. Secondly environmental processes can affect the preservation of cultural heritage materials to varying degrees or even destroy them completely. Lastly environmental features can contribute to the significance that people ascribe to these features.

The environmental information relevant to an Aboriginal cultural heritage assessment of the Project Area is highlighted below.

## 3.1 Topography

The Project Area is located in the Sydney Basin, which extends from Durras Lake, Batemans Bay to the south and Port Stephen to the north (Packham 1969: 311).

Within the basin, the Project Area is located within the Central Lowlands topographic zone. This zone is generally characterised by “undulating to rolling low hills” at elevations ranging from 10-140 m (Kovac and Lawrie 1991: 7).

An examination of 1: 25000 topographic maps of the Project Area indicate it is located within landform patterns characterised by rolling low hills, which are defined by low relief (between 30 and 90 m) and moderately inclined slopes (gradient between 10% and 32%) (Speight 1998: 36). Landform patterns are areas of land approximately 600 m across or with a 300 m radius used to describe landform (Speight 1998).

## 3.2 Geology

### 3.2.1 Background

The main rocks that outcrop or underlie the soils within the Project Area belong to the Vane Subgroup, Saltwater Creek Formation and Mulbring Siltstone geological units (see Glen and Beckett 1993).

The parts of the third track approximately north of chainage 247100 extend across the Vane Subgroup. The Vane Subgroup is part of the Wittingham Coal Measures, which date to the late Permian, and consists of the Foybrook Formation and the Bulga Formation (Beckett 1988: 20-21; Glen and Beckett 1993). The Foybrook Formation is the relevant sub group for the Project Area and consists of “siltstone, lithic sandstone and conglomerate” (Beckett 1988: 21).

The Rix’s Creek Lane extension and parts of the third track between chainages 247100 and 246400 extend across the Saltwater Creek Formation. The Saltwater Creek Formation is the basal unit of the Wittingham Coal Measures and underlies the Vane Subgroup (Beckett 1988: 20). It consists of “quartz-lithic sandstone with minor siltstone and claystone bands” (Beckett 1988: 20; also see Glen and Beckett 1993). The Saltwater Creek Formation is overlaid by the Vane Subgroup (Glen and Beckett 1993).

The parts of the third track and their immediate vicinity approximately south of chainage 246400 extend across the Mulbring Siltstone formation. This formation is part of the Maitland Group and dates between the middle and late Permian (Beckett 1988: 17; Glen and Beckett 1993). It predominately consists of siltstone and claystone and thin sandstone lenses (Beckett 1988: 19; Glen and Beckett 1993)

### 3.2.2 Geological cultural resources

Stone was used by Aboriginal people for a variety of purposes as tools or in the social information exchange as symbols or indexes, for example, stone markers. The stones selected would vary based on the particular task involved, the properties of the stone and may have also been influenced to a degree by the stylistic preferences of the cultural group and/or individual. Often the stone would need to be modified for the desired objective.

Based on the geological research there are no rocks suitable for stone tool manufacture that naturally outcrop or underlie the Project Area. Suitable rocks do occur in the region. Tuffaceous claystone outcrops north of the Project Area (see Glen and Beckett 1993) as part of the Jerrys Plains Subgroup (Beckett 1988:22; Glen and Beckett 1993). Tuff from an undifferentiated Carboniferous unit outcrops north east of the Project Area (Glen and Beckett 1993).

The dominant landscape form of the Project Area is hilly, presenting opportunities for the formation of gullies. Throughout eastern NSW (including the Central Lowlands), deeply incised gullies have commonly exposed gravels overlying bedrock, and these gravels may have been from the denudation of hill slopes during the last ice-age (Dean-Jones and Mitchell 1992). According to Dean-Jones and Mitchell (1993) the development of gullies increased significantly as the result of European land use; the exposure of these gravels and their availability to Aboriginal people prior to this time would have been less frequent.

According to Brayshaw (1986), indurated mudstone and silcrete gravels would have been available from the gravel beds of the Hunter River and major streams. Knappable stone raw material could also be found in high terraces (Dean-Jones and Mitchell 1992). The Hunter River is located approximately 4 km south of the southernmost part of the Project Area. Glennies Creek is located approximately 1 km west of the northernmost part of the Project Area. Recent gravel bed exposure may not be reflective of past exposures due to increased erosion from European land use (Dean-Jones and Mitchell 1992).

Any rocks and minerals suitable for stone tool manufacture may have been brought into the Project Area from the outside by Aboriginal people. These materials may have been obtained from considerable distances through travel or trading networks depending on the cultural landscape that existed at the time.

## 3.3 Soil Landscapes

Soil landscapes refer to areas of land that "have recognisable and specifiable topographies and soils, that are capable of presentation on maps, and can be described by concise statements" (Northcote 1978). As classified by the Soil Conservation Service of NSW, the soil landscapes associated with the Study Area are Roxburgh and Sedgefield.

**Roxburgh**

The Roxburgh landscape is associated with parts of the Project Area approximately located between rail chainages 246300.00 and 248900.00. This landscape is also immediately west of the parts of the Project Area between chainages 248900.000 and 250500.000.

Soils include Yellow Podzolic Soils, Red Solodic Soils, Lithosols, Brown Podzolic Soils and Yellow Soloths (Kovac and Lawrie 1991: 349-352). The soils pH ranges from 5.5 to 7.5 (Kovac and Lawrie 1991: 351-352). The soils are moderately to highly susceptible to the erosive agents prevalent within this landscape (Kovac and Lawrie 1991: 351-352). Minor to moderate sheet erosion commonly occurs (Kovac and Lawrie 1991:351). The risk of inundation by floodwaters is low (Kovac and Lawrie 1991:351-352).

**Sedgefield**

The Sedgefield landscape is associated with parts of the Project Area approximately located:

- Immediately perpendicular to and south of rail chainage 246300.00.
- Immediately perpendicular to and north of rail chainage 248900.00.

Soils include Yellow Soloths, Yellow Solodic soils and Black Soloths (Kovac and Lawrie 1991: 371-374). The soils pH ranges from 4.5 – 7 (Kovac and Lawrie 1991: 372-374). The soils are highly to extremely highly susceptible to the erosive agents prevalent within this landscape (Kovac and Lawrie 1991: 373-374). Gully and sheet erosion occurs in drainage lines and frequently on slopes (Kovac and Lawrie 1991: 372).

## 3.4 Hydrology

Watercourses within the Study Area would have been used by Aboriginal people for a variety of purposes. They were a source of water and supported animals and plants, a number of which would have been utilised by Aboriginal people - particularly for food. Water would have been used as a cleaning agent and in the construction of material technologies, for example, as an abrasive and dust reducing agent in stone axe sharpening. Aboriginal people would have travelled along the larger watercourses via watercraft, typically in bark canoes. In addition watercourses may have had and continue to have a social/spiritual value to Aboriginal people.

The third track and associated infrastructure extends across the six watercourses visible on a 1:100,000 scale map. The order of these watercourses was defined following Strahler (1964). The sections of track and watercourses over which they extend are approximately as follows:

- Track chainage 244500 extends across a 1st order tributary. This watercourse extends approximately north east to its confluence with a 2nd order tributary of a 3rd order tributary of the Hunter River
- Track chainage 245500, 245700, and 246300 each extends across different 1rd order tributaries. This watercourses extend approximately south and south west to their confluence with a 2nd order tributary of Rixs Creek
- Track chainage 247500 extends across a 1st order tributary. This watercourse extends approximately south west to its confluence with a 2nd order tributary of a 3rd order tributary of Rixs Creek
- Track chainage 249500 extends across a 1st order tributary. This watercourse extends approximately north east to its confluence with a 2nd order tributary of Blackwall Creek, a fourth order tributary.
- Track chainage 251500 is in the immediate vicinity of a 4th order section of Station Creek. This watercourse extends approximately south west and west to Glennies Creek

The Hunter River is located approximately 4 km south of the southernmost part of the Project Area. Glennies Creek is located approximately 1 km west of the northernmost part of the Project Area.

## 3.5 Climate

The nearest weather station to the Project Area, Singleton Water Board NSW (station number 061397, which is 8.0 km from Rix's Creek), has a total average annual rainfall of 649.4 mm, an average annual maximum temperature of 24.8 ºC and minimum temperature of 11.1 ºC <http://www.bom.gov.au/climate/averages/>. This is considered to be a pleasant climate for human occupation.

## 3.6 Flora

Plants were used by Aboriginal people for a wide range of purposes (see Clarke 2007). Plants were an important source of food, drink and seasoning. They were a source of drugs for personal use, narcotics, hallucinogens, medicines or stimulants. They were used as a poison for fishing - the resin of certain plant species can be used to paralyse fish. They were used to manufacture a wide range of items including personal decoration, clothing, tools (digging sticks, weapons, shields, and containers), art (paint fixatives), watercraft (canoes and rafts) and traps. They were used in the construction of shelters. They also featured in local mythologies, and some were considered sacred and/or had ritual uses.

Wood, bark, fibres and resin are all examples of useful materials derived from plants: wood could be used to manufacture items such as boomerangs, clubs, or shields; bark could also be used to manufacture shields, clothing, canoes, or dishes; fibres could be used to manufacture string, baskets, or mats; and resin could be used as an adhesive in tool manufacture and decoration, or to seal leaks in canoes.

The Hunter Central Rivers Catchment Management Authority (Peake 2005) have classified, described and mapped a number of native plant communities, “assemblages of plants that often grow together” (Keith 2004: 15), in the Central Hunter Valley.

The primary plant community in the locality of the Project Area consists of Central Hunter Ironbark Spotted Gum – Grey Box Forest (Peake 2005). Other communities include (listed in decreasing order of dominance) Central Hunter Swamp Oak Forest, Central Hunter Box – Ironbark Woodland, Hunter Valley River Oak Forest and Central Hunter Bulloak Forest Regeneration (Peake 2005).

According to Benson and Redpath (1997) and Brayshaw (1986) remnant native vegetation in the Upper and Central Hunter Valley is likely to be similar to those present at the time of European settlement.

As Peake noted (2005), the accounts of the early explorers and settlers, for example, Danger, Howe and Cunningham (see Brayshaw 1986; Howe 1989), appeared to indicate that the vegetation in the Upper and Central Hunter Valley primarily consisted of open woodland. Benson and Redpath (1997) argued, however, that parts of the valley were actually more densely vegetated than reported and attribute this discrepancy to reporting bias to arable, more thinly vegetated land, and subsequent misrepresentations of early accounts by certain secondary sources.

According to Brayshaw (1986) Aboriginal people burned large areas of the upper valley for vegetation maintenance and to encourage game to eat the regrowth. Benson and Redpath (1997) dispute that there is evidence to support this assertion.

These communities provide an indication of the plants that would have existed prior to the European settlement of the locality and may have been utilised in the past by Aboriginal people.

## 3.7 Fauna

The plant communities discussed previously would have supported a range of fauna utilised by Aboriginal people. Animals were not only used for food but also contributed to several cultural aspects of Aboriginal life. Animals provided materials for technologies, played a role in local mythologies and some were considered sacred and/or had ritual uses.

The NSW National Parks and Wildlife (NPWS) lists 453 native animal species within the locality <http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlasSpecies.jsp>. Terrestrial and freshwater animals would have been locally abundant and consistently present all year round.

## 3.8 Environmental Summary

In conclusion, the local environment of the Project Area would have provided ideal conditions for Aboriginal occupation. Access to water, resources provided by endemic plants and animals, a hospitable climate and useful geological material would have encouraged habitation by Aboriginal people, who would have left evidence of their presences behind.

### 3.8.1 Geomorphology

Since Aboriginal occupation of the local area encompassing the Project Area, the geomorphic processes that formed and continue to form the landforms over which the Project Area extends are likely to have significantly affected the degree to which any potential Aboriginal archaeological materials are preserved, remain *in situ* and are exposed as surface expressions. These processes can be broadly categorised as aggrading, stable, or eroding (Burke and Smith 2004: 80).

The dominant geomorphic process associated with the general landform patterns that characterise the Project Area, 'rolling low hills', can be broadly described as gradational with the hills continuously eroded by sheet wash (Speight 1988). This erosion may have exposed and / or shifted potential portable cultural material, such as stone artefacts, down slopes where there is increased sheet wash.

### 3.8.2 Texture Contrast Soils/Duplex Soils, Stratification and Soil pH

Most Aboriginal sites within the Hunter Valley central lowlands are located within soil profile characterised by an upper sandy layer that overlies a red and yellow clay (Dean-Jones and Mitchell 1993). The artefacts are present in the sandy layer or, where this has been eroded, left on top of the clay (Dean-Jones and Mitchell 1993).

These soils are characterised by a sharp contrast in the composition of soil particles, that is, texture, between the upper and lower layers (Dean-Jones and Mitchell 1993). These are known as texture contrast or duplex soils. It can be difficult to ascertain the relative age of these soil profiles. In areas of stable alluvial deposition, such a contrast is traditionally considered to indicate elapses of thousands of years (van Dijk 1959; Costin and Polach 1973; Walker and Coventry 1976; Walker and Butler 1983; and Chittleborough *et al* 1984).

However, on hillslopes, for example, Dean-Jones and Mitchell (1993) advised that such contrasts can develop within centuries, which in geological terms is a much faster pace. Dean-Jones and Mitchell (1993) attribute this development to the separation of the finer topsoil particles by bioturbation and their subsequent removal by rain wash. The range of remnant topsoil particles are thus coarser and contrast with the subsoil (Dean-Jones and Mitchell 1993). Any surface artefacts affecting by this process would undergo surface dispersion or down slope movement (Dean-Jones and Mitchell 1993)

Within these soil profiles, rain wash and bioturbation can then "thicken the topsoil" and shift/bury larger stone fragments (including stone artefacts) downwards in the soil profile, and this can result in a stone belt at the depth limit of the bioturbation (Dean-Jones and Mitchell 1993).

Any open stone artefact sites located within such soil profiles cannot be stratified in the sense of retaining their spatial integrity due to the movement of soil material within the profile (Dean-Jones and Mitchell 1993). Dean-Jones and Mitchell (1993) suggest that any artefacts recovered from such profiles cannot be used as the basis of a cultural time sequence and that the top layer is unlikely to be more than 2000 years old.

Stone artefact sites are only likely to be stratified as such on former ground surfaces within in the following areas (Dean-Jones and Mitchell 1993):

- Areas where alluvium accumulates, particularly:
    - The distal parts of naturally formed alluvial fans that have subsequently been subject to gully erosion (including lateral channel movements) which thus results in greater deposition of sediment over the apex of the fan (Dean-Jones and Mitchell 1993). Streams in the central lowlands commonly exhibit such deposits (Dean-Jones and Mitchell 1993). Alluvial fans can develop where streams run out onto low gradients or slower streams
    - Areas at which the alluvial fans of tributaries cover the terraces and floodplains of the main stream
    - Overlapping alluvial fans of streams and their tributary streams
    - Overlapping stream terraces (these are not known in the Hunter Valley Region (Dean-Jones and Mitchell 1993))
- Within or covered by aeolian dunes (Dean-Jones and Mitchell 1993)

### 3.8.3 Gully Erosion

The dominant landscape form of the Study Area is hilly, presenting opportunities for the formation of gullies. Gullies are channels formed by sheet erosion that “cannot be crossed by a wheeled vehicle or eliminated by ploughing” (American Geological Institute 1974: 223). The process of gully development is not completely understood, but it accelerated with European land use – in particular vegetation clearance, cattle grazing and soil cultivation (Dean-Jones and Mitchell 1993) – all of which have significantly increased the vulnerability of the soil to erosion.

Where present, it is important to consider gullies in any assessment of archaeological values. Most Aboriginal sites in the Hunter Valley central lowlands have been identified on areas exposed by sheet erosion (Brayshaw 1986: 96-97) but particularly on the banks of watercourses where the amount of sheet erosion has been significantly greater due to increased gullying and rilling (Dean-Jones and Mitchell 1993; also see Brayshaw 1986: 96). Erosion is exacerbated where hoofed animals are present along vulnerable sections such as banks (Dean-Jones and Mitchell 1993).

The channels of gullies are cut by water moving off steep gradients (Dean-Jones and Mitchell 1993). Sediment is transported down the channel and deposited as an alluvial fan, that is, cone-shaped alluvial deposits, at low gradients (Dean-Jones and Mitchell 1993). This pattern can repeated in separate areas over the course of a stream (Dean-Jones and Mitchell 1993), and this is known as discontinuous gullying. Over time, the gully channels can be cut to a depth of bedrock

and shift their course leaving “mini-terraces (Dean-Jones and Mitchell 1993). They can also join, thus becoming continuous, after which they tend to straighten their course (Dean-Jones and Mitchell 1993).

On the basis of ethnographic accounts, Dean-Jones and Mitchell (1993) suggests that the surroundings of first, second and third order streams around the Hunter Valley prior to the effects of European land use were well grassed. As the result of European land use, the areas around the streams were exposed by gully erosion and the streams became intersected by these relatively recent channels. The beds and banks of watercourses larger than 3$^{rd}$ order also have undergone significant erosion however predominantly due to floods (Dean-Jones and Mitchell 1993).

# 4.0 ABORIGINAL CULTURAL HERITAGE CONTEXT

## 1.1 E**thnohistory**

Knowledge of traditional Aboriginal social organisation and language groups across the lowland region of the Hunter Valley is restricted to a small number of written and oral historical documents because post-contact colonisation by settlers and the subsequent rapid dispossession of Aboriginal people from country has resulted in the loss of much information. Through dispossession of land and subsequent loss of many oral histories, many historians have only been able to piece together splintered accounts of Aboriginal life, mainly through nineteenth century European ethnographic observations.

There are a number of sources available that provide information on Aboriginal culture at the regional scale at the time of European contact. These sources include official records, personal observations recorded in diaries or newspaper publications and paintings. While these sources can present invaluable insight into Aboriginal lifestyles at the point of contact, it must be remembered that all of these sources have limitations because, by nature, colonial observers had a tendency to record the more unusual or unique patterns of Aboriginal culture. Spirituality and religious gatherings rather than the everyday economic events like resource extraction and utilisation were far more interesting to science and society in the late eighteenth century. Further, observations and discussion often focused on concepts of 'traditional ownership' which has to a large extent overshadowed issues related to social, political and economic lifestyles and practices. Typically, colonial settlers and researchers also had a tendency to observe and recount the activities of men as opposed to the activities of women and children.

Documented ethnohistoric sources for the central lowland region of the Hunter Valley are limited, however informative accounts of Aboriginal people can be found in Breton (1833, Curr (1887), Eyre (1859), Fawcett (1898), Howe (1819), Ridley (1864) and Sturt (1833). More recent secondary sources are also available, particularly Blyton et al. (2004), Brayshaw (1966; 1986), Davidson and Lovell-Jones (1993) and Wood (1972). The sources listed above were assessed in the context of the ethnohistoric section of this report. Where possible, the central lowland region of the Hunter Valley is discussed with an emphasis on the region around and between Singleton and Muswellbrook.

When looking at written documentation of the Hunter River as a whole, there appears to have been a clear focus on recording the lifestyles of Aboriginal coastal people or Aboriginal people along the lower deltaic reaches rather than the upper Hunter River. As such these documents cannot be relied upon to provide an unbiased or holistic interpretation of Aboriginal socio-economic or socio-political structures throughout the upper Hunter at the time of contact.

The Central Lowlands of the Hunter Valley were traditionally occupied by the Wonnarua people. Although tribal boundaries at the time of contact are not well defined, it is thought the country of the Wonnarua was situated within the upper Hunter Valley. Ethnographic accounts of the upper Hunter Aboriginal groups by Threlkheld (1892), suggest that there were very similar cultural practices

between the Wonnarua people and the Kamilaroi people, who occupied a large area of land as far west as Jerry's Plains.

Howitt (1904:104) also note that the Geawegal tribes which formed a part of the greater Kamilaroi nation occupied the land between Ravensworth (approximately 6 km north-west of the Project Area) as far north as Murrurundi (Brayshaw 1986: 51). The Wonnurua people also had contact with the coastal groups like the Awabakal people near Lake Macquarie and the Worimi people to the north of the Hunter River. An open system of exchange and redistribution was thought to underline this contact which clearly demonstrates that socio-economic and socio-political networks were extant and far reaching between coastal and hinterland people at the time of contact.

As stated it is thought that the Wonnarua consisted of an open system where there was little to no restrictions on movement within their own territory. There was also considerable movement of people through neighbouring tribe's territories to facilitate and maintain open social networks in order to engage in religious-based ceremonies as well as economic networks for trade and exchange. While Aboriginal people lived in small camps and moved from resource to resource in relatively small numbers, at times of heightened precipitation or the seasonal ripening of fruits and nuts large, localised gatherings numbering in the hundreds or even thousands occurred. Environmental instability and pressure on natural resources may also have had an impact on where and during what season people moved and when they gathered (Miller 1985: 10-11).

The subsistence resource base of the Hunter Valley would have yielded large populations of Kangaroos, emus, possums and fish (Breton 1833, Cunningham 1827, Dawson 1830). Resources were rotated through a cyclical resource management strategy called optimal foraging where people would align themselves near an important food resource before moving on to the next resource prior to exhausting it. This would allow the resource to recuperate for the next seasonal round. Foraging areas were generally limited to a few kilometres and gender specific roles were well established that saw men engage in hunting forays targeting kangaroos, wallabies, native dogs and emus (Fawcett 1898:153), echidna (Fitzpatrick 1914:43 from Brayshaw 1986), goanna and native dogs (Dawson 1830:203), bandicoot (Ebsworth 1826:80), snakes (Threlkeld (in Gunson 1974:55), flying foxes (Dawson 1830:309), possums (Dawson 1830:68) and larvae (Grant 1803:162-3). Men were also responsible for fishing (Fawcett 1898:152). Women collected staples like bush fruits, grubs, roots nuts, yams and native bush honey. Women also collected a wide variety of plant foods as well as trapping small mammals such as lizards, mice and possums, (Fawcett 1898:152-153).

Nineteenth century documents describe the Hunter Valley as an agriculturally productive area of extensive grasslands and floodplains with few trees (Breton 1833, Cunningham 1827, Howe 1819). The antecedent of these grasslands was likely the use of Aboriginal fire stick farming techniques, a deliberate cyclical firing of the countryside to stimulate regrowth and strategically maintain large open patches which encouraged target prey species such as kangaroos into these areas of new growth. This made faunal species such as kangaroos considerably more predictable in their foraging activities and increased the reliability of this food resource (Davidson and Lovell-Jones, 1993:5). Firing of woodlands also helped to maintain large open patches which helped to stimulate the growth of fruit and nuts along the margins of these open patches through a natural process of

photosynthesis. Cunningham (1827) makes mention of the use of fire by the Wonnarua people as does Fawcett (1898).

Ethnographic information regarding camp site locations and corroboree areas are limited; however, the primary requirements of fresh water, a suitable food supply and elevated landforms or 'vantage points' were the three most important considerations when deciding where to camp or hold corroborees (Fawcett 1898:152 in Brayshaw 1986:42). The archaeological record of the upper Hunter region is characterised by stone artefacts; unfortunately, there is a distinct paucity of ethnographic information concerning the production and use of these artefacts. Brayshaw (1986a 66; 68), states that quartz stone artefacts were being used as barbs on a spear while Collins (1798, 2:586) remarks that Aboriginal people used stone hatchets for a variety of purposes.

Early pioneer accounts of Aboriginal people in the upper Hunter are also limited; most accounts of Aboriginal life come from the Lower Hunter and coastal regions. Brayshaw (1986: 47) provides a brief list of some of the early observations and sightings of Aboriginal people by some of the pioneers of the upper Hunter region.

