**Proposed Collector Wind Farm**
**Aboriginal Cultural Heritage Assessment Report**

A report to RATCH-Australia Corporation

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# 1. EXECUTIVE SUMMARY

## 1.1 Introduction

New South Wales Archaeology Pty Ltd was commissioned by Transfield Services Pty Ltd to undertake an archaeological and cultural heritage assessment of the proposed Collector Wind Farm. The wind farm has since been sold to RATCH-Australia Corporation (the proponent). The wind farm is proposed to be situated in an area located approximately four kilometres to the north-west of Collector and 33 kilometres south-west of Goulburn, NSW.

The proposed Collector Wind Farm was defined as a Major Project (Critical Infrastructure) under Part 3A of the Environmental Planning and Assessment Act 1979. This archaeological and cultural heritage assessment has been prepared to form a component of an Environmental Assessment for the proposal.

## 1.2 Partnership with Aboriginal Communities

This assessment has been conducted in accordance with the Aboriginal consultation process as outlined in the NSW Department of Environment, Climate Change and Water (NSW DECCW) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (ACHCRP) (NSW DECCW 2010a). Three groups have registered an interest in the project (see Section 3).

The field survey of the proposal area has been undertaken with the assistance of Luke Burgess of the Pejar Local Aboriginal Land Council (PLALC) and Wally Bell, representing Buru Ngunawal Aboriginal Corporation.

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## 1.3 Description of Impact

The proposed wind farm would be comprised of up to 68 turbines. The impacts relating to the construction of the proposed Collector Wind Farm will result from the installation of wind turbine generators, three wind monitoring masts, access roads, hardstand areas, an onsite underground 33 kV electrical cable network linking wind turbine generators to the substation and control room, one substation comprising transformers and switch gear, a connection to an existing TransGrid 330 kV transmission line and works compound.

The proposed works entail ground disturbance and, accordingly, the construction of the wind farm has the potential to cause impacts to any Aboriginal objects or Non-Indigenous heritage items which may be present within the zones of direct impact. Impact areas will occur in an overall development envelope of c. 900 hectares. Within this overall area impacts will occur within approximately 47 hectares. All impacts will be generally confined to cleared areas currently utilised for grazing and cultivation, and existing road easements; where possible existing access roads will be used for site access.

The proposed impacts are discrete in nature and will occupy a relatively small footprint within the overall area; accordingly impacts to the archaeological resource across the landscape can be considered to be partial in nature, rather than comprehensive.

## 1.4 Objectives and Methods

The study has sought to identify and record Aboriginal objects and Non-Indigenous heritage items, to assess the archaeological potential of the landscape and to formulate management and mitigation strategies based on the results of background research, a field survey and significance assessment.

The investigation has included a literature review, field survey and analysis of results. Field work was undertaken over a five day period in October 2010. The field survey entailed a comprehensive field inspection.

*Indigenous*

The approach to archaeological recording in the current study has been a 'nonsite' methodology: the elementary unit recorded is an artefact (described as artefact locales) rather than a site. It is assumed that stone artefacts will be distributed across the landscape in a continuum with significant variations in artefact density and nature in different landforms. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to record and analyse archaeological variability across the landscape.

A landscape based approach and methodology has therefore been implemented during this study. The proposal area has been divided into a number of Survey Units defined according to landform morphological type. Survey Units are utilised as a framework for recording, analysis and the formulation of management and mitigation strategies.

The NSW DECCW has prepared a document which provide a series of guidelines regarding the assessment and management of Aboriginal cultural heritage in New South Wales (NSW DECCW 2010b). This report has been prepared in accordance with these guidelines.

Additionally the study has been conducted in accordance with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (NSW DEC July 2005) as relevant, which have been prepared specifically for development applications assessed under Part 3A of the Environmental Planning and Assessment Act 1979.

*Non-Indigenous*

The Non-Indigenous component of this assessment has been conducted with reference to literature relating to the European occupation area, a review of Parish maps and a field inspection aimed at locating historical items, features and potential archaeological sites.

The NSW Department of Urban Affairs and Planning and the NSW Heritage Office have produced guidelines for preparing archaeological and heritage assessments as set out in Archaeological Assessment Guidelines 1996 and Heritage Assessments 1996. Where relevant this report has been prepared in accordance with these guidelines and any recent amendments.

The historical component of this project aims to provide an assessment of the historical heritage status of the proposal area. Accordingly the current project aims to document the results of relevant heritage database searches, an archaeological surface survey and results.

## 1.5 Heritage Context

A review of heritage databases and previous archaeological investigations has been undertaken in order to provide an analytical context to the assessment.

A search of the NSW DECCW Aboriginal Heritage Management Information System has been conducted for this project (AHIMS # 32066 - 24th September 2010) indicates that there are three previously recorded Aboriginal objects located within the development envelope but outside the proposed impact area.

Searches of historical databases (28th September 2010) have been conducted. There are no previously recorded heritage items on the *Australian Heritage Database* or the *State Heritage Inventory* including the *Local Environmental Plan* listed as being present within the study area.

## 1.6 Results and Impact Assessment

The proposal area has been divided into 50 Survey Units; the total Survey Unit area measured approximately 484 hectares. It is estimated that approximately 298 hectares of that area was subject to direct visual survey inspection. Ground exposures inspected are estimated to have been 4.3 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 1.48 hectares.

### *Indigenous*

A total of five Aboriginal object locales which contain stone artefacts have been recorded. These are comprised of very low density stone artefact distributions located within broader Survey Units which likewise are assessed to contain very low or low density distributions. The five Aboriginal object locales are each assessed to be of low archaeological significance. In addition, four trees have been recorded as *possible* Aboriginal scarred trees. Two stone artefact locales and two of the scarred trees are located either in or in very close proximity to areas in which direct impacts are proposed. The remainder of the stone artefact locales and scarred trees are located outside proposed impacts.

Effective Survey Coverage encountered during the survey was low due to high levels of grass cover which limited the ability to identify additional stone artefact locales. It is predicted that additional stone artefacts are highly likely to be present in other areas of proposed impacts either on ground surfaces or in subsurface contexts. However, in all Survey Units and areas of adjacent terrain, artefact density is predicted to be either very low or in some instances very low to low. Accordingly, all Survey Units are assessed to be of low archaeological significance.

The archaeological significance assessment is based on scientific criteria and it is noted that the cultural significance (that is - values from an Indigenous perspective) of the local area and the Aboriginal sites it contains, differs considerably. We have obtained information in regard to cultural values of the region from the Buru Ngunawal Aboriginal Corporation, and this is included in Section 7 of this report.

The construction of the Wind Farm will result in substantial physical impacts to any Aboriginal objects which may be located within direct impact areas. That is, any Aboriginal object situated within an area of direct impact will be comprehensively disturbed, and/or destroyed during construction. As with any development the chances of impacting Aboriginal objects, particularly stone artefacts, is high given that they are present in a continuum across the landscape and located on or within ground surfaces.

In regard to the recorded Aboriginal object locales which assessed to be of low archaeological significance, the impacts can be viewed as being of correspondingly low scientific significance. However, as noted above the cultural significance of the recorded Aboriginal objects is much higher and, accordingly, for the local Aboriginal community, impacts may be considered to be of a higher order of significance. This assessment forms the basis for the formulation of management strategies which aim to mitigate development impact to the archaeological and cultural heritage resource.

### *Non-Indigenous*

No previously recorded Non-Indigenous heritage items are listed as being present within the study area and none were identified during the field survey. It is concluded that the proposal has a low likelihood of causing any impacts to items of Non-Indigenous heritage.

## 1.7 Mitigation and Management Strategies

Details of archaeological sensitivity, suitable management strategies and accompanying rationale for each Survey Unit and Aboriginal objects are outlined in Section 12 of this report.

*Indigenous*

The Survey Units and Aboriginal object locales recorded in the proposal area do not surpass scientific significance thresholds which would act to preclude the construction of the proposed wind farm.

Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, and the results of the study, it is concluded that the proposed impact areas do not warrant further investigation such as subsurface test excavation. The environmental contexts in which the turbines (and associated impacts) are proposed are not predicted to contain artefact density sufficient to warrant test excavation. It is considered that subsurface testing is unlikely to produce results which would differ significantly to predictions made in respect of the archaeological potential of the landforms in question.

Given the nature and density of the artefact locales recorded in the proposal area and the low scientific significance rating they have been accorded, unmitigated impacts is considered appropriate. However, in order to accommodate the higher cultural values of the Indigenous heritage, a strategy of impact avoidance, if feasible, is recommended in regard to these locales.

*Non-Indigenous*

No previously recorded Non-Indigenous heritage items are listed as being present within the study area and none were identified during the field survey. No impact mitigation strategies are required.

1.8 Recommendations

Management and mitigation strategies are outlined and justified in Section 12 of this report. The following recommendations are provided in summary form:

- No Survey Units have been identified in the proposal area to warrant further archaeological investigation such as subsurface test excavation. While the Effective Survey Coverage achieved during the field survey was low, recourse to predictive modelling and the resultant assessment of the archaeological potential of all Survey Units is considered to be generally adequate for the purposes of reliably determining the archaeological status of the proposed impact areas.

- None of the Survey Units or Aboriginal object locales in the proposal area have been assessed to surpass archaeological significance thresholds which would act to entirely preclude proposed impacts.

- While the Aboriginal stone artefacts locales recorded are very low density distributions of stone artefacts and the archaeological significance of these locales is assessed to be low it is nevertheless recommended that if feasible a strategy of avoidance of impacts be adopted.

- In regard to the recorded trees with possible Aboriginal scars, it is recommended that a strategy of avoidance of impacts be adopted.

- In regard to the previously recorded Aboriginal objects listed on the NSW DECCW AHIMS search which are located in the development envelope, but outside areas of proposed impact, these should be avoided during construction and operation of the wind farm. Steps should be taken to ensure that inadvertent impacts to these locales do not occur.

- Given that it is predicted that stone artefacts are likely to be present across the entire proposed impact area, albeit in very low or very low to low density, it is recommended

that ground disturbance impacts associated with the proposal be kept to a minimum and to defined areas so as to ensure as little impact as possible to those Aboriginal objects.

- It is recommended that after development approval and when the design layout is finalised, additional archaeological assessment should be conducted in any areas which are proposed for impacts that have not been surveyed during the current assessment. Significant Aboriginal objects can occur anywhere in the landscape and, accordingly, if present they need to be identified and impact mitigation strategies implemented prior to impacts.

- The proponent should develop a Cultural Heritage Management Plan, which documents the procedures to be followed for impact avoidance or mitigation. The development of an appropriate Cultural Heritage Management Plan should be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Office of Heritage and Environment (OEH).

- Personnel involved in the construction and management phases of the project should be trained in procedures to implement recommendations relating to cultural heritage where necessary.

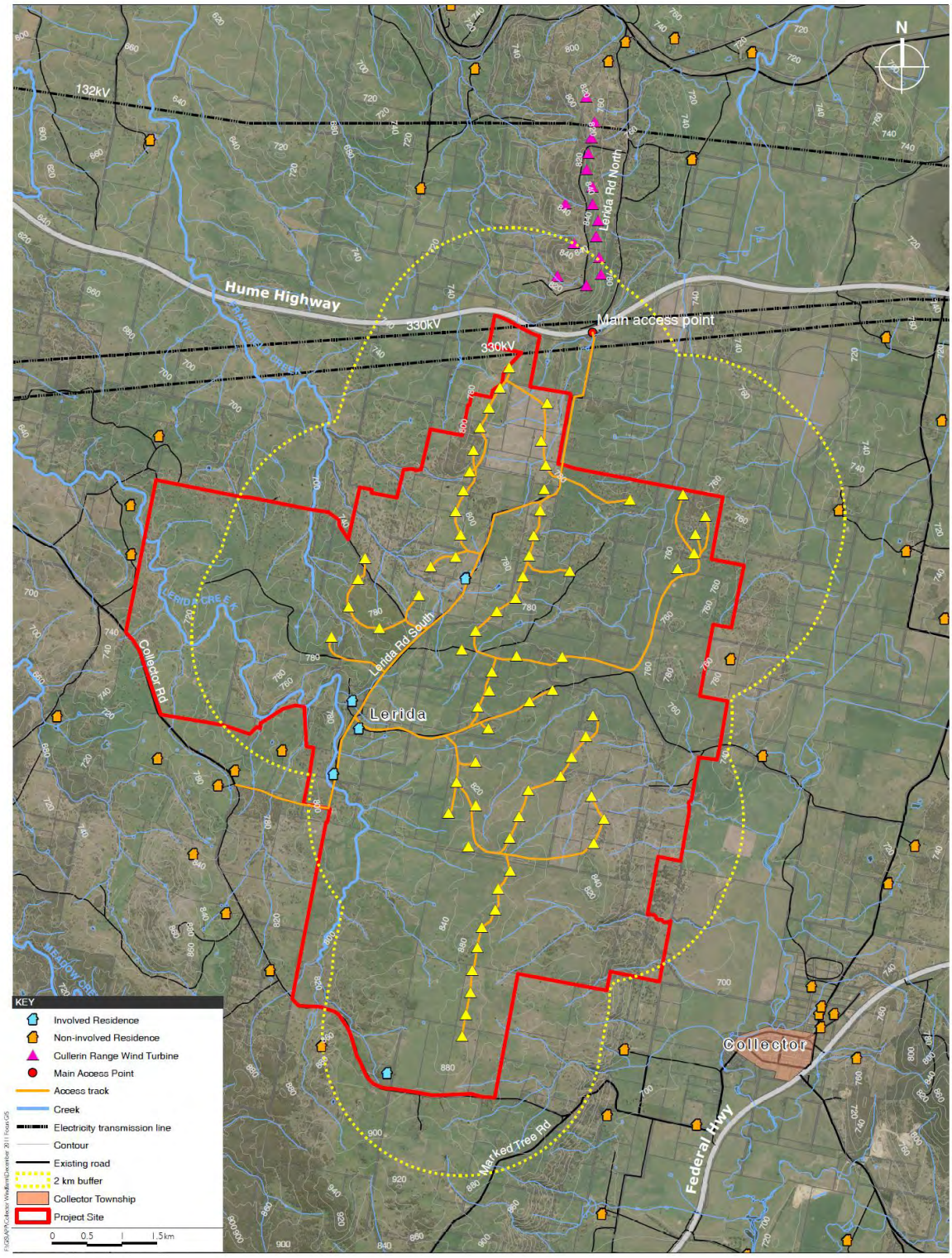


Figure 1 Location of the proposed Collector Wind Farm study area showing the wind turbine layout within the broader development envelope (map supplied by client).

# 2. INTRODUCTION

## 2.1 Introduction

RATCH-Australia Corporation is the proponent for the proposed Collector Wind Farm project. The Collector Wind Farm would be located to the north-west of the township of Collector, New South Wales (Figure 1) in the Upper Lachlan Shire Council. The proposal would involve the construction and operation of up to 68 turbines.

The subject area assessed in this heritage assessment is defined as the area encompassed by the project components (see reference to the DoP DGR's below).

The proposed wind farm is defined as a Major Project (Critical Infrastructure) under Part 3A of the Environmental Planning and Assessment Act 1979. The Director General, Department of Planning (DoP) has issued requirements (Director-General's Requirements [DGR's] dated 15 October 2010) for the preparation of an Environmental Assessment in which it is stated that an assessment of the potential impact of the project components on Indigenous heritage values (archaeological and cultural) must be prepared. In addition it is required that effective consultation with Indigenous stakeholders is undertaken during the assessment and in developing mitigation options (including the final recommended measures) consistent with the draft Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation (DEC 2005) and the EA must describe the actions that will be taken to avoid, mitigate or offset impacts. The archaeological investigation as documented in this report accordingly aims to address these requirements.

New South Wales Archaeology Pty Ltd was engaged to address the DoP DGR's, to assess the potential impact of the proposal on Aboriginal heritage (archaeological and cultural), to assess the potential impact of the proposal on items of European heritage including the potential impacts on the Bicentennial National Trail, and to conduct effective consultation with Indigenous stakeholders.

In accordance with the NSW DECCW Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW and the NSW DEC Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (NSW DEC 2005) this report aims to document:

- The Aboriginal consultation process undertaken for the project and the involvement in the project of the Aboriginal community (Section 3);
- A description of the proposal and whether or not it has the potential to result in impacts to Aboriginal cultural heritage or Non-Indigenous heritage items (Section 4);
- A description of the impact history of the proposal area (Section 4);
- The methodology implemented during the study (Section 5);
- The landscape and natural resources of the study area in order to establish background parameters (Section 6);
- A review of archaeological and relevant literature and heritage listings on the NSW DECCW Aboriginal Heritage Information Management System (Section 7);
- A synthesis of local and regional archaeology (Section 7);
- A predictive model of Aboriginal object type and location relevant to the proposal area (Section 7);
- The cultural and archaeological sensitivity of the landforms subject to proposed impacts (Section 7);
- A review of Non-Indigenous history of the proposal area and the results of relevant heritage database searches (Section 8);
- The field survey results (Section 9);
- The significance of Aboriginal objects (Section 11);

- An assessment of the impact of the proposal on Aboriginal objects and Non-Indigenous items (Section 9);
- A description and justification of the proposed management and mitigation strategies (Section 12); and
- A series of recommendations based on the results of the investigation (Sections 12 and 13).

This project has been managed by Julie Dibden (BA hons – 17 years experience). The field work component of this project has been conducted by Andrew Pearce (BA – 12 years experience) (with logistical support provided by Oscar Rayner), NSW Archaeology Pty Ltd and members of the Pejar Local Aboriginal Land Council and Buru Ngunawal Aboriginal Corporation. This report has been written by Julie Dibden and Andrew Pearce.

We gratefully acknowledge the assistance provided to NSW Archaeology Pty Ltd during the course of this project by the following people:

- Wally Bell - Buru Ngunawal Aboriginal Corporation;
- Delise Freeman and Luke Burgess - Pejar Local Aboriginal Land Council;
- Chris Clarke, manager '*Lerida*'; and
- Aaron Chandler, Nick Valentine and Greg Joblin – APP Corporation Pty Limited.

We would in particular like to acknowledge and pay our respects to the traditional owners of the country which is encompassed by the proposal. And we would like to thank Wally Bell for providing to us cultural knowledge and a cultural context of the proposal area and its meanings and values within Ngunawal country.

## 3. PARTNERSHIP WITH THE ABORIGINAL COMMUNITY

The NSW DECCW manages Aboriginal cultural heritage in NSW in accordance with the National Parks and Wildlife Act 1974. Part 6 of the Act provides specific protection for Aboriginal objects and Aboriginal places by administering offences for harming them without authorisation. When an activity is likely to impact Aboriginal objects or declared Aboriginal Places, approval of the Director-General of the NSW DECCW is required, issued in the form of an AHIP under s90 and/or s87 of the NPW Act. It is noted that given this project is a Part 3A Major Project s90 and s87 of the NPW Act does not apply. This project has however been conducted in accordance with the NSW DECCW Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (ACHCRP) (NSW DECCW 2010).

NSW DECCW requires effective consultation with Aboriginal people because it recognises that:

- Aboriginal people should have the right to maintain culture, language, knowledge and identity;
- Aboriginal people should have the right to directly participate in matters that may affect their heritage; and
- Aboriginal people are the primary determinants of the cultural significance of their heritage.

The purpose of the NSW DECCW Aboriginal Cultural Heritage Consultation Requirements for Proponents document (NSW DECCW 2010) is to facilitate positive Aboriginal cultural heritage outcomes by:

- affording an opportunity for Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project to be involved in consultation so that information about cultural significance can be provided to NSW DECCW to inform decisions regarding applications for an AHIP; and

- providing Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project with the opportunity to participate in decision-making regarding the management of their cultural heritage by providing proponents information regarding cultural significance and inputting into management options (NSW DECCW 2010).

The decision as to whether or not to issue an AHIP *or general terms of approval* is based on the supply by a proponent of adequate information to the NSW DECCW so as to enable the Director-General to make an informed decision with regard to the Aboriginal heritage values of Aboriginal object(s) and/or place(s) potentially harmed by an activity. As part of this process proponents must provide the opportunity for Aboriginal persons who hold cultural knowledge relevant to the proposed project area to be involved in consultation so that they may provide information relating to the cultural significance of objects or places that may be impacted (NSW DECCW 2010).

When evaluating an AHIP application or project NSW DECCW will consider, amongst other things, the:

- cultural and scientific significance of the Aboriginal object(s) and/or place(s);
- potential or likely impact of the proposal on the Aboriginal object(s) and/or place(s);
- adequacy of any proposed measures to avoid or reduce impacts; and
- the results of consultation with Aboriginal people (NSW DECCW 2010).

The DECCW ACHCRP requirements outline four main consultation stages to be implemented in the course of consultation undertaken with Aboriginal people. In order to fulfil these consultation requirements NSW Archaeology Pty Ltd, on behalf of the proponent, has followed the following procedure:

Stage 1: Notification of project proposal and registration of interest.

The proponent has actively sought to identify stakeholder groups or people wishing to be consulted about the project and has invited them to register their interest.

Written notification dated 14th September 2010, requesting a list of Aboriginal groups or persons who may have an interest in this project, has been forwarded to the following bodies:

- DECCW LHPS Queanbeyan office
- Pejar Local Aboriginal Land Council
- Onerwal Local Aboriginal Land Council
- Buru Ngunawal Aboriginal Corporation
- the Office of the Registrar, Aboriginal Land Rights Act 1983,
- the National Native Title Tribunal, requesting a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements
- Native Title Services Corporation Limited (NTSCORP Limited)
- Upper Lachlan Shire Council
- the Murrumbidgee Catchment Management Authority, requesting contact details for any established Aboriginal reference group.

In addition an advertisement was placed in the 15th September 2010 edition of the Goulburn Post newspaper. The closing date for registration of interest was noted as 29th September 2010.

In response to notifications received from various sources additional letters of notification were sent to:

- Gundungurra Aboriginal Heritage Association Inc (dated 5th October 2010)
- Peter Falk (dated 5th October 2010).

Registered Aboriginal Parties

The following parties registered an interest in the project:

Pejar Local Aboriginal Land Council;
Buru Ngunawal Aboriginal Corporation;
Gundungurra Aboriginal Heritage Association Inc.

It is noted that Onerwal Local Aboriginal Land Council were unable to be contacted in regard to this project despite many and repeated attempts to do so.

Stage 2 and 3. Presentation of information in regard to the project and gathering information about cultural significance.

An outline of the scope of the project, the proposed cultural heritage assessment process and the heritage assessment methodology was forwarded to Pejar Local Aboriginal Land Council on the 23rd September 2010, Buru Ngunawal Aboriginal Corporation on the 28th September 2010, and to Gundungurra Aboriginal Heritage Association Inc on the 11th October 2010. Luke Burgess of the Pejar Local Aboriginal Land Council and Wally Bell, representing Buru Ngunawal Aboriginal Corporation assisted with the fieldwork conducted for this project and provided valuable information in regard to the archaeological sensitivity and potential of the study area.

Stage 4. Reviewing the report.

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For review and comment, a copy of this draft report will be forwarded to:
Pejar Local Aboriginal Land Council;
Buru Ngunawal Aboriginal Corporation;
Gundungurra Aboriginal Heritage Association Inc.

A copy of the draft report has been provided to the registered Aboriginal parties on the 14th January 2011. The DECCW ACHCRP requirements provide a period of 28 days for registered Aboriginal parties to comment on the draft report. A written response has been received from Buru Ngunawal Aboriginal Corporation (see Appendix 1).

## 4. DESCRIPTION OF IMPACT

The information contained in this section of the report is provided in accordance with the NSW DECCW 2010 guidelines for archaeological survey reporting. A full description of the proposal and its potential impact on the landscape and heritage resource is described below. This information includes a summary of the impact history of the study area. These prior and existing land uses have caused significant changes to geomorphological processes in the area (accelerated erosion), with an associated effect on the archaeological resource.

The proposed wind farm would be comprised of up to 68 turbines.

### 4.1 Impact Justification

The Collector Wind Farm will have an average output capacity to supply the energy equivalent to the power usage of 80,000 homes. Over an estimated 25 year operating life the wind farm would reduce Australia's greenhouse gas emissions by more than 10 million tonnes of $CO_2$. The land on which the Collector Wind Farm would be developed is privately-owned farmland used primarily for sheep and cattle grazing. However, the wind farm would have little impact on farming activities, allowing the land to remain productive for the long term.

The site has been chosen because:

- It has an excellent wind resource;
- There are few residences in close proximity to the site;
- The site is traversed by the electricity grid, limiting the length of transmission line required;
- Preliminary environmental studies indicate a low impact on the environment; and
- There is community support for renewable energy developments in the region.

### 4.2 Impact History

The proposed impacts relating to the Collector Wind Farm are situated on farm land. The impact history of the area is therefore related to previous and current farming activities including grazing and cultivation. Given that the most common Aboriginal objects expected to be present within the proposal area are stone artefacts located in or on ground surfaces, the following review is focused on describing the impact to soils and soil profiles which has resulted from agriculture practice.

The local area has been utilised for stock grazing since the 1820s. The majority of the proposal area is situated on a gently undulating plain presently comprised of grassland. The effects of grazing across the proposal area have included vegetation loss and subsequent erosion primarily by precipitation and wind, as well as soil compaction due to stock treadage. In addition to grazing, over time much of the proposal area has been cultivated for pasture improvement and annual fodder production. Such cultivation has occurred not only on broad crests and ridges, but also frequently of the wide flats associated with drainage depressions.

Land clearance and subsequent erosional processes are likely to have resulted in varying levels of prior impacts to Aboriginal objects. The vast majority of trees that could potentially host evidence of Aboriginal cultural scarring will have been destroyed, while Aboriginal objects located in or on the ground are highly likely to have be disturbed and/or moved, resulting in loss of their original depositional context (both spatially and vertically).

### 4.3 Proposed Impacts

The following section provides an overview of the various components of the proposed wind farm.

*Wind Turbine Generators*

The exact model of wind turbine generator to be employed at the wind farm has not yet been determined and will be decided following a tender process. The proposal is for 68 wind turbine generators.

The turbines will be three-bladed with an individual turbine capacity of up to 3.4 MV. The blade length of the turbines will be up to 56 metres, mounted on cylindrical steel towers 94 metres in height, so that the total height of each tower extending to the blade tip will be up to 150 metres.

*Hardstands and Foundations*

At each wind turbine generator site a crane operation area (including crane hardstand and turbine footings) measuring 50 m x 50 m in size would be established. The hardstand is required for crane operations during the erection of the towers and wind turbine components. The hardstands would be maintained throughout the operational phase to permit scheduled maintenance activities. Given up to 68 turbines are proposed a total area of c. 17 hectares would be used as crane operation area.

Each wind turbine tower would be erected on a concrete and steel footing. Footings would be of either a gravity or rock-anchor type, depending on the prevailing geotechnical conditions. Gravity footings entail reinforced concrete slabs embedded to approximately a 2.5 metre depth below the ground surface so as to support the wind turbine tower by gravitational mass. This type of footing is a standard type for wind turbines and requires a substantial quantity of concrete and reinforcing steel. The alternative rock-anchor footing utilises of a series of tensioned steel cables (or tendons) installed into competent rock to a depth of approximately 20 metres below ground. The benefit of this type of footing is the much smaller quantity of concrete and reinforcing steel required; however the condition of the founding rock needs to be suitable to allow its use. Accordingly preliminary geotechnical investigations would be required to be undertaken at the concept design stage in order to determine the likely foundation type.

*Wind Monitoring Masts*

There are currently two wind monitoring masts installed onsite; both 65 metres in height and of a cable-stayed lattice structure. These towers were established in 2003 and 2004 to capture the necessary wind data set to allow project planning to progress. Three permanent wind monitoring masts would be installed for the operational phase in order to allow performance monitoring of the wind turbine generator output. The permanent masts would extend to turbine hub height at 80-90 metres above ground level.

*Access Roads*

On-site access roads would connect each wind turbine generator site and provide off-site access. Where possible existing farm tracks would be utilised; however it is likely that these tracks would require upgrading to handle the construction loads. Where existing tracks are not available, access routes would be chosen based on engineering requirements, optimal access for construction and operation, and avoidance of native vegetation. For the construction phase, access tracks would be up to 8 metres wide (6m once operational) to allow access for larger equipment (eg. mobile cranes). Access tracks will measure a length of c. 35 km (Total area = 28 ha).

*Electrical Works*

Site electrical works would comprise the following:

- a medium voltage transformer situated either within the wind turbine or at the base of each tower to convert wind turbine generator electricity to 33 kilovolts (kV).

- underground 33 kV electrical cabling and control cables linking each wind turbine generator to the substation and control room, respectively. Cable routes would, as far as possible, parallel the internal access roads to avoid unnecessary vegetation clearance and ground disturbance;
- wind farm substation, comprising transformers and switchgear, to step-up the voltage from 33 kV to 330 kV allowing grid connection.

*Grid Connection and Transmission Line*

The proposed grid connection is into either of the two TransGrid 330 kV transmission lines which traverse the north of the site. The wind farm substation would be sited in close proximity to the transmission line, limiting the length of overhead transmission line required to connect to the main line.

The following table outlines the main phases of the wind farm construction program, which has a duration of approximately 24 months (Table 1).

Table 1 Main phases of the wind farm construction program.

| | |
|---|---|
| Detailed Design and Contracting | • Contracting arrangements<br>• Final project design<br>• Preparation of Environmental Management Plan |
| Pre-construction | • Detailed geotechnical investigations<br>• Access arrangements – road upgrades, fencing works etc.<br>• Site survey and pegging of infrastructure locations<br>• Construction of works compound and concrete batch plant |
| Access Tracks, Hardstands and Cabling | • Construction of internal access tracks to turbine sites<br>• Excavation and compaction of crane hardstands<br>• Trenching and cable laying |
| Footings and Foundations | • Excavation and preparation of foundations<br>• Footing construction according to geotechnical conditions |
| Substation Civil and Electrical Works | • Site survey, clearing and levelling, foundations and fencing<br>• Erection and fit-out of control buildings<br>• Installation of transformers, busbars, earthing system etc. |
| Turbine Erection | • Delivery of tower and turbine components (tower sections,<br>• turbine blades, generator/nacelle)<br>• Tower erection and nacelle installation<br>• Rotor assembly and installation<br>• Electrical connections |
| Wind Farm and Substation Commissioning | • Turbine testing and commissioning<br>• Testing and commissioning transformers, cables,<br>• switchgear, SCADA, communications, earthing |
| Grid Connection | • High voltage connections and commissioning<br>• System energisation and turbine connection |

## 4.4 Potential Impacts

Table 2 presents the calculated area of the site proposed to be impacted by the project. Some of the impacts would be for the duration of the wind farm operation and some are temporary impacts incurred during the construction phase. In total approximately 48.75 hectares would suffer disturbance as a result of the project.

Table 2 Individual components of the proposal and their impact area.

| **Project Component** | **Approximate Dimensions** |
|---|---|
| Crane operation area (including turbine foundation and crane hardstand) | 50 x 50 m (ea.) x 68 = 17 ha |
| Substation | 50 x 150 m =0.75 ha |
| Site access | 35 km x 8 m = 28 ha |
| Construction compound and storage | 300 x 100 m = 3 ha |
| **Total** | 48.75 ha |

Impacts will be located on land currently utilised for sheep and cattle grazing and cultivation. Previous land uses in the region have resulted in relatively significant environmental impacts and a generally degraded landscape. European activated geomorphological processes and other actions will have caused significant prior impacts to Aboriginal objects within the region.

However, irrespective of prior impacts the proposed works entail ground disturbance and accordingly the project has the potential to cause additional impacts to any Aboriginal objects or historical items which may be present within the individual components of the proposal. Nevertheless impact areas can be considered as being small and discrete in area.

## 5. STUDY METHODOLOGY

This archaeological and cultural heritage study has included the following components:

- A NSW DECCW Aboriginal Heritage Information Management System site search to determine whether or not previously recorded Aboriginal objects are present in the proposal area and to give consideration to the type of sites known to be present within the local area.
- A review of Non-Indigenous heritage registers to determine whether or not historic items present in the proposal area are listed.
- A review of local and regional archaeological reports and other relevant documents in order to provide a contextual framework to the study and heritage management process.
- An historical overview of the region and local area.
- A review of impacts relating to the construction of the Wind Farm aimed at determining the potential nature and extent of impacts to any potential Aboriginal objects which may be present.
- A comprehensive field survey of the proposal area aimed at locating Aboriginal objects and cultural values, Non-Indigenous items, recording survey coverage data and assessing the archaeological potential of the landforms present.
- Documentation of survey results.
- A discussion of survey results.
- A site significance assessment.
- The formulation of management and mitigation strategies ensuing from the above.

### 5.1 Literature Review

Background research has been conducted to determine if known Aboriginal objects and Non-Indigenous items are located in the proposal area and to assist in the construction of a relevant model of site type and location.

The following information sources were accessed for this study:

- NSW DECCW Aboriginal Heritage Information Management System;
- Relevant archaeological reports held in the NSW DECCW Cultural Heritage Unit;
- Historical sources and databases;
- Relevant topographic maps;
- Parish maps; and
- GIS data relating to proposed impacts.

### 5.2 Field Survey and Methodology

The field survey entailed a comprehensive pedestrian survey and was undertaken by three people. The survey strategy was to inspect and assess all areas of defined proposed impacts. Survey coverage is described in Section 9 of this report.

The field survey was aimed at locating Aboriginal objects and Non-Indigenous heritage items. An assessment was also made of prior land disturbance, survey coverage variables (ground exposure and archaeological visibility) and the potential archaeological sensitivity of the land.

Field survey was designed to assess the archaeological sensitivity of the entire proposed impact area. Survey Units are linear transects (encompassing proposed roads, electrical connections and turbines) and measured 100 metres in width. The survey methodology entailed walking parallel transects across individual Survey Units with each surveyor situated ca. 20 - 30 m apart. Because of the high degree of vegetation ground cover, the field survey was particularly focused on any areas of ground surface exposure that may have been present within each Survey Unit. Each Survey Unit was surveyed until the entire area had been systematically inspected. This

methodology enabled direct visual inspection of as much of the ground surface of the proposal area as practicable.

The approach to recording in the current study has been a 'nonsite' methodology: the elementary unit recorded is an artefact rather than a site (*cf* Dunnell 1993; Shott 1995). The rationale behind this approach is that artefacts may be directly observed however 'sites' are a construction within an interpretative process. Given that it can be expected that full archaeological visibility will not be encountered during the survey the process of identifying site boundaries (if they exist at all) will not be possible.

The density and nature of the artefact distribution will vary across the landscape in accordance with a number of behavioural factors which resulted in artefact discard. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to analyse the variability in artefact density and nature across the landscape. Accordingly in this study while the artefact is the elementary unit recorded it is the Survey Unit which is utilised as a framework of recording, analysis, and management (*cf* Wandsnider and Camilli 1992). The study area has been divided into 50 Survey Units each of which have been defined according to broad landform morphological types.

It is noted that since undertaking the field survey some minor changes have been made in regard to the proposal layout, notably turbines have been removed from some areas surveyed, and some components, including several turbines, have been added to areas which are located outside surveyed areas. The result of these changes mean that some of the Survey Units as documented in this report, will now sustain limited or no impacts given the removal of turbines (and associated components such as electrical circuits and roads) from the areas in question. On the other hand some impacts which are now proposed have not been subject to survey at this time. This are addressed in the results and recommendations sections of this report.

The location of Indigenous and Non-Indigenous locales and Survey Units has been made using ArcGIS software and a hand-held non-differential GPS. In order to ensure consistency in data collection all field records were made in survey forms formulated specifically for the project. Two separate forms were used for recording Survey Unit data and Aboriginal Object data. The data collected forms the basis for the documentation of survey results outlined in Section 8. The variables recorded are defined below:

*Survey Unit Variables*

Landscape variables utilised are conventional categories taken from the *Australian Soil and Land Survey Field Handbook* (McDonald *et al.* 1998). The following landform variables were recorded:

*Morphological type*:
- Crest: - element that stands above all or almost all points in the adjacent terrain – smoothly convex upwards in downslope profile. The margin is at the limit of observed curvature.
- Simple slope: - element adjacent below crest or flat and adjacent above a flat or depression.
- Lower slope: - slope element not adjacent below a crest or flat but adjacent above a flat or depression.
- Flat: - planar element, neither crest or depression and is level or very gently inclined.
- Drainage depression: - landform element that stand below all or almost all points in the adjacent terrain.

*Slope class and value*:
- Level 0 - 1%.
- Very gentle 1 - 3%.
- Gentle 3 – 10%.

*Geology*
The type of geology has been recorded and as well the abundance of rock outcrop – *as defined below*. The level of visual interference from background quartz shatter was noted.
- No rock outcrop - no bedrock exposed.
- Very slightly rocky - <2% bedrock exposed.
- Slightly rocky - 2-10% bedrock exposed.

*Soil*
Soil type and depth was recorded. The potential for soil to contain subsurface archaeological deposit (based on depth) was recorded. This observation is based solely on the potential for soil to contain artefacts; it does not imply that artefacts will be present or absent.

*Geomorphological processes*
The following gradational categories were recorded:
- eroded
- eroded or aggraded

*Geomorphological agents*
The following geomorphological agents were recorded:
- precipitation: *creep; landslide; sheet flow*
- wind
- biological: *human; nonhuman*

Survey coverage variables were also recorded; these are described further below in Section 5.3. The archaeological sensitivity of each Survey Unit was defined according to assessed artefact density as very low or low. The proposed impacts are also noted for each Survey Unit.

*Aboriginal Object Recording*

For the purposes of defining the artefact distribution in space it has been labeled as a locale (eg. Survey Unit 1/Locale 1). GPS referenced locational information was captured as AGD66 readings (in accordance with available mapping datum) and transformed to GDA coordinates.

The measurable area in which artefacts were observed has been noted and if relevant, a broader area encompassing both visible and predicted subsurface artefacts has been defined. In addition locale specific assessments of survey coverage variables have been made. The prior disturbance to the locale has been noted as low, moderate or high. Artefact numbers in each locale have been recorded and a prediction of artefact density noted, based on observed density taking into consideration Effective Survey Coverage, and a consideration of the environmental context.

Artefact density has been defined in arbitrary categories (based on a consideration of artefact density calculated in detailed subsurface work conducted elsewhere) as follows;

- Very low: <1 artefact per square metre;
- Low: between 1 and 10 artefacts per square metre.

The potential for soil to contain subsurface archaeological deposit (based on depth) was recorded. Similarly to Survey Unit recordings this observation is based solely on the potential for soil to contain artefacts; it does not imply that subsurface artefacts will be present or absent, nor does it refer to a prediction of artefact density.

5.3 Survey Coverage Variables

Survey Coverage Variables are a measure of ground surveyed during the study and the type of archaeological visibility present within that surveyed area. Survey coverage variables provide a measure with which to assess the effectiveness of the survey so as to provide an informed basis for the formulation of management strategies.

Specifically, an analysis of survey coverage is necessary in order to determine whether or not the opportunity to observe stone artefacts in or on the ground was achieved during the survey. In the event that it is determined that ground exposures provided a minimal opportunity to record stone artefacts it may be necessary to undertake archaeological test excavation for determining whether or not stone artefacts are present. Conversely, if ground exposures encountered provided an ideal opportunity to record the presence of stone artefacts, the survey results may be considered to be adequate and accordingly no further archaeological work may be required.

The survey coverage data includes an estimate of the area surveyed within a Survey Unit, that is, the area subject to actual inspection; the surveyed area is always less than the Survey Unit in area given that not all parts of a Survey Unit are visually examined.

Two variables were used to measure ground surface visibility during the study; the area of ground exposure encountered and the quality and type of ground visibility (archaeological visibility) within those exposures. The survey coverage variables estimated during the survey are defined as follows:

Ground Exposure – an estimate of the total area inspected which contained exposures of bare ground; and

Archaeology Visibility – an estimate of the average levels of potential archaeological surface visibility within those exposures of bare ground. Archaeological visibility is generally less than ground exposure as it is dependent on adequate breaching of the bare ground surface which provides a view of the subsurface soil context. Based on subsurface test excavation results conducted in a range of different soil types across the New South Wales southeast it is understood that artefacts are primarily situated within 10 - 30 cm of the ground profile; reasonable archaeological visibility therefore requires breaching of the ground surface to at least a depth of 10 cm (see Dibden 2005a; 2005b, and 2005c).

Based on the two visibility variables as defined above, an estimate (Net Effective Exposure) of the archaeological potential of exposure area within a Survey Unit has been calculated. The Effective Survey Coverage (ESC) calculation is a percentage estimate of the proportion of the Survey Unit which provided the potential to view archaeological material.

## 6. LANDSCAPE CONTEXT

A consideration of the landscape is necessary in archaeological work in order to characterise and predict the nature of Aboriginal occupation across the land. In Aboriginal society landscape could be both the embodiment of Ancestral Beings and the basis of a social geography and economic and technological endeavour. The various features and elements of the landscape are/were physical places that are known and understood within the context of social and cultural practice.

Given that the natural resources that Aboriginal people harvested and utilised were not evenly distributed across landscapes Aboriginal occupation and the archaeological manifestations of that occupation will not be uniform across space. Therefore, the examination of the environmental context of a study area is valuable for predicting the type and nature of archaeological sites which might be expected to occur. Factors which typically inform the archaeological potential of a landform include the presence or absence of water, animal and plant foods, stone and other resources, the nature of the terrain and the cultural meaning associated with a place.

Additionally, geomorphological and humanly activated processes need to be defined as these will influence the degree to which archaeological sites may be visible and/or conserved. Land which is heavily grassed will prevent the detection of archaeological material while land which has suffered disturbance may no longer retain artefacts or stratified deposits. A consideration of such factors is necessary in formulating site significance and mitigation and management recommendations.

The following sections provide information in regard to the environmental context of the study area.

### 6.1 Topography, Geology and Vegetation

The proposed Collector Wind Farm is located c. four kilometres northwest of Collector and c. 33 kilometres southwest of Goulburn (Figures 1 and 2). The area is a rural landscape and is predominantly utilised for sheep and cattle grazing. It is situated in the Southern Tablelands region of New South Wales, within the South Eastern Highlands bioregion and the catchment of the Murrumbidgee River. The landscape lies between ca. 670 – 840 metres in altitude. Slopes generally range from 0 - 10% on broad ridge crests and valleys, to ca. 20% on the steeper range side slopes predominantly at the margins of the study area.

The landforms encompassed by the proposal include crests, slopes and drainage depressions. All streams are either 1$^{st}$ or 2$^{nd}$ order streams which would not have provided Aboriginal land users with either reliable or abundant water. The landscape is characterised as generally amorphous and does not possess focal points or features which are likely to have been targeted by Aboriginal people for repeated or sustained camping activities.

In a geological context the study area lies within the eastern Lachlan Fold Belt. The majority of the area is an undulating granite plain with some rounded granite boulder outcrops formed from the Silurian to Early Devonian Wyangala batholith comprised of gneissic, massive biotite and horneblende biotite granites. In addition there is a lesser proportion of the study area which consists of Ordovician sedimentary units predominantly made up of silty sandstone and micaceous siltstone, and accompanied by their metamorphic derivatives phyllite, shale, slate, quartzite and minor amounts of porphyry. There are also discrete areas which contain Tertiary deposits of gravels, sand, clay, claystone and sandstone (Biosis Research 2004; Brunker and Offenberg 1968).

Granite cobbles and low outcrops occur extensively across the southern section of the proposal area. The northern and eastern sections are generally underlain with metasedamentary geology which outcrops sporadically on elevated landforms such as crests. Soils within the proposal area are generally highly eroded. This has significant ramifications in regard to the stability and integrity or otherwise, of artefact bearing soil formations in the proposal area both on both crests and within valleys.

While the vegetation communities within the study area have substantially been cleared over the last 150 years for agricultural grazing, some areas of woodland are present. On the granitic geology and in some places on the metasedimentary, some stands comprised of Yellow Box (*Eucalyptus Melliodora*), Blakely's Red Gum (*E. blakelyi*), Apple Box (*E. bridgesiana*) with some Broad-leaved peppermint (*E. dives*) and Red Stringybark (*E. macrorhyncha*) exist. Areas of higher elevation on granitic soils to the south carry some Ribbon Gum (*E. viminalis*) and Snow Gum (*E. pauciflora*) communities. While the metasedimentary ridgelines have some examples of dry forest featuring Brittle Gum (*E. mannifera*), White or Scribbly Gum (*E. rossii*) and Broad-leaved peppermint (nghenvironmental 2010).

*Summary*

The proposed areas of impact associated with the project are located predominantly of a sparsely treed undulating plain which possesses relatively low biodiversity values. The area does not contain reliable or abundant sources of potable water. The area experiences cold temperatures seasonally as well as strong winds. In an Aboriginal landuse context, the study area is likely to have been utilised by Aboriginal people for a limited range of activities which may have included short stays, hunting and gathering forays and travel through country. Such activities are likely to have resulted in low levels of artefact discard. The nature of stone artefacts discarded can be expected to have been correspondingly limited in terms of artefact diversity and complexity.

In the broader region the usually large body of water that forms Lake George, and its immediate environs, would have been one locus of intensive habitation and activity for the local Aboriginal people. Not only did it represent a cosmologically significant site (Wally Bell pers. comm. October 2010), but it was also relatively higher in biodiversity values. This area also provided more sheltered contexts as well as a ready access to drinking water. To the north, the Lachlan River was also a major reliable water source. Artefact discard is likely to have been greater in these areas, reflecting more frequent and/or sustained occupation. It is possible that artefact diversity may also have been greater near to major lakes and rivers.

## 7. ARCHAEOLOGICAL CONTEXT - INDIGENOUS

### 7.1 Social geography

On the basis of archaeological research it is known that Aboriginal people have occupied Australia for at least 40,000 years and possibly as long as 60,000 years (Mulvaney and Kamminga 1999: 2). By 35,000 years before present (BP) all major environmental zones in Australia, including periglacial environments of Tasmania, were occupied (Mulvaney and Kamminga 1999:114).

At the time of early occupation Australia experienced moderate temperatures. However, between 25,000 and 12,000 years BP (a period called the Last Glacial Maximum) dry and either intensely hot or cold temperatures prevailed over the continent (Mulvaney and Kamminga 1999: 114). At this time the mean monthly temperatures on land were 6-10ºC lower; in southern Australia coldness, drought and winds acted to change the vegetation structure from forests to grass and shrublands (Mulvaney and Kamminga 1999: 115-116).