- (November 1819), John Howe recorded seeing five Aboriginal people near Jerry's Plains;
- (October 1824), Henry Dangar recorded a visit to his camp on Dart Brook by 15 Aboriginal people, and then observing eight or ten camp fires in the distance. A second entry that month also describes an attack by an Aboriginal party of approximately 150 on his party just beyond the Liverpool Range
- (1824), a settler at Patricks Plains near Singleton counted 300 able bodied men in the neighbourhood
- (1825), Allan Cunningham recorded evidence of Aboriginal people (their recent marks on trees and fired country), but did not actually observe people in the Upper Hunter and Goulburn valleys
- (1826), the official report on an attack on Merton near the junction of the Hunter and Goulburn Rivers, stated that over 200 Aboriginal people were believed to have participated
- (1830), Felton Mathew observed a group of 60 Aboriginal people (men, women and children) camped on Wollombi Brook
- (December 1831), Sir Thomas Mitchell described meeting a small group of Aboriginal people from Puen Buen on Dart Brook, while on the upper Page River

The abrupt displacement of Aboriginal people from traditional country in the nineteenth century would have been a constraint for early ethnographers and Aboriginal Protectors across many parts of Australia, including the upper Hunter region. This limited ethnographic records available for study. What is known is that not long after initial contact and following more sedentary practices of the early settlers along the Hunter River, disease was quick to spread amongst Aboriginal communities which decimated population levels in the space of a few years (Threlkeld cited in Gunson 1974: 119).

Further, the current confusion and contention related to issues of pre settlement land boundaries at the regional scale may be a product of the dramatic population decline in the immediate post contact period. Disease (small pox and syphilis), malnutrition, declining birth rates and alcohol are

reported to have largely contributed to this increase during the post contact period (Miller 1985: 54-55; 107; The Sydney Gazette 1826). Butlin (1983) suggests that the 1789 smallpox epidemic in Port Jackson spread quickly to other areas. Contact with this disease would have been fatal to Aboriginal people.

As a result of European settlement along the entire length of the Hunter River Aboriginal people were quickly displaced from their land and experienced starvation from an inability to access their resource bases. Traditional prey species population densities declined from diminished habitat or over hunting by Europeans. The Wonnarua people often came into contact with the first settlers as they attempted to regain access to their land for food gathering and hunting activities, which included cattle and sheep stock. Taking stock led to violent attacks by the Europeans on the Wonnarua and conflict ensued.

Historical records suggest that by 1830 (only nineteen years after the first European settlers arrived in the Hunter) a combination of disease and brutal attacks on Aboriginal communities ended all armed resistance by local Aboriginal people (Davidson and Lovell-Jones, 1993:17-18). Additional documentary evidence, however, indicates that a number of violent acts continued around the historic Bowman estate. One particularly macabre account details the death of up to 19 Aboriginal people in what is called the Ravensworth massacre (Sydney Gazette: 9 September 1826), although the exact location of the massacre is unknown, it was likely 30 kms or more outside of Ravensworth as the Aboriginal band were pursued a great distance before they were set upon (HRA XII: 617).

Approaching the middle of the nineteenth century the amalgam of disease, retribution and dispossession of land and country had a considerable impact on the Aboriginal population densities of the upper Hunter River Valley. In 1826, a report by two magistrates noted that '…the Upper Districts of Hunter's River, principally occupied by three tribes, whose numbers we should suppose to exceed Five hundred.' (Cited in Brayshaw 1986:47), while in 1831, Mitchell (1838:20) remarks '…the natives have almost all disappeared from the valley of the Hunter…' although some who lingered '…near their ancient haunts…' were occasionally to be met on the larger stations. An additional document from 1839 stated that there were 'no wild tribes in this vicinity' and that the Aboriginal people were being 'rapidly exterminated' by European settlers (Wilkes in Gunson 1974:158). Accounts such as these suggest that Aboriginal population densities in the upper Hunter declined rapidly, perhaps at a greater rate of acceleration than what was witnessed along the coast.

Since European settlement the Hunter Valley landscape has undergone radical changes. European colonisation saw the establishment of pastoral holdings, small towns and villages. Blyton *et al.* (2004:9) suggest that the European pattern of settlement and land use rapidly became the normative occupation pattern 'replacing traditional Aboriginal communities' (Blyton *et al.,* 2004:9). Davidson and Lovell-Jones (1993:17) state that shortly after European settlement all that remained were isolated family groups of Wonnarua existing 'on the fringes of towns and on properties trying as best they could to survive in a European modified environment'.

Aboriginal people continued to practice cultural ceremonies in the Hunter Valley despite the impact European colonisation had on their lifestyle. There are documented accounts of ceremonies conducted at Bulga in 1852 (Blyton *et al.* 2004:9). There was supposedly also a ceremony held at the confluence of the Page and Isis rivers at Gundy in 1870 (McDonald 1878:256-258).

The Aboriginal population along the Hunter and its surrounds incorporated European raw materials for manufacturing tools as opposed to stone. Threlkeld (Cited in Gunson 1974:54, 67) states that Aboriginal people were utilising glass raw material as opposed to stone for manufacturing artefacts, it was also observed that there appeared to be a clear transition from bone to iron for fish hooks. Archaeological research across the Hunter Valley has established that Aboriginal people were utilising European raw materials in the manufacture of a number of traditional artefacts, which suggests that the knowledge of how to create pre contact material culture was not broken, despite the upheaval of Aboriginal culture through the immediate post contact period.

There is evidence in primary historical documents suggesting that many of the locations in which Europeans first settled (homestead locations) and/or areas later designated as reserves for Aboriginal people (such as St Clair, also referred to as 'Mount Olive', and 'Glennies Creek' and Redbourneberry Hill Reserve) near Singleton, were actually pre-European camp sites (refer to accounts eluding to Ogilvies Hill and Dart Brook in ERM (2004:121—134); Maitland Mercury (1851); Blanket returns reported in Singleton Argus (1879) cited in ERM (2004:99); The Singleton Times, 31 May 1862 cited in ERM (2004:109). It is thought that these Aboriginal camp sites were the original camp sites occupied at the point of first contact with Europeans. More recent archaeological research supports this notion in the form of very large artefact scatters that have been observed and recorded at these locations.

Throughout the mid to late nineteenth century, and into the twentieth century, many Aboriginal people were forced into Aboriginal missions and reserves, some of which were a significant distance from traditional lands. In 1881 a Protector of Aborigines was appointed, succeeded in 1883 by the Aborigines Protection Board (Walker 1966:172). A system of protective segregation was adopted, with Aboriginal people being put in missions run by the church or managed stations which were generally away from white society (Bickford et al 1998:35), such as at the St Clair mission established in the upper Hunter Valley, thirteen miles from Singleton.

The Wonnarua community maintains a strong localised identity and issues of cultural heritage management regardless of the ethnocentric views or socio-political necessities of early and current ethnologists and anthropologists. Wonnarua descendants are active in Aboriginal cultural heritage in the Hunter today and continue to live in these areas up to the twentieth century despite European settlement (Miller 1985:157; Singleton Times Newsletter 1992:3-4). European settlement and encroachment on resources and traditional camping groups restricted Aboriginal land use patterns and dramatically affected Aboriginal communities, but it did not completely eradicate connections to knowledge of these areas and a general connection to country and place. There is a continuation of cultural connection and in some cases occupation of these places such as St Clair and Redbourneberry Hill that date well into the twentieth century. Redbourneberry Hill Reserve and St Clair are registered Aboriginal places on the DECCW AHIMS database.

## 4.1 Previous Archaeological Work

A considerable amount of archaeological research has been conducted in the upper Hunter Valley of NSW. Mining related activities has generated the majority of this research in the form of broad scale archaeological surveys and archaeological excavation programs, which has provided a considerable body of information on Aboriginal occupation patterns and site types at both the local and regional scale.

Thorpe analysed and described a number of stone artefacts from the Hunter Valley in the 1920s but it was not until F. D McCarthy undertook more expansive and informative archaeological excavations in the 1950s-1960s that a prehistory of Hunter Valley was established. Following the introduction of NSW legislation protecting Aboriginal archaeological sites in the 1970s academic research-based fieldwork has given way to commercial archaeological projects in the form of fieldwork and assessment reports in order to mitigate impact and provide management recommendations for Aboriginal archaeological sites affected by large scale mining operations.

Table 6 details the previous Aboriginal archaeological projects undertaken in the region between Singleton and Ravensworth. The table and accompanying sections that follow provide a summary of the type of archaeological assessment undertaken, the site type, the number of artefacts and the total area investigated.

Table 6 Previous archaeological projects undertaken in the region

| **Author** | **Date** | **Locality** | **Investigation** | | **Recorded Sites** | |
|---|---|---|---|---|---|---|
| | | | *Type* | *Area*[1] | *Number* | *Type* |
| Brayshaw | 1981a | Glendell, Ravensworth | Survey | 600 ha | 5 | Artefact scatters (3) Isolated finds (2) |
| Brayshaw | 1981b | Ravensworth | Survey | 35 ha | 1 | Artefact scatter |
| Brayshaw | 1982 | Ravensworth No. 2 Colliery | Survey | 520 ha | 19 | Artefact scatters (18), Isolated find (1) |
| Godwin | 1987 | Ravensworth & Narama | Survey | 300 ha | 58 | Artefact scatters (50) Isolated finds (8) |
| Rich | 1990 | Narama | Survey | 200 ha | 15 | Artefact scatters (13) Isolated finds (2) |
| Effenberger | 1992 | Cumnock | Survey | 252 ha | 8 | Artefact scatter (1), Isolated finds (7) |
| Brayshaw McDonald | 1992 | Narama | Salvage | 264 m² | 49 | N/A (salvage of known sites) |
| Ruig | 1994 | Cumnock | Survey | 15 ha | 4 | Artefact scatters (3), Isolated find (1) |
| HLA | 1996 | Cumnock | Survey | 717 ha | 38 | Artefact scatters (23) Isolated finds (14) Scarred tree (1) |
| ERM | 1997 | Ravensworth West | Survey | 462 ha | 58 | Artefact scatter (47) (possible grinding |

| Author | Date | Locality | Investigation | | Recorded Sites | |
|---|---|---|---|---|---|---|
| | | | *Type* | *Area*[1] | *Number* | *Type* |
| | | | | | | groove)<br>Isolated finds (11) |
| HLA | 2001 | Cumnock | Survey | 184.3 ha | 23 | Artefact scatters (11)<br>Isolated finds (11)<br>Grinding grooves (1) |
| HLA | 2004 | Ravensworth, Foy Brook | Survey | 11.52 ha | 3 | Artefact scatter (3) |
| HLA | 2005 | Newdell Junction, Ravensworth | Subsurface testing | 73 m² | 2 | Artefact Scatters (2) |
| Umwelt | 2004 | Glendell, Ravensworth, Bowmans Creek | Survey | N/A | 37 | Artefact scatters (29)<br>Isolated finds (7)<br>Quarry (1) |
| Umwelt | 2009a | Ravensworth West | Surface Collection | N/A | 23 | Artefact scatters (19)<br>Isolated Finds (4) |
| | | | Subsurface Testing | 664 m² | N/A | Spur Crest (2 areas)<br>Ridge Crest (2 areas)<br>Riparian Corridor (2 areas)<br>Emu Creek Locus D |
| Umwelt | 2009b | Narama | Survey | 136 ha | 43 | Artefact Scatters (25)<br>Isolated Finds (18) |
| Umwelt | 2009c | Ravensworth | Survey | N/A | 244 | Artefact scatters (136)<br>Isolated finds (103)<br>Scarred trees (4)<br>Grinding grooves (1) |
| Stern and Attenbrow | 1981 | Singleton | Survey | 120 ha | 86 | Artefact scatters (52)<br>Isolated finds (34) |
| Brayshaw | 1982 | Singleton | Survey | 1302 ha | 21 | Artefact scatters (18)<br>Isolated finds (3) |
| Brayshaw | 1986 | Glennies Creek | Survey | 1200 ha | 44 | Artefact scatters (31)<br>Isolated finds (13) |
| Koettig | 1986 | Singleton | Survey | 0.25 ha | 12 | Artefact scatters (12) |
| Koettig | 1990 | Glennies Creek | Survey | N/A | 24 | Artefact scatters (24) |

**Archaeological Survey of Glendell Open Cut Coal Mine at Ravensworth (Brayshaw 1981a)**

Brayshaw (1981a) undertook archaeological survey of the proposed Glendell Coal Mine in Ravensworth. The Project Area totalled approximately 600 ha which was surveyed by both vehicle and pedestrian inspection. A total of five archaeological sites consisting of three artefact scatters and two isolated finds were recorded. The highest density site consisted of 40 artefacts. The remaining sites were low density sites containing 5 artefacts or less. Brayshaw (1981a) recommends further archaeological research across the Hunter Valley to further our understanding of the archaeology of the region; however, Brayshaw states that no further archaeological survey or sub surface testing is required in the context of the proposed Glendell mining area.

**Archaeological Survey, Ravensworth Coal Washery and Rail Loading Facility near Liddell (Brayshaw 1981b)**

Brayshaw (1981b) undertook archaeological survey of the proposed washery and coal loading facility at Ravensworth just north of the New England Highway. The total area approximated 35 ha which was for the most part considerably disturbed. Survey was undertaken by pedestrian inspection and eight artefacts were located along a disturbed gully. The site consisted of waste flakes and one chert blade core. Brayshaw (1981b) suggests that the artefacts were likely exposed by ploughing and dam construction activities so there is no recommendation for further archaeological survey or excavation due to the amount of prior disturbance at the site.

**North Singleton Proposed Housing Subdivisions. Survey for Archaeological Sites (N. Stern and V. Attenbrow. 1981)**

Stern and Attenbrow (1981) conducted an archaeological survey over two areas of a proposed residential subdivision for the Singleton Council and Delamont Pty Ltd. Each area was approximately 120 ha in total area. The Project Area is located approximately 3 kms north of the township of Singleton, NSW. The purpose of the survey was to establish the nature, extent and significance of extant surface Aboriginal archaeological sites and to provide management recommendations in order to mitigate impact to the sites.

The survey aimed to document all extant surface Aboriginal archaeological sites within areas of high visibility (that is, vehicular and animal tracks, exposures from gully erosion, sheet wash, rabbit burrows, etc.). These areas were identified through aerial photography and then investigated on foot. Other areas were incorporated into the survey area as they were identified during the survey. A number of intact ridgelines were also assessed.

As a result of the survey a total of 52 artefact scatters and 34 isolated finds were identified. One of the scatters was recorded as a component of a scarred tree (PA-S-12). Most sites within both survey areas occur on ridge slopes (69% in survey area 1 and 44% in survey area 2) and on spurs (17% in survey area 1 and 25% in survey area 2). There was considerably more sites located on ridge tops in survey area 2 (25%) than in survey area 1(8%). This is not so much an indication of the land use patterns practiced by Aboriginal people within the Project Area as much as it is an indication of the amount of exposure and the higher visibility in survey area 2. All sites had been

disturbed to some extent with all sites located in the context of sheet erosion, gully erosion and colluvium processes such as lag and slope wash.

Raw material ratios were dominated by mudstone and silcrete with lesser quantities of quartz and quartzite. Artefact densities across both survey areas were generally very low and only three diagnostic tools were identified consisting of two geometric microliths and one backed blade. An edge –ground axe fragment was also located. Stern and Attenbrow (1981) noted that most of the sites contained very small waste flakes and micro-debitage which is markedly different than what has been recorded at other Aboriginal archaeological sites around the Singleton area, particularly at the Gowrie terrace site which consisted of a number of large flakes and nuclear tools. The authors suggested that this indicates that either;

- Gowrie terrace was located significantly closer to a raw material source
- Large artefacts have already been removed from the Project Area by collectors/local farmers
- The project area was associated with tool maintenance activities within a site significantly removed from a raw material source.

A consent to disturb was issued followed the archaeological survey and accompanying report based on the sites having limited archaeological potential. It was recommended that the scarred tree should remain undisturbed.

**Reconnaissance Survey of Ravensworth No. 2 Colliery Proposed Mining Extension and Diversion of Bayswater Creek (Brayshaw 1982)**

Brayshaw (1983) undertook archaeological survey of the proposed Ravensworth No. 2 Colliery area with a view to covering an area much larger than the 520 ha project area. The survey was discontinued when it was established that Bayswater Creek was an archaeologically sensitive land unit and should be investigated in greater detail through archaeological excavation.

The survey identified a number of exposures that contained extant Aboriginal archaeological material along the terrace margin of the creek. Several large artefact scatters were identified some of which contained densities of 100 artefacts $m^{2.}$

Brayshaw observed a number of large knapping floors that appeared to be relatively *in situ* across the terrace margins of the creek and also noted some variation in the spatial distribution of artefacts between Bayswater Creek and its tributaries. A total of 19 sites were recorded which consisted of 18 large artefact scatters and one isolated outlier. The dominate raw materials consisted of silcrete and mudstone, with lesser quantities of quartz, quartzite, basalt and siltstone. Typologically, the artefact scatters were typified by high numbers of waste flakes, broken flakes but also a considerable number of cores and backed artefacts in addition to smaller quantities of other tool types.

No other sites were identified during the survey of other land forms across the Project Area (including other water corridors). Brayshaw recommended that further archaeological investigation

in the form of an excavation program should be conducted at Bayswater Creek prior to any ground disturbance associated with proposed construction works along the water corridor.

**Archaeological Survey of Authorisation 89, Proposed Site of Bloomfield Collieries', Coal mine at Rix Creek, Singleton. Brayshaw (1982)**

Brayshaw (1982) undertook an archaeological survey approximately 4 kms north of Singleton for Bloomfield Collieries Pty. Ltd who propose to develop an open cut coal mine including all mining-related infrastructure (that is, the rail loop). Authorisation area for the mine total approximately 1302 ha. The area is dissected by Rix Creek flowing in a south westerly direction to the Hunter River. Eighty percent of the Project Area contains a slope of less than 2º. A large amount of natural erosion has occurred along the length of Rix Creek and this area was intensively surveyed.

From a result of the survey a total of approximately 1100 artefacts were identified from highly erosional surfaces along the length of Rix Creek and its tributaries. Two sites were recorded on the margins of Rix creek while the remainder were all located along the length of smaller tributaries. A total of 18 artefact scatters were identified, four of which contained densities of up to or more than 200 artefacts. Three isolated finds were also recorded. Other than the four medium density scatters (i.e. up to 200 artefacts) the remaining 14 sites consisted of low density artefact scatters of less than 60 artefacts per site. Mudstone and silcrete were the dominant raw material types and quartz occurred in very low densities.

No salvage program was recommended as all sites were assessed as not being unique to the regional landscape. However, it was stated that a Consent to Destroy would be required prior to the destruction and/or collection of the Aboriginal archaeological material before the onset of mine related construction activities.

**Archaeological survey of Glennies Creek Coal Authorisation Areas 81 and 308, Hunter Valley, NSW (Brayshaw 1986).**

Brayshaw (1986) conducted an archaeological survey for the proposed Glennies Creek coal mine project for Epps & Associates. The project area (authorisation area) encompasses approximately 1200ha in total area located approximately 7 kms north of Singleton, NSW. The objective of the survey was to identify Aboriginal archaeological sites within the authorisation area and to assess their extent, nature and significance in order to provide management recommendations prior to the commencement of mine-related construction activities.

The primary water source is 4th order Station Creek, a tributary of Glennies Creek (Fal Brook) which flows north-west through the Project Area. Glennies Creek flows in a westerly direction into the Hunter River. The topography of the authorisation area is general low relief undulating country, although a low spur and ridge <100m ASL runs along the northern boundary. Mudstone occurs locally as an *in situ* geological substrate. Surface erosion (rill erosion, gully wash and sheet erosion) was extensive along all water corridors and areas on top of spurs and ridgelines. Ground visibility was averaged across the Project Area as 15-40%.

A total of 31 artefact scatters and 13 isolated artefacts were identified during the course of the surface survey. Raw material percentages were dominated by mudstone (58.7%) followed by silcrete (31%), the remaining 10,2% consisted of chert, quartz, fine-grained volcanics and petrified wood. A total of 44 artefacts (or 14.5% of the total assemblage) showed signs of secondary modification but only one was identified as a backed blade. No edge-ground artefacts were identified.

All sites with the exception of three were located on slightly elevated land forms within 100 metres of natural water corridors (Station Creek and its tributaries). The remaining three sites were located on the ridgeline/spur landform. Brayshaw (1986) concluded that the complex of the sites as well as their spatial distribution across the authorisation area reflected other sites in both a local and regional context through the upper Hunter Valley. It was advised that a Consent to Destroy and Archaeological Site would be required prior to the commencement of any mine-related works.

**Assessment of Archaeological Sites along the proposed Singleton to Glennies Creek Water Pipeline Route and the reservoir Site at Apex Lookout, Hunter Valley, New South Wales (Koettig 1986)**

This report documents the results of two Aboriginal archaeological surface sites for the Public works department, NSW. The first assessment was an archaeological survey at a reservoir at Apex lookout west of Singleton. Total area covered by the survey was approximately 0.25 ha. The second assessment is a survey along a proposed pipeline between Singleton and Glennies Creek approximately 12 km north of Singleton.

A total of one site was located during the survey at Apex lookout. This site consisted of three artefacts in a disturbed context along the western section of a ridgeline overlooking the reservoir area. A total of 11 sites were identified along the proposed pipeline easement between Singleton and Glennies Creek. All 11 sites were open artefact scatters, the higher density sites were all located on erosional land surfaces within 100 metres of Martin's Creek and it tributaries. Locations of artefact scatters within 100 metres of water corridors was attributed to the higher visibility along these land forms as opposed to all other land forms within the pipeline easement. Mudstone was the overwhelmingly dominant stone raw material type across all 11 sites identified.

Koettig (1986) recommended that an application for a Consent to Destroy an archaeological site should be sought by the Department of Public Works for the Apex lookout site and numerous sites along the proposed pipeline easement between Singleton and Glennies Creek. All of these sites were highly disturbed as a consequence of various anthropogenic and natural disturbance activities. A program of subsurface excavation was recommended for higher density sites that contain marginal prior disturbance with a focus on Martin's creek and its tributaries.

**A Preliminary Archaeological Survey of a Proposed Open-Cut Coalmine at Ravensworth in the Hunter Valley of NSW (Godwin 1987)**

Godwin (1987) conducted archaeological survey across the proposed Ravensworth mining area, a total of 450 ha. A total of 300 ha was effectively surveyed. The target land form of the assessment

consisted of the Bayswater Creek catchment area, the creek length and its associated tributaries. A large section of the western area of the proposed development was not surveyed due to land access constraints.

The survey identified a total of 58 Aboriginal archaeological sites consisting of 50 artefact scatters and eight isolated finds. A total of 52 archaeological sites were recorded within 30 metres of water corridors, four sites were recorded on slopes and two were recorded on crests. The largest scatters were recorded along Bayswater Creek where large numbers of silcrete and mudstone stone raw materials had been discarded in discrete knapping floors. Isolated finds were all identified a considerable distance from water sources and artefact scatters were generally larger along Bayswater Creek than along its tributaries.

Artefact scatters contained silcrete and mudstone as the dominant stone raw material types with lower quantities of quartz and quartzite and petrified wood also observed.

Artefact densities ranged from one artefact per 0.25 $m^2$ to 38.2 $m^2$ as an average across all recorded sites. Godwin (1987) states that mudstone would have been locally abundant from creek beds but silcrete may have been traded or brought into the area as manuported stone material.

The spatial distribution of sites and their contents along natural water corridors led Godwin to suggest that food and stone resources were abundant and readily accessible. It appeared that some of the sites had undergone prior disturbance as a result of gully erosion and sheet wash as well as land clearance activities, however, it was recommended that a salvage program be undertaken in order to mitigate further destruction to Aboriginal archaeological sites across the Bayswater creek catchment area.

**Proposed Narama Open Cut Coal Mine at Ravensworth, NSW: Supplementary Archaeological Survey for Aboriginal Sites (Rich 1990)**

Rich (1990) conducted further archaeological survey at the Narama mine site at Ravensworth in order to assess areas that Godwin (1987) had omitted. These areas are situated on the western side of Bayswater creek and totalled an area of approximately 200 ha. The western side of Bayswater creek contained Aboriginal archaeological sites that had been recorded by Brayshaw (1983) and Godwin (1987). As a result of Rich's secondary survey across the area a total of 15 additional archaeological sites were identified which consisted of 13 artefact scatters and two isolated finds. Only one site contained more than 100 artefacts.