During the Last Glacial Maximum at about 24-22,000 years ago, sea levels fell to about 130 m below present levels and accordingly, the continent was correspondingly larger. With the cessation of glacial conditions, temperatures rose with a concomitant rise in sea levels. By ca. 6000 BP sea levels had more or less stabilised to their current position. With the changes in climate during the Holocene Aboriginal occupants had to deal not only with reduced landmass, but changing hydrological systems and vegetation; forests again inhabited the grass and shrublands of the Late Glacial Maximum. As Mulvaney and Kamminga (1999: 120) have remarked:

When humans arrived on Sahul's shores and dispersed across the continent, they faced a continual series of environmental challenges that persisted throughout the Pleistocene. The adaptability and endurance in colonising Sahul is one of humankinds' inspiring epics.

Human occupation of south east NSW dates from at least 20,000 years ago as evidenced by dated sites at Burrill Lake (Lampert 1971), and two sites near Buchan in Victoria; Cloggs Cave (Flood 1980) and New Guinea 2 (Ossa *et al*. 1995). The Bulee Brook 2 site in the south coast hinterland ranges, excavated by Boot (1994) provides evidence that occupation of this zone had occurred by at least 18,000 years ago. Pleistocene occupation sites are however few with the majority of recorded sites dating from the mid to late Holocene. It is nevertheless reasonable to assume that the Collector area was occupied and utilised by Aboriginal people from the late Pleistocene onwards.

The earliest European reports regarding the Aborigines of the region are provided through the written observations of the first explorers, adventurers and settlers to the district. These sources present only fragmentary and incomplete accounts of the traditional culture of those Aboriginal groups who inhabited the area. Very soon after European contact, with increasing numbers of white settlers in the 1820s, much of the Aboriginal language and lifestyle had changed before it could accurately be recorded. Because of this, reliable information is limited regarding traditional Aboriginal culture and the extent of group territories at the time of European arrival.

Tindale (1974) determined that the area of present-day Goulburn was situated at the boundary of two tribes – the Gandangara to the north and the Ngun(n)awal to the south so that the area of present day Collector, located south of Goulburn, fell within the traditional boundaries of the Ngunawal cultural group. Tribal boundaries are derived principally from linguistic evidence and a virtually identical correspondence in word lists recorded from both the Ngun(n)awal and Gandangara languages has been observed (Eades 1976:6).

Smith (1992) suggests that the current location of Goulburn fell within the territory of the Gandangara and was in effect an intersection of boundaries and a 'cross roads' for at least six

Gandangara 'bands', including the Burra Burra, Tarlo, Wollondilly, Cookmai, Parramarrago and Pajong (Smith 1992: 45). According to Smith's research (1992: 5) at least one of these 'bands' , the Burra Burra, had strong links with the Gandangara of the O'Connell Plains south of Bathurst and may have occupied a traditional range extending as far south as Lake George.

The paucity of reliable ethno-historic sources for the early period of European settlement also means that an estimate of the pre-European Aboriginal population of the district cannot confidently be established. By the time any dependable observations were made small pox, influenza and the effects of European settlement had devastated the local Aboriginal populations. The number of Aborigines estimated to occupy the Goulburn Plains in 1827 was 45 (Smith 1992: 22). It is variously estimated that by the last years of the 1840s the local Aboriginal population had been reduced to 25 individuals (Smith 1992: 30) or less than 20 (Lance and Koettig 1986:13). This is a slight number when one considers that in 1839 Aborigines are said to have outnumbered Europeans by 10 to 1 at the first Goulburn horse races to be held. Unfortunately the number of Europeans who attended the outing is not supplied.

Attempts to reconstruct the home territories occupied by the various Aboriginal cultural groups of the broader Goulburn/Canberra region are in large part reliant on evidence drawn from ethnohistorical sources. Unfortunately, when the early European settlers first came into contact with these Aboriginal groups, generally a higher priority appears to have been given to the exploration and assumption of land rather than the recording of detailed information concerning the Aboriginal peoples they were displacing. Very soon after European contact, introduced diseases devastated the Aboriginal population and thereafter, with an increasing number of white settlers from the 1820s, much of the Aboriginal language and lifestyle had changed before it could be accurately recorded. The earliest European reports regarding the Aborigines of the region are provided through the often cursory written observations made by the first explorers, adventurers and settlers to the district. However, given the aforementioned circumstances, these sources can only present fragmentary and incomplete accounts of the traditional culture of those Aboriginal groups who inhabited the area. Because of this, reliable information is limited regarding traditional Aboriginal culture and the extent of group territories at the time of European arrival.

Based on linguistic evidence collected in the late nineteenth century, primarily by anthropologists Curr, Howitt and Mathews, Tindale (1974) determined that the area of present-day Goulburn was situated at the boundary of two Aboriginal 'tribes' – the Gandangara to the north and the Ngunawal to the south. Traditional Ngunawal lands are described as extending north from Queanbeyan to Goulburn, and west to Tumut and Gundagai, so that the region of present day Collector fell within these traditional boundaries of the Ngunawal cultural group (Avery 1994). Bluett indicates that the Ngunawal in turn were comprised of three subgroups, each based within the three different regions of Yass, Lake George and Canberra/Queanbeyan within their overall territory. A ceremonial ground being located in each of these three regions. However George Augustus Robinson in 1844 designated the Onerwal of Yass and the Koronial or Yammoit Mittung on the Limestone Plains as being the two groups that comprised the Ngunnawal (Avery 1994).

William Wright recorded that at the time of initial white settlement the Aboriginal population of the broader Canberra district numbered between 400 and 500 people. This group came together once a year for a large ceremony, and then dispersed to spend the remainder of the time in small mobile groups of 20 to 30 individuals. From records made during the distributing of blankets to Aboriginal people it appears that Aborigines groups within the region had widespread affiliations with other groups, extending as far as the Tumut Valley, Yass, Boorowa, Goulburn, Gundaroo, Braidwood, Cooma and the Illawarra area. The groups whose territory incorporated the Canberra area are indicated to have made frequent travels to Braidwood in order to barter for salt, to the Yass Plains to hunt kangaroo and gather grass seed, to the Shoalhaven to procure sandstone for spear sharpening, the Monaro to obtain volcanic stone to make hatchets, to Kiandra to harvest bogong moths, and to the South Coast for fishing (Avery 1994).

Ethnohistorical sources indicate that within the southern tablelands a broad range of resources were accessed by the Ngunawal as they moved through their country. Open plains surrounded by woodland attracted kangaroos, wallabies, wallaroos, wombats, emus and a variety of other fauna which were hunted by men and older boys. Meanwhile women and children collected small game and vegetable foods that included birds, lizards, possums, native cats, fish, mussels, bird eggs, yams, berries, grubs and grass seed. In particular the various swamps and waterways with their thick reed beds were an abundant food source which included many types of aquatic birds (Avery 1994).

In research conducted for her unpublished PhD thesis, Karen Williams has reconstructed the range that the Ngunawal people would have moved through in order to access the seasonal resources and raw materials that were required for their subsistence over the course of a year. As indicated by Wally Bell (Oct. 2010 pers. comm.), the range described by Williams' very closely accords with traditional cultural knowledge of the extent of Ngunawal territory.

For the Ngunawal, within their country, Lake George - known as *Ngungara* in traditional language - and its immediate environs, are of extreme significance. Not only was the lake a reliable source of food and water, but more importantly it is from *Ngungara* that the Ngunawal creator being *Nadyund Bouruage* originates (Don Bell – cited in Gugler 2010). Because of this, Lake George was a central focus of activity for the Ngunawal and this is evident in the number of site complexes located nearby. This applies not only to the areas fringing the lake but also other nearby areas including the prominent ridgeline immediately to the west of the lake which has an abundance of stone artefacts distributed across it (Wally Bell Oct. 2010 pers. comm.).

Away from Lake George and other ceremonial grounds, the most frequently used areas for the Ngunawal were the travel routes along which they moved through country. One major route extended from the west at Yass to Gundaroo and Lake George, and then continued east to Queanbeyan and beyond, passing though the country of other cultural groups and eventually linking to the coast. Another route went north from Lake George, leading to the abundant resources that were found along the Lachlan River. It is along these travel corridors where the highest density and most complex distribution of Aboriginal objects will be found (Wally Bell Oct. 2010 pers. comm).

The study area lies away from these main travel corridors, so that it was less frequented by the Ngunawal (Wally Bell Oct. 2010 pers. comm). Nevertheless the area would have been occupied on occasion, albeit less intensively, and the resources present exploited. Such occupation would have resulted in the discard of stone artefacts and these will be distributed across the entire study area.

For the Ngunawal of today there continues to exist a strong connection with their past, their cultural inheritance and their country. Cultural knowledge has been passed on and arising from this is the desire to conserve Ngunawal heritage, especially given all that has been lost since the arrival of Europeans. Because of this there is a variance between the *cultural significance* and the *scientific significance* of Aboriginal objects. Scientific significance places higher values on an Aboriginal object or suite of objects from which new information can potentially be derived, and is accordingly linked with considerations of rarity or the number of associated objects. However Aboriginal cultural significance places value on each object as a physical connection to their cultural past and their current identity.

## 7.2 Previously Recorded Aboriginal Objects

A search of the NSW DECCW Aboriginal Heritage Management Information System has been conducted for this project on the 24th September 2010 (AHIMS # 32066). The search area measured 288 km² and encompassed eastings 710000 – 728000, and northings 6130000 – 6146000.

Thirty-four Aboriginal sites are recorded on AHIMS as being present within the site search area. Three of these sites, CR08 – Site # 51-5-0021, CR09 – Site # 51-5-0022, and CR10 – Site # 51-5-

0023, are listed as being present within the broad development envelope but outside proposed impact areas (Figure 4). The AHIMS register only includes sites which have been reported to NSW NPWS/DECCW. Generally, sites are only recorded during targeted surveys undertaken in either development or research contexts. Accordingly, this search cannot be considered to be an actual or exhaustive inventory of Aboriginal objects situated within the local area or indeed within the study area itself.

The Aboriginal objects on AHIMS for the site search area are listed below in Table 3, and the location of those sites nearest to the study area is shown in Figure 3. It should be noted that sites recorded in AGD have been converted to GDA.

Table 3 Aboriginal objects listed on NSW DECCW AHIMS search.

| Site ID | Site name | Easting GDA | Northing GDA | Recorder | Site type |
|---|---|---|---|---|---|
| 51-5-0008 | Collector | 724851 | 6133893 | ASRSYS | Open Camp Site |
| 51-5-0013 | C-AB1 | 726715 | 6134734 | ASRSYS | Open Camp Site |
| 51-5-0014 | C-AB2 | 724423 | 6134643 | ASRSYS | Open Camp Site |
| 51-5-0015 | C-AB3 | 724409 | 6134277 | ASRSYS | Open Camp Site, Quarry |
| 51-5-0016 | C-AB4 | 724127 | 6134105 | ASRSYS | Open Camp Site |
| 51-5-0017 | Windermere 1 | 722914 | 6131225 | Baker | Open Camp Site |
| 51-5-0018 | Windermere 2 | 722914 | 6131225 | Baker | Open Camp Site |
| 51-5-0019 | CR01 (Field Designation) Gunning | 712334 | 6145363 | Dallas | Open Camp Site |
| 51-5-0020 | CR03 (Field Designation) Wet Lagoon Nature Reserve, Greendale | 724294 | 6144623 | Dallas | Open Camp Site |
| 51-5-0021 | CR08 Gunning | 718434 | 6144113 | Silcox | Open Camp Site |
| 51-5-0022 | CR09 Cullerin Range | 718684 | 6143963 | Silcox | Open Camp Site |
| 51-5-0023 | CR10 Cullerin Range | 718784 | 6143913 | Silcox | Open Camp Site |
| 51-5-0024 | CR11 Cullerin Range | 718884 | 6143913 | Silcox | Open Camp Site |
| 51-5-0025 | CR12 Cullerin Range | 719334 | 6144163 | Silcox | Open Camp Site |
| 51-5-0026 | CR13 Cullerin Range | 718884 | 6144013 | Silcox | Open Camp Site |
| 51-5-0027 | CR14 Cullerin Range | 718534 | 6144213 | Silcox | Open Camp Site |
| 51-5-0029 | CR02 Cullerin Range | 720674 | 6144453 | Dallas | Open Camp Site |
| 51-5-0031 | CR04 Popeys Creek, Greendale (Cullerin Range) | 726884 | 6144623 | Dallas | Open Camp Site |
| 51-5-0056 | Norfolk Creek 1 | 719914 | 6144133 | Navin, Officer | Open Camp Site |
| 51-5-0063 | Byrnes Creek 2 | 724394 | 6134735 | Hamm | None |
| 51-5-0073 | CL1 | 724314 | 6132473 | Paton | None |
| 51-5-0075 | Cullerin Survey Unit 8/Locale 1 | 718486 | 6144545 | Dibden | None |
| 51-5-0076 | Cullerin Survey Unit 6/Locale 1 | 718795 | 6144606 | Dibden | None |
| 51-5-0077 | Cullerin Survey Unit 9/Locale 1 | 719359 | 6144869 | Dibden | None |
| 51-5-0079 | CS 1 | 725238 | 6133992 | Archaeological Heritage Surveys | None |
| 51-5-0080 | CS 2 | 725320 | 6134165 | Archaeological Heritage Surveys | None |
| 51-5-0081 | CS 3 | 725106 | 6134051 | Archaeological Heritage Surveys | None |
| 51-5-0082 | CS 4 | 725370 | 6133914 | Archaeological Heritage Surveys | None |
| 51-5-0083 | CS 5 | 725601 | 6134273 | Archaeological Heritage Surveys | None |
| 51-5-0086 | MTR 2 | 715684 | 6130937 | Archaeological Heritage Surveys | None |
| 51-5-0087 | MTR 3 | 715916 | 6130378 | Archaeological Heritage Surveys | None |

| Site ID | Site name | Easting GDA | Northing GDA | Recorder | Site type |
|---|---|---|---|---|---|
| 51-5-0094 | LPR1 (Lucky Pass Road 1) | 725884 | 6130775 | Saunders | None |
| 57-3-0245 | Kildare 1; | 710784 | 6137163 | Cain | Open Camp Site |
| 57-3-0288 | Kildare 1;Kildare; | 710784 | 6137163 | Cain | Open Camp Site |

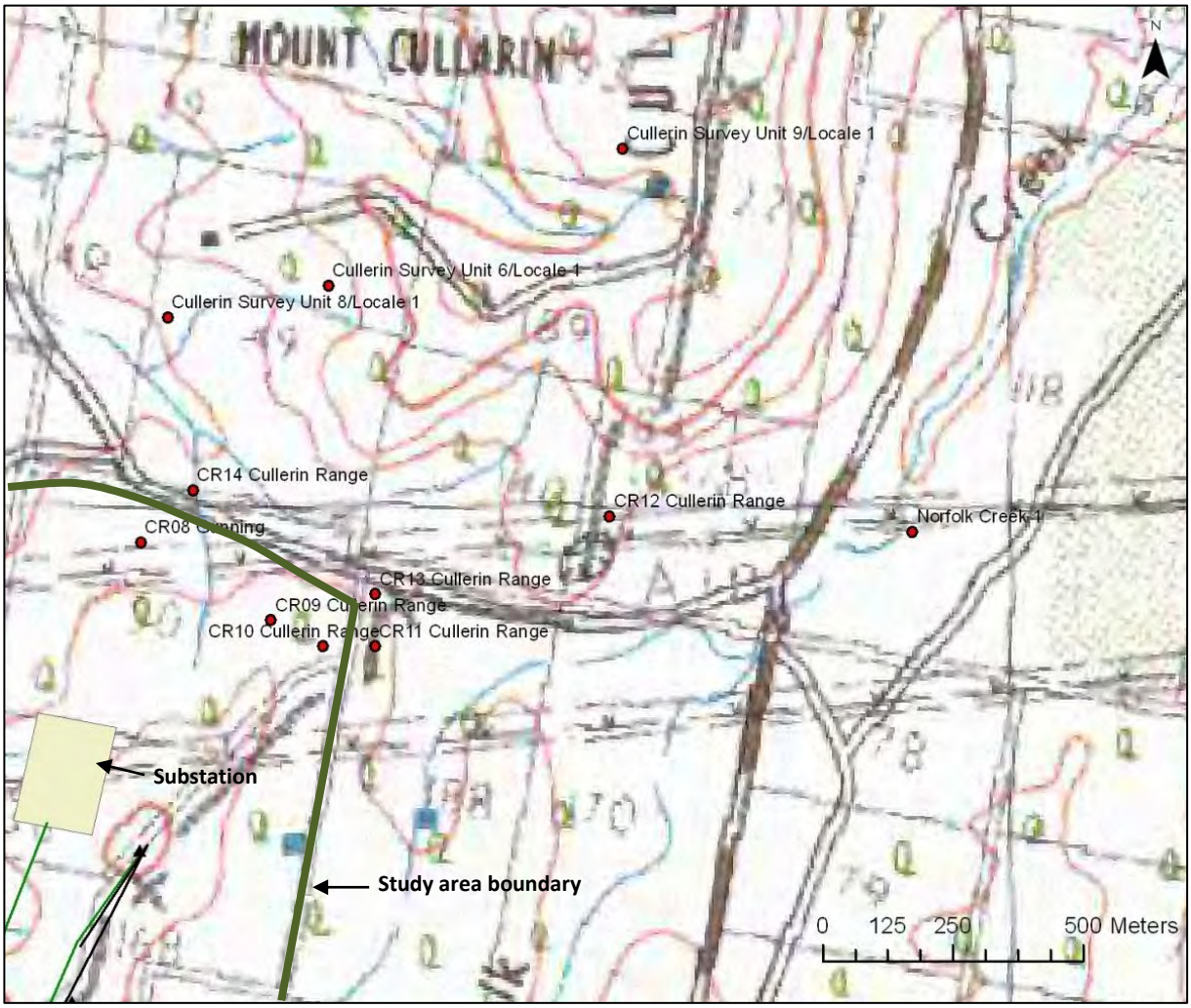


Figure 2 Detail of the northernmost section of the study area showing the location of previously recorded sites situated nearest to areas of proposed impacts (Gunning 8728-S 1:50 000 topographic map).

Two archaeological assessments, both in relation to the proposed Hume Highway by-pass route, have taken place which in part encompassed a section of land that runs along the most northerly boundary of the current proposal area.

Dallas (1985) conducted a survey of the Cullerin Range Bypass which extended between Breadalbane and Gunning for a distance of 31 kilometres. A ca. three kilometre section of this survey route passed along a part of the northern boundary of the current proposal area. A total of seven low density artefact scatters were recorded during the survey, six of which were found to the east of the Cullerin Range although none in the current study area. Dallas (1985) indicates that the frequency of sites along the survey route was low, at 1 per 4.4 kilometres, but that this was probably the product of both the 'straight line' survey and the intermittent nature of creeklines traversed along that route. Dallas (1985) suggests that the dryer hilly terrain in the area was used for transitory occupation, but that more favourable conditions for habitation were located downstream, closer to the Lachlan River.

Due to changes in the realignment of the bypass route a subsequent survey was conducted by Koettig and Silcox (1985) along a survey route 3 km long and 200 metres wide. During the survey an additional seven artefact locales were recorded. Three of these locales, CR08 – Site # 51-5-0021, CR09 – Site # 51-5-0022 and CR10 – Site # 51-5-0023 are located within the current proposal area envelope, although in an area where no impacts are currently proposed. All artefact locales were situated on moderate slopes associated with a main ridge, with the exception of CR12, located on top of a ridge, and CR14, located on top of a knoll. All artefact locales were situated within 200 metres of a creekline. The number and distribution density of artefacts at each site was found to be extremely low (Table 4). All locales were recorded in areas of shallow sheetwash erosion, although it was noted that many areas of erosion did not possess artefacts and that where artefacts were located they did not occupy the entire eroded area. Silcox (1993) summarised the results of both bypass surveys, indicating that in the local area open campsites are generally situated on slopes adjacent to water but were also found on creek flats and ridges.

Table 4 Artefact numbers and distribution density of Cullerin Range Deviation sites recorded by Koettig and Silcox (1985).

| Site | Number of artefacts | Average density |
|---|---|---|
| CR8 - Site # 51-5-0021 | 17+ | 1/10 m² |
| CR9 - Site # 51-5-0022 | 14 | 1/21 m² |
| CR10 - Site # 51-5-0023 | 6 | 1/65 m² |
| CR11 - Site # 51-5-0024 | 3 | 1/75 m² |
| CR12 - Site # 51-5-0025 | 30+ | 1/40 m² |
| CR13 - Site # 51-5-0026 | 7 | 1/40 m² |
| CR14 - Site # 51-5-0027 | 50+ | 1/80 m² |

Thereafter, Koettig (1986) carried out an excavation of one of the sites (CR14 - Site #51-5-0027) on the Bypass route which was situated on a small knoll immediately overlooking a creekline to the north of the current study area. An extensive assemblage of mostly quartz artefacts was retrieved with material occurring in variable density across the site. Prior to excavation a surface salvage retrieved 403 artefacts from an area of 2750 m². Excavation of part of this site produced a further 1844 artefacts. From these findings Koettig (1986) calculated that the total number of artefacts that would be expected to be present in a subsurface context across the entire 2750 m² area was in the vicinity of 100,000 -120,000 (we calculate this to ca. 43 artefacts per square metre). Both quartz and silcrete material was found to have been worked by both direct percussion and bipolar flaking techniques. The relatively high artefact density in this site could well be a factor of its location on an elevated landform situated immediately above a creekline as well as its position between two opposed, prominent ridges which would make such a location an obvious thoroughfare and nodal place in the broader landscape.

The following discussion in Section 7.3 will present a review of additional previous archaeological work in the region for the purposes of producing a predictive model of site type and location relevant to the study area.

### 7.3 Archaeology – The Local Area

Few previous archaeological studies have been undertaken within the immediate local area (however see above), while a number of studies have been carried out in the broader region in response to statutory requirements for environmental impact assessment. The following

discussion includes a review of archaeological work and its results conducted within the regional area.

Just to the northeast of Collector, Koettig (1982) conducted surface salvage at C-AB2 and C-AB1. This work was carried out in relation to the proposed construction of a dual carriageway on the Federal Highway. C-AB2 was situated on a low rise between two drainage lines that join to form Byrnes Creek and encompassed an area that extended for ca. 100 metres. C-AB1 was located ca. two kilometres east of C-AB2, next to Byrnes Creek and in a similar topographic context to C-AB2. From C-AB2 6,491 stone artefacts were recovered, ranging in size from 2 millimetres to 12 centimetres. Quartz comprised 94.6% of the raw material, with a high percentage of quartz waste material less than 1 centimetre in size, while silcrete (2.8%) was the second most common material. At C-AB1 178 artefacts were recovered with similar percentages of raw material to that exhibited at C-AB2. It was noted that an outcrop of quartz which showed evidence of knapping(C-AB3), was located just 300 metres to the south of C-AB2. Because of a high waste to tool ratio of 71:1 at C-AB2, Koettig (1982) proposed that the site was probably a knapping location.

Stone (1986) conducted an archaeological survey in relation to the proposed dual carriageway between the Cullerin deviation and the Yass bypass. Surveying along a 200 metre wide easement for a distance of 18 kilometres two low density artefact scatters were recorded west of Gunning. Both were located on slopes adjacent to streams that flow into Jerrawa Creek and each were assessed to be of low research potential due to being highly eroded.

Closer to Goulburn, Koettig (1983) surveyed the proposed highway by-pass route in areas to the south and east of the township. Twenty two sites were located, all of which were surface scatters of stone artefacts situated within 200 metres of watercourses, but distributed over a variety of landform units. Fifty four percent were located on slopes, 23% on ridges and 23% along creeks or river flats. Most of the artefact scatters were distributed at low density but one site (G17), located on a low sandbar on the eastern bank of the Mulwaree River near its junction with Gundary Creek, was found to be a high density site with stratified deposit. Koettig (1883) recovered 650 artefacts from test pits.

Paton (1990) subsequently conducted test excavation at site G17 as 15% of the site was to be effected by the proposed Goulburn highway by-pass construction. Paton (1990) retrieved a total of 15,257 stone artefacts, several European artefacts and several bone fragments from 29 trenches. Raw material proportions for the stone artefacts were:-quartz 85%, silcrete 10%, chert 2%, quartzite 1.2%, volcanic 0.8%, basalt 0.2% and others 0.8%, noting that quartz is known to outcrop on a hill about 750 metres from the site. There was little evidence of the manufacture of formal tool types at the site, with less than 1% of artefacts being identified as formal tools. One bone fragment was identified as being a 4cm section of a human bone. Dating of the site suggested that it was up to 5,000 years old, and occupied up until the present.

Extrapolating from the excavated area Paton (1990) estimated that the site held about 4.5 million artefacts, indicating that it was probably occupied on a regular basis over several thousand years. Situating his (Paton 1990) findings within the models of occupation and site patterning for the area proposed by Koettig (1983), Lance and Koettig (1986) and Fuller (1989), G17 is characterized as being a site which was the focus of human activity, regularly used as a base camp by Aboriginal groups 'because of its reliable resources and comfortable camping conditions'.

Lance (1984) surveyed the route of a proposed pipeline between Sooley Dam and Rossi Weir on the Wollondilly River, finding a single quartz flake adjacent to Sooley Creek in conditions of reduced exposure.

Lance and Koettig (1986) compiled an Aboriginal Resources Planning Study for the City of Goulburn. Using ethnographic, environmental, archaeological and sampled field survey data, an Aboriginal site location model for the Goulburn area was proposed. Four landform zones were

designated (major watercourses, undulating hills and plains, hill tops and built-up areas), and each assigned an archaeological sensitivity and site significance rating. The most common site-type within the Goulburn region was found to be stone artefact scatters situated within the undulating hills and plains zone and predominantly on basal slopes adjacent to watercourses.

Silcox (1988) conducted a survey at a reopened slate quarry at Chatsbury. Three surface scatters of stone artefacts were located (C1 – 33 artefacts; C2 - 25 artefacts; C3 – 23 artefacts) with quartz being the dominant raw material, and silcrete, chert, acid volcanic and 'other' also present. These sites were all located within 50 metres of the Tarlo River, on lower slopes. The characteristic landform of the area consisted of prominent rounded hills with moderate to steep slopes and sloping valley floors. The survey area was situated at the junction of the Tarlo River and Kings Creek. Site C1 was located on a gentle to moderate slope leading down to the original course of the Tarlo River (the river having been diverted when the original mine operated). Site C2 was located on the lower slopes of a spur ridge adjacent to the river. Site C3 was found along a steep eroding bank of Kings Creek. Silcox (1988) identified several potential campsite locations, and it was determined that excavation should be carried out at two of these (CA & CB). CA was an area of moderately sloping land on both sides of the original course of the Tarlo River. Location CB consisted of an expanse of flat ground bordering the west bank of the original Tarlo River.

Test excavations were subsequently carried out (Silcox 1989) at both locations near to the river, however only five artefacts were recovered. The artefacts were all from the uphill end of location CA. The absence of subsurface material from the majority of the test locations was explained to be the result of a real absence of past activity on the sites.

Fuller (1989) conducted a further archaeological investigation of Aboriginal site location within the Goulburn area, and in so doing explored and developed Lance and Koettig's (1986) model. Locating 17 artefact scatters and 5 isolated finds during field survey, it was found that the majority of sites were small low density scatters of less than 10 artefacts. However, at one site (GC5) more than 100 artefacts were located, while at another (GC4) an estimated 1000 artefacts were scattered over an area measuring 1 $km^2$. Quartz, chert and silcrete were the most common stone from which artefacts were made. Fuller's analysis largely supported Lance and Koettig's (1986) model and added further refinement with regard to the landform unit 'undulating hills and plains' (discussed further below).

Silcox (1991) conducted a field survey and test excavation at a proposed storm flow detention pond in Goulburn, adjacent to the Wollondilly River. The area was situated on an extensive elevated surface overlooking the wide floodplain. No artefacts were found and this was attributed to thick grass cover producing low levels of ground visibility. Subsequent subsurface testing recovered 97 artefacts from a total of 30 pits (Silcox 1991). Artefacts were found to be present in low numbers; density ranged between 36/$m^2$ and 1.5/$m^2$. The stone artefact assemblage was dominated by quartz (78%) with silcrete representing the next most common raw material.

Williams (1992) surveyed archaeologically sensitive areas located on a proposed Optus cable route between Goulburn and Campbelltown. In the Goulburn district he conducted both surface survey and subsurface testing in the vicinity of G17, the site previously located by Koettig (1983) adjacent to the Mulwaree River and later reinvestigated by Paton (1990). While no artefacts were located on the western side of the river, some were recovered from surface survey and deposits at G17. Examination of Koettig's (1983) site G19/20 led to the relocation of 53 of 191 artefacts originally recorded at that site.

Australian Archaeological Survey Consultants (1993) surveyed some 5 kilometres of a proposed Telstra optical fibre cable route between Goulburn and 'The Forrest', and located three very low density artefact scatters, four isolated finds and a possible scarred tree.

Silcox (1993a) carried out test excavations at a proposed ironstone mine access road situated ca. five kilometres north of the proposal area, near Breadalbane. While no sites had been identified in a previous survey (Silcox 1992), two areas of potential archaeological sensitivity were noted,

one on a gentle slope and the other on a flattish saddle at the end of a ridge. The excavation work conducted at these two locations retrieved four artefacts from a total of 57 pits at the site situated on the gentle slope. At the ironstone mine site, situated on the broad flatfish saddle, no Aboriginal objects were found.

Effenberger (1994) conducted a survey of the new Goulburn racecourse, an area of 93 ha, and located two isolated finds.
Silcox (1995) surveyed the route of a proposed power line and Telstra radio base at Sunnyside, some 14 kilometres south west of Goulburn. Two artefact scatters and one isolated find were located. Site S1, an extensive but low density scatter calculated to be comprised of at least 2,500 lithic artefacts, was situated on a low, broad spur ridge at the base of a major ridge system some 3.75 kilometres west of the Mulwaree River and 100 metres from a tributary creekline. S2 consisted of four artefacts distributed across an area of 50 metres on the opposite side of the tributary creekline.

Stuart (1995) carried out a survey for proposed effluent irrigation areas east of Goulburn and near to the Wollondilly River. Two small artefact scatters and two isolated finds were located, both of which were situated in Lance and Koettig's (1986) high potential 'zone 1', which in this instance was near to the Wollondilly River.

Kuskie (1996) surveyed the proposed site of a rural residential development on Lots 2-4 DP835933, just south west of the Goulburn township. One small artefact scatter and one isolated find were recorded. The scatter was located in the middle of a lower slope, 150 metres east of a minor drainage line, and consisted of two silcrete flakes.

Navin Officer Heritage Consultants (2000) conducted an archaeological assessment for the raising of Sooley Dam, 5.5 kilometres north west of Goulburn, as part of the Goulburn Water Supply Augmentation Project. The survey encompassed low hills and gently undulating land in areas on both sides of creeks subsequently inundated by Lake Sooley. The area was assessed to be of low archaeological potential. No Aboriginal sites or areas with archaeological sensitivity were recorded.

Dominic Steele Consulting Archaeology (2003) conducted a survey in relation to the proposed Goulburn Sewerage Augmentation works within Goulburn itself, in the areas of Ross Street, Gorman Road and sections of Kenmore Hospital. The proposal area was situated predominantly on flat and/or undulating elevated land overlooking the Wollondilly River. The area was found to have been significantly disturbed by European development. One scarred tree was recorded, two possible scarred trees identified, and one quartz flake was located. It was assessed that the proposal had low potential to cause impacts to subsurface deposits of significance.

Navin Officer Heritage Consultants (2003) carried out a survey for the proposed Pictura Tourist Complex on the lower catchment of the Run of Waters Creek immediately to the south west of Goulburn. The study area is situated on a broad low gradient ridge and adjoining low to moderate gradient mid and upper slopes. A 1$^{st}$ to 2$^{nd}$ order tributary stream traversed one corner of the 37.8 ha property. One low density artefact scatter was found situated on a broad, low gradient spur top over 700 metres from the watercourse, and consisting of one chert flake and one silcrete flaked piece.

Dibden (2004a and 2004b) carried out a survey of the Greenwich Park subdivision area situated northeast of Goulburn. A large number artefact scatters were recorded on spur crests, spur side slopes and drainage depression/spur side slope interface landforms in conditions of very good archaeological visibility. Artefact density which was calculated according to effective archaeological visibility, was found to be extremely low.

Saunders (2007) conducted a survey in relation to proposed subdivisions on Pomeroy and Gurrundah Roads, Parkesbourne, ca. 14 kilometres northeast of the current study area. Situated along low gradient basal slopes immediately adjacent to the Wollondilly River, 14 Aboriginal

object locales were identified, comprised of 12 artefact scatters and two isolated finds. All but two of the locales were assessed to have the potential to contain further artefacts.

A number of studies have been carried out specifically in relations to wind farms in the local area. These are discussed below:

At Crookwell Jo McDonald Cultural Heritage Management (1998) conducted salvage excavation at the proposed Crookwell wind farm. Excavating a total of 25 1 m x 1 m squares, 2,154 stone artefacts were retrieved, with this find interpreted as '…indicating a single limited encampment where one (or several) person(s) knapped a limited range of raw materials (silcrete, chalcedony and quartz) to produce a set of distinctive tools…' including 10 complete Pejar Points. The site was located on a secondary spur with a westerly aspect and was situated at ca. One kilometre from Middle Creek.

Jo McDonald Cultural Heritage Management Pty Ltd (2003) undertook a survey of the Gunning Wind Farm, situated on the Cullerin Range northwest of the current study area. The Gunning Wind Farm proposal area consists of range crest and valley topography elevated at 840 meters (asl). Four sites containing stone artefact scatters and three isolated artefacts were recorded across the proposal area (Jo McDonald Cultural Heritage Management Pty Ltd 2003). One of the scatters was identified as a quartz quarry; blocky quartz was found to outcrop at the site. The majority of recorded artefacts were identified as quartz, however, quartzite, silcrete and red agate was also recorded. Steep hill tops were considered to be of low archaeological potential, while elevated contexts close to water were considered to be of higher sensitivity.

Austral Archaeology Pty Ltd (2005) subsequently conducted subsurface testing at the Gunning Wind Farm in six areas identified by Jo McDonald Cultural Heritage Management Pty Ltd (2003) as having potential archaeological deposit. A total of 15 excavator scrapes were dug however no artefacts were identified. Austral Archaeology Pty Ltd (2005) attributed the absence of subsurface artefactual material to the elevation of the site and its distance to reliable water, as well as the skeletal nature of the soils, these being less than 15 centimetres deep.

Reeves and Thomson (2004) undertook a survey in relation to the proposed Woodlawn Wind Farm at Tarago. The Woodlawn proposal area is situated at the site of the former Woodlawn open cut mine situated nine kilometres west of Tarago. The majority of the proposed impact zones are situated on the spine of a steep ridge of the Turallo Range. Fifteen stone artefact sites, eight of which were isolated finds, were recorded and the low density distribution was determined to be representative of background scatter calculated to be six artefacts per hectare. Artefacts were recorded across a wide range on landform elements including crest, slopes, and drainage depressions; the results indicated no strong patterning of artefact location in relation to landform. Stone materials recording included rhyolite, quartz and silcrete, volcanics and tuff. The impact zone was assessed to be of low archaeological potential. The results indicated that the range was utilised for low levels of Aboriginal exploitation and may have functioned as a transit route between larger resource zones.

OzArk Environment & Heritage Management P/L (2004) conducted an assessment of the proposed Taralga Wind Farm. The proposed impact zones encompassed ridge crest, slopes and drainage depression. Six artefact sites and one scarred tree were recorded. Stone materials recording included rhyolite, quartz and silcrete and volcanics. The majority of site recordings were made near water.

Dibden (2005) conducted a survey in relation to the proposed Cullerin Wind Farm located immediately to the north of the current study area. Surveying predominantly on ridge crests, knolls and saddles, in conditions which afforded reasonable effective survey coverage, four locales containing stone artefacts were recorded. The artefacts recorded were distributed in low densities and the Survey Units in which they are situated were similarly assessed to contain low density artefact distributions. These findings were attributed to an absence of reliable fresh water source in the proposal area as well as the limited resources that would have been present in the former

woodland zone. As such, the study area was assessed to be of low archaeological potential and sensitivity.

Austral Archaeology Pty Ltd (2007) undertook a survey in relation to the proposed Capital Wind Farm, located on the eastern side of Lake George. Five Aboriginal archaeological surface sites were recorded during the survey, consisting of two small artefact scatters and three isolated finds. Four sites, HH 1, 2 & 3 and WC 1, were located on gently sloping topography adjacent to creek tributaries while site HH 4 was located on a moderate sloping ridge top. In addition, six areas of potential archaeological deposit (PAD) were also identified; one associated with the recorded surface site WC 1. The remaining five areas of PAD were identified sensitive on the basis of topographic features, location and/or their estimated research potential. No surface sites recorded during assessment will be impacted by the proposed development.

Austral Archaeology Pty Ltd (2007) characterised the Capital Wind Farm study area as having distinct areas of high, moderate and low archaeological and cultural sensitivity, with areas of high and moderate archaeological sensitivity located on slightly elevated, gently sloping topography associated with local resource bases and/or reliable watercourses, and areas of low archaeological sensitivity on high, steep and rocky ridgelines at a distance to resources and freshwater. Accordingly, the eastern edge of Lake George was deemed to be a zone of high archaeological and cultural sensitivity.

Thereafter six distinct areas were subjected to subsurface investigation and a total of 348 artefacts were retrieved from a total of 83 test pits (Austral Archaeology Pty Ltd 2009). The majority of artefacts were found to be of quartz (66%), with remainder composed of silcrete (22%), chert (11%) and quartzite (1%). All artefact densities from the six excavation sites were found to be uniformly low, calculated to range from 0.32 artefacts per square metre to 13.46 artefacts per square metre. The overall artefact assemblages of four of the six test areas were described as being suggestive of little more than background artefact scatter, while the densities at the two other areas were assessed to be particularly low so as to indicate that those areas were not used frequently or extensively.

Based on the above review and a consideration of the elevation, geology, hydrology and topography of the study area the type of sites known to occur in the region and the potential for their presence within the study area are described in Section 7.4 below.

### 7.4 Predictive Model of Aboriginal Object and Location

Stone artefact distributions of variable artefact densities are the most common Aboriginal object found within the region. In the wider Goulburn area a general correlation between different types of watercourses and the nature of the evidence of past Aboriginal occupation is evident. Higher artefact density sites are located near to permanent water sources and low density artefact distributions are found elsewhere.

Lance and Koettig (1986) developed a predictive model for Aboriginal site location around Goulburn City based on four defined environmental zones – major watercourses, undulating hills and plains, hill tops and built-up areas. This model was later tested and refined by Fuller (1989) who conducted surface surveys of these zones. Areas of good exposure and natural erosion were targeted, however no subsurface investigation was involved.

Fuller (1989) recorded 17 open artefact scatters and five isolated finds during this survey. These sites were found across all environmental zones as previously defined by Lance and Koettig (1986), including those indicated as less archaeologically sensitive. Eleven of the 17 open sites were recorded in Lance and Koettig's (1986) 'Zone 2: Undulating hills and plains', predicted in their model to be of low archaeological sensitivity, including GC4 and GC5, estimated by Fuller (1989) to contain over 1,000 and 100 artefacts respectively. Nine of the 11 sites located in the 'undulating hills and plains' zone were situated on mid-slope landform units.

From the results of this survey Fuller (1989) produced a subsequent augmented model of predicted Aboriginal site location in the Goulburn City region, based on a combination of: - proximity to watercourses; the nature of those watercourses; elevation; and steepness of slope. Fuller's (1989) conclusion was that Aboriginal occupation in the Goulburn area appeared to be concentrated to a large extent around utilization of the resources of the Mulwaree and Wollondilly Rivers, although the presence of other lesser watercourses distributed at intervals throughout the region meant that land usage was not limited to these major rivers.

Subsequent surveys carried out in the broader region, cited above, have to a large extent borne out Fuller's (1989) findings. Consequently, a predictive model for Aboriginal sites in the Southern Tablelands informs that Aboriginal sites will be found across a broad spectrum of topographic units such as slopes, hilltops, ridges, spurs and watercourse flats (Silcox 1991), and according to Lance & Koettig (1986) and Fuller (1989), within close proximity to watercourses. Koettig (1983) has identified that larger sites will be contiguous with major streams, while lesser sites will be associated with low order watercourses.

As indicated, the most common Aboriginal object recordings in the region are distributions of stone artefacts. Rare site types however include rock shelter, scarred trees, quarry and procurement sites, burials, stone arrangements, carved trees and traditional story or other ceremonial places. The distribution of each site type is related to variance in topography and ground surface geology.

The type of sites known to occur in the region and the potential for their presence within the study area are listed as follows:

*Stone Artefacts*

Stone artefacts are found either on the surface of the ground and/or in subsurface contexts. Stone artefacts will be widely distributed across the landscape in a virtual continuum, with significant variations in density in relation to different environmental factors. Artefact density and site complexity is expected to be greater near reliable water and the confluence of a number of different resource zones. In the region sheltered contexts are likely to have been utilised for camping. The detection of artefacts during a surface survey depends on whether or not the potential archaeological bearing soil profile is visible.

Given the environmental context of the proposed Collector Wind Farm stone artefacts are predicted to be distributed across this landscape in variable densities. The broader area in which the majority of the wind farm infrastructure is proposed is comprised of amorphous crests, slopes and flats, located away from reliable water and in an area of limited biodiversity. It is predicted that the artefact density will be generally low.

*Grinding Grooves*

Grinding grooves are found in rock surfaces and result from the manufacture and maintenance of ground edge tools. Grinding grooves are only found on sedimentary rocks such as sandstone. Given the low prospect of suitable rock exposures being presence in the study area grinding groove sites are unlikely to be present.

*Burials sites*

Burial sites have been recorded within the wider region. This site type is rarely located during field survey and given the topography, nature of the soils and geology, burials are not predicted to be present in the study area.

*Rock Shelter Sites*

Rock shelters sites are unlikely to be present in the study area given the absence of large vertical stone outcrops.

*Scarred and Carved Trees*

Scarred and Carved trees result from either domestic or ceremonial bark removal. Carved trees associated with burial grounds and other ceremonial places have been recorded in the wider region. In an Aboriginal land use context this site type would most likely have been situated on flat or low gradient landform units in areas suitable for either habitation and/or ceremonial purposes.

Bark removal by European people through the entire historic period and by natural processes such as fire blistering and branch fall make the identification of scarring from a causal point of view very difficult. Accordingly, given the propensity for trees to bear scarring from natural causes their positive identification is impossible unless culturally specific variables such as stone hatchet cut marks or incised designs are evident and rigorous criteria in regard to tree species/age/size and it specific characteristics in regard to regrowth is adopted.

Nevertheless, the likelihood of trees bearing cultural scarring remaining extant and in situ is low given events such as land clearance and bushfires. Generally scarred trees will only survive if they have been carefully protected (such as the trees associated with Yuranigh's grave at Molong where successive generations of European landholders have actively cared for them).

The study area has been extensively cleared although some trees of moderate age remain. While not impossible, this site type is unlikely to have survived and therefore be extant in the study area.

*Stone Quarry and Procurement Sites*

A lithic quarry is the location of an exploited stone source (Hiscock & Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occur. Quarries are rare site types in the region. A stone quarry is unlikely to be recorded during the current study although it is possible.

## 8. HERITAGE CONTEXT – NON-INDIGENOUS

### 8.1 Alienation of Lands Within the Colony of New South Wales

When New South Wales was settled as a British Colony in 1788, all lands became the property of the Crown. A major component of the colonial process was the creation and maintenance of spatial order (Jeans 1966: 205). The alienation of land was controlled at the discretion of the colonial government, initially under direction of the Colonial Office in London. Grants, in the first instance, were offered to officers and civil servants as both reward and incentive to relocate. This was later extended after Governor Phillip was instructed to grant land for farming to discharged soldiers, free settlers and convicts who had served their term (Shaw 1970: 11).

As the population and demand for land increased, measures were adopted by both the government and settlers to enable the spread of settlement and an increase in agricultural production. With a further increase in the population of settlers and livestock numbers after 1800, the demand for land continued to grow.

In 1822 J. T. Bigge filed his Report to the Commissioner of Inquiry into the State of the Colony of New South Wales. Bigge had been dispatched to the Colony in 1819 by the British government to establish, among other things, if the Colony was achieving its aims as a penal settlement and to consider its development and commercial viability. Bigge recommended an increase in land grants, but only to those who could contribute to an increase in pastoral production (Molony 1988: 45). Assigned convict labour was intended to assist with the maintenance of pastoral properties granted under such a system.

Governor Macquarie continued to grant land to cater for the needs of increasing livestock numbers. Although alienation was not allowed without survey, by 1821 about 340,000 acres of land grants could not be located, as their issue had outpaced the ability of surveyors to accurately determine their placement (Perry 1965: 44). The three-man survey department was not able to cope with the demands made on it, and the number of uncompleted surveys of the country beyond the immediate vicinity of Sydney began to mount. This situation became more problematical in 1825 when officialdom declared that the area to be settled was to be divided into counties and parishes and, in 1826, temporarily restricted land that could be granted to the first nineteen counties created around Sydney, which became known as the 'Limits of Location'. The southern boundary of the nineteen counties was the latitude of Batemans Bay on the coast (Ellis 1997: 27, Gibbney 1989: 17-19).

In order to allow occupation of new lands, satisfy demand and maintain some control on the spread of settlement, in 1827 the government introduced 'tickets of occupation' to allow graziers rights over the lands they occupied (Carter 1994: 9-10). These were replaced in 1828 by grazing licences. From that time, through a variety of means, there was a spread of both official and unofficial settlement, and Crown Lands began to be broken up into smaller portions.

Grants and sales, either directly or at auction, permitted the alienation of land. However, demand outstripped supply. 'Squatters' began to occupy large tracts of land outside the settled districts beyond the control of the colonial government (Cannon 1988: 9, Carter 1994: 10-12). In order to wrest back control, various regulations were introduced to allow land to be leased or licensed for a fee to depasture stock. Sales as a result of improvements to land occurred later, along with sales at auction for a set minimum price per acre. Access to and availability of land, along with insufficient capital for many prospective landowners restricted expansion. The majority of suitable land remained in the hands of a wealthy few.