Although at variance with Brayshaw's (1983) and Godwin's (1987) survey Rich (1990) observed that 75% of the 15 archaeological sites were situated a considerable distance from water corridors which reflects poor ground surface visibility and lack of surface exposures rather than a viable comparative study of the spatial distribution of artefacts to landform. The data sets were composed of waste flakes, broken flakes and other forms of debitage and micro-debitage all of which appeared to be manufactured from mudstone, silcrete and quartz stone raw material types. The assemblage contained a high proportion of retouched artefacts with 21% of exhibiting signs of retouch or usewear. Two backed blades were also observed as was a fractured axe bevel which

was identified on a spur crest land form. Rich (1990) observed a correlation between flake type and raw material and stated that flakes manufactured on silcrete raw material were in the most part elongate which may indicate that silcrete raw material was the preferred stone material for blade production.

None of the sites were large or scientifically significant enough to warrant amendments to the project design and further archaeological investigations consisting of surface collection and excavation were recommended in order to mitigate further impact to Aboriginal archaeological sites prior to the onset of mine related activities.

**Camberwell Coal Project- Glennies Creek, Supplementary Report on Aboriginal Sites (Koettig 1990)**

Following on from Brayshaw (1986) at the Glennies Creek Coal Authorisation Areas 81 and 308 (renamed Camberwell Coal Project); Koettig (1990) inspected two additional areas that were added to the original authorisation area. These areas included a large parcel of land for a proposed dam and an access road connecting the coal processing plant with Bridgeman Road, sections of both areas are situated within 100 metres of Martins Creek. The proposed access road is 2.4 km in length.

Two terrain unit types were inspected via pedestrian survey, valley floor and the lower slopes of the surrounding hills. The entire survey area was covered with dense grass so visibility was extremely low. The survey area around the proposed dam site is approximately 2.6km in length and ground surface visibility was generally low, although 17 small exposures were observed. Thirteen of these contained Aboriginal archaeological material. Koettig (1990) inspected 13 small exposures along this proposed route and identified Aboriginal archaeological material in three of the exposures. All but two of the sites were located within 100 metres of Martins Creek, the remaining two sites were identified approximately 500 metres from the creek which indicates that archaeological material is not confined exclusively to the water corridor.

The majority of the sites constituted low density scatters (58% of all sites identified had less than 10 artefacts); however site GCC19 contained up to 1000 artefacts. Mudstone and silcrete were the dominant raw material types with lesser quantities of quartz also occurring, a frequent raw material frequency correlation identified throughout the Hunter Valley. Artefact densities varied between one per 23 $m^2$ to 40 per 1 $m^2$.

Koettig recommended that archaeological salvage in the form of an excavation program should be undertaken for the 14 larger sites recorded in the course of the surface survey. Fencing should be erected around the dam sites and an ongoing monitoring program put in place in order to assess potential impact from dam waters or dam construction. Sites located in the dam development footprint will all be destroyed by water inundation. For all sites impacted by mine related construction activities the developer must submit an application to NPWS for A Consent to Destroy. The remaining sites should be fenced off so that construction activities do not impact on extant archaeological surface material.

**Archaeological Survey and Assessment of Stage One Cumnock South Open Cut Mine Singleton Shire (Effenberger 1992)**

Effenberger (1992) undertook archaeological survey of the proposed Cumnock south coal mine. Total area surveyed was approximately 252 ha with a focus on water corridors including Davis Creek and an additional three unnamed drainage lines. Areas where surface visibility was high and discrete exposures prevailed as well as all elevated land forms were rigorously assessed. The survey identified a total of eight Aboriginal archaeological sites consisting of one artefact scatter and seven isolated finds, all sites were considerable removed from reliable water sources.

Six of the artefacts were manufactured from mudstone while one was manufactured from silcrete and the other an unidentified meta-sedimentary rock. Tool to flake ratios were high with two blades and two scrapers identified. Cores and waste flakes constitute the remainder of the assemblage.

The results of the survey suggest that the sites likely reflect low density discard patterns on transient land forms which are in line with site use on land forms that are significantly removed from water corridors. All sites were assessed as representing low scientific significance. A cluster of unutilised mudstone and silcrete cobbles was also observed along a gully near a haul road. These cobbles were not local to the immediate Project Area and were likely manuported into the area from the Hunter River by human action as opposed to natural processes.

**Narama Salvage Project Lower Bayswater Creek Hunter Valley NSW (Brayshaw McDonald 1992, Rich 1990 b & c, Baker and Gorman 1992)**

Brayshaw and McDonald (1992) undertook a broad-scale salvage program at the proposed Narama mine site. The salvage program aimed to investigate the potential for Aboriginal archaeological material across the entire site except the north-west area which had previously been assessed by Brayshaw and Haglund (1984). Bayswater Creek, prior to its diversion, was understood to be an area of Aboriginal archaeological sensitivity, consequently considerable resources were spent on investigating this landform.

The methodology of the salvage program aimed to sample expansive areas as well as along linear transects across a range of land forms in order to assess how the landscape may have been utilised in the past and whether there were obvious patterns of stone artefact discard rates, tool types, tool to flake ratios and flake types across a range of geomorphic units. Rich (1990) assessed the assemblage from the Brayshaw and McDonald (1992) report and prepared a table based on the post excavation analysis of the data sets as detailed below in Table 7. A total of 10, 300 artefacts were collected during the course of the salvage program.

Table 7 Summary of Salvage Data Provided by Rich (1990)

| Site | Landform | Salvage | Salvage area m² | Number of artefacts | Number of heat affected artefacts | Artefact density m² | Dominant raw material |
|---|---|---|---|---|---|---|---|
| 2 | Hillslope | Surface collection | 675 | 831 | 99 | 1.23 | Mudstone |

| Site | Landform | Salvage | Salvage area m² | Number of artefacts | Number of heat affected artefacts | Artefact density m² | Dominant raw material |
|---|---|---|---|---|---|---|---|
| | Hillslope | Excavation | 1.25 | 608 | 98* | 486.40 | Mudstone |
| 4 | Hillslope | Surface collection | 160 | 309 | 83 | 1.93 | Mudstone |
| 12 | Hillslope | Surface collection | 17500 | 684 | 93 | 0.04 | Mudstone |
| | | Excavation | 30.25 | 3099 | 1947** | 102.45 | Silcrete |
| 15 | Footslope | Surface collection | 1 | 1 | NA | 1.00 | Silcrete |
| 16 | Footslope | Surface collection | 3000 | 17 | NA | 0.01 | Mudstone |
| 17 | Footslope | Surface collection | 7000 | 12 | NA | 0.00 | Mudstone |
| 18 | Hillslope | Surface collection | 4800 | 146 | 58 | 0.03 | Mudstone |
| 27 | Brown pedal alluvium | Surface collection | 20.25 | 82 | 28** | 4.05 | Silcrete |
| | | Excavation | 20.25 | 1162 | 151** | 57.38 | Silcrete |
| 28 | Brown pedal alluvium | Surface collection | 125 | 45 | 25 | 0.36 | Mudstone |
| 29 | Brown pedal alluvium | Surface collection | <1000 | 45 | NA | 0.05 | Silcrete |
| 30 | Footslope | Surface collection | 347 | 238 | 12 | 0.69 | Silcrete |
| 31 | Footslope/ brown pedal alluvium | Surface collection | 1830 | 43 | 1 | 0.02 | Silcrete |
| 32 | Brown pedal alluvium | Surface collection | 66 | 79 | 10 | 1.20 | Silcrete |
| | | Excavation | 6.5 | 164 | 4 | 25.23 | Silcrete |
| 33 | Terrace alluvium | Surface collection | 525 | 42 | 14 | 0.08 | Mudstone |
| 34 | Terrace alluvium | Surface collection | 85 | 98 | 14 | 1.15 | Mudstone |
| | | Excavation | 8 | 88 | 14 | 11.00 | Mudstone |
| 35 | Terrace alluvium | Surface collection | NA | 1429 | 1323 | NA | Other # |
| | | Excavation | 18 | 551 | 444 | 30.61 | Silcrete |
| 45 | Terrace alluvium | Surface collection | NA | 104 | 104 | NA | Mudstone |
| | | Excavation | 10 | 781## | 281** | 78.10 | Silcrete |
| 47 | Hillslope | Surface collection | 3790 | 1092 | 124 | 0.29 | Mudstone |
| 48 | Terrace alluvium | Surface collection | 2647 | 1867 | 153** | 0.71 | Silcrete |
| | | Excavation (extensive) | 45.25 | 7728 | 979** | 170.78 | Silcrete |

| Site | Landform | Salvage | Salvage area m² | Number of artefacts | Number of heat affected artefacts | Artefact density m² | Dominant raw material |
|---|---|---|---|---|---|---|---|
| 49 | Terrace alluvium | Surface collection | 2725 | 465^ | 79 | 0.17 | Silcrete |
| 50 | Terrace alluvium | Surface collection | 650 | 10 | 0 | 0.02 | Silcrete |
| 51 | Terrace alluvium | Surface collection | 400 | 30 | 1 | 0.08 | Mudstone |
| 52 | Terrace alluvium | Surface collection | NA | 201 | 5 | NA | Silcrete |
| | | Excavation | 2 | 6 | 1 | 3.00 | Silcrete |
| 53 | Footslope | Surface collection | 1800 | 128 | 9 | 0.07 | Mudstone |
| 60 | Hillslope | Surface collection | 20000 | 5 | 0 | 0.00 | Mudstone |
| 61 | Footslope | Surface collection | 300 | 34 | NA | 0.11 | Mudstone |
| BH19 | Footslope | Surface collection | 9068 | 225 | 19 | 0.02 | Silcrete |
| R4 | Terrace alluvium | Surface collection | 2508 | 794 | 94 | 0.32 | Mudstone |
| | | Excavation | 8 | 47 | 3 | 5.88 | Mudstone |
| R5 | Hillslope | Surface collection | 35250 | 353 | 30 | 0.01 | Mudstone |
| R9 | Hillslope | Surface collection | 240 | 5 | 0 | 0.02 | Mudstone |
| R10 | Hillslope | Surface collection | 400 | 13 | 2 | 0.03 | Mudstone |
| R11 (part) | Hillslope/ terrace alluvium | Surface collection | 27106 | 2218 | 76 | 0.08 | Mudstone |
| | | Excavation | 43 | 3178 | 416 | 73.91 | Mudstone |
| | | | 143211 | 29057 | 6794 | | |

Based on his results of the analysis Rich (1990: 247) concluded that stone reduction strategies were more intensive on terrace and other low lying alluvium than on any other land form. There was a distinct reduction in the density of sites the further they were from Bayswater Creek. Rich (1990: 247) interpreted this as representing a pattern of land use which saw a focus on the resources of Bayswater Creek with relative isolated occurrences between 100-200 metres from the creek channel. Rich does not mention whether the stone artefacts are *in situ* or indeed, whether there is any spatial congruency to the excavated material (especially in the alluvium associated with Bayswater creek), factors which would need to be addressed when discussing the spatial distribution of artefacts across a site on a range of landforms.

The Narama salvage program assemblage is typologically in line with other Hunter Valley data sets which contain comparatively high proportions of broken flakes and relatively low quantities of retouched/used artefacts, cores and formal tool types such as Bondi Points and eloueras.

Baker and Gorman (1992:54) also analysed part of the assemblage and stated that a large percentage of the material exhibited a 'greasy lustre' which indicated heat shattering. Pot lids and crazing were also evident on many of the stone artefacts which suggested that a large proportion of the stone raw material may have been fired prior to being consumed, which generally facilitates more predictable fracture planes across crystal boundaries, thus enabling the knapper to have greater control over the reduction of the stone. Stone raw material preparation through firing only seemed to extend to the silcrete material. The mudstone material did not appear to have been heat treated to the same extent as the silcrete stone raw material. This is a common trend throughout the Hunter Valley which may indicate that mudstone does not require heat treatment on the same scale as silcrete because it is a higher grade material with more predictable fracture planes.

Another trend observed throughout the Hunter Valley that was evident in the Narama data set is that mudstone constitutes the highest total number of artefacts in a surface context (63% of the total surface collection), while silcrete constitutes the highest total number in a sub surface context (64% of the total sub surface collection). In total however; silcrete continues to dominate the raw material count making up 64% of the assemblage with mudstone occurring in less frequent quantities (35% of the total assemblage).

A number of knapping floors (n=39) were identified during the field survey. The term 'knapping floor' is not supported by any conjoin analysis so it can only be surmised that Rich (1990) defined a knapping floor by clusters of Aboriginal stone artefacts that appeared to have been manufactured from the same type of stone raw material over a relatively confined area. The higher density knapping floors were identified on terrace alluvium which is in line with the total density of artefacts on this land unit when compared to other land units across the site. Silcrete (51%) and mudstone (43%) were dominant raw material types followed by igneous volcanic (2%) and quartz (1%) and unidentified material (3%).

It would be difficult to assume that the observed knapping floors were the result of discrete single knapping events without undertaking a conjoin analysis, although a cluster of stone raw material similar in texture and colour over a relatively small area may indicate was some spatial integrity to the scatter.

A number of charcoal samples were taken from deposits believed to contain hearths; however the definition of what constitutes a hearth at the Narama site was never clearly described. What is clear is that areas containing burnt materials including clay in association with heat affected stone raw materials were dated to 680 $\pm$ 50 BP at site 48 and 260 $\pm$ 60 BP potentially associated with a discrete silcrete knapping floor was obtained at site 30 (Rich 1990 110; Rich 1990: 55).

Baker (Baker and Gorman 1992) conducted a more detailed analysis on cores, flakes and backed blades identifying a number of patterns in regard to the consumption of the stone raw material. Some of the primary observations were;

- Unidirectional core reduction strategies that contain many small expanding flake scars as well as some larger core rejuvenation scars. Cores of this type did not exhibit blade scars and have been described as representing opportunistic or expedient flaking strategies in order to create a preferential platform. This suggests that raw material was consumed in large quantities which in turn indicate that stone raw material was locally abundant and readily accessible. Stone reduction strategies of this kind may also indicate that stone raw material was consumed in large volumes
- Further to the above, cores may have been primarily worked to establish preferential platforms, which indicates that following the removal of primary (cortical) flakes cores were then rotated in order to provide preferential platforms for blade production
- The process by which silcrete is heated in order improve the crystal boundaries of the stone raw material

Baker (Baker and Gorman 1992) surmised that alternating platform strategy represented a preconceived intention of producing backed blades. A total of 228 backed blades were identified, a number of which contained transverse snaps. It is unclear whether the blades had been snapped due to post depositional anthropogenic or nature processes or whether they have been snapped through use. A number of other blades were diagnostic and did not appear to have been utilised.

In summary, Baker (Baker and Gorman 1992) suggests that the Narama site represents a blade manufacturing area probably for the purposes of exploiting the resources of Bayswater Creek. Stone raw material was heat treated following removal of cortical flakes in order to provide preferential platforms for blade production. Cores discarded on site without being exhausted indicated there were no restraints on stone raw material sources.

**Archaeological Survey of Cumnock South (Ruig 1994)**

Ruig (1994) undertook archaeological survey of a proposed dump site as part of the Cumnock South colliery. The dump site contained a footprint of 25 ha although only 15 ha was surveyed. It was not made clear why 10 ha was omitted from the assessment although a lack of surface visibility or land access may have been a constraint.

Field survey identified a total of four Aboriginal archaeological sites consisting of three artefact scatters and one isolated find. The sites were dominated by mudstone stone raw material and flakes constituted the most typologically frequent artefact type. Site 1 contained the greatest density of artefacts (n=42) and Ruig (1994) stated that these artefacts appeared to be *in situ*. The remaining three sites contained less than five artefacts per site and were assessed as containing very little scientific significance. Site 1 which was assessed as being *in situ* was thought to contain some significance for educational purposes. It was recommended that Site 1 be subject to sub surface investigations in order to assess the nature, extent, significance and stratigraphic integrity of this site prior to the commencement of mine related development works.

**Environmental Impact Statement for Cumnock No. 1 Colliery Expansion (HLA 1996)**

HLA (1996a) undertook archaeological survey throughout the upper catchment of Davis Creek for the proposed Cumnock No. 1 Colliery. Effective survey coverage totalled of 14.1ha of ridge/crest and 703ha on valley land forms. Coverage varied depending on gradient and surface visibility on land forms.

In total, 38 sites were identified consisting of 23 artefact scatters, 14 isolated finds and one scarred tree. Valley land forms contained the most sites where 23 artefact scatters and 9 isolated finds were identified. Elevated sites like upper slopes and crests contained 8 sites consisting of 5 isolated artefacts, 2 artefact scatters and one scarred tree.

The scarred tree (CUM-10) was reported to have been only recently (1996) cut down. Mudstone stone raw material and waste flakes constituted the majority of the assemblage which was assessed as representing different aspects of land use patterns by Aboriginal people in the past. It was assumed that stone reduction activities along Davis Creek with more variable activities like specific tool production occurring along lower order streams, ridge lines and slopes.

It was recommended that the all surface artefacts be collected prior to the onset of mining related construction works and that the site be monitored by Aboriginal stakeholders. It was also recommended that a program of site monitoring be implemented into the Cultural Heritage Management Plan (CHMP) in order to assess any increase in erosion affecting archaeological sites.

**Extension of Mining Operations at Ravensworth West Environmental Impact Statement, Archaeological Investigations (ERM 1997)**

ERM (1997) undertook archaeological survey of the Ravensworth West mine to establish the nature, extent and significance of any Aboriginal archaeological sites. The survey covered an area over 450 ha and sampled three different land form types including creeks, ridges and gullies. The survey identified 58 new sites which consisted of 47 artefact scatters, one grinding groove site and 11 isolated outlier sites. The sites were located across a range of different land forms with:

- 25 sites recorded on slopes
- 20 sites recorded along gullies or creeks/drainage lines
- 13 sites recorded on ridgelines/crest

A total count of 1,737 stone artefacts was recorded from all 58 sites including:

- 1091 flaked pieces
- 490 flakes
- 110 cores
- 27 backed blades
- 8 manuport pebbles
- 1 edge-ground axe
- 1 scraper

Mudstone stone raw material dominated raw material frequencies totalling 995 artefacts, silcrete occurred in relatively high densities (n=483) as did porcellanite (n=83) and quartz (n=75). The other stone raw materials were manufactured from chert (n=45), petrified wood (n=24), a fine-grained siliceous material (n=21) and unidentified igneous types (n=8).

Sites were generally low density scatters in association with high levels of natural disturbance (slope wash, gullying and sheet erosion); consequently scientific significance was assessed as low. Two sites, the edge-ground axe site and a site containing possible grinding grooves were assigned a higher significance value based on their uniqueness within the regional landscape. ERM (1997) stated that the observed stone artefact scatters were consistent with other sites at the local and regional scale throughout the Hunter Valley, with isolated finds on elevated landforms more than 100 metres from water corridors and more extensive and higher density scatters on terrace margins.

ERM (1997) proposed that cultural heritage management recommendations should be implemented to conserve Aboriginal archaeological sites that will not be impacted by the proposed development. Management recommendations for the sites that will be impacted by the development should be developed in conjunction with the feedback form Aboriginal stakeholders.

**Archaeological Survey, Cumnock No. 1 Colliery, Ravensworth NSW (HLA 2001)**

HLA (2001) undertook archaeological surface survey over a proposed extension to the Cumnock mine to determine impacts to cultural heritage places and values resulting from potential subsidence. The survey was conducted over an area of 184 ha with 23 Aboriginal archaeological sites identified. Site types included 11 artefact scatters, 11 isolated finds and 1 grinding groove site. A total of 15 out of 23 sites contained between 1-4 artefacts, the highest density site recorded included 20 artefacts. A range of artefact types were observed including waste flakes and cores and raw material types included silcrete, mudstone and quartz. The grinding groove site was considered to be of high scientific significance while the artefact scatters were considered moderate-low scientific significance.

HLA (2001) recommended that a tributary of Emu Creek should be monitored for the effects of subsidence; however, a planning design detailing the extension mining operations was not available at the time of the survey. Consequently, HLA (2001) proposed that management recommendations should only be formalised following the development of the Cumnock No. 1 Colliery Master Plan.

**Indigenous Heritage Assessment: Ravensworth Rail Unloader Extension (HLA 2004)**

HLA (2004) conducted an archaeological survey in order to assess the cultural heritage values of a proposed rail loader extension at Newdell Junction. The Project Area totalled 24 ha, some of which extended along the western bank of Bowmans creek, a tributary of the Hunter River. Archaeological survey was conducted as linear transects which covered approximately 50 % of the total Project Area (12ha) and was designed to sample all land forms.

A total of three sites all containing small artefact scatters were located during the surface survey (MG#1 n=49 consisting of flakes, broken flakes, retouched flakes and cores, MG#2 n=61 consisted of flakes, broken flakes, retouched flakes and cores and MG#3 n=7 consisted of flakes and broken flakes). All Aboriginal artefacts were manufactured from mudstone, silcrete or a fine-grained unidentified siliceous stone raw material.

All three sites were situated in areas of significant ground disturbance in a lower hillslope landform, small sections of MG#1 and MG#2 were partly buried by sediment which may be a product of colluvium or slope wash. Given the relative lack of surface visibility due to vegetation cover, it was assumed that many more surface artefacts remained unidentified. The terrace and alluvial sediments along Bowman's creek were defined as an area of potential archaeological sensitivity which is in line with the discovery of large archaeological sites adjacent to water corridors in other parts of the Hunter Valley.

HLA (2004) recommended that subsurface excavations should be conducted at MG#1 and MG#2 to assess the stratigraphic context (if any) of these sites. Further, subsurface excavations should also focus on the terrace margin of Bowmans Creek in order to assess the potential for buried Aboriginal archaeological materials on this landform.

**Aboriginal Archaeological Assessment - Glendell Open Cut Mine Project (Umwelt 2004)**

Umwelt (2004) conducted a resource, landform and geomorphic assessment in 200 for the Glendell Open Cut Mine Project. The Glendell survey included sections of Swamp Creek, Bowmans Creek and Betty Creek. The purpose of the surface survey was to identify areas of Aboriginal archaeological sensitivity and to also observe and record known resources including stone, timber, water, medicinal plants as well as edible plants and fauna that may have been available to Aboriginal people within the boundaries of the Project Area.

This information was used as the basis for the predictive model within the Project Area. A geomorphic assessment was also undertaken to establish potential areas of sensitivity based on disturbance (through both natural and cultural processes) as well as relative ages of soil profiles. The Geomorphic assessment was also undertaken to investigate a buried soil profile on the dual Bowmans Creek-Swamp Creek floodplain in order to establish whether there was any possibility that Late Pleistocene-Early Holocene soil deposits were present in association with Aboriginal archaeological material.

The results of the resource, landform and geomorphic assessment suggested that the Project Area would have provided enough resources for a small band of hunter-gatherers practicing a form of optimal foraging. All three water corridors in the Project Area would have provided mobile hunter gatherers a relatively reliable source of fresh water as well as numerous aquatic plant species. It follows that the terrace margins of all three water corridors were expected to contain the highest density Aboriginal archaeological sites.

Land use patterns were evident from previous archaeological research at the local and regional scale with the majority of sites located along the watercourses (58 %). Just over 50% of the sites

were within 30 metres of the nearest water corridor and 66 % of sites were within 100 metres. Sites on slope landforms constituted 18.5 % and sites on crest/spur landforms totalled 16.6 %. Sites on midslopes equated to 8% of total sites.

In total, 37 sites were identified within the Glendell Mine Lease project boundary all of which are tabulated below (Table 8).