By 1850, settlement had spread throughout New South Wales and Victoria (Shaw 1970: 45) and at that time 3,000 squatters had the use of over 70 million acres of Crown Land (Jeans 1966: 212). It was during this period that political support increased for small rural landholders. Support came from a number of groups, including:

- land owners seeking to restrict the squatters and capitalise on their own investments;
- tenant farmers seeking access to rural land;
- successful gold-miners with capital to invest in land;
- independent shopkeepers who resented the squatters use of Sydney wholesalers; and
- agitated politicians fearful of the growing power of the 'squattocracy'.

In 1861, Sir John Robertson, the Minister of Lands, introduced legislation (Crown Lands Occupation Act 1861 and Crown Lands Alienation Act 1861) to allow selection of land by any person under certain conditions, at a set price of one pound per acre. One quarter of the purchase price was required with the balance deferred as long as certain conditions were met. This legislation set minimum and maximum sizes for portions as well as orientation and boundary proportions. Selection could also take place prior to survey. The intention of this legislation was to allow access to land on fair and easy terms and promote closer settlement throughout the colony. Despite these intentions, the legislation failed in that loopholes and indiscriminate practices allowed the original landholders to maintain control of much of their original 'runs' (Carter 1994: 21). By 1874 "... deserted farms are everywhere visible to the traveller ..." (Jeans 1972: 213). Nevertheless, the policy of closer settlement continued and by the 1890s large land holdings had gradually given way to a myriad of smaller farms. As a result of World War I, the first half of the twentieth century saw Soldier Settlement land programs in place throughout Australia.

The modern landscape not only reflects a sequence of occupation and activity through a number of phases of ownership, improved technology and changing farm management practices, but evidence of the legislative and administrative controls governing alienation and land use.

## 8.2 Regional History

### *Exploration and Pioneers*

Much of the impetus for early exploration in NSW was driven by the need for new land for grazing (*cf* Andrews 1998). In 1814 Hamilton Hume started to explore the country to the south of the established colony and on that trip came to the region which became known as Argyle. He revisited this area several times over the following years and in 1818 returned with a party which included the Deputy Surveyor James Meehan. On this journey they came to Lake Bathurst on 3 March, after which Meehan travelled north-west with a smaller party and reached the area now called the Mulwaree Chain of Ponds with its extensive surrounding plains (Taylor 1987). Other exploration parties to the district at this time were led by Throsby – 1818, Throsby-Smith – 1820, Wild – 1820, and Kearns – 1822 (Navin Officer Heritage Consultants 2003: 8).

The Goulburn Plains were found to be attractive land for European grazing purposes as they were extensive, lightly timbered with an abundance of native grasses, and the water provided by the Chain of Ponds appeared to be permanent. The granting of land in the district of Argyle was first promised to the public in 1822, and the township of Goulburn was established in 1824. However, settler expansion by land hungry graziers into these newly discovered districts south of Sydney was rapid, taking place before official grants were sanctioned. In part this was driven by the harsh droughts of 1825 and 1828, and vast expanses of uncultivated land were simply taken up by these first graziers without endorsement from the governing authorities (Navin Officer Heritage Consultants 2003:8).

Europeans swiftly began occupying land beyond the immediate Goulburn environs and moved into the area around the present day township of Gunning in 1821. Hamilton Hume had taken up his sheep property 'Collingwood' by this time, located just to the northeast of the township, and it was from here in 1824 that Hume and Hovell set out on their expedition that eventually arrived at Port Phillip.

The first permanent European settler to be granted land in the Collector area was Sir Terence Aubrey Murray, who grew to be known as the 'Father of Collector'. In September 1827 Murray's

father, Captain T. Murray, was given authority to take possession of 2,500 acres (1012 ha) in the Argyle district and he chose to take up land in an area north of Lake Bathurst on the eastern banks of Mulwaree Ponds. However some months later the government instructed Murray and his family to relocate. Thereafter they started again at another site, this time to the west of Mulwaree Ponds, but once more were ordered to move. In compensation for this inconvenience the Murrays were given an additional land grant in the name of the then nineteen year old son Terence Aubrey (T.A.) Murray. Eventually they chose to settle at a site in the broad valley north of Lake George. Adjoining his father's land, T.A. Murray's called his property Old Collector, apparently after the Aboriginal name for the area 'Colegdar' (Wilson 1967).

In 1832, after four years spent in improving the original land grants, T.A. Murray established another farm, called 'Ajamatong', in the south-west corner of the Collector valley. When Captain T. Murray died in 1835 his property passed into the possession of his son, who in 1837 started to build himself a substantial residential house on the property he called 'Winderadeen' near Collector. That same year a postal service began from Goulburn across the flat plains to Lake George and down to Yass. This inevitably meant the development of staging posts and the town of Collector began to be established. The 'Winderadeen' house was finally completed in 1840 and in 1841 Murray commissioned a surveyor to layout the village of 'Murray Town' or Old Collector (Wilson 1967).

At around this time Thomas Walker visited, and recorded in his later published journal:

> One of the most valuable estates in this quarter is that of Mr Murray; he has the only land that runs up flat from the lake; it is situated at the north end of it, and occupies a valley of very considerable and varying width, and of many miles in length, the soil very good, and uncommonly well-watered by a chain of ponds running through the centre, and containing several large and small flats, either totally clear of timber or very thinly timbered. This valley is bounded on each side by slopes and ranges, some very high, but generally well-clothed with grass, and runs, gradually rising, into the Breadalbane plains country; it is a very beautiful and a very valuable estate, is adapted for, and maintains, considerable numbers of both sheep and cattle; the sheep graze on the slopes and ranges, the cattle on the flats, and at present on the lake (Walker 1838).

T.A. Murray was recognised for his good relationship with the Aboriginal population. In January 1839, at the peak time of a severe drought during which Lake George evaporated, Murray and a small party, which included two Aboriginal friends, rode into the mountains looking for fresh pastures on the high plains where he decided to set up an additional station for his starving stock in the snow country at Cooleman. It is also recorded that in 1841 Murray rode overland from his property to Melbourne, meeting many Aboriginal friends in the mountains, and had returned home within eighteen days of his departure (Wilson 1967).

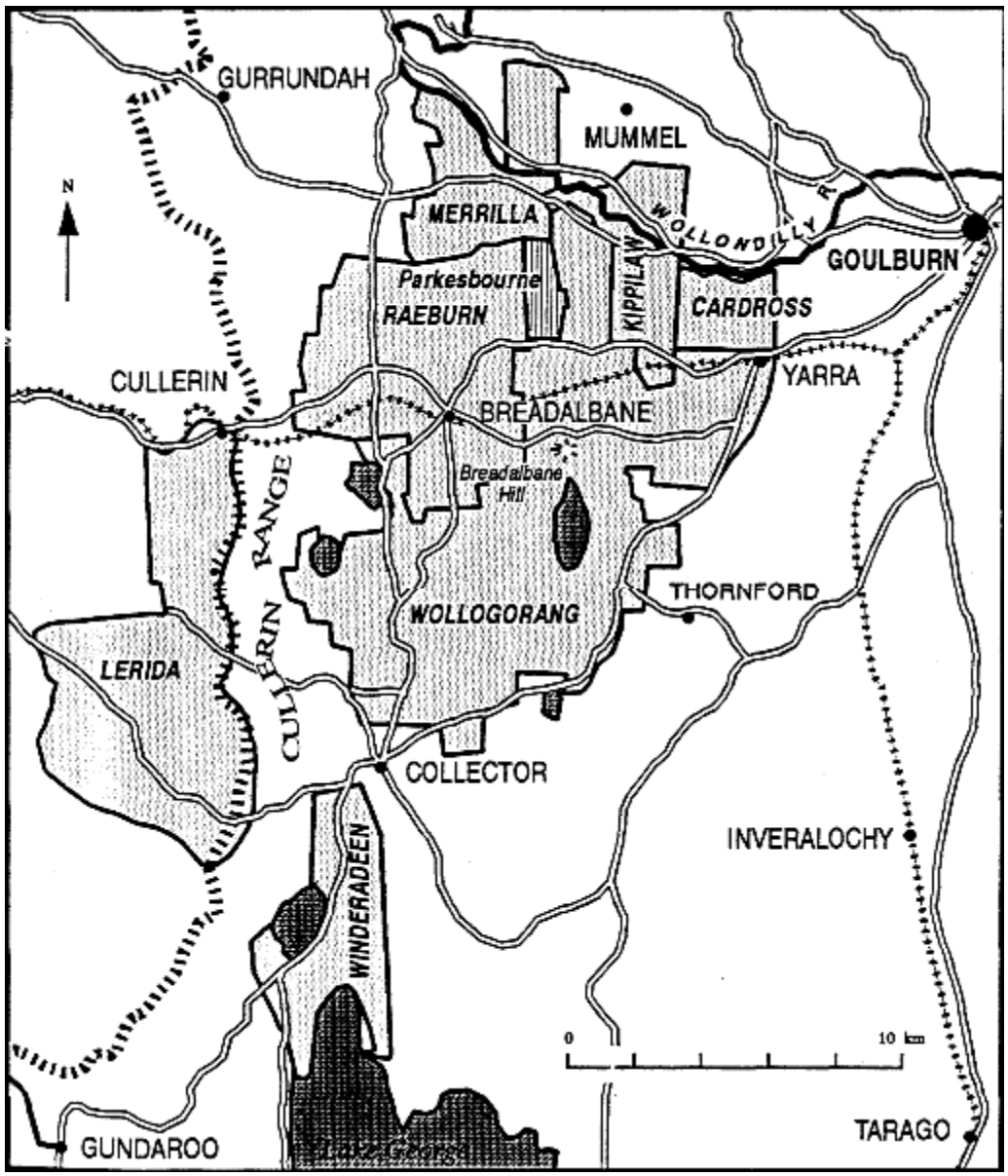


Figure 3 Map showing the Chisholm properties ca. 1898 (shaded in grey) including 'Lerida' (Griffiths 2010).

*Towns and Settlements*

By 1847 Collector had grown to have an inn, store, three hotels, several blacksmiths' shops and a tailor. By 1851 it had further expanded to become a bustling frontier town, most notably as a supply point for a wave of people who were swept up in the goldrushes that were taking place throughout the southern district. The township of Old Collector, which had sustained flood damage as the result of being located on low ground next to Collector Creek, was resurveyed in 1959 on nearby elevated ground (Tracey 2007).

The village was illuminated by oil lamps in 1850 and a wind powered mill was operating in 1859. This was the same year New Collector had been surveyed on top of a hill, away from flood danger that had previously damaged the township of Old Collector as it had been sited on lower ground next to Collector Creek (Tracey 2007).

T.A. Murray possessed sufficient property in the Collector valley to qualify for election to the Legislative Council. In 1856 he was elected unopposed to the first Legislative Assembly as representative for the combined Counties of Murray, King and Georgiana. In 1862 Murray became president of the Legislative Council and in 1869 was knighted for his services (Wilson 1967).

Between 1862 and 1867 bushranging became more prevalent in the Collector area. On 27th January, 1865, Ben Hall and his gang, including Johnny Gilbert and John Dunn, held up Kimberley's Commercial Hotel and the adjacent Wellington boot store in Collector. Constable Samuel Nelson tried to apprehend them but was shot and killed. On the following day they held up to 50 travellers along the Collector road (Wilson 1967; Tracey 2007). In the same year T.A. Murray was bankrupt and 'Winderadeen' was sold. The property changed hands to Andrew Chisholm the son of James Chisholm, a prominent pastoralist in the Goulburn district.

*Pastoralism*

It was the search for grazing land that brought the first European settlement to the Collector district. Expanding southward from the Goulburn area stockmen drove herds of cattle and sheep for their landowners and established themselves on the open plains, where rainfall was good and there was no need for clearing the land.

James Chisholm, who with his wife Elizabeth had arrived in the Goulburn district in the early 1830s, began amassing a large pastoral holding, including the 'Meia' property and 'Kippilaw', and 'Raeburn' on the Breadalbane Plain. The present day 'Lerida' holding, which in its current configuration of 10,000 acres comprises the greatest part of the proposal area, would have been taken up as grazing land at much the same time as the surrounding area in the early 1820s. Thereafter James Chisholm acquired the station property of 'Lerida' which at that time encompassed some 11,700 acres, extending from the eastern slopes of the Cullerin Range south to the outskirts of the Collector township (Figure 4). The property's residence was located to the north, on the top of the Cullerin Range. James and Elizabeth Chisholm had nine sons one of whom, Arthur Chisholm, later took over the running of 'Lerida' (Griffiths 2010; Southern Tablelands Regional Library 2008).

8.3 Previously Recorded Heritage Items

Searches have been conducted for previous heritage listings in and around study area; these searches have included all of the relevant heritage registers for items of local through to world significance. Details of these searches are provided below.

*Australian Heritage Database*

This database contains information about more than 20 000 natural, historic and Indigenous places. The database includes places in:

- the World Heritage List
- the National Heritage List
- the Commonwealth Heritage list
- the Register of the National Estate

and places under consideration for any one of these lists.

A search of this database (28th September 2010) revealed that there are no items listed on the Register of the National Estate as being in the proposal area.

*State Heritage Inventory*

The *NSW heritage databases* contain over 20,000 statutorily-listed heritage items in New South Wales. This includes items protected by heritage schedules to local environmental plans (LEPs), regional environmental plans (REPs) or by the State Heritage Register.

The information is supplied by local councils and State agencies and includes basic identification details and listing information. Consequently listings should be confirmed with the responsible agency.

A search of this database (28th September 2010) revealed that there are five items that are listed as being present in the local Collector area, four of which are in Collector township and also on the local LEP schedule. An additional site is a stone lined channel outlet at Murrays Lagoon on the Federal Highway; this item is listed under s170 of the Heritage Act. All items are outside the proposal area.

8.4 Historical Themes

A historical theme is a way of describing a major historical event or process that has contributed to the history of NSW. Historical themes provide the background context within which the heritage significance of an item can be understood. Themes have been developed at National and State levels, but corresponding regional and local themes can also be developed to reflect a more relevant historical context for particular areas or items.

A summary of themes that are potentially applicable to the study area are listed in the table below.

Table 5 National, state and local historical themes applicable to the study area and surrounds.

| Australian Theme | NSW Theme | Local Theme |
|---|---|---|
| Peopling Australia | Aboriginal cultures and interactions with other cultures | Day-to-day life |
| | | Mythological and ceremonial |
| | | Natural resources |
| | | Contact period |
| Developing local, regional and national economies | Agriculture | Fencing |
| | | Sheds |
| | | Pasture |
| | | Water provision |
| | | Farmsteads |
| | | Shearing |
| | | Machinery |
| | Commerce | Banking |
| | | Trade routes |
| | | Shops |
| | | Inns |
| | Communication | Postal services |
| | | Telephone and telegraph services |
| | | Newspapers |
| | | Transport networks |
| | Environment – cultural landscape | Tree plantings |
| | | Picnic areas |
| | | Fishing spots |
| | Events | Floods |
| | Exploration | Camp sites |
| | | Exploration routes |
| | | Water sources |
| | Industry | Mills |
| | | Shearing sheds |
| | | Workshops |
| | | Transport networks |
| | | Mines |
| | | Quarries |
| | | Lime kilns |
| | | Miners' camps |
| | | Processing plants |
| | Pastoralism | Pastoral homesteads |
| | | Sheds and yards |
| | | Travelling stock reserves |

| Australian Theme | NSW Theme | Local Theme |
|---|---|---|
| | | Fencing and boundaries |
| | | Pastoral workers' camps |
| | | Water sources |
| | Technology | Communication networks |
| | Transport | Railways |
| | | Early roads |
| | | Private tracks |
| | | Coaches and teamsters |
| | | Bridges |
| Building settlements, towns and cities | Towns, suburbs and villages | Town plan |
| | | Neighbourhoods |
| | Land tenure | Fencing and other boundary markers |
| | Utilities | Water distribution |
| | | Garbage disposal |
| | | Sewage/septic systems |
| | | Provision of electricity |
| | | Bridges |
| | | Culverts |
| | Accommodation | Inns and hostels |
| | | Domestic residences |
| | | Temporary encampments |
| | | Homesteads |
| | | Humpies |
| Developing Australia's cultural life | Domestic life | Domestic artefact scatters |
| | | Residences |
| | | Food preparation |
| | | Gardens |
| | | Domesticated animals |
| | Leisure | Show grounds |
| | | Picnic/camping areas |
| | | Racecourse |
| | | Scenic lookouts |
| | | Town halls |
| | | Tourism |
| | Religion | Churches |
| | Social institutions | Public hall |
| | | Social groups/associations |
| | Sport | Sports grounds |
| | | Sports teams |
| Marking the phases of life | Birth and death | Graves |
| | Persons | Individual monuments |
| | | Significant individuals/families |
| | | Place names |

## 8.5 Predictive Statement

While the table above lists a wide variety of themes that are important contextually to the history and heritage of the Collector proposal area, the theme of direct relevance to this project is Agriculture/pastoralism. The land in and around the study area has been used by Europeans for agricultural purposes for over 180 years. Sheep grazing has been the primary industry during that period however cattle grazing has also contributed to the local economy. There is potential for items associated with the theme of pastoralism to be present in the study area. Potential heritage item types are likely to include, but not be limited to, stock yards, fences, plough-lands, dams, roads and tree plantings. There is also some potential for domestic buildings to be present. These items may be present as extant/standing features or ephemeral remnants. In either case such items may have archaeological research potential and historical/social significance. The location of such features is difficult to predict, although it might be expected that the potential

will increase in and around existing homestead complexes, and along property boundaries and drainage lines. It should be noted that while there is the potential for such items to occur this does not necessarily indicate that any items which may be present will be of sufficient significance to warrant heritage listing.

*The Australian Bicentennial National Trail (BNT)*

It is noted here that the Australian Bicentennial National Trail (BNT) extends through the proposal area (Lerida Road). This trail is not listed on either the Australian Heritage Database or the State Heritage Inventory. The Bicentennial National Trail is the longest marked, non-motorised, self-reliant multi-use trekking route in the world, stretching 5,330 kilometres from Cooktown in tropical North Queensland, to Healesville in Victoria. Following the inspiration of the R. M. Williams, the BNT follows historic coach and stock routes, old pack horse trails, and country roads. The Trail has been designed to be a "living history" of our country, following the routes of early pioneers and highlighting historic sites and artifacts along the way. As a multi-purpose trail it was officially launched as the Bicentennial National Trail. The BNT is run from a mobile office, currently in Oberon NSW. The emphasis now is about securing the route of the Trail and ensuring the Trail remains open and available to trekkers. In 1999 the NSW government recognised the significance of the Trail, and established a Coordinator to work with the government agencies and the community in NSW to develop and incorporate access agreements (The Bicentennial National Trail 2010).

The BNT was raised as a concern relating to access, safety impacts on horses and riders and loss of visual and historic amenity (among other things) in submissions relating to the then proposed Cullerin Wind Farm project. The proponents response to these concerns, in particularly those relating to historic amenity, emphasised that, unlike many areas that are traversed by the BNT, at Lerida Road, the trail crosses largely cleared agricultural lands with heritage values but that the Wind Farm proposal was not incongruous with the production based economy of the area and is not situated near formalised nature based recreation activities. It was noted that the close proximity of the site to existing infrastructure, including the Hume Highway and electricity easements, suggests that its placement is not inconsistent with visitor's experiences of the character of the area. For the same reasons the proposed Collector Wind Farm can be considered to have the potential to cause low levels of impact in regard to the BNT.

# 9. SURVEY RESULTS

## 9.1 Survey Coverage

The development area has been divided into 50 Survey Units. These Survey Units are described in Table 6; their location is shown in Figures 4, 5, 6 and 7.

The environmental context in which the proposed wind farm is to be situated is generally comprised of broad undulating crests, intersected predominantly by wide 1st order drainage lines with associated flats. In the immediate region higher order more reliable stream systems are located to the west at Lerida Creek, to the east at Collector Creek, to the northwest at Frankfield Creek and to the north at the various lagoons and creeklines that form upper tributaries to the Lachlan River.

The turbines and their associated roads and electrical connections are primarily located on crests of varying widths. The crests are aligned generally in a north-south orientation. Those to the south of the study area are situated on a granitic geology with areas of exposed cobbles and boulders, while crests to the north are underlain by metasedimentary geology which outcrops sporadically, generally as low exposures. To the east of the study area the landforms drop away steeply towards Collector Creek. Similarly the north-western area falls away towards Sandy Creek.

The current and historical landuse for the study area is sheep and cattle grazing. Throughout the study area, there are patches of scattered and isolated trees. At the time of field survey, after a period of above average rainfall, most areas had a reasonable to thick cover of pasture grasses and clover, as well as tussock, many areas of capeweed (*Arctotheca calendula*) and minor areas of thistle. Some areas have been recently cultivated and the western section of Survey Unit 35 was sown to oats. Much of the remaining area is likely to have been cultivated in the past. Prior to European occupation the area would have been open woodland and subsequently substantial tree clearance has occurred.

The site possesses evidence of active sheet wash and wind erosion on crests and hillslopes, and ground surfaces are disturbed as a result of a long history of grazing. Many areas within drainage depressions showed evidence of moderate to severe ongoing erosion and are deeply scoured. Soils are silty loams.

The proposed impact areas are assessed to be generally of low archaeological potential and sensitivity. The landforms present are predominantly large exposed broad amorphous features with low biodiversity values and an absence of reliable potable water. These landforms are likely to have been utilised by Aboriginal people on occasional and a generally limited basis for activities such as hunting and gathering forays and travel through country. Such activities are likely to have resulted in the discard of isolated and discrete clusters of stone artefacts in low densities only.