Table 8: Sites in the Glendell ML

| **Creek catchment** | **No. of sites** | **Site types** | **Site locations** |
|---|---|---|---|
| Swamp Creek | 9 sites | 3 isolated finds<br>6 artefact scatters | 3 on footslope<br>1 on upper slope<br>1 on bank of Swamp Creek<br>2 on banks minor tributary<br>2 on floodplain/alluvial flats of Swamp Creek |
| Bettys Creek | 22 sites | 4 isolated finds<br>18 artefact scatters | 8 on banks minor tributaries<br>3 on footslope<br>4 on banks Bettys Creek<br>2 on ridge crests/saddle<br>5 on floodplain/alluvial flats of Bettys Creek |
| Bowmans Creek/Swamp Creek shared floodplain | 1 site | 1 artefact scatter | 1 on shared floodplain/alluvial flats between Bowmans and Swamp Creek. |
| Bowmans Creek | 5 sites | 4 artefact scatters<br>1 quarry with artefact scatter | 3 on floodplain/alluvial flats of Bowmans Creek<br>1 on ridge crest<br>1 on banks minor tributary |
| Total | 37 | 29 artefact scatters<br>7 isolated finds<br>1 quarry in association with artefact scatter | 6 on footslopes<br>5 associated with banks of main creek channel<br>4 on crests and upper slopes<br>11 associated with banks of minor tributaries<br>11 on floodplain/alluvial flats of main creek |

Artefact scatters accounted for 30 of the 37 sites recorded (including a small quarry site) and seven isolated finds. An artefact scatter associated with a buried soil profile was situated on the dual Bowmans Creek-Swamp Creek floodplain. This area was trenched in the 1980s in order to divert water and run off from Swamp Creek into Bowmans Creek. During the 2001 archaeological survey it was noted that this trench did not appear to connect the two creeks. The artefact scatter in this area may have undergone some disturbance due to the construction of the trench, the artefact scatter was eroding out of an upper $A^1$ profile. A buried $A^2$ profile was also observed approximately

1 metre below the artefact scatter, geomorphic dating established this profile dated to the early Pleistocene-Tertiary epoch. This profile did not contain Aboriginal archaeological material.

Umwelt (2004) concluded that ideal camping locales existed along Bowmans Creek which provided good flat land for camping up to 30-40 metres back off the terrace margin. Bowmans Creek was a reliable water corridor providing fresh water, aquatic food staples and a well sheltered outlook throughout all seasons.

In a general sense the geomorphic assessment undertaken on the dual Bowmans Creek-Swamp Creek floodplain indicted that the soil profile reflected a probably relict swamp floodplain not conducive to human occupation due to its marshy conditions. The artefacts collected from the terrace margin of Bowmans creek reflected the data sets of other water corridors observed throughout the upper Hunter Valley in that it consisted of a relatively high density in total count with a complex array of typological forms. Other areas excavated along Bowmans Creek contained only low-medium density sites which suggests that there were likely preferential camp site locations along the creek that may have been occupied continuously over a considerable amount of time.

**Preliminary Research Permit #1982: Excavations and Findings at Newdell Junction, Ravensworth (HLA, 2005)**

HLA (2005) undertook excavations at two archaeological sites and three areas of archaeological sensitivity at Newdell Junction in order to mitigate impact to potential and extant cultural heritage material at a proposed expansion for rail infrastructure.

Following on from the survey undertaken by HLA (2004) that identified site MG#1 (containing 49 artefacts) and MG#2 (containing 61 artefacts), the excavation of these two sites as well as manual and machine excavation on the terrace margin of Bowmans Creek identified 198 artefacts, including 156 un-retouched flakes, 24 retouched flakes, 12 flaked pieces and five cores. 100% of sediment was sieved from all excavations. Raw material was mostly silcrete and fine grained siliceous stone raw material types with fewer quantities of chert, unidentified volcanics and quartz.

HLA (2005) determined that the two sites, as well as the area of archaeological sensitivity constituted relatively low density scatters that were not rare or unique to the Hunter Valley and thus would not require further management. A post excavation artefact analysis was recommended that proposed to investigate the technological aspects of the assemblage as well as raw material variability.

**Ravensworth West Salvage Report (Umwelt 2009a)**

Umwelt (2009) undertook broad scale archaeological excavations and salvage at the Ravensworth West mine site. The Project Area comprised 277 ha. Surface collection of 23 Aboriginal archaeological sites was undertaken and archaeological subsurface excavations were undertaken on three land form types. A salvage program was also undertaken at Emu Creek.

A series of research questions were presented that aimed to assess the spatial distribution of artefacts in order to determine whether different types of activities were undertaken on specific land

unit types. A technological analysis was also undertaken to assess a number of questions relating to raw material consumption at each individual site and whether there was any evidence to suggest variation in raw material use, reduction sequences and artefact types at each individual site.

Excavations were conducted on distinct landform types including ridge crest, spur crest and along water corridors and all excavations were within relatively close proximity to surface scatters. The Emu Creek salvage program consisted of the excavation of 60 1m² test pits and all stone artefacts excavated in the context of the salvage program were analysed. Residue analysis was performed on a sample of 20 artefacts (all retouched flakes, backed blades or axe bevels).

In total, 708 artefacts were collected from eight sites on Emu Creek, five sites along a tributary of Bayswater Creek and one site on a tributary of Farrells Creek. Artefacts were also recorded from three sites on a crest landform, three sites on slope or lower slope landforms and three sites on spur landforms. A total of 13 of 23 sites comprised low density scatters of less than 10 artefacts and five sites contained more than 50 artefacts. Four of these five sites were located along Emu Creek.

Umwelt (2009), concluded that Emu Creek was a focus for Aboriginal people in the Project Area, a conclusion based on the premise that four of the five largest scatters were identified on this landform.

Post excavation analysis undertaken on artefacts across all landforms mirrored the results of other assemblages across the Hunter Valley with mudstone and silcrete constituting the dominant stone raw material types and waste flakes, broken flakes, cores, retouched flakes, backed blades and a fragment of what appeared to be an edge-ground implement completing the assemblage composition. Umwelt (2009) noted that there appeared to be a high number of mudstone cores as opposed to the total numbers of mudstone flakes at the sites which may indicate that mudstone cores were manuported into the sites but were only intermittently utilised, which perhaps signifies that other raw material sources were locally available or preferred.

A high concentration of tertiary flakes at Emu Creek indicated that primary flakes may have been removed off-site which suggests that cores were potentially carried into the site prior to secondary reduction.. It's possible that the cortex of cores was removed at the raw material source location in order to reduce and optimise the mass of the stone raw material.

There was no stratigraphic integrity at any of the sites although some spatial integrity was observed at Emu Creek. This site as opposed to others in the Project Area contained a relatively high quantity of porcellanite (22%), which is a higher ratio that elsewhere in the Hunter Valley. Porcellanite artefacts are by definition highly siliceous, splinters when knapped and rarely remains *in situ* in open sites. There were a number of discrete, small porcellanite scatters including micro-debitage and cores dispersed over a small area, this may indicate that porcellanite knapping activities were undertaken on site and that little to no natural or cultural disturbance factors have impacted the sites. The closest known porcellanite raw material source is located over 10 kms away so it was assumed that porcellanite had been transported to the site from a considerable distance, even when other suitable stone raw material sources were locally available. Umwelt

(2009), made no mention whether porcellanite might be available as cobbles along local water corridors.

It was noted that a high proportion of mudstone flakes were tertiary flakes and that mudstone cores had not been exhausted so it was assumed that there were no constraints on raw material availability and accessibility (Umwelt 2009:11.2). In conclusion, Umwelt (2009) stated that that the resources at Emu Creek were intensively exploited and artefact manufacture, maintenance and discard was higher here than at any other site and that suitable raw material sources existed locally, with the exception of porcellanite, which, if it was not transported by streams or creeks must have been carried or traded into the site.

**Narama Extended Aboriginal Heritage Assessment (Umwelt 2009b)**

Umwelt (2009) conducted an archaeological survey of a proposed extension to the Narama mine. Archaeological survey was undertaken over 136ha which identified 43 Aboriginal archaeological sites, 25 of which were artefacts scatters and 18 isolated finds. The artefact scatters were generally low density containing no more than 20 artefacts per site and types included waste flakes, broken flakes, cores and backed blades. Silcrete and mudstone dominated raw material type frequencies followed by lesser quantities of chert and quartz. Glass artefacts (a retouched flake and a bottle base that had been utilised as a core) were identified at two sites which were assessed as containing moderate scientific significance. The remaining sites were assessed as low significance.

**Aboriginal Archaeological Assessment – New Ravensworth West Mine Project (Umwelt 2009)**

Umwelt (2009) completed an archaeological survey at the Ravensworth West mine site in order to reassess known sites within the Project Area.

Field survey identified a total of 244 additional Aboriginal archaeological sites including 136 artefact scatters, 103 isolated finds, four scarred trees and one grinding groove site. The sites (198 out of 244) generally constituted low density scatters and only 15 sites contained more than 50 artefacts. The one high density site was recorded totalling more than 600 artefacts. This site was identified in association with the grinding groove site.

Raw material frequencies were dominated by silcrete and mudstone with quartz, quartzite, hornfels, porcellanite and chalcedony all occurring in lower quantities. The sites contained a large range of artefact types including broken flakes, waste flakes, retouched flakes, backed blades, scrapers, tablet flakes, axes, fractured hammer stones, cores and an anvil.

**Integra Open Cut Project Aboriginal Archaeological Assessment (Navin Officer 2008)** conducted a cultural heritage assessment of a proposed extension of the Integra Open Cut, which encompasses approximately 379ha for Integra Coal Operations (Navin Officer 2008: 1). The focus area was located between the existing South Pit and Glennies Creek (Navin Officer 2008: 1).

The field survey component of the assessment mainly focused on “flat ground on ridges and spur crests”, along creeks and mature trees present in the Project Area (Navin Officer 2008: 7).

A total of 47 sites were recorded consisting of 33 open artefact scatters, 11 isolated artefacts and three possible modified (scarred) trees (Navin Officer 2008: 25). Six of these sites were previously recorded but amalgamated into two new site recordings (Navin Officer 2008: 25).

An analysis of these sites combined with other previously recorded sites in the focus area (67 in total) revealed that the highest number (n=27) of sites were identified on the valley floor (Navin Officer 2008: 35). Landform units for this analysis included valley floor and basal, mid and upper valley slopes (Navin Officer 2008: 35). The predominate artefact raw material type was silcrete followed by lesser quantities of mudstone (Navin Officer 2008: 36).

Areas with potential to be associated with subsurface archaeological material were identified. A zone of moderate potential was identified "mostly on spurs lines and slopes of moderate gradient, or higher order drainage lines" (Navin Officer 2008: 37). A zone of high potential "adjacent to creeklines where the highest densities of artefact occur in (mostly) depositional environments" and the archaeological significance of a number of these sites was classed as moderate (Navin Officer 2008: 37; 41-43). This high sensitivity zone includes the section of Station Creek in the Navin Officer's (2008: 47) focus area. However, the area immediately north of Station Creek to Glennies Creek is simply noted as 'alluvium' with no sensitivity classification (Navin Officer's 2008: see page 47). This area likely forms part of the Station Creek-Glennies Creek dual floodplain.

One of Navin Officer's (2008: 49) key recommendations was subsurface investigation of the zones of moderate and high archaeological potential which will be impacted by the proposed extension.

### 4.1.1 Aboriginal Archaeological Site Patterning

Throughout the Central Lowlands of the Hunter Valley, artefact scatters and isolated finds are the dominant site type, comprising 97% of known site types (ERM 2004). Review of previous archaeological research (survey) from Ravensworth to Singleton reflects this pattern, with artefact scatters and isolated finds comprising over 98% of the assemblage.

Table 9: Site types recorded

* indicates that only a sample of the total artefact count was recorded

N/A indicates that these data were not listed or made available in the assessment report

| Author/Date | Survey area (ha)[2] | Artefact scatter | Isolated find | Grinding groove | Grinding groove & artefact scatter | Quarry & artefact scatter | Scarred tree |
|---|---|---|---|---|---|---|---|
| Brayshaw (1981a) | 600* | 3 | 2 | 0 | 0 | 0 | 0 |
| Brayshaw (1981b) | 35 | 1 | 0 | 0 | 0 | 0 | 0 |
| Stern and | 120 | 52 | 34 | 0 | 0 | 0 | 0 |

| Author/Date | Survey area (ha)$^2$ | Artefact scatter | Isolated find | Grinding groove | Grinding groove & artefact scatter | Quarry & artefact scatter | Scarred tree |
|---|---|---|---|---|---|---|---|
| Attenbrow (1981) | | | | | | | |
| Brayshaw (1983) | 1302 | 18 | 3 | 0 | 0 | 0 | 0 |
| Brayshaw (1986) | 1200 | 31 | 13 | 0 | 0 | 0 | 0 |
| Koettig (1986) | 0.25 | 12 | 0 | 0 | 0 | 0 | 0 |
| Godwin (1987) | 300 | 50 | 8 | 0 | 0 | 0 | 0 |
| Koettig (1990) | N/A | 24 | 0 | 0 | 0 | 0 | 0 |
| Rich (1990) | 200 | 13 | 2 | 0 | 0 | 0 | 0 |
| Effenberger (1992) | 252 | 1 | 7 | 0 | 0 | 0 | 0 |
| Ruig (1994) | 15 | 3 | 1 | 0 | 0 | 0 | 0 |
| HLA (1996) | 717 | 23 | 14 | 0 | 0 | 0 | 1 |
| ERM (1997) | 462 | 46 | 11 | 0 | 1 | 0 | 0 |
| HLA (2001) | 184.5 | 11 | 11 | 1 | 0 | 0 | 0 |
| Umwelt (2004) | 1152 | 29 | 7 | 0 | 0 | 1 | 0 |
| HLA (2004) | 11.52 | 3 | 0 | 0 | 0 | 0 | 0 |
| Umwelt (2009) | 136.10 | 25 | 18 | 0 | 0 | 0 | 0 |
| ***Totals*** | **6687.37** | **345** | **131** | **1** | **1** | **1** | **1** |

Table 10: Distribution of site numbers by landform

* indicates that only a sample of the total artefact scatter observed was recorded

N/A indicates that these data were not listed or made available in the assessment report

| **Author/Date** | **Ridge crest & spur** | **Hillslope** | **Lowerslope/ footslope** | **Flats & creek Banks** | **Crest & slope** |
|---|---|---|---|---|---|
| Brayshaw (1981a) | 0 | 0 | 0 | 5 | 0 |
| Brayshaw (1981b) | 0 | 0 | 0 | 1 | 0 |
| Stern and Attenbrow (1981) | 16 | 48 | 2 | N/A | 20 |
| Brayshaw (1983) | N/A | N/A | N/A | N/A | N/A |
| Brayshaw (1986) | 3 | 0 | 0 | 41 | 0 |
| Koettig (1986) | 0 | 0 | 5 | 7 | 0 |
| Godwin (1987) | 2 | 4 | 0 | 52 | 0 |
| Koettig (1990) | 2 | 0 | 2 | 20 | 0 |
| Rich (1990) | 8 | 2 | 0 | 5 | 0 |
| Effenberger (1992) | 0 | 1 | 0 | 7 | 0 |
| Ruig (1994) | 0 | 0 | 0 | 4 | 0 |
| HLA (1996) | 5 | 2 | 0 | 30 | 1 |
| ERM (1997) | 13 | 25 | 0 | 20 | 0 |
| HLA (2001) | 4 | 4 | 0 | 15 | 0 |
| Umwelt (2004) | 0 | 0 | 6 | 27 | 4 |
| HLA (2004) | 0 | 0 | 3 | 0 | 0 |
| Umwelt (2009) | 0 | 25 | 0 | 16 | 2 |
| **Totals** | **53** | **111** | **18** | **250** | **27** |

Table 11: Distribution of artefact numbers by landform

N/A indicates that these data were not listed or made available in the assessment report

| **Author/Date** | **Ridge crest & spur** | **Hillslope** | **Flats & creek banks** | **Crest & slope** |
|---|---|---|---|---|
| Brayshaw (1981a) | 0 | 0 | 49 | 0 |
| Brayshaw (1981b) | 0 | 0 | <10 | 0 |
| Stern and Attenbrow (1981) | N/A | N/A | N/A | N/A |
| Brayshaw (1983) | N/A | N/A | N/A | N/A |
| Brayshaw (1986) | 16 | 0 | 1000+ | 0 |
| Koettig (1986) | N/A | N/A | N/A | N/A |
| Godwin (1987) | 2 | 6 | 2400+ | 0 |
| Koettig (1990) | 11 | 0 | 273+ | 8 |
| Rich (1990a) | 49 | 27 | 135+ | 0 |
| Effenberger (1992) | 0 | 1 | 15 | 0 |
| Ruig (1994) | 0 | 0 | 51 | 0 |
| HLA (1996a) | 16 | 3 | 318 | 0 |
| ERM (1997) | 82 | 133 | 1476 | 43 |
| HLA (2001) | 7 | 4 | 100+ | 0 |
| Umwelt (2004) | 2 | 826+ | 629 | 56 |
| HLA (2004) | 0 | 117 | 0 | 0 |
| Umwelt (2009) | 0 | 278+ | 181+ | 4 |
| **Totals** | **185** | **1395+** | **6637+** | **111** |

Table 12: Artefact numbers of previously recorded sites

* indicates that only a sample of the total artefact scatter observed was recorded

N/A indicates that these data were not listed or made available in the assessment report

| **Author/Date** | **<5 artefacts** | **5-10 artefacts** | **10-50 artefacts** | **50-100 artefacts** | **100-500 artefacts** | **500+ artefacts** |
|---|---|---|---|---|---|---|
| Brayshaw (1981a) | 4 | 0 | 1 | 0 | 0 | 0 |
| Brayshaw (1981b) | 0 | 1 | 0 | 0 | 0 | 0 |
| Attenbrow and Stern (1981) | 59 | 18 | 7 | 2 | 0 | 0 |
| Brayshaw (1983) | N/A | N/A | N/A | N/A | 2+ | N/A |
| Brayshaw (1986) | 26 | 13 | 4 | 0 | 0 | 1 |
| Koettig (1986) | N/A | N/A | N/A | N/A | N/A | N/A |
| Godwin (1987) | 20 | 6 | 18 | 6 | 0 | 1 |
| Koettig (1990) | 4 | 12 | 6 | 2 | 0 | 0 |
| Rich (1990) | 8 | 2 | 4 | 0 | 1 | 0 |
| Effenberger (1992) | 7 | 1 | 0 | 0 | 0 | 0 |
| Ruig (1994) | 3 | 0 | 1 | 0 | 0 | 0 |
| HLA (1996) | 20 | 8 | 5 | 3 | 0 | 0 |
| ERM (1997) | 29 | 10 | 12 | 4 | 2 | 1 |
| HLA (2001) | 15 | 3 | 2 | 0 | 0 | 0 |
| Umwelt (2004) | 18 | 6 | 10 | 0 | 3 | 0 |
| HLA (2004) | 0 | 1 | 1 | 1 | 0 | 0 |
| Umwelt (2009) | 27 | 9 | 5 | 0 | 2 | 0 |
| **Totals** | **240** | **58** | **76** | **21** | **8** | **2** |

Table 13: Artefact types

* indicates that only a sample of the total artefact scatter observed was recorded

N/A indicates that these data were not listed or made available in the assessment report

| Author/ Date | Flakes | Flaked Pieces | Cores | Backed artefacts | Scraper | Pebbles/ hammerstone | Ground edge axe | Blade | Glass artefact |
|---|---|---|---|---|---|---|---|---|---|
| Brayshaw (1981a) | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Brayshaw (1981b) | 9 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Attenbrow and Stern (1981) | N/A | 506 | 29 | 3 | 1 | 0 | 0 | 0 | 0 |
| Brayshaw (1983) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Brayshaw (1986) | 169* | 129* | 18* | 1 | 0 | 1 | 0 | 0 | 0 |
| Koettig (1986) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Koettig (1990) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Rich (1990) | 79 | 64 | 10 | 0 | 0 | 0 | 1 | 0 | 0 |
| Effen-berger (1992) | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 2 | 0 |
| Ruig (1994) | 30 | 19 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| HLA (1996) | 108 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 1 |
| ERM (1997) | 490 | 1091 | 110 | 27 | 1 | 8 | 1 | 0 | 0 |
| HLA (2001) | 31 | 10 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| HLA (2004) | 109 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Umwelt (2009) | 229 | 2 | 21 | 0 | 0 | 0 | 0 | 1 | 1 |
| **Totals** | **1262** | **1821** | **211** | **32** | **4** | **9** | **2** | **4** | **2** |

Table 14: Raw materials

* indicates that only a sample of the total artefact scatter observed was recorded

N/A indicates that these data were not listed or made available in the assessment report

| Author/ Date | Mudstone | Silcrete | Quartz/ quartzite | Chert | Porcell-anite | Petrified wood | Volcanic | FGS | Siltstone |
|---|---|---|---|---|---|---|---|---|---|
| Brayshaw (1981a) | 4 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| Brayshaw (1981b) | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 |
| Stern and Attenbrow (1981) | 393 | 167 | N/A | | | | N/A | | |
| Brayshaw (1983) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Brayshaw (1986) | 184* | 77* | 11* | 5 | 0 | 1* | 5* | 3* | 1* |
| Koettig (1986) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Godwin (1987) | 442 | 518 | 14 | 21 | 0 | 3 | 0 | 0 | 0 |
| Koettig (1990) | 222 | 42 | 20 | | | | 3 | | |
| Rich (1990) | 71 | 40 | 14 | 27 | 0 | 0 | 0 | 1 | 0 |
| Effenberger (1992) | 11 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Ruig (1994) | 25 | 18 | 7 | 0 | 0 | 0 | 1 | 0 | 0 |
| HLA (1996) | 31 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ERM (1997) | 995 | 483 | 75 | 48 | 83 | 24 | 8 | 21 | 0 |
| HLA (2001) | 31 | 8 | 2 | 0 | 5 | 0 | 0 | 0 | 0 |
| HLA (2004) | 32 | 86 | 3 | 0 | 0 | 0 | 0 | 42 | 0 |
| Umwelt (2009) | 156 | 84 | 6 | 6 | 0 | 0 | 1 | 0 | 0 |
| Totals | 2597 | 1526 | 152 | 122 | 88 | 28 | 18 | 150 | 3 |

## 4.2 AHIMS results

152 Aboriginal cultural heritage sites were registered with AHIMS (search conducted August 2010) within an approximate 2 km buffer of the Project Area.

Five of these sites have been incorporated as part of other sites:

- Station Creek 21 (SC21) incorporated into site Integra 46 (I46) (37-3-0913)
- Station Creek 22 (SC22) incorporated into site Integra 47 (I47) 37-3-0914)
- Station Creek 23 (SC23) incorporated into site Integra 46 (I46) (37-3-091)
- Station Creek 27 (SC27) incorporated into site Integra 47 (I47) (37-3-0919)
- Station Creek 13 (SC13) incorporated into site Integra Site 47 (I47) (37-3-0909)

11 other registered sites are actually updates of sites previously registered:

- Station Creek 3 (SC3) (37-3-0903) - Update of SC-3 (37-3-0564)
- Station Creek 6 (SC6) (37-3-0904) - Update of SC-6 (37-3-0567)
- Station Creek 9 (SC9) (37-3-0906) - Update of SC-9 (37-3-0569)
- Station Creek 10 (SC10) (37-3-0907)- Update of SC-10 37-3-0570
- Station Creek 14 (SC14) (37-3-0910) - Update for SC-14 37-3-0574
- Station Creek 15 (SC15) (37-6-2205) - Update of SC-15 (37-3-0575)
- Station Creek 16 (SC16) (37-6-2206) - Update for site SC-16 (37-3-0576)
- Station Creek 24 (SC24) (37-3-0916) - Update of SC-24
- Station Creek 25 (SC25) (37-3-0917) - Update for SC-25
- Station Creek 26 (SC26) (37-3-0918) - Update for SC-26
- Station Creek 8 (SC8) same as 37-3-0568 (37-3-0905)

The AHIMS database only includes Aboriginal sites registered with AHIMS and is not a complete list of Aboriginal sites within any given area. These sites have been described here from the DECCW AHIMS site recording forms for each site (Table 15).

Table 15: Description of sites registered within an approximate 2 km buffer of the Project Area.

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| 37-6-0388 | SH17;Singleton Heights; | Open site - artefact scatter | | Spur, ridge line and ridge slopes | 10-15 up to 45 | 100 | 5 stone artefacts including silcrete and mudstone | |
| 37-6-0389 | SH18;Singleton Heights; | Open site - artefact scatter | | Spur and creek confluence | 1-10 | 20 | 3 silcrete | |
| 37-6-0391 | SH20;Singleton Heights; | Open site - artefact scatter | | Creek bank | | | Silcrete and indurated mudstone predominantly, also petrified wood and porphyry | |
| 37-6-0392 | SH21;Singleton Heights; | Open site - artefact scatter | | Creek banks | | | Indurated mudstone and silcrete almost exclusively, also fine grained material and 1 quartz | |
| 37-6-0393 | SH22;Singleton Heights; | Open site - artefact scatter | | Ridge slope | | | | |
| 37-6-0193 | Singleton BR19 | Open site - artefact scatter | Steep rounded hills | | | | 1 quartz<br>2 chert | |
| 37-6-0198 | Singleton BR24 | Open site - artefact scatter | Steep rounded hills | Ridge slope | | | 2, chert<br>2 silcrete<br>1 quartzite | |
| 37-6-0199 | Singelton BR25 | Open site - artefact scatter | Steep rounded hills | Slope | | | 1 quartzite and | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 2 chert | |
| 37-3-0158 | 37; | Open site - artefact scatter | valley floor | Minor creek and creek banks | Flat | 12 | 3 (material not stated) | |
| 37-3-0159 | 38; | | | | | | | |
| 37-3-0160 | 39; | Open site - artefact scatter | Valley floor | Minor creek and creek banks | Flat | 50 | 10 indurated mudstone | |
| 37-6-0200 | Singleton BR26 | Open site - artefact scatter | Steep rounded hills | Slope | | | 1 quartzite<br>1 quartz<br>1chert | |
| 37-6-0201 | Singleton BR27 | Open site - artefact scatter | Steep rounded hills | Ridge slope | 10-15 | | 2 chert | |
| 37-6-0202 | Singleton BR28 | Open site - artefact scatter | Steep rounded hills | Ridge slope | | | 2 silcrete | |
| 37-6-0203 | Singleton BR29 | Open site - artefact scatter | Steep rounded hills | Ridge top | | | 4 chert | |
| 37-6-0204 | Singleton BR30 | Open site - artefact scatter | Steep rounded hills | Ridge top and gully | | | 1 chert<br>1 quartzite | |
| 37-6-0205 | Singleton BR31 | Open site - artefact scatter | Steep rounded hills | Ridge top | Gentle | | 2 quartz<br>1 chert | |
| 37-6-0206 | Singleton BR32 | Open site - artefact scatter | Steep rounded hills | Gully and ridge top | | | 1 silcrete<br>1 quartz | |
| 37-6-0207 | Singleton BR33 | Open site - artefact scatter | Steep rounded hills | Slope | | | 3 chert | |
| 37-6-0208 | Singleton BR34 | Open site - artefact scatter | Steep rounded hills | Slope | Medium | | 2 quartzite<br>1 chert | |
| 37-6-0209 | Singleton BR35 | Open site - artefact scatter | Steep rounded hills | Spur and ridge top | | | 2 chert | |
| 37-6-0210 | Singleton BR36 | Open site - artefact scatter | Steep rounded hills | Upper ridge slope | | | 1 quartzite<br>1 chert | |
| 37-6-0233 | Singleton;BR37; | Open site - artefact scatter | Steep rounded hills | Ridge slope | | | 1 chert<br>1 quartz | |
| 37-6-0237 | Rixs Creek; | Open site - artefact scatter | | Dam run off channel, dam wall, creek bank | | | Silcrete and chert | |
| 37-6-0239 | Rixs Creek (Singleton) | Open site - artefact scatter | | Gully junction | | | 20 chert and siltstone | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| 37-6-0240 | Rixs Creek (Stone Quarry Gully) | Open site - artefact scatter | | Dam wall | | | | |
| 37-6-0241 | Rixs Creek Stone Quarry Gully | Open site - artefact scatter | | Gully banks | | | 60 (material not stated) | |
| 37-3-0150 | A; | | Valley floor | Major creek river and creek flat | Flat | 10 | 1 sandstone | |
| 37-3-0154 | 33; | Open site - artefact scatter | Valley floor | Minor creek and creek flats | Flat | 15 | 22 indurated mudstone<br>1 silcrete<br>1 quartz | |
| 37-3-0155 | 34; | Open site - artefact scatter | Valley floor | Minor creek and creek flats | Gentle | 40 | 3 indurated mudstone | |
| 37-3-0156 | 35; | Open site - artefact scatter | Valley floor | Minor creek and creek banks | Flat | 10 | 9 indurated mudstone<br>8 silcrete<br>6 quartz | |
| 37-3-0157 | 36; | Open site - artefact scatter | | Minor creek and creek flats | Gentle | 20 | 5 indurated mudstone | |
| 37-3-0074 | GCC12;Caswell; | Open site - artefact scatter | | | | 20 | 1 mudstone<br>1 quartz | |
| 37-6-0184 | Singleton BR10 | Open site - artefact scatter | Steep rounded hills | Sloping surface | | | 7 chert | |
| 37-6-0185 | Singleton BR11 | Open site - artefact scatter | Steep rounded hills | Ridge slope | | | 10 chert | |
| 37-6-0186 | Singleton BR12 | Open site - artefact scatter | Steep rounded hills | Spur | | | 6 chert | |
| 37-6-0187 | Singleton BR13 | Open site - artefact scatter | Steep rounded hills | Slope and bottom slope | | | 2 silcrete<br>1 chert | |
| 37-6-0188 | Singleton BR14 | Open site - artefact scatter | Steep rounded hills | Spur | | | 3 silcrete | |
| 37-6-0189 | Singleton BR15 | Open site - artefact scatter | | | | | 4 chert | |
| 37-6-0190 | Singleton BR16 | Open site - artefact scatter | Steep rounded hills | Ridge slope | | | 4 chert | |
| 37-6-0191 | Singleton BR17 | Open site - artefact scatter | Steep rounded hills | Small spur | | | 1 silcrete<br>1 chert | |
| 37-6-0192 | Singleton BR18 | Open site - artefact scatter | Steep rounded hills | Down slope | | | 2 quartz | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 chert | |
| 37-3-0075 | GCC13;Caswell; | Open site - artefact scatter | | Creek bank | | 20 | 23 stone artefacts including 3 silcrete, 2 mudstone and 1 quartz | |
| 37-3-0076 | GCC14;Caswell; | Open site - artefact scatter | | Creek bank | | 20 | 41 stone artefacts including 32 mudstone, 8 silcrete | |
| 37-3-0077 | GCC15;Caswell; | Open site - artefact scatter | | | | 30 | 2 mudstone<br>2 silcrete<br>2 fine grained material | |
| 37-3-0078 | GCC16;Caswell; | Open site - artefact scatter | | Hill slope | | 200 | 6 mudstone<br>4 silcrete | |
| 37-3-0079 | GCC17;Caswell; | Open site - artefact scatter | | Spur | | 300 | 2 mudstone | |
| 37-3-0080 | GCC18;Caswell; | Open site - artefact scatter | | Creek confluence | | 20 | 2 mudstone | |
| 37-3-0081 | GCC19;Caswell; | Open site - artefact scatter | | Creek bank | | 20 | Approximately 1000 stone artefacts with mudstone and silcrete predominant, followed by quartz and porphyry | |
| 37-3-0082 | GCC20;Caswell; | | | Creek | | 20 | | |
| 37-3-0083 | GCC21;Caswell; | Open site - artefact scatter | | Spur top and hill slope | | 100 | 3 mudstone<br>1 silcrete | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| 37-3-0084 | GCC22;Caswell; | Open site - artefact scatter | | Creek bank | | 20 | 9 mudstone | |
| 37-3-0085 | GCC23;Camberwell; | Open site - artefact scatter | | Creek bank | | 20 | 3 (material not stated) | |
| 37-3-0086 | GCC24;Caswell; | Open site - artefact scatter | | Creek confluences | | 20 | 6 stone artefacts including 2 mudstone | |
| 37-3-0087 | GCC25;Camberwell; | Open site - artefact scatter | | Creek bank | | 20 | 19 stone artefacts including 3 mudstone and 3 silcrete | |
| 37-3-0088 | GCC26;Camberwell; | Open site - artefact scatter | | Creek bank | | 20 | 4 stone artefacts including 2 mudstone and 1 silcrete | |
| 37-3-0089 | GCC27 Camberwell | Open site - artefact scatter | | Creek bank | | 20 | 3 mudstone<br>2 silcrete<br>1 fine grained material<br>1 volcanic material | |
| 37-3-0090 | GCC28;Camberwell; | Open site - artefact scatter | Floodplain | Creek bank | | 20 | 2 chert<br>2 mudstone<br>2 silcrete<br>1 quartzite | |
| 37-3-0091 | Camberwell;GCC.29; | Open site - artefact scatter | | | | 20 | 6 stone artefacts including 2 mudstone, 1 quartz and 1 quartzite | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| 37-3-0092 | GCC30;Camberwell; | Open site - artefact scatter | | | | 20 | 2 fine grained material | |
| 37-3-0094 | SGCD 1;Obanvale; | Open site - artefact scatter | | Minor creek, creek banks and foot slope | Gentle | 15 | 26 indurated mudstone and 5 silcrete | |
| 37-3-0095 | SGCD 2;Obanvale; | Open site - artefact scatter | | Minor creek, creek banks and foot slope | Flat | 10 | 2 indurated mudstone, 3 silcrete and 1 quartz | |
| 37-3-0096 | SGCD 3;Obanvale; | Open site - artefact scatter | | Creek bank, rise | | | 10 indurated mudstone, 9 silcrete<br>4 chert, 4 fine grained material<br>1 quartz | |
| 37-3-0097 | SGCD 4;Obanvale; | Open site - artefact scatter | | Minor creek, creek banks and foot slope, gully | Flat | 10 | 14 indurated mudstone | |
| 37-3-0098 | SGCD5;Obanvale; | Open site - artefact scatter | | Minor creek, creek banks and foot slope | Gentle | 50 | Over 40 stone artefacts - 50% indurated mudstone, 40% silcrete, quartzite 5%, igneous material 5% | |
| 37-3-0099 | SGCD 6;Obanvale; | Open site - artefact scatter | | Minor creek, creek banks and foot slope | Gentle | 50 | 80 mudstone, 10 silcrete<br>1 quartz<br>1 quartzite<br>1 igneous<br>1 chert | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| 37-3-0104 | SGCD 11;Obanvale; | Open site - artefact scatter | | Minor creek and hill slope | Moderate | 80 | 3 quartz<br>1 quartzite | |
| 37-6-0753 | Maquella 4; | Open site - artefact scatter | | Slope | Gentle and 5 | Immediate vicinity | 2 mudstone | |
| 37-6-0754 | Maqella 3; | Open site - isolated artefact | | Slope | <5 | Immediate vicinity | 1 mudstone | |
| 37-6-0755 | Maqella 2; | Open site - artefact scatter | | Slope | 25 | Immediate vicinity | 2 silcrete | |
| 37-6-0756 | Maqella 1; | Open site - artefact scatter | | Slope | Gentle | Immediate vicinity | 22 mudstone, 5 silcrete, 2 acid volcanic material and 1 quartz | |
| 37-6-0648 | Wattle Ponds Rd 2; | Open site - artefact scatter | | Mid slope | 5 | 220 | 7 mudstone | |
| 37-3-0563 | SC-2 | Open site - isolated artefact | | Stream bank and terrace | | | Pebble scraper | |
| 37-3-0564 | SC-3 | Open site - artefact scatter | | Stream bank | | 1 | 2 mudstone | |
| 37-3-0565 | SC-4 | Open site - isolated artefact | | Bank | | 1 | 1 mudstone | |
| 37-3-0566 | SC-5 | Open site - isolated artefact | | Stream bank | | 1 | 1 mudstone | |
| 37-3-0567 | SC-6 | Open site - artefact scatter | | Hill crest | | 300 | 2 (material not stated) | |
| 37-3-0568 | SC-8 same as 37-3-0905 | Open site - isolated artefact | | Hill slope | | 300 | 1 silcrete | |
| 37-3-0569 | SC-9 | Open site - artefact scatter | | Hill slope | | 400 | 1 mudstone<br>1 silcrete | |
| 37-3-0570 | SC-10 | Open site - artefact scatter | | Ridge crest | | 400 | 2 mudstone | |
| 37-3-0572 | SC-12 | Not stated | | | | | | |
| 37-3-0573 | SC-13 | Not stated | | | | | | |
| 37-3-0574 | SC-14 | Not stated | | | | | | |
| 37-3-0575 | SC-15 | Not stated | | | | | | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| 37-3-0576 | SC-16 | Not stated | | | | | | |
| 37-3-0577 | SC-17 | Open site - artefact scatter | | Hill crest and hill slope | | 30 | 6 silcrete | |
| 37-6-1178 | SC/83 | Open site - artefact scatter | | Lower slope | Gentle | 20 | 1 quartz<br>1 mudstone | |
| 37-6-1179 | SC/84 | Open site - artefact scatter | | Lower slope | Gentle, very gentle | 8 | 2 mudstone<br>1 silcrete<br>1 quartz | |
| 37-6-1180 | Site SC/85 | Open site - isolated artefact | | Lower slope | Gentle and moderate | 7 | | |
| 37-6-1181 | Site SC/86 | Open site - artefact scatter | | Lower slope | Gentle | 20 | 3 mudstone<br>1 quartz | |
| 37-6-1193 | Site SC/90 | Open site - artefact scatter | Steep rounded hills | Ridge | | | 1 quartz<br>2 chert | |
| 37-6-1194 | Site SC/91 | Open site - artefact scatter | | Crest and simple slope | Gentle | 200 | 2 silcrete<br>2 mudstone | |
| 37-6-1198 | Site SC/65 | Open site - artefact scatter | | Crest and upper slope | | 65 | 40 mudstone<br>12 silcrete<br>4 glass<br>3 wood<br>2 quartz<br>chert 1 | |
| 37-6-1199 | Site SC/66 | Open site - artefact scatter | | Crest | Level | 120 | 31 mudstone<br>2 silcrete<br>2 unknown material | |
| 37-6-1200 | Site SC/67 | Open site - artefact scatter | | Crest | | 100 | 2 mudstone | |
| 37-6-1201 | Site SC/68 | Open site - artefact scatter | | Crest and simple slope | | 210 | 2 mudstone | |
| 37-6-1202 | Site SC/69 | Open artefact scatter | | Simple slope | Moderately inclined | 70 | 2 mudstone | |
| 37-6-1203 | Site SC/70 | Open site - isolated artefact | | Simple slope and | Gently and | 70 | 1 mudstone | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| | | and scarred tree | | crest | moderately inclined | | 1 ironbark | |
| 37-6-1204 | Site SC/71 | Open site - artefact scatter | | Upper slope and crest | Gently inclined | 120 | 1 quartzite<br>7 mudstone<br>1 chert<br>1 ground edge artefact (material not stated) | |
| 37-6-1205 | Site SC/72 | Open site - artefact scatter | | Simple slope | Gently inclined | 140 | 14 mudstone<br>3 silcrete | |
| 37-6-1206 | Site | Open site - artefact scatter | | Lower slope | Gently inclined | 30 | 3 mudstone | |
| 37-6-1207 | Site SC/74 | Open site - artefact scatter | | Lower slope | Gently inclined | 30 | 5 mudstone | |
| 37-6-1208 | Site SC/75 | Open site - artefact scatter | | Lower slope | | 70 | 5 mudstone | |
| 37-6-1209 | Site SC/76 | Open site - artefact scatter | | Simple slope | Gently and moderately inclined | 230 | 9 silcrete<br>2 mudstone<br>1 glass | |
| 37-6-1210 | Site SC/78 | Open site - artefact scatter | | Crest and simple slopes | Gentle and moderately inclined | 500 | 4 mudstone<br>1 quartz<br>1 quartzite | |
| 37-6-1211 | Site SC/79 | Open site - artefact scatter | | Crest and upper slope | Gently inclined | 400 | 2 silcrete<br>2 mudstone<br>1 chert | |
| 37-6-1212 | Site SC/80 | Open site - artefact scatter | | Simple slope | Gently inclined | 70 | 2 mudstone | |
| 37-6-1213 | Site SC/81 | Open site - artefact scatter | | Crest and upper slope | Very gently inclined | 50 | 2 silcrete<br>2 mudstone<br>1 chert | |
| 37-6-0390 | SH19;Singleton Heights; | Open site - artefact scatter | | Spur and slope | | 40 | 6 silcrete | |
| 37-6-0238 | Rixs Creek (singleton) | Open site - artefact scatter | | Elevated slope | | | 30 (material not stated) | |
| 37-3-0093 | GCC31;Camberwell; | Open site - artefact scatter | | Creek bank | | 20 | 5 (material not | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | stated) | |
| 37-6-0183 | Singleton BR9 | Open site - artefact scatter | Steep rounded hills | Ridge slope | | | Stone artefacts include 7 silcrete, 10 chert and 2 quartz | |
| 37-6-0242 | Rixs Creek-singleton | Open site - artefact scatter | | Gully bank | | | 5 siltstone<br>5 silcrete | |
| 37-3-0858 | Integra 3 (I3) | Open site - artefact scatter | | Basal slopes | Gentle and 20 | | 8 silcrete, 1 (material not stated)<br>1 tuff | |
| 37-3-0859 | Integra 4 (I4) | Open site - isolated artefact | | Mid slopes | Gentle and 10 | | 1 tuff | |
| 37-3-0860 | Integra 5 (I5) | Open site - artefact scatter | | Creek bank | Gentle and 10 | | 1 tuff<br>1 silcrete | |
| 37-3-0861 | Integra 6 (I6) | Open site - isolated artefact | | Mid valley slope | 30 | | 1 tuff | |
| 37-3-0862 | Integra 7 (I7) | Open site - artefact scatter | | Mid valley slopes | 30 | | 2 tuff | |
| 37-3-0863 | Integra 8 (I8) | Open site - artefact scatter | | Mid valley slopes and small crest rise | 30 | | 30 stone artefact including 10 tuff | |
| 37-3-0864 | Integra 9 (I9) | Open site - artefact scatter | | Slope | Gentle | | 6 tuff<br>2 silcrete | |
| 37-3-0871 | Integra 16 (I16) | Open site - artefact scatter | | | | | 2 tuff | |
| 37-3-0872 | Integra 17 (I17) | Open site - artefact scatter | | Alluvial flats and alluvial terraces | 5 | | 156 in total including tuff, silcrete and chert | |
| 37-3-0875 | Integra 20 (I20) | Open site - artefact scatter | | Mid valley slopes and slight rise | 15 | | 6 tuff<br>2 silcrete<br>1 quartz<br>1 quartzite | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| 37-3-0880 | Integra 25 (I25) | Open site - artefact scatter | | Basal slopes and mid slopes | Gentle and 30 | | 1 tuff<br>3 silcrete | |
| 37-3-0881 | Integra 26 (I26) | Open site - artefact scatter | | Basal slope knoll and mid slopes | 20 | | 4 tuff<br>1 silcrete | |
| 37-3-0882 | Integra 27 (I27) | Open site - isolated artefact | | Mid valley slopes | 20 | | 1 tuff | |
| 37-3-0883 | Integra 28 (I28) | Open site - artefact scatter | | Mid valley slopes | 20 | | 4 tuff | |
| 37-3-0886 | Integra 31 (I31) | Open site - artefact scatter | | Lower basal slopes | | | 4 tuff<br>1 silcrete | |
| 37-3-0889 | Integra 34 (I34) | Open site - isolated artefact | | Lower basal slopes and mid valley slopes | Moderate | | 1 tuff | |
| 37-3-0890 | Integra 35 (I35) | Open site - isolated artefact | | Mid valley slopes | 10 | | 1 tuff | |
| 37-3-0896 | Integra 41 (I41) | Open site - artefact scatter | | Mid valley slopes | 20 | | 3 tuff | |
| 37-3-0898 | Integra 43 (I43) | Open site - artefact scatter | | Mid valley slopes and spur crest | 20 | | 1 silcrete<br>1 tuff | |
| 37-3-0913 | Station Creek 21 (SC21) incorporated into site Integra 46 (I46) | Incorporated into site Integra 46 (I46) | | | | | | |
| 37-3-0914 | Station Creek 22 (SC22) incorporated into the site Integra 47 (I47) | Incorporated into site Integra 47 (I47) | | | | | | |
| 37-3-0915 | Station Creek 23 (SC23) incorporated into site Integra 46 (I46) | Incorporated into site Integra 47 (I47) | | | | | | |
| 37-3-0916 | Station Creek 24 (SC24) | Open site - artefact scatter | Floodplain | Lower valley slopes | | | 6 tuff<br>2 quartz | Update of SC24 |
| 37-3-0917 | Station Creek 25 (SC25) | Open site - artefact scatter | Floodplain | Valley floor basal slopes | 10 | | 2 tuff | Update for SC25 |
| 37-3-0918 | Station Creek 26 | Open site - artefact scatter | Floodplain | Lower valley slopes | | | 4 tuff | Update for |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| | (SC26) | | | and slightly raise terrace | | | | SC26 |
| 37-3-0919 | Station Creek 27 (SC27) incorporated into site Integra 47 (I47) | Incorporated into site Integra 47 (I47) | | | | | | |
| 37-3-0899 | Integra 44 (I44) | Open site - artefact scatter | | Bench and mid valley basal slopes | | | 1 silcrete<br>1 tuff | |
| 37-3-0900 | Integra 45 (I45) | Open site - isolated artefact | | Upper valley slopes | 20 | | 1 silcrete | |
| 37-3-0901 | Integra 46 (I46) | Open site - artefact scatter | Lower valley slopes, floodplain | Creek bank and creek bed | | Immediate vicinity | 50 to 100 stone artefacts including silcrete and tuff | |
| 37-3-0902 | Integra 47 (I47) | Open site - artefact scatter | | Mid to upper valley basal slopes, lower basal valley slopes, drainage, low slope and micro spur line | 20 | | 13 artefacts including 7 tuff, 2 silcrete and 1 quartz | |
| 37-3-0903 | Station Creek 3 (SC3) | Open site - artefact scatter | Valley floor | Basal slopes and creek bank | 10 | Immediate vicinity | 3 tuff | Update of SC3 (37-3-0564) |
| 37-3-0904 | Station Creek 6 (SC6) | Open site - isolated artefact | | Crest of spur line and mid valley slope | | | 1 tuff | Update on SC6 (37-3-0567) |
| 37-3-0905 | Station Creek 8 (SC8) same as 37-3-0568 | Open site - artefact scatter | | Low and mid valley slope | 15 | | | Update of SC8 (37-3-0568) |
| 37-3-0906 | Station Creek 9 (SC9) | Open site - artefact scatter | | Basal and mid valley slope | 20 | | 1 silcrete | Update of SC9 (37-3-0569) |
| 37-3-0907 | Station Creek 10 (SC10) | Open site - artefact scatter | | basal mid valley slopes | 20 | | | Update of SC10 37-3-0570 |
| 37-3-0909 | Station Creek 13 (SC13) incorporated | Incorporated into site Integra Site 47 (I47) | | | | | | |

| Site ID | Site name | Type | Greater landform | Less landform | Slope gradient (degree or qualitative description) | Distance from watercourse (m or qualitative description) | Raw Material | Notes |
|---|---|---|---|---|---|---|---|---|
| | into site Integra Site 47 (I47) | | | | | | | |
| 37-3-0910 | Station Creek 14 (SC14) | Open site - artefact scatter | | Upper and mid valley slope | 10 | | 9 tuff<br>1 silcrete | Update for SC14 37-3-0574 |
| 37-6-2205 | Station Creek 15 (SC15) | Open site - isolated artefact | | Upper valley slope and low rise | 20 | | 1 silcrete | Update of SC15 (37-3-0575) |
| 37-6-2206 | Station Creek 16 (SC16) | Open site - artefact scatter | | Mid and upper valley slope | 20 | | | Update for site SC16 (37-3-0576) |

### 4.2.1 Aboriginal cultural heritage sites within and in the immediate vicinity of the Project Area

Nine Aboriginal cultural heritage sites *registered with AHIMS* are located within the immediate vicinity (within 100 m) of the Project Area (Figures 4 and 5). The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from site cards and Aboriginal heritage reports where available. These descriptions and maps were relied where notable discrepancies occurred.