Table 6 Survey Unit descriptions.

| SU | Proposed Impacts | Landform | Environmental context | Slope | Aspect | Geology | Abundance Rock | Quartz Back-ground | Soil | Deposit Potential | Geomor-phology | Agents | Disturbance Levels | Predicted Artefact Density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SU1 (Plate 1) | Turbines, road and circuit | Crest; (c. 150m wide); gently undulating | Low biodiversity; scattered trees; broad amorphous landform; 1.4 km from reliable water at Lerida Ck | Very gentle | Open | Granite | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind; mechanical (track) | Low/ moderate | Very low |
| SU2 (Plate 2) | Formally: Road and circuit Now: nil | Simple slope | Low biodiversity; broad amorphous landform; 1.8 km from reliable water at Lerida Ck | Very gentle | S | Granite | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind; mechanical (track) | Low | Very low |
| SU3 | Formally: Circuit Now: nil | Drainage depression (ephemeral)/ Flat | Low biodiversity; 1.8 km from reliable water at Lerida Ck | Level | E | Granite | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; mechanical (track) | Low/ moderate | Very low |
| SU4 (Plate 3) | Turbine, road and circuit | Simple slope | Low biodiversity; slightly elevated landform abutting an ephemeral drainage depression | Gentle | N | Granite | Very slightly rocky | Moderate | Silty loam | Yes | Eroded | Precipitation; wind; mechanical (track) | Low | Very low/ low |
| SU5 | Turbine, road and circuit | Crest; (c. 250m wide) | Low biodiversity; scattered trees; 1.4 km from reliable water at Lerida Ck | Very gentle | Open | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind; mechanical (track) | Low/ moderate | Very low |
| SU6 | Road Circuit | Simple slope | Low biodiversity; scattered trees; 1.3 km from reliable water at Lerida Ck | Very gentle | N | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind; mechanical (track) | Low | Very low |
| SU7 (Plate 4) | Turbines, road and circuit | Crest (c. 400m wide); | Low biodiversity; 1.2 km from reliable water at Lerida Ck | Very gentle | Open | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU8 | Turbines, road and circuit | Simple slope | Low biodiversity; broad amorphous landform; 1.5 km from reliable water at Lerida Ck | Gentle | S | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU9 | Turbines, road and circuit | Crest; (c. 700m wide); gently undulating | Low biodiversity; broad amorphous landform; 1.5 km from reliable water at Lerida Ck | Gentle | Open | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |

| SU | Proposed Impacts | Landform | Environmental context | Slope | Aspect | Geology | Abundance Rock | Quartz Back-ground | Soil | Deposit Potential | Geomor-phology | Agents | Disturbance Levels | Predicted Artefact Density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SU10 (Plate 5) | Formally: Road and circuit Now: nil | Lower slope | Low biodiversity; broad amorphous landform; 1.5 km from reliable water at Lerida Ck | Gentle | NE | Granite | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; mechanical (track) | Low/ moderate | Very low |
| SU11 | Road | Simple slope | Low biodiversity; broad amorphous landform; 2.2 km from reliable water at Lerida Ck | Gentle | E-NE | Granite | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU12 | Turbines, road and circuit | Simple slope | Low biodiversity; broad amorphous landform; 2 km from reliable water at Lerida Ck | Very gentle | W | Granite | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU13 | Turbines road and circuit | Crest (c. 250m wide) | Low biodiversity; broad amorphous landform; 2.2 km from reliable water at Lerida Ck | Very gentle | Open | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU14 | Turbines, road and circuit | Crest (c. 150m wide) | Low biodiversity; scattered trees; 2.2 km from reliable water at Lerida Ck | Very gentle | Open | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU15 | Circuit | Simple slope | Low biodiversity; scattered trees; 3.5 km from reliable water at Lerida Ck | Very gentle | E | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU16 | Circuit | Lower slope | Low biodiversity; scattered trees; 3.5 km from reliable water at Lerida Ck | Very gentle | E | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low/ low |
| SU17 (Plate 6) | Circuit | Drainage depression (ephemeral) | Low biodiversity; scattered trees; 4 km from reliable water at Lerida Ck | Level | NE | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Moderate | Very low/ low |
| SU18 | Circuit | Crest - minor (c. 800m wide) | Low biodiversity; broad amorphous landform; scattered trees | Very gentle | Open | Meta-sedimentary | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low/ low |
| SU19 (Plate 7) | Circuit | Drainage depression (ephemeral)/ Flat | Low biodiversity; scattered trees | Level | NE | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low/ low |
| SU20 | Turbines, | Crest; (c. 800m | Low biodiversity; | Gentle | Open | Meta- | Very | Low | Silty | Yes | Eroded | Precipitation; | Low/ | Very low/ |

| SU | Proposed Impacts | Landform | Environmental context | Slope | Aspect | Geology | Abundance Rock | Quartz Back-ground | Soil | Deposit Potential | Geomor-phology | Agents | Disturbance Levels | Predicted Artefact Density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Plate 8) | road and circuit | wide); gently undulating | scattered trees; 1.5 km from reliable water at Collector Ck | | | sedimentary | slightly rocky | | loam | | | wind | moderate | low |
| SU21 (Plate 9) | Road | Drainage depression (ephemeral)/ flat | Low biodiversity; scattered trees | Level | NE | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Moderate | Very low/ low |
| SU22 | Formally: Turbine, road and circuit Now: nil | Simple slope | Low biodiversity; scattered trees; 4.3 km from reliable water at Collector Ck | Gentle | N | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Moderate | Very low |
| SU23 | Formally: Turbine, road and circuit Now: nil | Crest (c. 150m wide) | Low biodiversity; scattered trees; 2.1 km from reliable water at Collector Ck | Gentle | Open | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Moderate | Very low |
| SU24 | Turbine, road and circuit | Crest (c. 700m wide); gently undulating | Low biodiversity; broad amorphous landform; scattered trees; 3.2 km from reliable water at Lerida Ck | Gentle | Open | Granite and meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU25 | Formally: Circuit Now: nil | Drainage depression (ephemeral)/ flat | Low biodiversity | Very gentle | E | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU26 | Turbines, road and circuit | Crest (c. 750m wide); gently undulating | Low biodiversity; broad amorphous landform; scattered trees; 0.9 km from reliable water at Lerida Ck | Gentle | Open | Meta-sedimentary | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU27 (Plate 10) | Turbines, road and circuit | Crest (c. 500m wide); gently undulating | Low biodiversity; broad amorphous landform; scattered trees; 2.9 km from reliable water at Lerida Ck | Gentle | Open | Granite and meta-sedimentary | Very slightly rocky | High | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU28 (Plate 11) | Road and circuit | Drainage depression (ephemeral)/ flat | Low biodiversity; scattered trees | Very gentle | Open | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Moderate | Very low/low |

| SU | Proposed Impacts | Landform | Environmental context | Slope | Aspect | Geology | Abundance Rock | Quartz Back-ground | Soil | Deposit Potential | Geomor-phology | Agents | Disturbance Levels | Predicted Artefact Density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SU29 | Road and circuit | Simple slope | Low biodiversity; scattered trees; 2.7 km from reliable water at Lerida Ck | Gentle | E | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Moderate | Very low/low |
| SU30 | Turbines, road and circuit | Crest (c. 300m wide); gently undulating | Low biodiversity; broad amorphous landform; scattered trees; 2 km from reliable water at Lerida Ck | Gentle | Open | Meta-sedimentary | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU31 | Road and circuit | Drainage depression (deeply incised) | Low biodiversity; scattered trees; 2 km from reliable water at Lerida Ck | Gentle | NW | Meta-sedimentary | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation | Low/ moderate | Very low |
| SU32 | Circuit | Drainage depression (ephemeral)/ flat | Low biodiversity; scattered trees | Very gentle | NE | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Moderate | Very low |
| SU33 (Plate 12) | Turbines, road and circuit | Crest (c. 700m wide); gently undulating | Low biodiversity; broad amorphous landform; scattered trees; 1 km from reliable water at Lerida Ck | Gentle | Open | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation | Low/ moderate | Very low |
| SU34 | Turbines, road and circuit | Simple slope | Low biodiversity; broad amorphous landform; scattered trees; 3.9 km from reliable water at Lerida Ck | Gentle | NE | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation | Low/ moderate | Very low |
| SU35 (Plate 13) | Turbines, road and circuit | Crest (c. 650m wide); gently undulating | Low biodiversity; broad amorphous landform; scattered trees; 2.5 km from reliable water at Lerida Ck | Gentle | Open | Meta-sedimentary | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU36 | Road | Lower slope | Low biodiversity; scattered trees; 2.7 km from reliable water at Lerida Ck | Gentle | Open | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; | Low/ moderate | Very low |
| SU37 | Turbines, road and circuit | Crest (150 - 500m wide); gently undulating | Low biodiversity; scattered trees; 2.3 km from reliable water at Collector Ck | Gentle | Open | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |

| SU | Proposed Impacts | Landform | Environmental context | Slope | Aspect | Geology | Abundance Rock | Quartz Back-ground | Soil | Deposit Potential | Geomor-phology | Agents | Disturbance Levels | Predicted Artefact Density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SU38 | Circuit | Drainage depression (deeply incised) | Low biodiversity; scattered trees | Very gentle | E | Meta-sedimentary | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation | Low/ moderate | Very low |
| SU39 | Turbines, road and circuit | Simple slope | Low biodiversity; broad amorphous landform; scattered trees; 3.2 km from reliable water at Lerida Ck | Gentle | N | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU40 (Plate 14) | Turbines, road and circuit | Crest (c. 400m wide); gently undulating | Low biodiversity; broad amorphous landform; scattered trees; 3.3 km from reliable water at Lerida Ck | Gentle | Open | Granite | Slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU41 | Circuit | Drainage depression (deeply incised) | Low biodiversity; scattered trees | Very gentle | N | Granite | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU42 | Circuit | Crest (minor) | Low biodiversity; elevated landform abutting an ephemeral drainage depression | Very gentle | Open | Granite | Very slightly rocky | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low | Very low/low |
| SU43 | Circuit | Drainage depression (deeply incised) /flat | Low biodiversity; scattered trees | Very gentle | E | Granite | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation | Low/ moderate | Very low |
| SU44 | Circuit | Lower slope | Low biodiversity | Gentle | S | Granite | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low/low |
| SU45 (Plate 15) | Turbines, road and circuit | Crest (c. 200m wide); gently undulating | Low biodiversity; scattered trees; 2.2 km from reliable water at Sandy Ck | Gentle/ moderate | Open | Meta-sedimentary | Slightly rocky | High | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU46 | Road and circuit | Simple slope | Low biodiversity; regrowth trees; 2.1 km from reliable water at Sandy Ck | Moderate | S | Meta-sedimentary | Very slightly rocky | High | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU47 | Circuit | Simple slope | Low biodiversity; regrowth trees; 1.5 km from reliable water at Sandy Ck | Gentle/ moderate | NW | Meta-sedimentary | No rock outcrop | High | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU48 | Circuit | Drainage depression | Low biodiversity; scattered trees | Very gentle | W | Meta-sedimentary | No rock outcrop | Low | Silty loam | Yes | Eroded | Precipitation | Low/ moderate | Very low |

| SU | Proposed Impacts | Landform | Environmental context | Slope | Aspect | Geology | Abundance Rock | Quartz Back-ground | Soil | Deposit Potential | Geomor-phology | Agents | Disturbance Levels | Predicted Artefact Density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (deeply incised) | | | | | | | | | | | | |
| SU49 | Circuit | Simple slope | Low biodiversity; regrowth trees; 1.8 km from reliable water at Sandy Ck | Moderate | W | Meta-sedimentary | Rocky | High | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |
| SU50 (Plate 16) | Formally: Substation and circuit; Now nil | Lower slope | Low biodiversity; sparse regrowth trees | Very gentle/ gentle | W | Meta-sedimentary | Very slightly rocky | Moderate | Silty loam | Yes | Eroded | Precipitation; wind | Low/ moderate | Very low |

Plate 1 SU1 looking east.

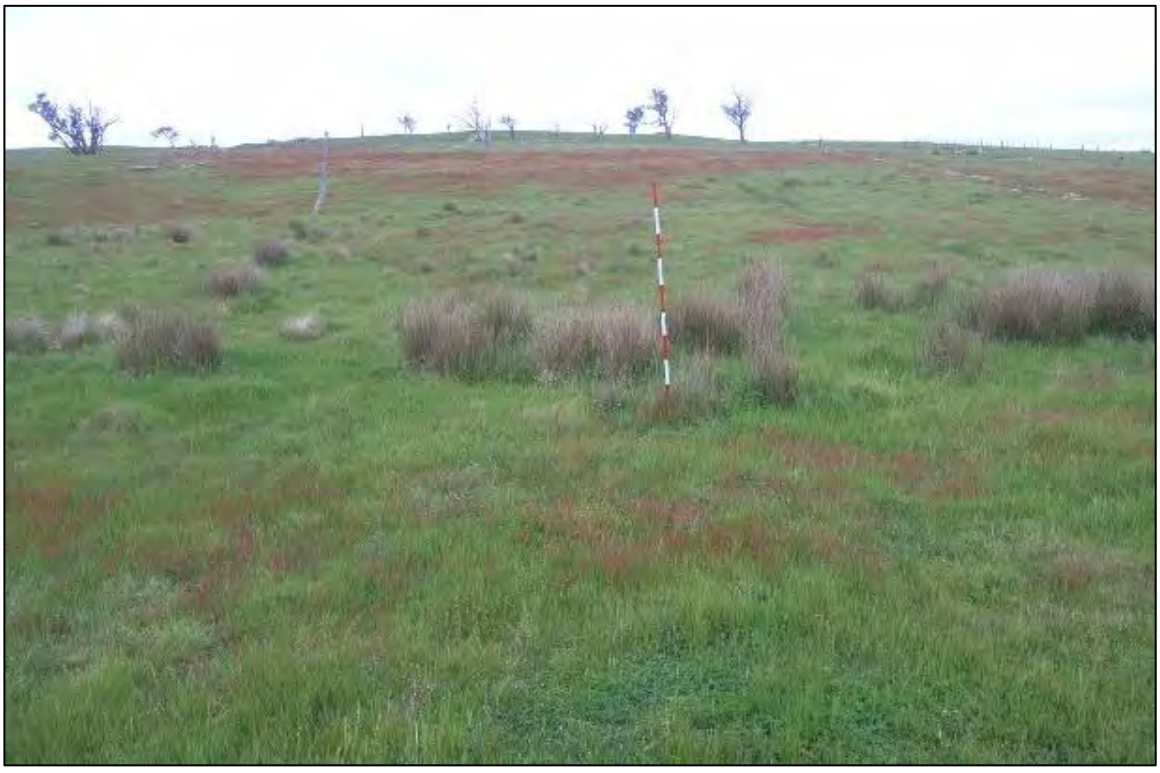

Plate 2 SU2 looking north.

Plate 3 SU4 looking south.

Plate 4 SU7, turbine # 40 site, looking northeast.

Plate 5 SU10 looking south.

Plate 6 SU17 looking east.

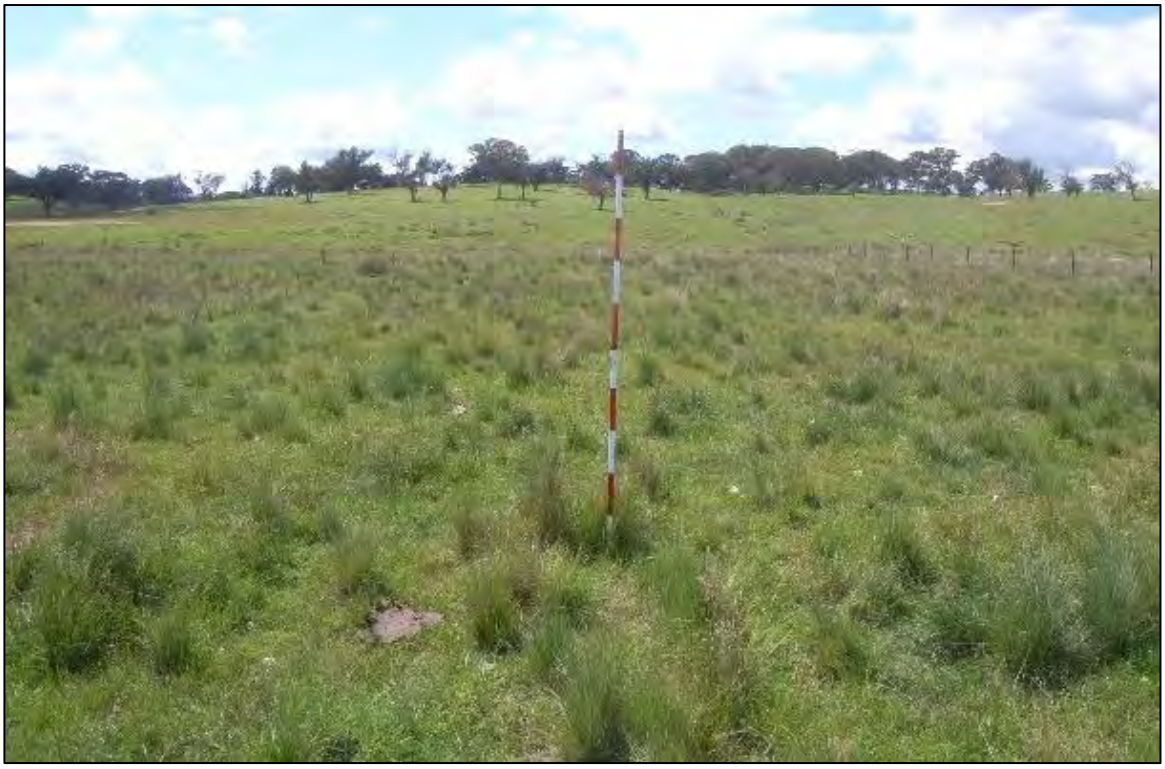

Plate 7 SU19 looking east.

Plate 8 SU20, turbine # 70 site, looking southwest.

Plate 9 SU21, looking south.

Plate 10 SU27, turbine # 30 site, looking east.

Plate 11 SU28, turbine # 19 site, looking north.

Plate 12 SU33, turbine # 33 site, looking southeast.

Plate 13 SU35, turbine # 44 site, looking north.

Plate 14 SU40, turbine # 57 site, looking north.

Plate 15 SU45, turbine # 4 site, looking north. Note Cullerin Wind Farm in the distance.

Plate 16 SU50 looking north.

*Survey Coverage*

The survey entailed walking linear transects which measured approximately 100 metres in width. The development area surveyed during this assessment measured approximately 484 hectares in area (Table 7). It is estimated that approximately 298 hectares of that area was subject to direct survey inspection. Ground exposures inspected are estimated to have been 4.3 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 1.48 hectares. Effective Survey Coverage is therefore calculated to have been 0.31% of the survey area.

Table 7 Survey Coverage Data.

| SU | SU Area sq m | Area Inspected % | Area Inspected sq m | Ground Exposure % | Ground Exposure sq m | Visibility % | Net Effective Exposure sq m | Effective Survey Coverage % |
|---|---|---|---|---|---|---|---|---|
| SU1 | 184200 | 60 | 110520 | 2 | 2210.4 | 30 | 663.12 | 0.36 |
| SU2 | 13200 | 70 | 9240 | 1.5 | 138.6 | 20 | 27.72 | 0.21 |
| SU3 | 10000 | 65 | 6500 | 1 | 65 | 20 | 13 | 0.13 |
| SU4 | 104700 | 60 | 62820 | 4 | 2512.8 | 40 | 1005.12 | 0.96 |
| SU5 | 20600 | 70 | 14420 | 2 | 288.4 | 30 | 86.52 | 0.42 |
| SU6 | 63700 | 60 | 38220 | 0.5 | 191.1 | 40 | 76.44 | 0.12 |
| SU7 | 82900 | 60 | 49740 | 0.5 | 248.7 | 30 | 74.61 | 0.09 |
| SU8 | 49500 | 60 | 29700 | 0.5 | 148.5 | 30 | 44.55 | 0.09 |
| SU9 | 186200 | 60 | 111720 | 0.5 | 558.6 | 30 | 167.58 | 0.09 |
| SU10 | 24800 | 70 | 17360 | 1.5 | 260.4 | 45 | 117.18 | 0.4725 |
| SU11 | 68400 | 60 | 41040 | 1 | 410.4 | 35 | 143.64 | 0.21 |
| SU12 | 46000 | 70 | 32200 | 0.5 | 161 | 30 | 48.3 | 0.105 |
| SU13 | 104500 | 70 | 73150 | 0.5 | 365.75 | 20 | 73.15 | 0.07 |
| SU14 | 41400 | 60 | 24840 | 0.5 | 124.2 | 40 | 49.68 | 0.12 |
| SU15 | 23100 | 60 | 13860 | 0 | 0 | 0 | 0 | 0 |
| SU16 | 36300 | 60 | 21780 | 0.5 | 108.9 | 25 | 27.225 | 0.075 |
| SU17 | 9700 | 70 | 6790 | 15 | 1018.5 | 50 | 509.25 | 5.25 |
| SU18 | 60000 | 60 | 36000 | 1 | 360 | 20 | 72 | 0.12 |
| SU19 | 36400 | 60 | 21840 | 0.5 | 109.2 | 45 | 49.14 | 0.135 |
| SU20 | 379300 | 60 | 227580 | 0.5 | 1137.9 | 20 | 227.58 | 0.06 |
| SU21 | 176000 | 65 | 114400 | 0.5 | 572 | 20 | 114.4 | 0.065 |
| SU22 | 40300 | 70 | 28210 | 7 | 1974.7 | 55 | 1086.085 | 2.695 |
| SU23 | 42700 | 70 | 29890 | 1 | 298.9 | 30 | 89.67 | 0.21 |
| SU24 | 116100 | 60 | 69660 | 0 | 0 | 0 | 0 | 0 |
| SU25 | 9800 | 75 | 7350 | 0 | 0 | 0 | 0 | 0 |
| SU26 | 197500 | 70 | 138250 | 0.2 | 276.5 | 30 | 82.95 | 0.042 |
| SU27 | 511300 | 60 | 306780 | 0.5 | 1533.9 | 40 | 613.56 | 0.12 |
| SU28 | 356900 | 50 | 178450 | 0.5 | 892.25 | 30 | 267.675 | 0.075 |
| SU29 | 251500 | 70 | 176050 | 2 | 3521 | 60 | 2112.6 | 0.84 |
| SU30 | 133500 | 60 | 80100 | 1 | 801 | 75 | 600.75 | 0.45 |
| SU31 | 7000 | 75 | 5250 | 0 | 0 | 0 | 0 | 0 |
| SU32 | 116600 | 60 | 69960 | 0 | 0 | 0 | 0 | 0 |
| SU33 | 237500 | 60 | 142500 | 0.5 | 712.5 | 30 | 213.75 | 0.09 |
| SU34 | 39000 | 60 | 23400 | 10 | 2340 | 20 | 468 | 1.2 |
| SU35 | 223700 | 60 | 134220 | 2 | 2684.4 | 30 | 805.32 | 0.36 |
| SU36 | 39300 | 60 | 23580 | 0.5 | 117.9 | 30 | 35.37 | 0.09 |
| SU37 | 159400 | 60 | 95640 | 1 | 956.4 | 35 | 334.74 | 0.21 |
| SU38 | 11800 | 70 | 8260 | 4 | 330.4 | 30 | 99.12 | 0.84 |
| SU39 | 34200 | 60 | 20520 | 0 | 0 | 0 | 0 | 0 |
| SU40 | 76100 | 60 | 45660 | 0 | 0 | 0 | 0 | 0 |
| SU41 | 26100 | 60 | 15660 | 10 | 1566 | 50 | 783 | 3 |
| SU42 | 24900 | 70 | 17430 | 0.3 | 52.29 | 40 | 20.916 | 0.084 |
| SU43 | 13800 | 60 | 8280 | 15 | 1242 | 45 | 558.9 | 4.05 |
| SU44 | 38700 | 60 | 23220 | 0.1 | 23.22 | 50 | 11.61 | 0.03 |
| SU45 | 167200 | 70 | 117040 | 2 | 2340.8 | 40 | 936.32 | 0.56 |

| SU | SU Area sq m | Area Inspected % | Area Inspected sq m | Ground Exposure % | Ground Exposure sq m | Visibility % | Net Effective Exposure sq m | Effective Survey Coverage % |
|---|---|---|---|---|---|---|---|---|
| SU46 | 16300 | 70 | 11410 | 5 | 570.5 | 25 | 142.625 | 0.875 |
| SU47 | 34300 | 60 | 20580 | 0.5 | 102.9 | 40 | 41.16 | 0.12 |
| SU48 | 4700 | 60 | 2820 | 5 | 141 | 30 | 42.3 | 0.9 |
| SU49 | 104800 | 60 | 62880 | 15 | 9432 | 20 | 1886.4 | 1.8 |
| SU50 | 84700 | 60 | 50820 | 0.1 | 50.82 | 25 | 12.705 | 0.015 |
| **Total** | **4840600** | | **2977590** | | **42952** | | **14836** | **0.31** |

The effective survey coverage is assessed to be low and is a factor of high levels of grass cover encountered during the survey. Given the low effective survey coverage the ability to detect Aboriginal objects on and in ground surfaces was correspondingly low. Accordingly the assessment of the archaeological status and sensitivity of the proposal area is necessarily dependent on the predictive model relating to Aboriginal landuse of the area and the predicted nature of artefact density such occupation is likely to have produced.