The AGD coordinates provided by AHIMS for the Aboriginal cultural heritage site, Rixs Creek Stone Quarry Gully (37-6-0241), place the site within the Project Area (Figures 4 and 5). These coordinates do not correspond, however, with the map displayed in the assessment (Brayshaw 1982). The map places the site outside both the Project Area and its immediate vicinity (within 100 m). Consequently this site is not considered further in this assessment.

These sites have been described from DECCW AHIMS site recording forms (Table 16).

Table 16: Aboriginal cultural heritage sites registered with AHIMS within and in the immediate vicinity of the Project Area

| Site | Map coordinates | Reference documents/recorder affiliation | Location | Distance from water | Artefacts | Disturbances | Notes |
|---|---|---|---|---|---|---|---|
| *Within the immediate vicinity of the Project Area* | | | | | | | |
| Site SC/75 (37-6-1208) | 326612E 6398706N (AGD) | McCardle Cultural Heritage (37-6-1208)<br><br>"Singleton Council's Remaining Land Archaeological Assessment Volume 1: Report" (37-6-1208) | "north-east facing lower slope" (37-6-1208)<br><br>"artefacts were identified on a heavily eroded area measuring approximately 60 m x 60 m" (37-6-1208) | "70 m from an un-named creek" (37-6-1208) | "Four mudstone flakes (one retouched) and a core" (37-6-1208)<br><br>"one of the artefacts was found within 10 m of the railway line" (37-6-1208) | "disturbed" (37-6-1208) | |
| Site SC/74 (37-6-1207) | 326607E 6398851N (AGD) | McCardle Cultural Heritage (37-6-1207)<br><br>"Singleton Council's Remaining Land Archaeological Assessment Volume 1: Report" (37-6-1207) | "top of a south facing gently inclined slope" (37-6-1207) | Approximately 35 m from an un-named creek" (37-6-1207) | "four mudstone flakes (two retouched) and one mudstone core" (37-6-1207)<br><br>"artefacts found on a 30 metre x 35 metre exposure subject to sheet wash and rill erosion" (37-6-1207) | "disturbed" (37-6-1207) | |
| Site SC/73 (37-6-1206) | 326607E 6398787N (AGD) | McCardle Cultural Heritage (37-6-1206) | "east–northeast facing gently inclined lower slope" (37-6- | Approximately 30 m from an un-named creek" (37-6-1206) | "three mudstone artefacts" (37-6-1206) | "Disturbed" (37-6-1206) | |

| Site | Map coordinates | Reference documents/recorder affiliation | Location | Distance from water | Artefacts | Disturbances | Notes |
|---|---|---|---|---|---|---|---|
| | | "Singleton Council's Remaining Land Archaeological Assessment Volume 1: Report" (37-6-1206) | 1206) | | "The artefacts were found on two large exposures subject to sheet wash and rill erosion" (37-6-1206) | | |
| Rixs Creek (Singleton) (37-6-0239) | 326111E 6401592N (AGD) | "Arch. Survey of Authorisation 89, proposed site of Bloomfield Collieries coal mine at Rix's Crk, Singleton. # Brayshaw Nov 1981" (37-6-0239) | "between the junction of two gullies" (37-6-0239) | | "less than 20 chert and siltstone flakes in an eroded area 25x25m" (37-6-0239) | "undisturbed" (37-6-0239) | |
| 36; (37-3-0157) | 324800E 6404080N (AGD) | "Camberwell Coal Project – Supplementary Survey for Aboriginal Sites. M. Koettig March 1990" (37-3-0157) | "minor creek", "creek flat" and slope "gentle (2-5˚)" (37-3-0157) | "0-50m" (37-3-0157) | 5 "indurated mudstone" (37-3-0157) | "heavy >50%" "total dist." "generally disturbed area – railway about 50 m away" "continuous track – covered with gravel" (37-3-0157) | |
| GCC26;Camberwell; (37-3-0088) | 324990E 6402790N (AGD) | "H. Brayshaw September 1986 | "western bank of the western tributary" (37-3- | "<20" (37-3-0088) | 3 mudstone and 1 quartz | | |

| Site | Map coordinates | Reference documents/recorder affiliation | Location | Distance from water | Artefacts | Disturbances | Notes |
|---|---|---|---|---|---|---|---|
| | | Archaeological survey of Glennies Creek Coal Authorisation Areas 81 + 308, Hunter Valley, NSW" (37-3-0088) | 0088) | | "Four 4 artefacts found scattered along 40m of creek to a small confluence" (37-3-0088) | | |
| GCC25;Camberwell; (37-3-0087) | 325020E 6403300N (AGD) | "H. Brayshaw September 1986 Archaeological survey of Glennies Creek Coal Authorisation Areas 81 + 308, Hunter Valley, NSW" (37-3-0087) | "western bank of the western tributary, 200-250m above the confluence" (37-3-0087) | "<20" (37-3-0087) | Mudstone and silcrete artefacts<br><br>"19 artefacts were found over 50m of creek bank" (37-3-0087) | | |
| GCC24;Caswell; (37-3-0886) | 325030E 6403500N (AGD) | Navin Officer Heritage Consultants (2008) Integra Coal western Extension: Cultural Heritage Assessment. A report to the URS for Integra Coal Operations (37-3-0886) | "lower/basal slopes" (37-3-0886) | | "five artefacts situated adjacent to and on two dam walls" (37-3-0886)<br><br>Four tuff and one silcrete artefact | "The site is in poor condition with major disturbance from vegetation clearance and erosion caused by the dam construction and stock movement" (37-3-0886) | "moderate to high potential for additional artefacts to be associated with this site" (37-3-0886) |

### 4.2.2 AHIMS site analyses

Simple analyses of the Aboriginal cultural heritage sites registered within an approximate 2 km buffer of the Project Area were conducted (Tables 16 to 19).

People describe sites differently, as evident from the AHIMS site information cards for the registered sites. This variation reduces the detail of the categories that can be identified with consistent applicability for analysis. The identification of broader categories does not necessarily prevent the identification of meaningful patterns.

Each analysis only included sites for which information had been recorded that was applicable to one or more categories used in the particular analysis. As previously mentioned a number of these registered sites were actually updates of previously registered sites or noted as having been incorporated into other sites. Although these 'sites' provide updated information, they were not included in the analysis to prevent duplicating information.

The AHIMS database only includes Aboriginal sites registered with AHIMS and is not complete list of Aboriginal sites within any given area.

**Site Types**

The frequency of site types are displayed in Table 17.

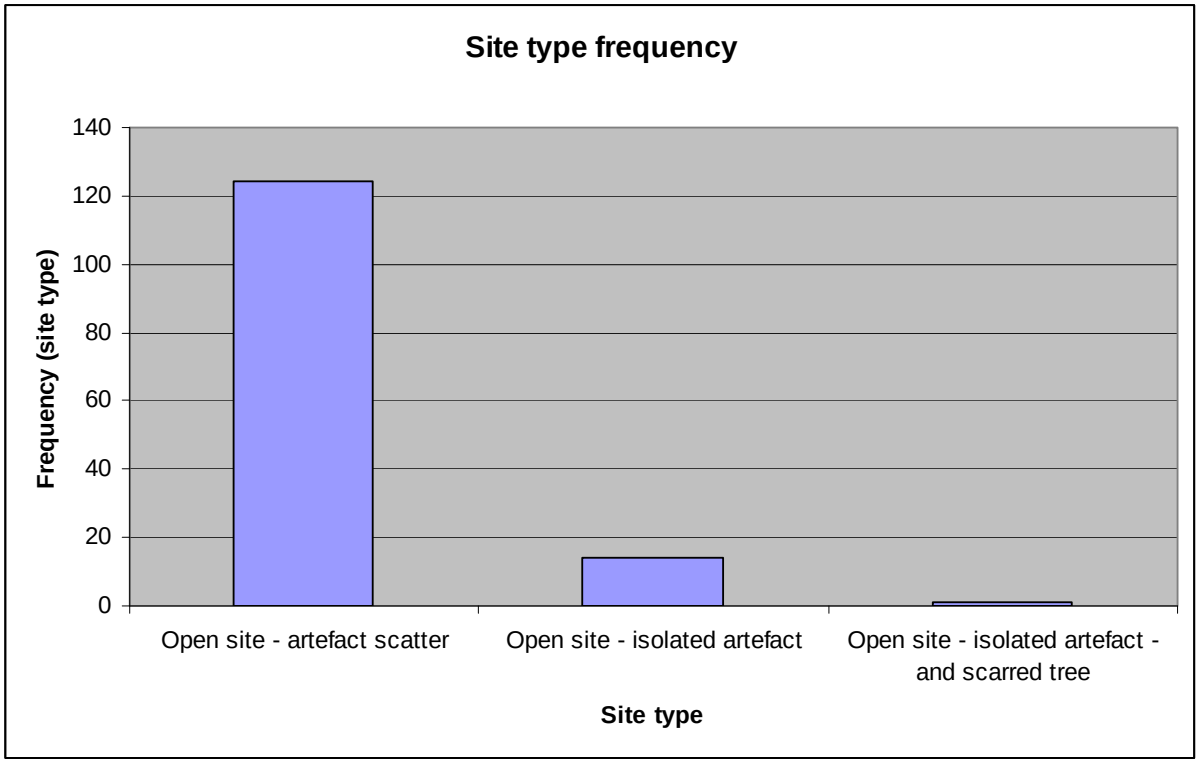


Table 17: Site type frequency

Information was available for 91% of sites. Open sites, which consist of artefact scatters and isolated artefacts, were the most commonly identified site type (99.2%). The isolated artefact sites may

actually be artefact scatters as the artefacts associated with the site are only those recorded / identified.

Scarred trees (a single tree - less than 1%) were significantly less frequent most likely due to a combination of the relatively short life-span of trees and European land clearing practises

**Landforms associated with sites**

The frequency of landforms associated with sites is displayed in Table 18.

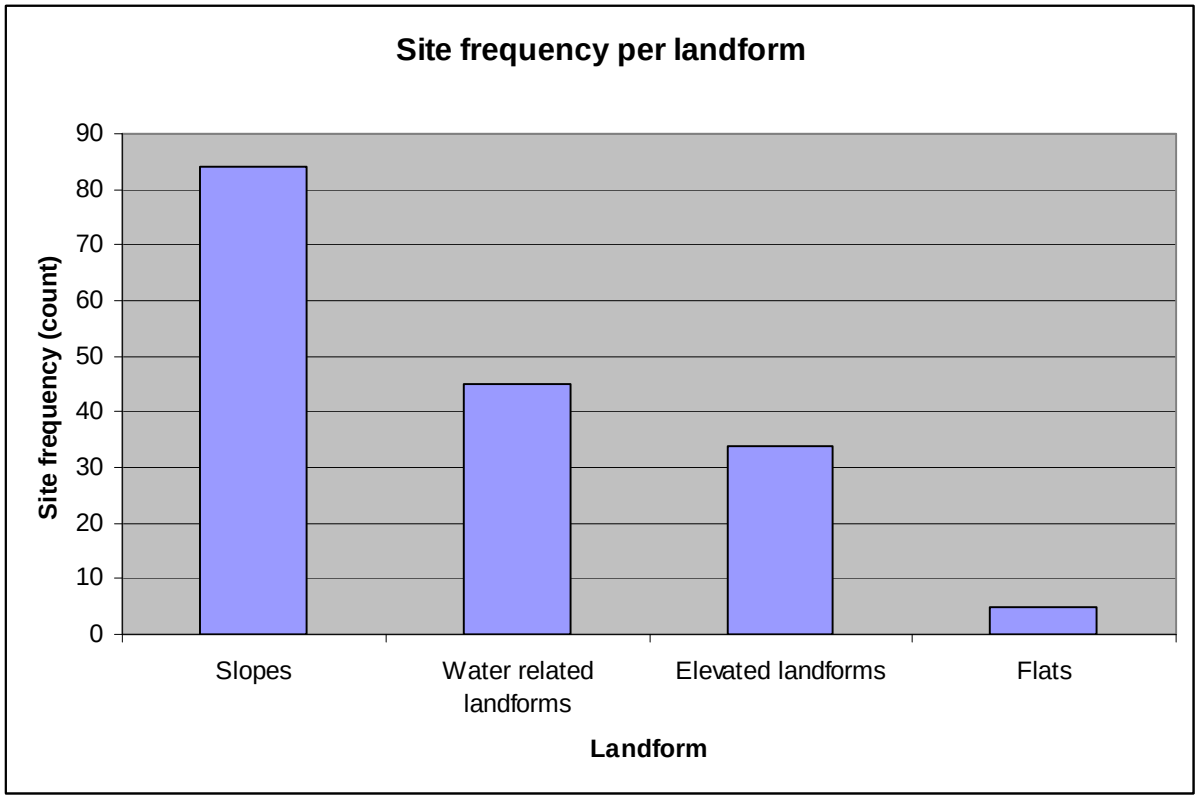


Table 18: Frequency of sites per landform

Information was available for 88% of these sites. Sites were most commonly identified on both slopes (50%), followed by water related landforms (26.8%), elevated landforms (20.2%) and flats (3%).

**Site distance from water sources**

The distances of sites from water sources are displayed in Table 19.

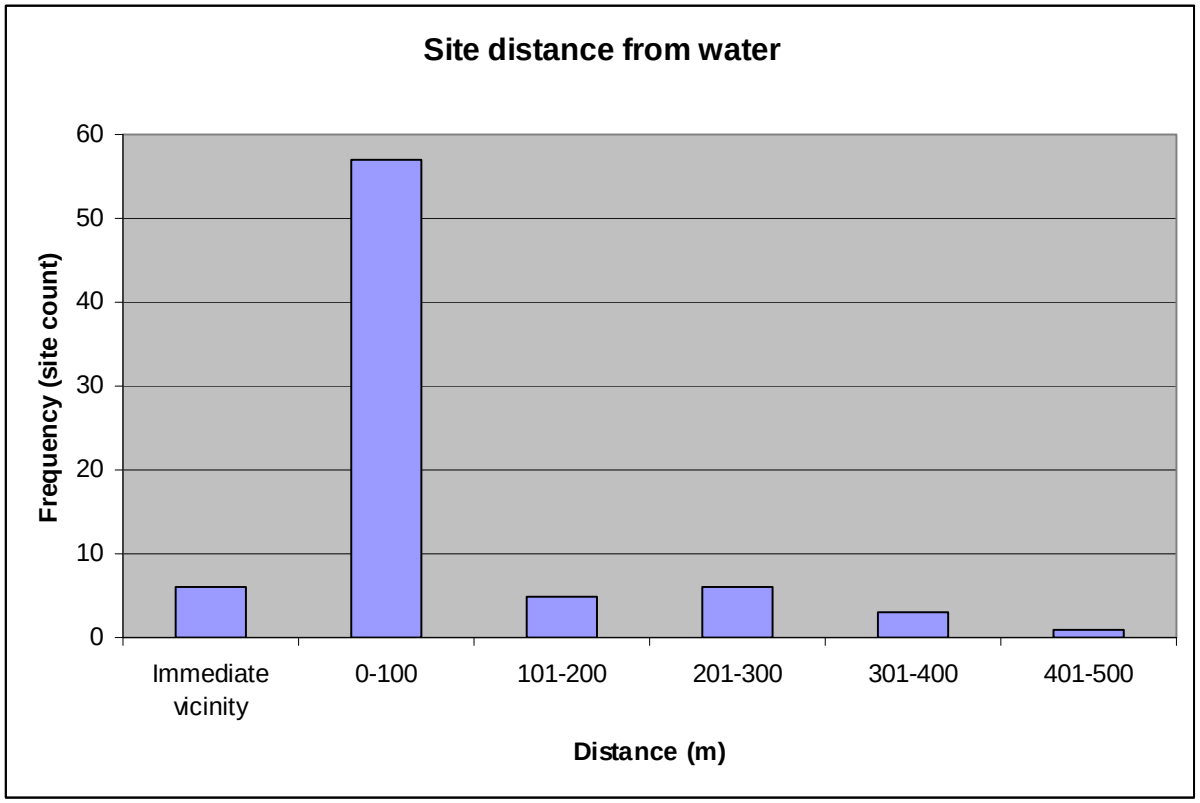


Table 19: Site distance from water

Information was available for 51% of sites. 80.8% of these sites were located within 100 m of watercourses (including those sites, which based on qualitative descriptions, were clearly in the immediate vicinity, for example, those described having been located on watercourse beds and banks). There is likely bias with this information, however, as distance from water was more likely to be noted by the recorder if water was clearly visible from the site.

**Site density and raw materials present at sites as artefacts**

The predominate artefact raw material type at sites was indurated mudstone / tuff, followed by silcrete. Quartz, chert, quartzite, glass, siltstone, petrified wood, porphyry, petrified wood, and materials described simply as ‘fine-grained’, ‘volcanic’, ‘pebble’, ‘igneous’ or ‘unknown’ occurred in lesser quantities. .

Generally, recorded artefact counts at sites was low with most sites associated with less than 10 artefacts. The contents visivle on the surface at sites , however, can be significantly misrepresentative of original stone artefact discard rates. The extent to which the identified artefacts represent the original contents of a site is dependent on the amount of erosion and/or the amount of sedimentation that has occurred at the site and also the degree to which other taphonomic processes have affected the integrity of the site.

### 4.2.3 Predictive Model

Previous site prediction models throughout the region have been based on more general models of Aboriginal archaeological site distribution in the upper Hunter region which can be correlated to the limited number of archaeological surveys completed throughout the Station Creek area.

Previous models suggest that the majority of sites will be located within close proximity to current watercourses and swamps, although Smith (1989) cautions against making such inferences with limited archaeological information.

In the past a lack of comparative data has arisen due to a number of factors relating to the bias of archaeological assessments. These factors include but are not limited to;

- Field assessments tend to focus on waterways where previously defined prediction models indicate Aboriginal sites are most likely to occur
- Ground surface visibility and exposures across the open grassy floodplains are less common when compared to the banks of creek lines and drainage lines, this is due to higher rates of erosion along water corridors but also of increased sedimentation on floodplains
- There is a lack of information concerning past geological, hydrological and general environmental changes in specific assessment areas. This can hinder the understanding of the relationship of such areas in relation to Aboriginal archaeological sites
- Without accurate geomorphological information, the predicted location of subsurface archaeological deposits cannot be accurately determined as initial field surveys only look for surface sites

The predictive model for the Project Area was formulated to increase an understanding of site specific archaeological site types expected at a relatively local scale, and to assess their distribution, content and integrity. The role of predictive modelling is twofold as it also highlights the types of sites that are not expected across the local landscape. When sites types that are not expected are observed at a local level they will be geographically unique and archaeologically significant.

The section below details the predictive model formulated for the Project Area based on site type, landform context, complexity of Aboriginal archaeological material, raw material acquisition and use and the availability of local natural resources. The information for the predictive model was obtained from the background report review at both the local and regional scale.

**Expected site types**

The range of site types that may be found in the region has been defined previously. These site types includes artefact scatters (open camp sites), isolated finds and, less commonly, scarred trees.

The following points regarding the possibility of site types being found within the assessment area is derived from the review of previous archaeological reports at both the local and regional scale as well as a review of the AHIMS site register.

**Site types that may occur within the Project Area:**

- Artefact scatters will typically have assemblages with less than 10 artefacts and will rarely exceed 50 artefacts
- The dominant raw material used in artefact manufacture and visible in surface scatters will be indurated mudstone followed by silcrete. The most likely source of these materials will be cobbles from the Hunter River or its tributaries (for example, Glennies Creek)
- Other raw materials such as quartz, quartzite, petrified wood, porcellanite, crystalline tuff, chalcedony and volcanics will commonly be located in the larger assemblages but always as a minor component of the assemblage
- The predominant artefact types will be flakes and flaked pieces followed by cores and retouched flakes. Freehand percussion will be the dominant knapping method
- Large assemblages may contain minor components of retouched flakes and ground artefacts (grindstones and axes). A small component of the larger assemblages may also reflect microlithic technology

**Site types that are unlikely to occur in the Project Area:**

- Carved trees are unlikely to occur due to extensive clearance of mature vegetation across this part of the Hunter Valley. Carved trees are highly recognisable Aboriginal archaeological site types that were often targeted for clearance in the past by landholders to remove evidence of Aboriginal occupation or by museums for display purposes
- Sandstone grinding groove sites do occur in the regional landscape but are relatively rare site types and therefore not expected. Preliminary field survey failed to identify any grinding groove sites within the Project Area
- Although an engraving site is known in the Ravensworth area 6 km north-west of the subject Project Area, this site type is not predicted to occur due in part to its rarity on the landscape but additionally due to the widespread clearance of most mature native trees in the Project Area. Preliminary field survey failed to identify any carved trees within the Project Area; therefore, there is very low potential for this site type to occur
- There are no rock outcrops in the Project Area. Given the generally low relief landscape it is highly unlikely that rock shelters or overhangs occur in the Project Area

- Sources of ochre raw material have been reported to occur at a regional scale (ERM 1997), however subsequent surface survey failed to identify any *in situ* occurrences. There are no known ochre sites in the Project Area thus it is predicted that the location of sources of ochre raw material is highly unlikely
- No skeletal remains or burial sites were identified from the AHIMS site search. The acidity of the soils throughout the Project Area also suggests that preservation of skeletal materials is unlikely

### 4.2.4 Site Content

Artefact scatters and isolated finds are likely to occur within the Project Area, and the following predictions are made regarding likely site composition:

- The majority of artefact scatters are expected to be low in density (that is, less than 20 artefacts) with a few sites (perhaps 1 in 10) having up to 100 artefacts. Higher density sites are usually associated with natural water corridors containing slightly elevated land forms such as Station Creek and Glennies Creek and their associated tributaries
- Waste flakes, broken flakes, flakes, and cores are likely to be the dominant artefact types, with lesser quantities of hammerstones, retouched flakes, blades, nuclear tools and edge-ground stone axes less likely to occur
- Indurated mudstone and silcrete are likely to be the dominant raw materials as they are a preferred raw material type and locally abundant (as river cobbles out of the Hunter River and its tributaries). Other materials utilised include quartz, quartzite, basalt, meta-sediments (hornfels), chert, petrified wood, porcellanite, rhyolite, volcanic, and chalcedony

Grinding grooves are grooves on rock surfaces that have been manufactured by the sharpening of stone axe heads, adzes or to harden the points of fired projectiles. In the Central Lowlands of the Hunter Valley, the majority of known grinding groove sites are associated with water, and sites often contain other components such as artefact scatters. Grinding groove sites are likely to have a number of grooves, such as the Loders Creek site near Singleton, a grinding groove site containing 55 grooves which was recorded in association with a high density open artefact scatter (AHIMS site card 37-6-0148).

Scarred trees result from the removal of bark (most common) or wood, which leaves distinctive shapes depending on the intended use of the removed bark or wood. Two primary uses include removal of bark or wood for a canoe, shield or container (for example, coolamons) or removal for use in a shelter. Scars are generally recorded on the lower portion of the trunk near ground level, and should the tree survive the removal event (which many do), the original wounds are often obscured by bark regrowth. The majority of scarred trees exhibit only one scar, although multiple scars on a single tree have been recorded. Eucalypt varieties most specifically box trees are the most common trees scarred. Should scarred trees occur in the Project Area, they are likely to be symmetrical, elliptical shapes, and are most likely to have only one occluded scar.