A summary of landforms sampled and results is presented in Table 8. The majority of artefacts were recorded on crests (in 4 locales) and no artefacts were recorded in lower slopes, drainage depressions and drainage depression/flat landforms. Given the very low effective survey coverage the summary data listed in Table 8 is problematic in regard to an interpretation of the results. Both crests and lower slopes, drainage depression and drainage depressions/flat landform contained equally low exposure and visibility; the results may therefore be inferred to indicate that elevated crests do actually contain more artefacts than lower landforms.

Table 8 Landform summary.

| Landform | Landform area ha | Area effectively surveyed ha | Effective survey coverage % | No. sites | No. artefacts |
|---|---|---|---|---|---|
| Crest | 294.9 | 0.5 | 0.17 | 4 | 22 |
| Simple slope | 84.3 | 0.7 | 0.83 | 1 | 4 |
| Lower slope | 26.98 | 0.0025 | 0.09 | 0 | 0 |
| Drainage depression | 4.96 | 0.0092 | 1.8 | 0 | 0 |
| Drainage depression/flat | 72.92 | 0.15 | 0.2 | 0 | 0 |

9.2 Survey Results - Indigenous

The five Aboriginal object locales recorded during the survey are described below. They are listed in Table 9 and their location is shown in Figures 5, 6, 7 and 8. The recorded stone artefacts are described in Table 10.

Table 9 Table of findings.

| Site Identifier | Feature | Survey Unit | Landform |
|---|---|---|---|
| SU29/Locale 1 | 4 stone artefacts | Survey Unit 29 | Simple slope |
| SU37/Locale 1 | 1 stone artefact | Survey Unit 37 | Crest |
| SU37/Locale 2 | 1 stone artefact | Survey Unit 37 | Crest |
| SU42/Locale 1 | 2 stone artefacts | Survey Unit 42 | Crest |
| SU45/Locale 1 | 18 stone artefacts | Survey Unit 45 | Crest |

*Survey Unit 29/Locale 1* 718051e 6141254n GDA

Four stone artefacts were recorded in the lower eastern portion of Survey Unit 29, which is a simple slope with easterly aspect and gentle gradient (Plate 17). The artefacts were located in an eroding exposure formed from vehicle wheels and stock tracks.

The artefacts were recorded within an exposure measuring approximately 30 x 3 metres. Ground exposure in this location is calculated to have been 80%, with archaeological visibility estimated at 70% within that area. Ground surface visibility surrounding the area of exposure is negligible. There is a potential for additional artefacts to occur at this locale. However it is predicted that artefact densities are likely to be very low/low in this landform.

No impacts are proposed for this location.

Plate 17 SU29/L1 looking southwest.

*Survey Unit 37/Locale 1* 719787e 6137022n GDA

One stone artefact was recorded in this locale in Survey Unit 37, in a gently sloping area with north-easterly aspect and very gentle gradient on an undulating crest (Plate 18). The artefact was located in an eroding exposure comprised of bare earth patches and animal tracks.

The artefact was recorded within an overall exposure measuring approximately 10 x 5 metres. Ground exposure in this location is calculated to have been 60%, with archaeological visibility estimated at 60% within that area. Ground surface visibility surrounding the area of exposure is estimated to be 15% with 20% archaeological visibility. There is potential for additional artefacts to occur at this locale. It is predicted that artefact densities are likely to be very low in this landform.

This locale is situated within close proximity to the location of a proposed turbine, road and circuit.

Plate 18 SU37/L1 looking east.

*Survey Unit 37/Locale 2* 719838e 6137202n GDA

One stone artefact was recorded in this locale in Survey Unit 37, in a gently sloping area with northerly aspect and very gentle gradient on an undulating crest (Plate 19). The artefact was located in an exposure created by the mechanical grading of a water diversion mound emplaced immediately above the headwall of a heavily eroding gully.

The artefact was recorded within an overall exposure measuring approximately 45 x 8 metres. Ground exposure in this location is calculated to have been 60%, with archaeological visibility estimated at 60% within that area. Ground surface visibility surrounding the area of exposure is estimated to be 5% with 20% archaeological visibility. There is potential for additional artefacts to occur at this locale. It is predicted that artefact densities are likely to be very low in this landform.

No impacts are proposed for this locale.

Plate 19 SU37/L2 looking southeast.

*Survey Unit 42/Locale 1* 718568e 6138010n GDA

Two stone artefacts were recorded in this locale in Survey Unit 42, on the shoulder of a crest with moderate gradient and an easterly aspect (Plate 20). The locale is situated within ca. 50 metres of a first order stream located to the east. The artefact was located in an exposure created by stock tracks.

The artefacts were recorded within an overall exposure measuring approximately 15 x 1.5 metres. Ground exposure in this location is calculated to have been 80%, with archaeological visibility estimated at 60% within that area. Ground surface visibility surrounding the area of exposure is estimated to be 5% with 40% archaeological visibility. There is potential for additional artefacts to occur at this locale. It is predicted that artefact densities are likely to be very low/low in this landform.

No impacts are proposed for this locale.

*Survey Unit 45/Locale 1* 717884e 6142324n GDA

Eighteen stone artefacts were recorded in this locale in Survey Unit 45, located on an undulating ridge crest adjacent to a minor saddle on that crest. The area has a very gentle gradient and an open aspect (Plate 21). The artefacts are located in an eroding exposure formed from stock and vehicle wheels tracks.

The artefacts were recorded within an overall exposure measuring approximately 50 x 3 metres. Ground exposure in this location is calculated to have been 70%, with archaeological visibility estimated at 60% within that area. Ground surface visibility surrounding the area of exposure is estimated to be 10% with 30% archaeological visibility. All but three of the artefacts are of grey silcrete which possesses similar characteristics and were possibly created in a single knapping event. There is potential for additional artefacts to occur at this locale. The soil in this locale is eroded and very shallow so that there is a low potential for subsurface artefacts. It is predicted that artefact densities are likely to be very low/low in this landform.

This locale is located within close proximity to the location of a proposed turbine, road and circuit.

Plate 20 SU42/L1 looking northeast.

Plate 21 SU45/L1 looking northeast.

Table 10 List of stone artefacts recorded.

| Locale | Type | Dimensions | Material | Comments |
|---|---|---|---|---|
| SU29/L1 | Flake | 20 x 11 x 4 mm | Grey chert | |
| SU29/L1 | Flaked piece | 35 x 31 x 12 mm | Brown silcrete (mottled) | |
| SU29/L1 | Flake | 20 x 11 x 4 mm | Milky quartz | Hertzian |
| SU29/L1 | Medial flake portion | 15 x 14 x 5 mm | Brown silcrete | |
| SU37/L1 | Core | 37 x 30 x 11 mm | Milky quartz | Bipolar core; two negative flake scars |
| SU37/L2 | Flake | 25 x 41 x 5 mm | Brown chert | |
| SU42/L1 | Pebble fragment | 70 x 55 x 24 mm | Brown fine grain volcanic | Broken pebble fragment with usewear pitting on rounded edge over area 30 x 20 mm |
| SU42/L1 | Ground edge hatchet fragment | 19 x 27 x 4 mm | Grey fine grain volcanic | Rectangular fragment ground to a smooth surface on one side; most probably broken piece from ground edged hatchet |
| SU45/L1 | Flake | 22 x 20 x 11 mm | Grey silcrete | |
| SU45/L1 | Core | 25 x 23 x 13 mm | Grey silcrete | Three negative flake scars; 40% terrestrial cortex |
| SU45/L1 | Flake fragment | 20 x 19 x 8 mm | Grey silcrete | |
| SU45/L1 | Flake fragment | 20 x 17 x 6 mm | Grey silcrete | |
| SU45/L1 | Flake fragment | 12 x 12 x 6 mm | Grey silcrete | |
| SU45/L1 | Distal flake portion | 15 x 12 x 3 mm | Grey silcrete | |
| SU45/L1 | Proximal flake portion | 10 x 11 x 2 mm | Light grey silcrete | |
| SU45/L1 | Flake fragment | 25 x 26 x 21 mm | Grey silcrete | |
| SU45/L1 | Medial flake portion | 19 x 22 x 6 mm | Grey silcrete | |
| SU45/L1 | Flake fragment | 12 x 12 x 4 mm | Grey silcrete | |
| SU45/L1 | Flake fragment | 20 x 19 x 12 mm | Red/yellow variegated chert | |
| SU45/L1 | Flake fragment | 12 x 13 x 9 mm | Grey silcrete | |
| SU45/L1 | Flake fragment | 22 x 6 x 5 mm | Grey silcrete | |
| SU45/L1 | Flake | 17 x 14 x 3 mm | Grey silcrete | Transverse fracture |
| SU45/L1 | Flake fragment | 30 x 14 x 5 mm | Grey silcrete | |
| SU45/L1 | Flaked piece | 12 x 6 x 6 mm | Grey silcrete | |
| SU45/L1 | Proximal flake portion | 12 x 15 x 3 mm | Grey silcrete | |
| SU45/L1 | Flake fragment | 8 x 14 x 6 mm | Grey silcrete | |

In addition to the Aboriginal object locales recorded during the field survey four trees, each of which had exposed heartwood (scars), were recorded as *possible* (see DECCW 2010) Aboriginal scarred trees. It is however probable that the causes of the scarring on these trees is the result of natural processes. The trees are described below.

*SU1/Tree 1* 718144e 6138445n GDA

This tree is a eucalypt located in a sparse scattering of trees in Survey Unit 1 (Plate 22). The tree is ca. 18 m tall and possesses both a major trunk as well as a secondary side trunk. It has a main section of elongated scarring that appears to have been reasonably symmetrical in shape prior to the regrowth of the callus tissue which now partially covers the original scarred area. There is also a second minor scar at the upper right hand side of the main scar. The main scar measures 2.23 cm in length and 17 cm in width at its widest point in its centre. The callus tissue regrowth tapers to a point at both ends of the scar. The base of the scar is located 36 cm above the ground. At 1.5 metres above the ground the major trunk has a circumference of 2.72 m. There are no incision marks on the area of exposed scarring. This tree is located in an area in which a circuit is proposed. It is recommended that the circuit be designed to avoid impacts to the tree.

Plate 22 SU1/Tree 1 looking northwest.

*SU1/Tree 2* 718046e 6138387n GDA

This tree is a eucalypt located at the edge of a sparse scattering of trees in Survey Unit 1 (Plate 23). The tree is ca. 14 m tall. It has elongated scarring that appears to have been reasonably symmetrical in shape prior to the regrowth of the callus tissue which now covers most of the original scarred area. The visible scar measures 78 cm in length and 8 cm in width at its widest point. The base of the scar is located 75 cm above the ground. At 1.5 metres above the ground the tree has a circumference of 1.9 m. There are no incision marks on the area of exposed scarring. This tree is located outside proposed impacts however it is recommended that it is not inadvertently impacted during construction.

Plate 23 SU1/Tree 2 looking southwest.

*SU4/Tree 1* 717926e 6137762n GDA

This tree is an isolated eucalypt located in Survey Unit 4 (Plate 24). The tree is ca. 10 m tall and appears to be either dead or close to expiring. It has elongated scarring that appears to have been reasonably symmetrical in shape prior to the regrowth of the callus tissue which now partially covers the original scarred area. The scarring measures 175 cm in length and 11 cm in width at its widest point. The base of the scar is located 36 cm above the ground. At 1.5 metres above the ground the tree has a circumference of 1.6 m. There are no incision marks on the area of exposed scarring. This tree is located outside proposed impacts however it is recommended that it is not inadvertently impacted during construction.

Plate 24 SU4/Tree 1 looking north-east.

*SU37/Tree 1* 729174e 6101603n GDA

This tree is a eucalypt located at the edge of a sparse scattering of trees in Survey Unit 37 (Plate 25). The tree is ca. 12 m tall and has elongated scarring now substantially covered with growth callus tissue. The exposed area of scarring measures 160 cm in length and 11 cm in width at its widest point. The base of the scar is located 239 cm above the ground. At 1.5 metres above the ground the tree has a circumference of 180 cm. There are no incision marks on the area of exposed scarring. This tree is located in an area in which a road and circuit is proposed. It is recommended that the circuit and road be designed to avoid impacts to the tree.

Plate 25 SU37/Tree 1 looking north-east.

9.3 Indigenous Heritage - Discussion and Impact Assessment

It is believed that the proposal area is likely to contain stone artefacts across the majority, if not all the Survey Units defined during this study. Accordingly the five stone artefact locales which have been recorded are expected to be indicative of the archaeological status of the proposal area only, rather than a comprehensive inventory. All stone artefacts recordings are very low density distributions and any unrecorded stone artefacts, either in surveyed areas or in adjacent terrain, are likewise predicted to be present in very low or very low/low densities only.

The proposed impact areas are located in landforms and terrain which is highly amorphous and generally undifferentiated in character (the photos in this report illustrate this). During the field survey no landforms (or areas within landforms), were identified that are likely to have been environmental focal points that Aboriginal people would have habitually occupied and hence which would result in high density concentrations of artefacts. In addition biodiversity is assessed to be relatively low, and water sources are ephemeral. Accordingly Aboriginal use of this landscape is predicted to have been sparse, of low intensity, and restricted to a limited range of activities; - movement through country, hunting and gathering forays and so on. These types of activities would have resulted in artefact discard which is patchy and low density in distribution.

Accordingly it is concluded that the proposed impacts to the archaeological resource can be considered to be of low significance. It is noted that three of the five recorded Aboriginal object locales are located outside areas of proposed impacts, and in regard to the remainder, it is highly likely that avoidance of impacts is feasible by implementing a policy of 'micro-sitting'. It is also relevant to take into consideration that impacts will be discrete in nature and will occupy a relatively small foot print. The archaeological resource in the broader development envelope (those areas which lie outside actual proposed impacts) will not sustain any impacts as a result of the proposal.

The Indigenous cultural value of the landscape in general, as well as the Aboriginal objects it contains, is considerably higher than the scientific value. Both the landscape and the objects which are encompassed within it, are material testament to the lives of Indigenous people's

ancestors and the focus of their current identity, concerns and aspirations. Therefore the proposed impacts will have an impact on the cultural significance which attaches to the area.

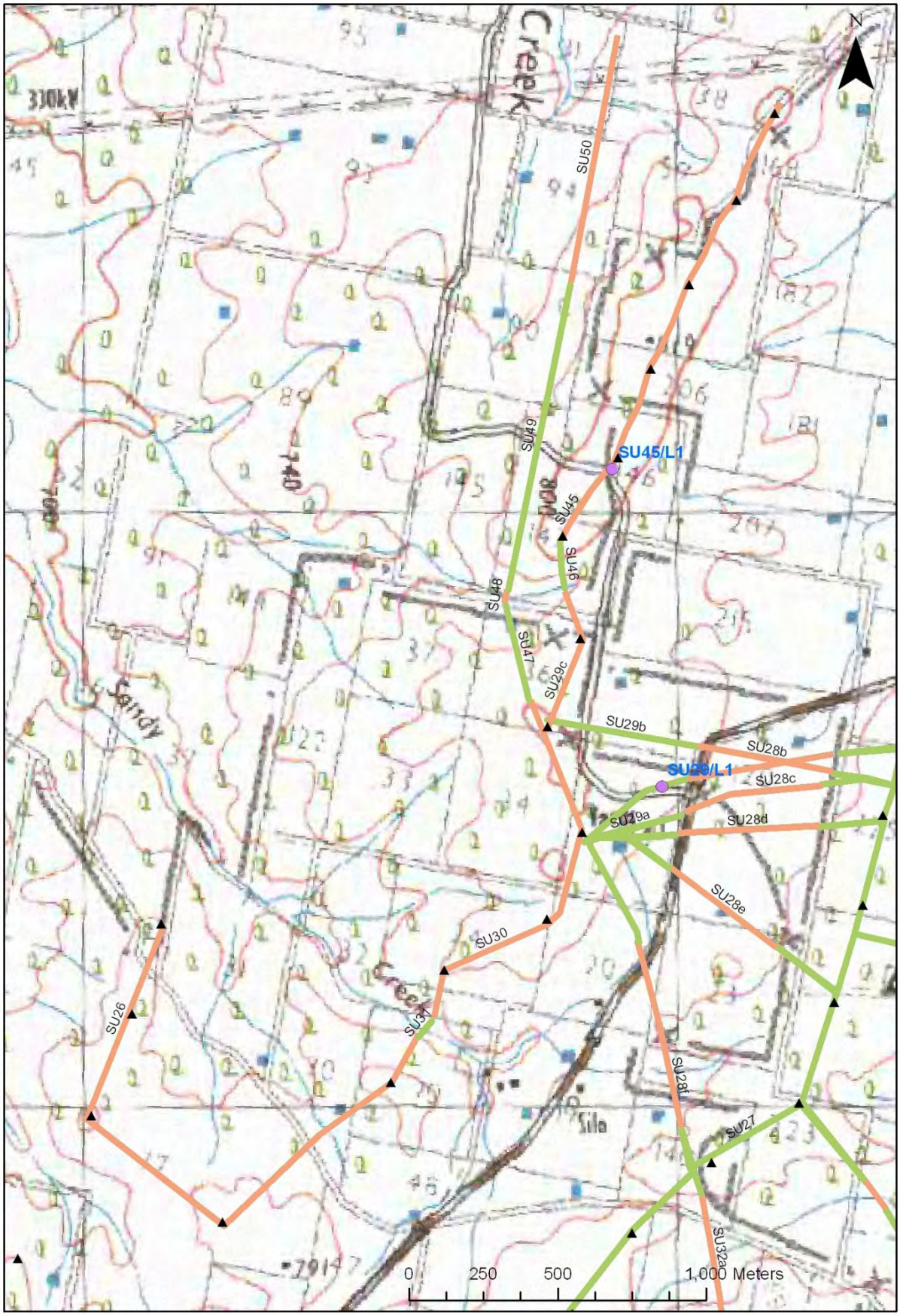

Figure 4 Location of Survey Units and Aboriginal objects recordings in northwest proposal area (Note that Survey Units measured 100 metres in width and accordingly their graphic display in this series of maps represents the centre line).

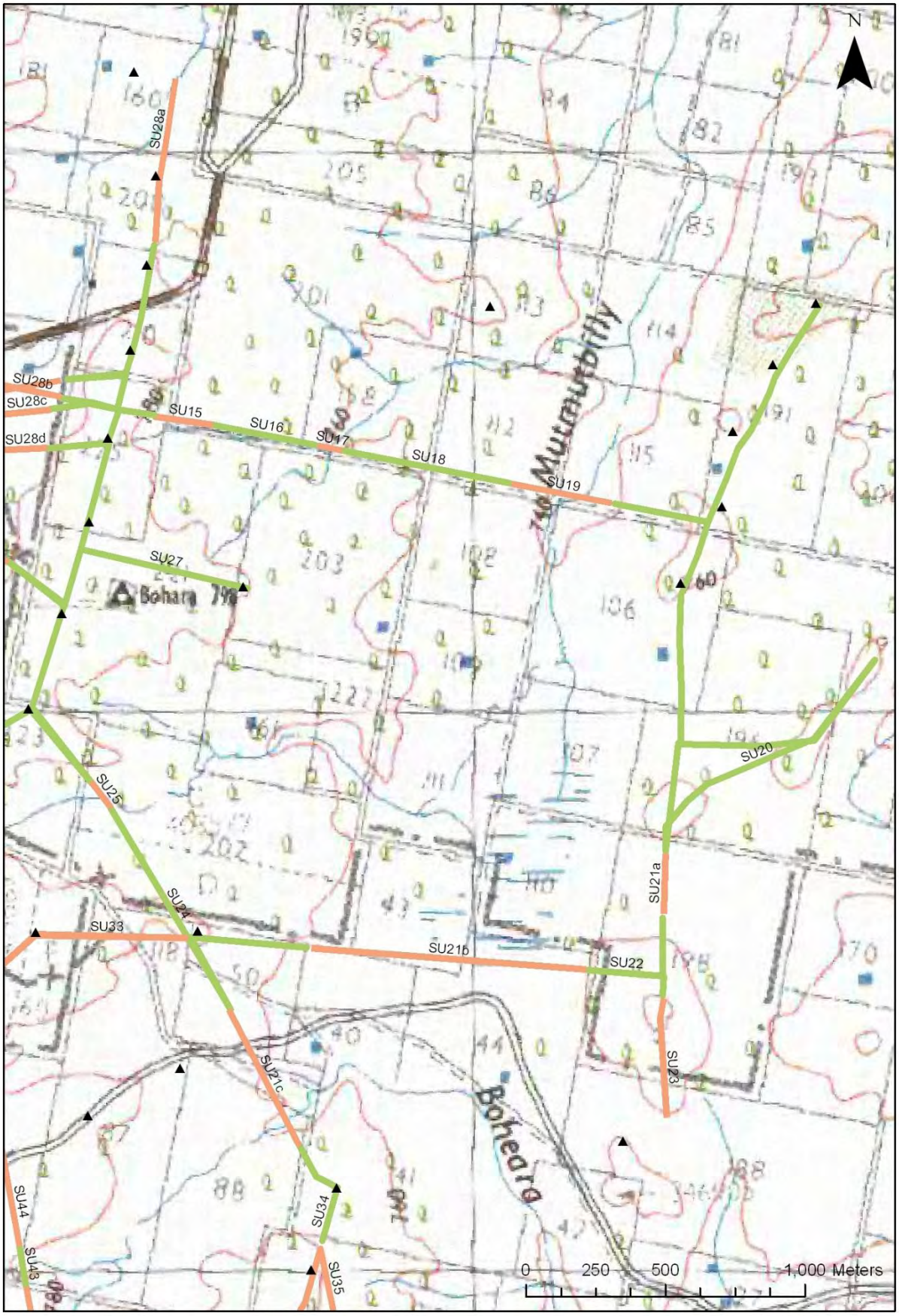

Figure 5 Location of Survey Units and Aboriginal objects recordings in northeast proposal area.

Figure 6 Location of Survey Units and Aboriginal objects recordings in central proposal area.