**Site distribution**

Stone artefact scatters and isolated finds are predicted to occur within the Project Area, and the following predictions are made regarding their likely site distribution:

- The predictive model identified that sites were likely to be found in all landform contexts, but the majority would be within 100 m of a watercourse, reflecting local and regional trends. Ecotones and creek confluences were also identified as key areas likely to contain higher artefact densities. The Project Area contains one fourth order steam (Station Creek) and a number of first order tributaries
- Sites associated with Station Creek have been detailed by Navin Officer (2008) and were located either along the creek or overlooking the creek from elevated landforms. A number of these sites were identified within 100 metres of Station Creek. Therefore, areas situated on floodplains adjacent to streams, and, therefore, conform to the predictive model
- The landscape prior to European contact would have consisted of open woodland communities adjacent to streams of varying permanence dominated by the Hunter River and associated floodplains. This environment would have been characterised by a wide variety of plant and animal resources, particularly along major creek systems which also included aquatic animal habitats. These resources would have sustained Aboriginal occupation within the area
- Low-relief landforms in association with permanent or semi-permanent water sources are preferred areas for camp sites. Areas such as spur crests and ridge crests that offer broad outlooks may also be used for camp sites. Creek lines or ridge lines may provide suitable travel routes between resources
- Artefact scatters and isolated finds are predicted to be located in areas of $A^1$ soil exposure resulting from natural erosive processes and / or anthropogenic (human) action, as these areas often provide the only effective visibility within pastoral landscapes dominated by dense grasses

Grinding groove sites are predicted to occur on sandstone outcrops within or immediately adjacent to creek lines within sandstone-rich geological units. Scarred trees may occur wherever mature, native vegetation remains intact. Subsurface archaeological deposit may be present in areas along Station Creek or adjacent to buried former streambeds.

Detailed information concerning past streambeds and geological changes is limited. The existence of such streambeds at some stage in the past can account for deeply buried Aboriginal archaeological sites some distance from present watercourses. More recent work has suggested that many sites will be located away from watercourses due to the changing patterns of Aboriginal land use associated with long-term environmental changes (Umwelt 2009). In the case of the Project Area, large scale floods and vegetation types along Station Creek may have influenced land use patterns throughout and to the north of the Project Area. It is acknowledged that Aboriginal archaeological material may be present at considerable distances from current water sources on the valley floor; however, the most archaeologically productive areas throughout the valley floor landform would be slightly elevated land

units adjacent to water corridors. Previous research associated with numerous mine-related activities throughout the upper Hunter has confirmed a relationship between Aboriginal archaeological material and slightly elevated land units adjacent to water corridors, although artefact densities continue to remain generally low in number on the Hunter River's lower order streams and tributaries.

**Site integrity**

- Stone artefact scatters/isolated finds located in deeper alluvial deposits may retain integrity below the plough zone or under recent alluvium
- Artefacts within the plough zone have been subject to vertical and horizontal displacement during cultivation and thus will not retain spatial integrity and will have no relationship to artefacts below them and beneath the plough zone
- The ridges and associated crests, spurs, secondary spurs and saddles will have higher integrity for artefact scatters / isolated finds based on the density of intact vegetation and minimal ground surface disturbance in these terrain units
- Artefact scatters/isolated finds associated with streams and tributaries are unlikely to retain integrity due to natural erosive processes such as rill erosion, sheet wash, lag, gully wash and slope wash. These erosive processes are exasperated by stock trampling
- Artefact scatters on slopes will have been affected by colluvium movement of soils causing the redistribution of the artefacts down the slope and their remixing and redeposition on lower slopes and low gradient land units

The following predictions are made for likely integrity of artefact scatters and isolated finds within the Project Area.

The Project Area has been modified, although the extent of this modification does vary. Sections of the Project Area have been impacted by earthworks associated with unsealed road construction, particularly in relation to the numerous vehicular tracks as well as the extant Northern Line. Much of the entire Project Area has been primarily used for pastoral grazing, and this has resulted in extensive tree clearance and isolated earthworks, such as for dams and artificial drainage lines. Extensive tree clearance has affected the integrity of surface soil deposits and has also modified water flow within the landscape resulting in increased run off. Water management infrastructure (dams) dominate the banks of water corridors, which also contains natural or humanly modified drainage lines along its length. Numerous east-west oriented channels and/or natural drainage lines have been constructed or utilised to redirect water flow into existing dams. Station Creek has been redirected in the northern section of the Project Area. In some sections of the Project Area Station Creek runs linear and parallel to the existing rail track. It is assumed that the creek's course has been diverted in these areas.

All of the land units within the entire Project Area have undergone varying degrees of modification through a variety of natural and humanly induced disturbance. A number of these contributing factors have the potential to impact on site integrity within the boundaries of the Project Area. Some of these factors are synthesized below.

- Extensive clearance of vegetation to create grazing lands would have disturbed any archaeological deposits associated with tree bases and root zones, possibly displacing subsurface artefacts to the surface and vice versa. Loss of vegetation is also expected to have

changed erosion patterns throughout the landscape, possibly creating higher exposures on slopes than previously known and possibly increasing sedimentation of creek lines and floodplains

- Water management infrastructure (dams and contour banks) associated with the drainage lines of Glennies Creek to the north of the Project Area and to a lesser degree Station Creek affect both the lateral and vertical integrity of the soils in the areas, especially on the creek level plain. The installation of such infrastructure may have directly impacted archaeological sites during construction. Further, this infrastructure has altered water flow and erosion patterns associated with these watercourses, suggesting that erosion may act to expose and possibly redeposit archaeological materials
- Should areas have been subject to past cultivation within the assessment areas, surface archaeological materials present within the plough zone are expected to have no spatial integrity as a result of ploughing. However, archaeological deposits below the plough zone may retain some integrity
- Sites associated with ephemeral creeks (lower order drainage lines) are unlikely to retain integrity due to erosion, and sites associated with all creek lines are likely to be affected by higher levels of stock movement and therefore potentially higher rates of artefact damage

The Glennies Creek and Station Creek areas are subject to channel migration, sediment deposition, rill erosion, over bank flows, sheet wash and cultivation. Given the above, these areas have little potential to retain archaeological deposits with any integrity. Most of the Project Area has been cleared of vegetation and has been subject to significant erosion including bank collapse, gully and sheet wash and recent fluvial sediment deposition along or near creeks; consequently, it has little potential to retain archaeological deposits with any integrity. Furthermore, considerable agricultural / cultivation activities have also directly affected the upper $A^1$ soil unit throughout this area.

## 4.3 Survey

### 4.3.1 Aims

The field survey of the Project Area aimed to:

- Identify, record and assess the condition of previously unrecorded Aboriginal cultural heritage sites
- Locate and update the information for documented sites where possible
- Help assess the archaeological (scientific) and cultural sensitivity of the Project Area
- Identify and document cultural heritage values noted by the Aboriginal people involved in the field survey and / or previously noted by the Aboriginal parties

There were eight previously documented Aboriginal sites within the immediate vicinity (within 100 m) of the Project Area (Table 20; Figures 4 and 5).

| **Sites** | **Notes** |
|---|---|
| *Previously documented sites within the immediate vicinity (within 100 m) of the Project Area* | |
| Third track and associated impact area | |
| Integra 31 (I31) (37-3-0886) | |
| 36; (37-3-0157) | |
| GCC26;Camberwell; (37-3-0088) | |
| GCC25;Camberwell; (37-3-0087) | |
| Rixs Creek (Singleton) (37-6-0239) | The AGD coordinates provided by AHIMS for Aboriginal cultural heritage site, Rixs Creek Stone Quarry Gully (37-6-0241), place the site within the Project Area (Figures 4 and 5). These coordinates do not correspond, however, with the map displayed in the assessment (Brayshaw 1982). The map places the site outside both the Project Area and its immediate vicinity (within 100 m). Consequently this site is not considered further in this assessment. |
| SC/73 (37-6-1206) | |
| Site SC/74 (37-6-1207) | |
| Site SC/75 (37-6-1208) | |

Table 20: Previously recorded Aboriginal sites within and in the immediate vicinity of the Project Area

### 4.3.2 Methodology

Recording during the survey followed the guidelines of the DECCW, in particular the 'Guidelines for Archaeological Survey Reporting', a companion document of the 'Aboriginal Cultural Heritage Standards and Guidelines Kit' (NPWS (now DECCW) 1997) and widely considered to represent best archaeological practise for survey reporting.

Information recorded during the survey included:

- Aboriginal sites
- Landforms elements, distinguishable areas of land approximately 40 m across or with a 20 m radius (Speight 1998)
- Ground surface visibility (GSV), distance visibility (DV) and areas of exposure (for definitions see Appendix 6)
- Observable past or present disturbances to the landscape from human or animal activities
- Any resources that may have potentially have been exploited by Aboriginal people

Distinguishing landform elements and their association with Aboriginal cultural heritage may assist with the identification of site patterning, though with an understanding of the following limitations:

- The degree of GSV and amount of exposed areas can significantly bias the discovery of surface artefacts
- Cultural material exposed on the surface is not necessarily representative of the potential extent of the site (either horizontally or vertically)

Information about the presence of potentially exploitable resources helps contribute to predictions of where Aboriginal sites may occur within the Project Area.

Information about GSV, DV and areas of exposures help to provide a general indication of the effectiveness of the survey for identifying Aboriginal cultural heritage exposed to the surface. Observable disturbances are also considered when assessing the integrity of known or potential sites for an area.

The location of Aboriginal cultural heritage and points marking the boundary of the landform elements were recorded using a hand-held Differential Global Positioning System (DGPS) and the Map Grid of Australia (MGA) (94) coordinate system.

### 4.3.3 Survey

The survey was conducted from 6 to 10 September 2010. Light was adequate during the entire survey. The survey parties included:

- Wayne French, Yarrawalk Enterprises
- Sarah Jane Hall, Wanaruah Local Aboriginal Land Council
- Allen Paget, Ungoorooo Aboriginal Corporation
- Lachlan Sweeney, Upper Hunter Valley Alliance
- Two Railcorp Protection Officers
- Pamela Kottaras and Dominic Brady (Biosis Research)

The survey was undertaken throughout the Project Area via pedestrian means. Lachlan Sweeney, ARTC, provided additional guidance concerning the location of the proposed works.

The survey focused on areas and features within the Project Area where Aboriginal cultural heritage was considered more likely to be identified, such as areas of erosional exposure, slightly elevated land forms and trees that appeared to be more mature.

The survey parties elected to survey the part of the Project Area south of the secondary site compound by car (approximate landform waypoints 59 and 60), as impacts within this area were to be confined to the existing access track on the upside (pers.comm Lachlan Sweeney, ARTC), an already disturbed area.

### 4.3.4 Results

The field survey identified 18 previously undocumented Aboriginal cultural heritage sites within and in the immediate vicinity of the Project Area (Table 21; Figures 8 a, b, c, d and e and 9a, b, c, d and e).

Table 21: Site survey results

| **Sites** | **Notes** |
|---|---|
| *Previously undocumented within the Project Area* | |
| Third track and associated impact area | |
| NBTT01 (site card pending) | Newly documented |
| NBTT02 (site card pending) | |
| NBTT03 (site card pending) | |
| NBTT04 (site card pending) | |
| NBTT05 (site card pending) | |
| NBTT06 (site card pending) | |
| NBTT07 (site card pending) | |
| NBTT08 (site card pending) | |
| NBTT09 (site card pending) | |
| NBTT10 (site card pending) | |
| Primary Compound | |
| | Changes were made to the proposed impact area, including the relocation of the Primary Compound to within the rail corridor and |

| | |
|---|---|
| | removal of the access road off Bridgman Road. Subsequently, this table has been amended to reflect these changes. |
| Rixs Creek Lane extension impact area | |
| RCLE01 (site card pending) | Newly documented |
| RCLE03 (site card pending) | |
| Secondary site compound impact area | |
| SC01 (site card pending) | Newly documented |
| *Previously undocumented within the immediate vicinity of the Project Area* | |
| Rix Creek Lane extension impact area | |
| RCLE02 (site card pending) | Newly documented |
| *Previously documented sites within the immediate vicinity (within 100 m) of the Project Area* | |
| Third track impact area | |
| Integra 31 (I31) (37-3-0886) | Not located |
| 36; (37-3-0157) | |
| GCC26;Camberwell; (37-3-0088) | |
| GCC25;Camberwell; (37-3-0087) | |
| Rixs Creek (Singleton) (37-6-0239) | |
| SC/73 (37-6-1206) | |
| Site SC/74 (37-6-1207) | |
| Site SC/75 (37-6-1208) | |

The information recorded during the survey has been summarised by landform (Appendix 2, 3 and 4; Figures 6 a, b, c, d and e and 7 a, b, c, d and e) help add to general knowledge about the relationship between the landscape and Aboriginal cultural heritage sites within the Hunter Valley region.

### 4.3.5 Results Summary

17 previously unrecorded Aboriginal cultural heritage sites within the Project Area were identified during the field survey. One site was recorded in the immediate vicinity of the Project Area. These sites have been described (Appendix 5). The sites consisted of 9 stone artefact scatters and 8 isolated stone artefacts. The identification of these sites is consistent with the earlier prediction that open stone artefact scatters and isolated finds are the most likely sites to be identified within the Project Area.

The overall effectiveness of the survey for assessing the location, nature and extent of Aboriginal archaeological sites was considered low due to poor surface visibility as a consequence of vegetation cover and the low amount of exposures. The main types of exposures present were grassed vehicle tracks, dam walls, tree plantings and erosional exposures.

The general landscape over which the Project Area extends is characterised by rolling low hills (as per Speight 1998: 36). Landforms types observed within the Project Area included ‘crest’, ‘upper, mid, lower and simple slope’, ‘flat’ and ‘depression’.

The main land shaping processes associated with these landforms are (as per Speight 1998: 27-29):

- Erosion on crests, ridges and hill slopes from sheet wash

- Erosion and aggradation on flats from sheet wash
- Erosion on depressions from channel flow

The effect of sheet wash erosion is likely to be greater on areas cleared of vegetation and steeper slopes. A large part of the Project Area has been cleared of trees. Slope gradients associated with the landforms identified within the Project Area range from very gently inclined to moderate. The number of observed mature trees within the Project Area was very low.

A number of disturbances from modern human activities were observed within the Project Area. Disturbances with greater impacts individually include the construction of the Northern Line, mining rehabilitation areas, an artificial channel and rail access roads. Disturbances with greater impacts collectively include bridges / tunnels, dams and tree replanting areas.

The proposed third track and associated infrastructure, is surrounded by existing and former mining pits and mining rehabilitation areas, where there has been earthworks and replanting (between approximate landform waypoints WP7 to WP90). Remnant natural landscape appears to exist, however, within this area between these disturbances, as evidenced by remnant vegetation and, on occasion, the presence of discrete stone artefact scatters.

### 4.3.6 Results analysis and archaeological (scientific) sensitivity zoning

The likelihood of Aboriginal cultural heritage with archaeological (scientific) value (referred to as archaeological sensitivity here) occurring within the Project Area was assessed and zoned as low, moderate or high.

This sensitivity was based on a cross-consideration of the archaeological (scientific) significance criterion which was assessed with the:

- The predictive model detailing the type and character of Aboriginal cultural heritage sites likely to exist(ed) throughout the Project Area and where they are more likely to be located.
- AHIMS site list and location of sites
- Background report review at a local and regional scale
- Site analysis (including land use history / previous disturbance)
- Information obtained from the field survey
- More specific areas of sensitivity identified by other assessments

*Ridge lines*

Parts of the Project Area follow or extend across a number of ridge lines. These landforms are considered to be generally easier to traverse by foot than the surrounding slopes and may have been used by Aboriginal people as part of travel routes.

Aboriginal presence on ridge lines is likely to have been transient. Stone artefact discard associated with this presence is likely to be associated with tool maintenance or limited artefact manufacture. Artefact counts for each event are likely to be low and consist of a background scatter. Overall artefacts counts will depend on how often the ridge was used and the number of people making the journey.

The sensitivity of these parts of the Project Area is low.

*Hill slopes*

Much of the Project Area extends across gentle and moderate slopes.

More intensive Aboriginal presence is generally more likely to be located on more level ground.

In addition the vulnerability of slopes sheet wash erosion increases with less vegetation and the steepness of slope, especially during storms and after bushfires, which would have removed the vegetation anchoring the soil. Cultural heritage material located in an unstable environment or landform is likely to be redeposited down slopes.

The sensitivity of these parts of the Project Area are low.

*Water disturbances and availability*

Station Creek

Parts of the Project Area are in the immediate vicinity of a 4$^{th}$ order section of Station Creek (the order of watercourses within the Project Area were identified as per Strahler 1964). A number of Aboriginal cultural heritage sites have been documented along Station Creek and on slopes overlooking the creek immediately to the west (for example see Navin Officer Heritage Consultants 2008).

The parts of the Project Area in the immediate vicinity of Station Creek (within approximately 100 m) not disturbed by the railway or mining rehabilitation are on a flat valley floor (landform waypoints WP01-WP02-WP03) that has been cleared of vegetation. The visibility and amount of exposures this area was low.

Although modern cultural activities such as the construction of the railway, dams and mining activities have modified the creek, its overall alignment, at least in the immediate vicinity of the Project Area, does not appear to have been diverted; this observation is based on the timber sheet abutment of the existing timber beam bridge on Middle Falbrook Road (Biosis Research 2010).

The sites previously identified from survey on the valley floor in the immediate vicinity of Station Creek were open stone artefact sites (for example see Navin Officer 2008). The integrity of these sites ranged from poor to good and their potential for subsurface deposits ranged from low to high (Navin Officer 2008). Navin Officer (2008) identified a zone of high archaeological potential for a section of Station Creek outside the Project Area and subsurface testing within this zone should it be impacted (Navin Officer 2008: 37-8,48-9).

Sites are considered more likely to occur within the Project Area in the immediate vicinity of Station Creek (within approximately 100 m) on relatively undisturbed parts of the valley floor. The archaeological (scientific) value of potential sites within this area, particularly relating to their integrity and density, however, is not clear.

The sensitivity of these parts of the Project Area have been classified as *moderate*.

Lower order tributaries

The Project Area extends across six first order tributaries (the order of watercourses within the Project Area were identified as per Strahler 1964). Aboriginal presence around lower order tributaries is generally likely to have been short term and associated with low artefact counts.

The sensitivity of those parts of the Project Area where low order water courses exist have been assessed as low.

The parts of the Project Area that extend across watercourses are likely to have been disturbed by channel flow and sediment deposition.

*Stratification*

Stratified sites are likely to retain their spatial and temporal integrity within the soil profile. Much of the soils over which the Project Area extends, however, are duplex or texture contrast soils, and Aboriginal sites associated with these soils will not be stratified.

There are no landforms within the Project Area where Aboriginal sites are particularly likely to be stratified.

*Disturbed Areas*

There are parts of the Project Area that have been disturbed by modern cultural activities to the extent that the integrity of potential Aboriginal cultural material is likely to be low.

These activities include the construction the Northern Line and associated infrastructure - including access roads, bridges and tunnels - mining rehabilitation areas, communication towers, graded vehicle tracks, an artificial channel, dams and tree replanting areas.

The sensitivity of these parts of the Project Area are considered low.

*Conclusion*

The overall sensitivity of the Project Area has been zoned based on a cross consideration of the above points (Figures 10a, b, c, d and e and 11a, b, c, d and e).

# 5.0 SIGNIFICANCE ASSESSMENT

Assessing the heritage significance of a historic building, cultural heritage place or archaeological site is undertaken to make decisions about the best way to protect and manage the particular heritage place. The nature and level of cultural significance will also determine if statutory protection is appropriate under State or Federal heritage legislation. The statutory frameworks that govern heritage protection have been discussed previously

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia ICOMOS Burra Charter which was adapted from the UNESCO sponsored ICOMOS (International Council for Monuments and Sites) Venice Charter (Australia ICOMOS 1999).This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia (Burke and Smith, 2004:248-250). These values include but are not limited to the following:

- **Historical** significance (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment
- **Aesthetic** significance (scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use
- **Social** significance (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities
- **Scientific** significance (archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information

The NSW National Parks and Wildlife Service have produced *Guidelines for Archaeological Survey Reporting.* (Working Draft)', Cultural Heritage Services Division, (1997), and *'Guidelines for Aboriginal Heritage Impact Assessment'* (NSW NPWS 1997). The NSW Heritage Office has produced the *Heritage Manual* (1996)

The 'definitive' international archaeology guidelines, the *ICOMOS Charter for the Protection and Management of the Archaeological Heritage* ( 'ICAHM Charter' 1990) by ICOMOS Committee on Archaeological Heritage Management, enunciates the goal of preserving existing, original physical fabric. However, It provides no prescription of standards for archaeology beyond the requirement that:

*"The protection of the archaeological heritage must be based upon the fullest possible knowledge of its extent and nature. General survey of archaeological resources is therefore an essential working tool in developing strategies for the protection of the archaeological heritage. Consequently archaeological survey should be a basic obligation in the protection and management of the archaeological heritage."*

The last phase of archaeological research is Phase III-mitigation. Once a cultural heritage place has been determined to have a level of significance warranting some form of further cultural heritage management, the archaeologist must make recommendations to the site's management how to preserve the data contained in the site. This process must be consistent with Commonwealth, state and local heritage legislation and be commensurate with the level of significance of the site.

The Burra Charter defines cultural significance as the 'aesthetic, historic, scientific or social value for past, present or future generations' of a place. The NSW NPWS (1997 – now part of the DECCW) provides further discussion on the assessment of cultural significance for Aboriginal sites, and for artefact scatter sites in particular. Categories of significance relevant to Aboriginal archaeological sites include Aboriginal significance, archaeological/scientific significance, aesthetic significance, tourism potential and educational significance. *The NSW NPWS Guidelines for Archaeological Report Writing* (1997: 25) states:

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

The significance of the sites within this assessment report will be assessed in relation to their Aboriginal significance and their scientific significance. The criteria for assessing each type of 'significance' are outlined in the sections to follow. The scientific significance assessment of the sites recorded during the survey for this project and those previously recorded will be discussed and justifications for the significance ranking provided.

## 5.1 Aboriginal Cultural Significance

Aboriginal people are the primary determiners of their cultural heritage. Comments were received from three registered Aboriginal stakeholders regarding the draft Aboriginal Cultural Heritage Assessment; however, the comments did not address the cultural significance of sites within the project area. The LALC commented that preserving the cultural integrity of the sites within their environment and cultural landscape, as well as that of the Project Area is of cultural sensitivity. However, no specific comments regarding the cultural significance or sensitivity (e.g high, moderate, low etc) were made in any of the comments received. Therefore, it is not possible to produce a statement of Aboriginal cultural significance.

## 5.2 Archaeological (Scientific) Significance

The archaeological or scientific significance of Aboriginal archaeological sites is primarily assessed according to their value to contribute to the archaeological/scientific understanding of Aboriginal culture (their research potential). Six criteria underlie the scientific assessment process, being:

- **Rarity:** established on the basis that the site (location, type, integrity, contents, and archaeological potential) is common or rare within the local and/or regional landscape;
- **Representativeness:** established on the basis that the site (location, type, integrity, contents, and archaeological potential) is common or uncommon within the local and/or regional landscape;
- **Integrity:** established on the basis that the site appears relatively undisturbed and there is a high possibility that useful spatial data can still be obtained from subsurface excavations;
- **Connectedness:** established on the basis that the site is connected to like sites in the local and/or regional landscape through chronology, site type, raw material use, knapping technique/reduction strategy, and/or information provided by Aboriginal oral history;
- **Complexity:** established on the basis that the site exhibits or is predicted to contain either a complex assemblage of stone artefacts in terms of artefact types and/or raw materials, or features such as hearths or heat treatment pits, activity areas;
- **Potential for archaeological deposit:** established on the basis that the site has the potential to contain subsurface Aboriginal archaeological material that has some stratigraphic or spatial integrity or is of a nature that indicates it may provide useful intra or inter-site archaeological data that can be used directly for research or training purposes.

The assessment criteria are detailed below with site specific information relating to the Project Area.

### 5.2.1 Rarity

The scientific significance of a site is assessed as higher if it is perceived as unique or rare within the local or regional landscape. All 18 sites recorded within and in the immediate vicinity of the Project Area were assessed as having low scientific significance for rarity in the local and regional context, based on the following:

- Artefact scatters and isolated finds are the most common site types in the local area,
- This reflects regional trends, with artefact scatters and/or isolated finds the most common site types in the Hunter Valley;

- The location of artefact scatters and/or isolated finds within the landscape is typical of local and regional trends, with isolated finds and small artefact scatters found throughout the wider area and as opposed to larger sites and high densities being associated with natural water corridors.
- The artefact types and raw materials recorded in these artefact scatters and/or isolated finds reflect local and regional trends. Higher densities of broken flakes than any other artefact type and high ratios of mudstone and silcrete stone raw material with lesser quantities of quartz are in line with local and regional site compositions. No raw materials or artefact types that are considered rare at local and regional levels were identified within the assessment area.
- All artefact scatters and/or isolated finds recorded are in landscape areas of low integrity, with all being recorded in exposures resulting from erosion or human action. This lack of undisturbed sites is typical of open sites at local and regional levels.

### 5.2.2 Representativeness

This refers to the regional distribution of a particular site type. Representativeness is assessed by whether the site is *common*, *occasional*, or *rare* in a given region. Assessments of representativeness are subjectively biased by current knowledge of the distribution and number of archaeological sites in a region. This varies from place to place depending on the extent of archaeological research. Any such site should be subject to re-assessment as more archaeological research is undertaken.

All 18 sites recorded within and in the immediate vicinity of the Project Area were assessed as having low scientific significance for representativeness in the local and regional context, based on the following:

- They are common site types, and their distribution reflects local and regional trends;
- They are located in areas disturbed by past anthropogenic land use and/or natural erosion, indicating they are of low archaeological integrity and thus low research potential, similar to all previously recorded sites in the region

### 5.2.3 Integrity

This includes the state of preservation of particular remains (e.g. animal bones, plant remains, stone artefacts, and ancestral remains) as well as the stratigraphic integrity of the site, the taphonomic processes acting on the site, the impact of past artefact collections made at the site, etc.

All 18 sites recorded within and in the immediate vicinity of the Project Area were assessed as having low scientific significance for integrity in the local and regional context, based on the following:

- All sites recorded are in open landscape contexts, and thus have been subject to ongoing erosion and soil movement.
- In general, a number of sites are located within the existing easements of the rail corridor, and have been directly impacted by past earthworks for track, embankment and associated contouring

### 5.2.4 Connectedness

Connectedness refers to the inter-site relationship between different components of a site (for example, a scarred tree and artefact scatter), which also can be conferred to assess the intra-site relationships between sites over a large area.

All 18 sites recorded within and in the immediate vicinity of the Project Area were assessed as having low significance for connectedness at both local and regional levels, as no recorded archaeological evidence provides associations between sites on the basis of landform distribution or the nature of assemblages recorded.

### 5.2.5 Complexity

This refers to the structure and form of the site, whether it covers a large area, contains large numbers of artefacts, or a wide range of archaeological features. This is a relative factory, as it is dependent on comparison with other sites in similar environmental and cultural contexts. A more complex and extensive site is likely to answer more archaeological questions by the very nature of its formative processes.

Features that may occur within a site include knapping floors, heat treatment pits, hearths or other items that do not fall within the description of a generalised scatter of flaked stone artefacts.

All 18 sites recorded within and in the immediate vicinity of the Project Area were assessed as having low scientific significance for complexity based on the low artefact numbers and limited range of raw materials and artefact types recorded, and the absence of associated features such as hearths, knapping floors or heat treatment pits.

### 5.2.6 Potential for Archaeological Deposit

For a site to be able to contribute to an understanding of cultural sequences, it must contain distinguishable features or aspects that can be shown to have been created at different times within the context of that site or between sites. For such relationships to be possible the artefacts or features within the sites need to be located within a stratified context. It is also possible that a site may contain artefacts in a subsurface context that may not remain in a stratified context, but that may by their investigation add to the knowledge of Aboriginal use of the landscape / resource base in a more general sense.

All 18 sites recorded within and in the immediate vicinity of the Project Area were assessed as having low scientific significance for potential archaeological deposit based on the generally disturbed nature of the sites, all being in open contexts directly affected by erosion and / or human activity, and the limited potential for high density subsurface deposits to occur in these landforms based on archaeological site patterning in the Hunter Valley.

### 5.2.7 Evaluation of Criteria

Past studies within the Singleton to Ravensworth area have developed a standardised approach to the evaluation of scientific significance, involving the use of numerical values for each significance

criterion so that an overall significance assessment could be quantified. Table 22 outlines the basis for numerical values attributed to each criteria set, which are as follows:

- Low significance was afforded a score of 1
- Moderate significance was afforded a score of 2
- High significance was afforded a score of 3

Overall significance was scored as follows:

- Low significance 12-15
- Low to moderate significance 16-19
- Moderate significance 20-23
- Moderate to high significance 24-27
- High significance 27+

Table 22: Criteria Used in Evaluating Archaeological Significance

| | **Low (Score of 1)** | **Moderate (Score of 2)** | **High (Score of 3)** |
|---|---|---|---|
| **Rarity** | The location of the site within the landscape, its type, integrity, contents and/or potential for subsurface artefacts, are common within the local and regional context. | The location of the site within the landscape, its type, integrity, contents and/or potential for subsurface artefacts, are common within the regional context but not the local context. | The location of the site within the landscape, its type, integrity, contents and/or potential for subsurface artefacts, are rare within the local and regional context. |
| **Representativeness** | The site, when viewed in relation to its type, contents, integrity and location in the landscape, is common within a local and regional context and sites of similar nature (or in better condition) are already set aside for conservation within the region. | The site, when viewed in relation to its type, contents, integrity and location in the landscape, is uncommon within a local context but common in a regional context and sites of similar nature (or in better condition) are already set aside for conservation within the region. | The site, when viewed in relation to its type, contents, integrity and location in the landscape, is uncommon within a local and regional context and sites of similar nature (or in better condition) are not already set aside for conservation within the locality or region. |
| **Integrity** | Stratigraphic integrity of the site has clearly been destroyed due to major disturbance/loss of topsoil. The level of disturbance is likely to have removed all spatial and chronological information. | The site appears to have been subject to moderate levels of disturbance, however, there is a moderate possibility that useful spatial information can still be obtained from subsurface investigation of the site, even if it is unlikely that any useful chronological evidence survives. | The site appears relatively undisturbed and there is a high possibility that useful spatial information can still be obtained from subsurface investigation of the site, even if it is still unlikely that any useful chronological evidence survives. |

| | **Low (Score of 1)** | **Moderate (Score of 2)** | **High (Score of 3)** |
|---|---|---|---|
| **Connectedness** | There is no evidence to suggest that the site is connected to other sites in the local area or the region through:<br>- their chronology (rarely known);<br>- their site type (e.g. connectedness could be argued between an axe quarry, a nearby set of axe grinding grooves and an adjacent site exhibiting evidence of axe reduction);<br>- by the use of an unusual raw material, knapping technique/reduction strategy;<br>- similar designs/motifs in the case of art sites and engravings; and/or<br>- information provided by Aboriginal oral history. | There is some evidence to suggest that the site is connected to other sites in the local area or the region through one of the following:<br>- their chronology (rarely known);<br>- their site type (e.g. connectedness could be argued between an axe quarry, a nearby set of axe grinding grooves and an adjacent site exhibiting evidence of axe reduction);<br>- by the use of an unusual raw material, knapping technique/reduction strategy;<br>- similar designs/motifs in the case of art sites and engravings; or<br>- information provided by Aboriginal oral history. | There is good evidence to support the theory that the site is connected to other sites in the local area or the region through two or more of the following:<br>- their chronology (rarely known);<br>- their site type (e.g. connectedness could be argued between an axe quarry, a nearby set of axe grinding grooves and an adjacent site exhibiting evidence of axe reduction);<br>- by the use of an unusual raw material, knapping technique/reduction strategy;<br>- similar designs/motifs in the case of art sites and engravings; and/or<br>- information provided by Aboriginal oral history. |
| **Complexity** | The site does not exhibit and is not predicted to contain either of the following in a subsurface context:<br>- a complex assemblage of stone artefacts in terms of artefact types and/or raw materials (including use of local and imported raw materials) and/or knapping techniques/reduction strategies; and/or<br>- features such as hearths or heat treatment pits, activity areas. | The site exhibits or can be predicted to contain one of the following in a subsurface context:<br>- a complex assemblage of stone artefacts in terms of artefact types and/or raw materials and/or knapping techniques/reduction strategies and/or use of local and imported raw materials; and/or<br>- features such as hearths or heat treatment pits, activity areas. | The site exhibits or can be predicted to contain both of the following in a subsurface context:<br>- a complex assemblage of stone artefacts in terms of artefact types and/or raw materials and/or knapping techniques/reduction strategies and/or use of local and imported raw materials; and<br>- features such as hearths or heat treatment pits, activity areas. |

| | **Low (Score of 1)** | **Moderate (Score of 2)** | **High (Score of 3)** |
|---|---|---|---|
| **Potential for Archaeological Deposit** | The site does not have or has only a low potential to contain subsurface archaeological material that has stratigraphic integrity or is of a nature that suggests its subsurface investigation would assist with answering questions of contemporary archaeological interest or that indicate it should be preserved for its future research potential. | The site has a moderate potential to contain subsurface archaeological material that has stratigraphic integrity or is of a nature that its subsurface investigation would assist with answering questions of contemporary archaeological interest or that indicate it should be preserved for its future research potential. | The site has a high potential to contain subsurface archaeological material that has stratigraphic integrity or is of a nature that its subsurface investigation would assist with answering questions of contemporary archaeological interest or that indicate it should be preserved for its future research potential. |

Table 23: Scientific Significance Assessment for Sites in the Assessment Area. The table lists the numerical values attributed to each archaeological site recorded for each scientific assessment criterion

| **Site** | **Rarity** | | **Representativeness** | | **Archaeological Integrity** | | **Connectedness** | | **Complexity** | | **Potential for Archaeological Deposit** | | **Archaeological Significance** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Local* | *Regional* | *Local* | *Regional* | *Local* | *Regional* | *Local* | *Regional* | *Local* | *Regional* | *Local* | *Regional* | | |
| TTAR01 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| TTAR02 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| TTAR03 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| TTAR04 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| RCLE01 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| RCLE03 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| RCLE02 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT01 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT02 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT03 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT04 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT05 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT06 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT07 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT08 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT09 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| NBTT10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |
| SC01 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | Low |

As outlined above, all 18 of the Aboriginal archaeological sites recorded were assessed to be of low scientific significance at local and regional levels due to the following:

- Small artefact scatters and isolated finds are common site types at local and regional levels, and are not considered rare
- Integrity of the sites is generally low, with all sites recorded in areas of disturbance resulting from human action or geomorphic processes. These processes have resulted in sites with little potential for spatial or stratigraphic integrity
- There is no evidence for connectedness amongst all sites, as recorded archaeological features do not directly link any sites
- There is no evidence for complexity at any site, primarily as a result of the low archaeological integrity detailed above
- Potential for archaeological deposit is limited, with the sites located in open contexts affected by erosion and/or human activity, and archaeological patterning for the region identifying limited potential for high density artefact deposits

# 6.0 STATEMENT OF HERITAGE IMPACT

## 6.1 Proposed development limitations and mitigation measures

There were two main development alternatives considered in addition to a 'do nothing' alternative. They were:

- Resignalling of the current track for loaded trains
- Implementation of an additional third track

Reducing headways would be achieved by both alternatives providing an increase in rail capacity, although the amount of capacity would vary between the two alternatives as well as other inherent differences and risks.

Operational modelling showed that resignalling of the existing up main at Nundah Bank would not provide the desired level of capacity to ensure delivery of 191 million tonnes per annum at the Port of Newcastle in 2018. Additionally, this alternative would not provide any additional operational efficiency or flexibility than the current two track configuration.

Development and consideration of options therefore focussed on the third track alternative and the following primary design considerations:

- Location of the third track on either the up or down side of the existing tracks
- Achievement of 8 or 10 minute headways by providing either a 'long' or 'short' third track respectively
- Providing the third track either at grade following existing topography or grade-eased with a maximum of 1:100 grade

Some 18 feasible third track options were considered to provide the required freight volumes to the Port of Newcastle in 2018. The re-signalling alternative was also reviewed to confirm whether under reduced freight volume conditions, it might provide a more cost-effective solution than the third track.

The options were considered using a combination of qualitative and quantitative criteria across economic, social and environmental parameters. A number of technical reports were completed regarding operational, economic, engineering design and environmental considerations before four options were shortlisted for more detailed evaluation.

All available information concerning these four options was collated and a workshop held in April 2010 comprising Upper Hunter Valley Alliance (UHVA) design, construction and environmental personnel as well as the ARTC maintenance and operations representatives. The options were ranked initially on non-price performance before price was introduced. The workshop outcomes were presented and ratified by the ARTC Board in May 2010.

The preferred option, an approximately 4 kilometre at grade third track on the up side of the rail corridor was selected as the preferred option based on:

- Achievement of all the project objectives at a lower capital cost
- Reduced scope of civil, signalling and earthworks and overall less complexity
- Reduced environmental and social impacts relative to Options 12 and 16
- It provides a brand new up main and up relief track, which can be in extended in the future if required, for only a slightly greater cost than the cheapest option

A number of other project design and construction options are being considered as part of the ongoing design development conducted in parallel with the Environmental Assessment. These included:

- Locations of site access ways
- Details of the alterations to Camberwell Junction
- Provision/ location of turnout laydown areas/ maintenance pads
- Site compound locations
- The elevation of maintenance vehicle access tracks

## 6.2 Predicted Physical Impacts

Potential development related impacts (including indirect impacts) to Aboriginal cultural heritage have been assessed.

Statements of impact have been produced for all Aboriginal sites within and in the immediate vicinity (within 100 m) of the Project Area, alongside their significance for those sites documented during the field survey and that may be potentially impacted by the development, and the zone of moderate (archaeological) sensitivity identified by this assessment (Table 24)

Table 24: Statements of impact for Aboriginal sites within and in the immediate vicinity of the Project Area and the zone of moderate (archaeological) sensitivity

| **Aboriginal cultural heritage sites** | **Significance** | **Cultural significance** | **Potential development related impact(s)** |
|---|---|---|---|
| *Within the Project Area* | | | |
| NBTT01 (site card pending) | Low | Not identified | Third track and associated infrastructure impact area |
| NBTT02 (site card pending) | Low | Not identified | |
| NBTT03 (site card pending) | Low | Not identified | |
| NBTT04 (site card pending) | Low | Not identified | |
| NBTT05 (site card pending) | Low | Not identified | |
| NBTT06 (site card pending) | Low | Not identified | |
| NBTT07 (site card pending) | Low | Not identified | |
| NBTT08 (site card pending) | Low | Not identified | |
| NBTT09 (site card pending) | Low | Not identified | |
| NBTT10 (site card pending) | Low | Not identified | |

| | | | |
|---|---|---|---|
| RCLE01 (site card pending) | Low | Not identified | Rixs Creek Lane extension impact area |
| RCLE03 (site card pending) | Low | Not identified | |
| SC01 (site card pending) | Low | Not identified | Secondary Site compound impact area (downside) |
| Access Road off Bridgman Road | | | |
| | N/A | N/A | Changes were made to the proposed impact area, including the removal of the access road off Bridgman Road. Subsequently, this table has been amended to reflect these changes. |
| *In the immediate vicinity of the Project Area (within 100 m)* | | | |
| Integra 31 (I31) (37-3-0886) | | Not identified | None |
| 36; (37-3-0157) | | Not identified | |
| GCC26;Camberwell; (37-3-0088) | | Not identified | |
| GCC25;Camberwell; (37-3-0087) | | Not identified | |
| Rixs Creek (Singleton) (37-6-0239) | | Not identified | |
| SC/73 (37-6-1206) | | Not identified | |
| Site SC/74 (37-6-1207) | | Not identified | |
| Site SC/75 (37-6-1208) | | Not identified | |
| RCLE02 (site card pending) | Low | Not identified | |
| Primary Compound outside the Rail Corridor | | | |
| N/A | N/A | N/A | Changes were made to the proposed impact area, including the relocation of the Primary Compound to within the rail corridor. Subsequently, this table has been amended to reflect these changes. |

# 7.0 RECOMMENDATIONS

Strategies to manage Aboriginal cultural heritage relevant to the Project Area have been developed based on archaeological (significance) and influenced by:

- Predicted impacts to Aboriginal cultural heritage
- The planning approvals framework
- Current best conservation practise considered to include:
    - Ethos of the Australia ICOMOS Burra Charter
    - 'Standards Manual for Archaeological Practise in Aboriginal Heritage Management', a companion document of the 'Aboriginal Cultural Heritage Standards and Guidelines Kit' (NPWS (now DECCW) 2007)

Prior to any impacts occurring within the Project Area, the following is recommended:

***1. Continued consultation with the registered Aboriginal parties***

The ARTC continue to consult with the Aboriginal parties about the management of Aboriginal cultural heritage sites within the Project Area throughout the life of the project as per the Aboriginal cultural heritage consultation requirements for proponents 2010.

***2. Development of a Conservation Heritage Management Sub Plan***

A Conservation Heritage Management Sub Plan (CHMSP) should be developed for the project should it be approved. The CHMSP would provide an overarching framework to guide the management of Aboriginal cultural heritage relating to the Project Area during the life of the project and to also accommodate future ARTC operations, including maintenance, associated with the Project Area after this time. The CHMSP should be developed in consultation with the Aboriginal parties and include the management strategies developed here.

***3. Conservation opportunities through avoidance***

Where possible, impacts from the proposed development should avoid:

- All documented Aboriginal cultural heritage sites
- The zone of moderate (archaeological) sensitivity, which is associated with the main site compound, identified in this report

Protective measures to protect sites that can be avoided during construction should be implemented. Such measures might include the erection of fencing an approximate 10 m buffer around the sites where practical. The buffer can be reduced if the site is physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information. The long term management of these sites should be addressed in the CHMSP.

***4. Further archaeological work***

*Aboriginal cultural heritage sites*

- Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties

*Zone of low (archaeological) sensitivity*

- No further archaeological work is recommended within the zone of low Aboriginal (archaeological) sensitivity identified in this report with the exception of the identification of sites of an unanticipated nature.

*Additional areas*

Further cultural heritage assessment, including survey, will be required for areas incorporated into the Project Area not considered in this assessment.

***5. Ongoing management***

The management of Aboriginal cultural heritage should be considered at all stages of the project – before, during and after all development activities. Detailed management steps should be outlined in the CHMSP.

***6. Unanticipated Aboriginal sites***

Should Aboriginal cultural heritage of an unanticipated nature be identified during any time in the life of the project, works should cease in the vicinity of the find and the project archaeologist contacted to assess the find. Should the unanticipated nature of the find be confirmed, the Aboriginal parties should be notified.

***7. Discovery of human remains***

If any suspected human remains are discovered during any activity works, all activity in the vicinity must cease immediately. The remains must be left in place and protected from harm or damage. The following list describes the immediate actions that must be taken in instances where identified or suspected human remains are discovered. Any such discovery at the activity area must follow these steps:

- The find will be reported to the NSW Police and State Coroner
- KMH Environmental and the ARTC will be notified of the find
- Aboriginal stakeholders will be notified of the find
- DECCW NSW will be notified of the find
- If the skeletal remains are confirmed to be of Aboriginal ancestral origin, an appropriate management strategy will be developed in consultation with the Aboriginal parties
- The find will be recorded in accordance with the *National Parks and Wildlife Act 1974* (NSW) and the NSW NPWS Aboriginal Cultural Heritage Standards and Guidelines Kit (1997)
- The construction management plan (see below) will be amended to include the newly discovered Aboriginal ancestral remains in the management regime established by the plan

***8. Project Construction Environmental Management Plan***

Incorporate the site-specific recommendations in Table 25 into the Project Construction Environmental Management Plan (PCEMP) prepared for this project.

Table 25: Specific recommendations for the development components

| **Sites** | **Notes** |
|---|---|
| *Aboriginal cultural heritage sites within the Project Area* | |
| Third track and associated infrastructure impact area | |
| NBTT01 (site card pending) | • All sites within the third track and associated infrastructure impact area should be avoided where possible<br>• Protective measure to protect sites that can be avoided should be implemented. Such measures include the erection of fencing an approximate 10 m buffer around the site where practical. The buffer can be reduced if the site is |
| NBTT02 (site card pending) | |
| NBTT03 (site card pending) | |
| NBTT04 (site card pending) | |
| NBTT05 (site card pending) | |
| NBTT06 (site card pending) | |
| NBTT07 (site card pending) | |

| | |
|---|---|
| NBTT08 (site card pending)<br>NBTT09 (site card pending)<br>NBTT10 (site card pending) | physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information.<br>• Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties |
| Low sensitivity (archaeological) zone (see Figures 10a, b, c, d and e and 11a, b, c, d and e) | No further archaeological work required within the zone of low sensitivity (archaeological) identified within this report. |
| <u>Primary Compound</u> | |
| | • Changes were made to the proposed impact area, including the relocation of the Primary Compound to within the rail corridor and removal of the access road off Bridgman Road. Subsequently, this table has been amended to reflect these changes. |
| <u>Rixs Creek Lane extension impact area</u> | |
| RCLE01 (site card pending)<br>RCLE03 (site card pending) | • All sites within the third track and associated infrastructure impact area should be avoided where possible<br>• Protective measure to protect sites that can be avoided should be implemented. Such measures include the erection of fencing an approximate 10 m buffer around the site where practical. The buffer can be reduced if the site is physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information.<br>• Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties. |
| Low sensitivity (archaeological) zone (see Figures 10a, b, c, d and e and 11a, b, c, d | No further archaeological work required within the zone of low sensitivity |

| | |
|---|---|
| and e) | (archaeological) identified within this report. |
| <u>Secondary Site Compound (downside) impact area</u> | |
| SC01 (site card pending) | • All sites within the Satellite Compound (Downside) impact area should be avoided where possible<br>• Protective measure to protect sites that can be avoided should be implemented. Such measures include the erection of fencing an approximate 10 m buffer around the site where practical. The buffer can be reduced if the site is physically located and immediately marked by high visibility fencing. All contractors working within the Project Area must be notified of the location of these fenced areas, which are to be simply referred to as 'exclusion zones' due to the potentially sensitive nature of this information.<br>• Should impacts from the proposed development to documented Aboriginal cultural heritage sites within the Project Area be unavoidable then cultural material visible on the surface at the sites should be collected prior to site impacts / destruction. The location of the collected artefacts should be determined in consultation with the Aboriginal parties |
| Low sensitivity (archaeological) zone (see Figures 10a, b, c, d and e and 11a, b, c, d and e) | No further archaeological work required within the zone of low sensitivity (archaeological) identified within this report. |
| *Aboriginal cultural heritage sites in the immediate vicinity of the Project Area* | |
| RCLE02 (site card pending) | These sites are outside the Project Area. There are to be no impacts outside the Project Area. |
| Integra 31 (I31) (37-3-0886) | |
| 36; (37-3-0157) | |
| GCC26;Camberwell; (37-3-0088) | |
| GCC25;Camberwell; (37-3-0087) | |
| Rixs Creek (Singleton) (37-6-0239) | |
| SC/73 (37-6-1206) | |
| Site SC/74 (37-6-1207) | |
| Site SC/75 (37-6-1208) | |

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