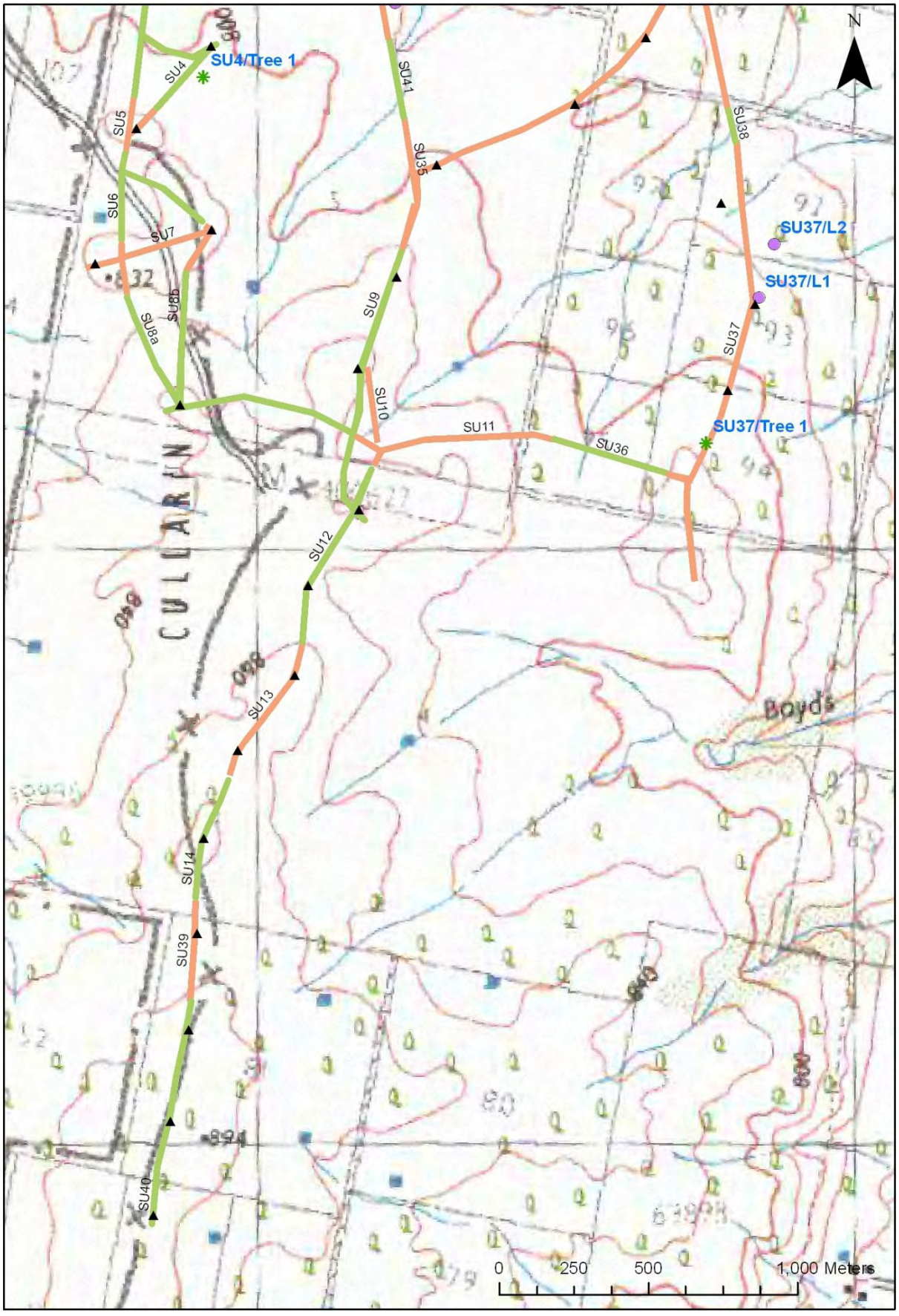

Figure 7 Location of Survey Units and Aboriginal objects recordings in south proposal area.

## 9.4 Survey Results – Non-Indigenous

No items of Non-Indigenous heritage were located during the survey.

## 10. STATUTORY CONTEXT

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

The Environmental Planning and Assessment Act 1979 (EP&A Act), its regulations, schedules and guidelines provides the context and requirement for environmental impact assessments to be undertaken during land use planning (NPWS 1997).

*Part 3A of the Environmental Planning and Assessment Act 1979*

On 9 June 2005 the NSW Parliament passed the Environmental Planning and Assessment Amendment (Infrastructure and Other Planning Reform) Bill. The Act was assented to on 16 June 2005 and commenced on 1 August 2005. This amendment contains key elements of the NSW Government's planning system reforms and makes major changes to both plan-making and major development assessment.

A key component of the amendments is the insertion of a new Part 3A (Major Projects) into the EP&A Act. The new Part 3A consolidates the assessment and approval regime for all major developments which previously were addressed under Part 4 (Development Assessment) or Part 5 (Environmental Assessment).

Part 3A applies to all major State government infrastructure projects, developments previously classified as State significant and other projects, plans or programs of works declared by the Minister. The amendments aim to provide a streamlined assessment and approvals regime and also to improve the mechanisms available under the EP&A Act to enforce compliance with approval conditions of the Act.

The current report has been compiled for inclusion within an Environmental Assessment Report.

Under the terms of Part 3A of the Environmental Planning and Assessment Act 1979 the following authorizations are not required for an approved project (and accordingly the provisions of an Act that prohibit an activity without such an authority do not apply):

- a permit under section 87 or a consent under section 90 of the *National Parks and Wildlife Act 1974;*
- an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*.

## 11. SIGNIFICANCE ASSESSMENT

The information provided in this report and the assessment of significance provides the basis for the proponent to make informed decisions regarding the management and degree of protection which should be undertaken in regard to the Aboriginal objects and Non-Indigenous items located within the study area.

### 11.1 Significance Assessment Criteria - Indigenous

The NPWS (1997) defines significance as relating to the meaning of sites: "meaning is to do with the values people put on things, places, sites, land". The following significance assessment criteria is derived from the relevant aspects of ICOMOS Burra Charter and NSW Department of Urban Affairs and Planning's 'State Heritage Inventory Evaluation Criteria and Management Guidelines'.

Aboriginal archaeological sites are assessed under the following categories of significance:

- cultural value to contemporary Aboriginal people,
- archaeological value,
- aesthetic value,
- representativeness, and
- educational value.

*Aboriginal cultural significance*
The Aboriginal community will value a place in accordance with a variety of factors including contemporary associations and beliefs and historical relationships. Most heritage evidence is highly valued by Aboriginal people given its symbolic embodiment and physical relationship with their ancestral past.

*Archaeological value*
The assessment of archaeological value involves determining the potential of a place to provide information which is of value in scientific analysis and the resolution of potential archaeological research questions. Relevant research topics may be defined and addressed within the academy, the context of cultural heritage management or Aboriginal communities. Increasingly, research issues are being constructed with reference to the broader landscape rather than focusing specifically on individual site locales. In order to assess scientific value sites are evaluated in terms of nature of the evidence, whether or not they contain undisturbed artefactual material, occur within a context which enables the testing of certain propositions, are very old or contain significant time depth, contain large artefactual assemblages or material diversity, have unusual characteristics, are of good preservation, or are a part of a larger site complex. Increasingly, a range of site types, including low density artefact distributions, are regarded to be just as important as high density sites for providing research opportunities.

*Representativeness*
Representative value is the degree to which a "class of sites are conserved and whether the particular site being assessed should be conserved in order to ensure that we retain a representative sample of the archaeological record as a whole" (NPWS 1997). Factors defined by NPWS (1997) for assessing sites in terms of representativeness include defining variability, knowing what is already conserved and considering the connectivity of sites.

*Educational value*
The educational value of cultural heritage is dependent on the potential for interpretation to a general visitor audience, compatible Aboriginal values, a resistant site fabric, and feasible site access and management resources.

*Aesthetic value*
Aesthetic value relates to aspects of sensory perception. This value is culturally contingent.

11.2 Significance Value of the Aboriginal Objects in the Study Area

The scientific significance of the recorded Aboriginal artefact locales in the project area are listed below in Table 11.

Table 11. Archaeological significance assessment of recorded Aboriginal object locales.

| SU | Locale | Artefact Number | Predicted Density | Integrity | Subsurface potential at site | Subsurface potential away from site | Significance | Criteria |
|---|---|---|---|---|---|---|---|---|
| 29 | 1 | 4 | Very low/ low | moderately disturbed: vehicle and animal tracks - eroding | Yes | Yes | Low local scientific significance | Common Aboriginal object and site type<br>Low educational value<br>Low aesthetic value<br>Low research potential: predicted very low/low artefact density in majority of Survey Unit |
| 37 | 1 | 1 | Very low | moderately disturbed: animal tracks - eroding | Yes | Yes | Low local scientific significance | Common Aboriginal object and site type<br>Low educational value<br>Low aesthetic value<br>Low research potential: predicted very low artefact density in majority of Survey Unit |
| 37 | 2 | 1 | Very low | highly disturbed: graded water diversion mound | Yes | Yes | Low local scientific significance | Common Aboriginal object and site type<br>Low educational value<br>Low aesthetic value<br>Low research potential: predicted very low artefact density in majority of Survey Unit |
| 42 | 1 | 2 | Very low/ low | somewhat disturbed: animal tracks - eroding | Yes | Yes | Low local scientific significance | Common Aboriginal object and site type<br>Low educational value<br>Low aesthetic value<br>Low research potential: predicted very low/low artefact density in majority of Survey Unit |
| 45 | 1 | 18 | Very low | moderately disturbed: vehicle and animal tracks - eroding | Yes | Yes | Low local scientific significance | Common Aboriginal object and site type<br>Low educational value<br>Low aesthetic value<br>Low research potential: predicted very low artefact density in majority of Survey Unit |

## 12. MITIGATION AND MANAGEMENT STRATEGIES

The aim of this study has been to identify Aboriginal objects and Non-Indigenous heritage items and to predict the archaeological potential within each Survey Unit, to assess site significance and thereafter, to consider the potential impact of the proposal upon this heritage.

In the following section a variety of strategies that can be considered for the mitigation and management of development impact to Aboriginal objects and Survey Units (including those without Aboriginal object recordings) are listed and discussed.

### 12.1 Management and Mitigation Strategies - Indigenous

*Further Investigation*

The field survey has been focused on recording artefactual material present on visible ground surfaces. Further archaeological investigation would entail subsurface excavation undertaken as test pits for the purposes of identifying the presence of artefact bearing soil deposits and their nature, extent, integrity and significance.

Further archaeological investigation in the form of subsurface test excavation is necessary when it can be demonstrated that sub-surface Aboriginal objects with potential conservation values have a high probability of being present in an area, and when the area cannot be substantially avoided by a proposed activity (NSW DECCW 2010).

No Survey Units have been identified in the proposal area to warrant further archaeological investigation. Based on a consideration of the predictive model of site type applicable to the environmental context in which impacts are proposed, sub-surface Aboriginal objects with potential conservation values are not predicted to have a high probability of being present.

The environmental contexts in which the turbines (and associated impacts) are proposed contain eroded and disturbed soils as a result of moderate levels of environmental degradation and also are not predicted to contain artefact density sufficient to warrant test excavation. Furthermore proposed impacts are small scale, discrete and primarily narrow, linear impacts (road access, transmission line construction etc). In addition, it is considered that in regard to the archaeology itself, subsurface testing is unlikely to produce results much different to predictions made in respect of the subsurface potential of these landforms. Accordingly a program of subsurface testing undertaken within the impact assessment and planning phase of the project is not considered to be necessary or warranted.

*Conservation*

Conservation is a suitable management option in any situation however, it is not always feasible to achieve. Such a strategy is generally adopted in relation to sites which are assessed to be of high cultural and scientific significance, but can be adopted in relation to any site type.

When conservation is adopted as a management option it may be necessary to implement various strategies to ensure Aboriginal object locales are not inadvertently destroyed or disturbed during construction works or within the context of the life of the development project. Such procedures are essential when development works are to proceed within close proximity to identified sites.

In the case at hand, avoidance of impacts (or minimisation of impacts) in regard to all Aboriginal object locales is considered to be desirable *if at all possible*. The artefact locales in question are identified in the table below (Table 12). Three recorded Aboriginal object locales (SU29/L1, SU37/L2 and SU42/L1) are located outside zone of proposed impacts and accordingly it is believed that achieving a strategy of conservation or impact avoidance is highly possible. It is

also recommended that avoidance of impacts to all the *possible* scarred trees be undertaken if feasible.

*Mitigated Impacts*

Mitigated impact usually takes the form of partial impacts only (ie conservation of part of an Aboriginal artefact locale or Survey Unit) and/or salvage in the form of further research and archaeological analysis prior to impacts. Such a management strategy is generally appropriate when Aboriginal objects are assessed to be of moderate or high significance to the scientific and/or Aboriginal community and when avoidance of impacts and hence full conservation is not feasible. Salvage can include the surface collection or subsurface excavation of Aboriginal objects and subsequent research and analysis.

No Aboriginal objects have been identified to warrant a strategy of impact mitigation in the form of salvage. However if impacts cannot be avoided to some of the identified Aboriginal object locales it is recommend that limiting the extent of impacts be achieved if feasible.

*Unmitigated Impacts*

Unmitigated impact to Aboriginal objects can be given consideration when they are assessed to be of low archaeological and cultural significance and otherwise in situations where conservation or limiting the extent of impacts is simply not feasible.

The majority of Aboriginal object locales identified have been assessed to be of low archaeological significance. In addition the majority of Survey Units are assessed to be of low archaeological sensitivity. Given the nature and artefact density of the majority of artefact locales recorded in the proposal area and the low scientific significance rating they been accorded, unmitigated impacts are appropriate if necessary. The Survey Units/artefact locales in question are identified in the table below (Table 12).

*Proposed management and mitigation strategies*

The table below summarises the management and mitigation strategies considered to be relevant to proposal area. Management and mitigation strategies are addressed in relation to all Survey Units recorded during the study (noting that not all Survey Units contain recorded Aboriginal object locales) and where relevant individual locales located within each Survey Unit. The recommended management strategy listed for each Survey Unit and Aboriginal object locale is selected from the various management options as discussed above. Finally the rationale behind each recommendation is outlined, taking into consideration the nature of the Aboriginal object and its archaeological significance rating. In addition it is noted that management strategies have been formulated with the recognition that the proposed impacts are discrete and minimal in area, and that accordingly the archaeological resource which is known or predicted to be located within the wider are encompassed by each Survey Unit, and indeed the broader landscape, will be exempt from impact.

Table 12. Recommended management strategies relating to Survey Units and Aboriginal object locales in the proposal area.

| SU | Locale | Artefact density (predicted and as per analysis of ESC) | Proposed Impacts | Significance | Recommended management strategy | Rationale |
|---|---|---|---|---|---|---|
| SU1 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU2 | - | Very low | Formally: Road and circuit Now: nil | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |

| SU | Locale | Artefact density (predicted and as per analysis of ESC) | Proposed Impacts | Significance | Recommended management strategy | Rationale |
|---|---|---|---|---|---|---|
| SU3 | - | Very low | Formally: Circuit Now: nil | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU4 | - | Very low/ low | Turbine, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU5 | - | Very low | Turbine, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU6 | - | Very low | Road Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU7 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU8 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU9 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU10 | - | Very low | Formally: Road and circuit Now: nil | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU11 | - | Very low | Road | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU12 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU13 | - | Very low | Turbines road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU14 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU15 | - | Very low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU16 | - | Very low/ low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU17 | - | Very low/ low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU18 | - | Very low/ low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU19 | - | Very low/ low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU20 | - | Very low/ low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU21 | - | Very low/ low | Road | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU22 | - | Very low | Formally: Turbine, road and circuit Now: nil | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU23 | - | Very low | Formally: Turbine, road and | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |

| SU | Locale | Artefact density (predicted and as per analysis of ESC) | Proposed Impacts | Significance | Recommended management strategy | Rationale |
|---|---|---|---|---|---|---|
| | | | circuit<br>Now: nil | | | |
| SU24 | - | Very low | Turbine, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU25 | - | Very low | Formally: Circuit<br>Now: nil | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU26 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU27 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU28 | - | Very low/low | Road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU29 | - | Very low/low | Road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU29 | L1 | Very low/low | Road and circuit | Low local scientific significance | **Conservation of L1**<br>**Avoid impacts to L1 if feasible** | Cultural significance high.<br>Low density artefact distribution.<br>Archaeological significance assessed to be low. |
| SU30 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU31 | - | Very low | Road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU32 | - | Very low | Circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** pacts | Predicted very low density artefact distribution. |
| SU33 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU34 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU35 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU36 | - | Very low | Road | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU37 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU<br>**Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU37 | L1 | Very low | Turbines, road and circuit | Low local scientific significance | **Conservation of L1**<br>**Avoid impacts to L2 if feasible** | Cultural significance high.<br>Low density artefact distribution.<br>Archaeological significance assessed to be low. |
| SU37 | L2 | Very low | Turbines, road and circuit | Low local scientific significance | **Conservation of L2**<br>**Avoid impacts to L2 if feasible** | Cultural significance high.<br>Low density artefact distribution.<br>Archaeological significance assessed to be low. |

| SU | Locale | Artefact density (predicted and as per analysis of ESC) | Proposed Impacts | Significance | Recommended management strategy | Rationale |
|---|---|---|---|---|---|---|
| SU38 | - | Very low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU39 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU40 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU41 | - | Very low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU42 | - | Very low/low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU42 | L1 | Very low/low | Circuit | Low local scientific significance | **Conservation of L1 Avoid impacts to L1 if feasible** | Cultural significance high. Low density artefact distribution. Archaeological significance assessed to be low. |
| SU43 | - | Very low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU44 | - | Very low/low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low/ low density artefact distribution. |
| SU45 | - | Very low | Turbines, road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU45 | L1 | Very low | Turbines, road and circuit | Low local scientific significance | **Conservation of L1 Avoid impacts to L1 if feasible** | Cultural significance high: Low density artefact distribution. Archaeological significance assessed to be low. |
| SU46 | - | Very low | Road and circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU47 | - | Very low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU48 | - | Very low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU49 | - | Very low | Circuit | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |
| SU50 | - | Very low | Formally: Substation and circuit; Now nil | n/a | No constraints to impacts in SU **Unmitigated impacts** | Predicted very low density artefact distribution. |

## 13. RECOMMENDATIONS

The following recommendations are made on the basis of:

- A consideration of the Part 3A amendment to the Environmental Planning and Assessment Act (see Section 10 Statutory Information).
- The results of the investigation as documented in this report.
- Consideration of the type of development proposed and the nature of proposed impacts.

The following recommendations are provided:

1. Management and mitigation recommendations are listed in respect of each Survey Unit and Aboriginal object locale in Section 12 of this report. The tables in Section 12 should form the basis for implementing management and mitigation strategies prior to and during construction.

2. No Survey Units have been identified in the proposal area to warrant further archaeological investigation such as subsurface test excavation.

3. None of the Survey Units or Aboriginal object locales in the proposal area has been assessed to surpass archaeological significance thresholds which would act to entirely preclude proposed impacts.

4. The majority of the Aboriginal object locales recorded are very low or low density distributions of stone artefacts. Any unrecorded or subsurface Aboriginal stone artefacts are predicted to be present as very low or low density artefact distributions. The archaeological significance of recorded artefact locales and the predicted unrecorded artefact distribution is assessed to be low; accordingly a management strategy of unmitigated impact is considered to be appropriate.

   However it is recommended that impacts to the recorded artefact locales be avoided *if feasible* and this could be achieved by 'micro-sitting' the relevant components.

   In regard to the recorded trees with *possible* Aboriginal scars, it is recommended that a strategy of avoidance of impacts be adopted.

5. All previously recorded Aboriginal objects listed on the NSW DECCW AHIMS search which are located in the development envelope, but outside areas of proposed impact, should be avoided during construction and operation of the wind farm.

6. It is recommended that ground disturbance impacts associated with the proposal be kept to a minimum and to defined areas so as to ensure as little impact as possible to the Aboriginal objects (stone artefacts) which can be expected to extend in a relatively continuous distribution across the broader landscape encompassed by the proposal.

7. It is recommended after development approval and the finalisation of the design/layout, that additional archaeological assessment is conducted in any areas which are proposed for impacts that have not been surveyed during the current assessment. It is predicted that significant Aboriginal objects can occur anywhere in the landscape and, accordingly, if present, they need to be identified and impact mitigation strategies, such as 'micro-sitting' of individual components, implemented prior to impacts.

8. The proponent should, in consultation with an archaeologist, develop a Cultural Heritage Management Protocol, which documents the procedures to be followed for impact avoidance or mitigation. The development of an appropriate Cultural Heritage

Management Protocol should be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW OEH.

9. Personnel involved in the construction and management phases of the project should be trained in procedures to implement recommendations relating to cultural heritage where necessary.

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**APPENDIX 1. CORRESPONDENCE FROM BURU NGUNAWAL ABORIGINAL CORPORATION.**

BURU NGUNAWAL
ABORIGINAL CORPORATION

ABN : 24 059 704 833

18 March 2011

Nick Valentine
Transfield Services
PO Box 1573
North Sydney NSW 2059

Cc: NSW Archaeology Pty Ltd
PO Box 2135
Central Tilba NSW 2546

**Aboriginal Cultural Heritage Investigation – Collector Wind Farm**

Thank you for the opportunity to participate in the Aboriginal Cultural Heritage archaeological investigation of the Collector Wind Farm at Collector, NSW for evidence of Aboriginal occupation by the local Ngunawal people, who are the Traditional Carers. As you may appreciate any planned work to be undertaken in the area that lies within our tribal boundaries will impact on our cultural heritage. We therefore appreciate that the proper protocol of advising and consulting with us has occurred.

As the Traditional Carers for the area known as Ngunawal we wish to acknowledge the assistance of the other groups with an interest in Cultural Heritage issues here on Ngunawal Country and wish to advise that only Ngunawal people hold the right to provide advice on the cultural heritage management for all sites and artefacts that come under the jurisdiction of the Ngunawal people.

Field work was undertaken on the week commencing 25th of October 2010 by our representatives accompanied by Mr Andrew Pearce, archaeologist from NSW Archaeology Pty Ltd.

BNAC would like to also reinforce the point as noted under subsection 1.6 of the report that the coverage of the area to be developed for the wind farm was minimal (not even 1%)

due mainly to low visibility from grass regrowth. Where that was any clear visibility is where the majority of artefacts were located.

BNAC having read the Draft Report and noted the recommendations provided under Section **13. Recommendations** of the draft report are in agreeance with those recommendations.

In particular BNAC wishes to express our desire to be involved in reference to points 7,8 & 9 purely because we consider any decision making that impacts our cultural heritage should have input from us as the Traditional Owners. BNAC also believes that the statement at point 4 must be included in all management protocol documentation which must be made available to all contract workers.

BNAC having had prior experience with all phases of the establishment of wind farms, such as the Capital Wind Farm, the proposed Gunning Wind Farm and the nearby Cullerin Range Wind Farm, would appreciate being fully consulted about construction arrangements. In the past we have been informed about the establishment of infrastructure such as maintenance roads to the turbines, the connection of power lines to substations, site offices, etc which is surveyed within a given corridor/footprint only to have those changed and established on a different route or on a larger scale than first indicated.

This then creates the problem of potential destruction of sites such as a burial site that was at first not within any impact zones. We are of the belief that decision-making is a collaborative process involving all concerned parties. Being inclusive develops a strong working relationship with respect for opinions and an understanding of values and may increase the understanding of our need to protect our cultural heritage.

Thank you for the opportunity to provide comment which hopefully will be taken into consideration and we look forward to working with you collaboratively on this project.

Yours faithfully

Wally Bell (Ngunawal TC)
Director/Chair