Proposed Crudine Ridge Wind Farm
European and Aboriginal Cultural Heritage Assessment Report

A report to Crudine Ridge Wind Farm Pty Ltd

January 2012

Proponent: Wind Prospect CWP Pty Ltd
Bathurst Regional and Mid-Western Regional Local Government Areas

Julie Dibden
New South Wales Archaeology Pty Limited
PO Box 2135
Central Tilba NSW 2546
www.nswarchaeology.com

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EXECUTIVE SUMMARY

New South Wales Archaeology Pty Ltd has been commissioned by Wind Prospect CWP to undertake an archaeological and cultural heritage assessment of the proposed Crudine Ridge Wind Farm. Both Aboriginal and European heritage is considered in this report.

Crudine Ridge is located 45 kilometres south of Mudgee and 45 kilometres north of Bathurst. The nearest locality is Pyramul, situated approximately five kilometres to the north-west.

The project comprises two potential turbine layouts, one consisting of 106 wind turbines (Layout Option 1) and the other, 77 wind turbines (Layout Option 2) and ancillary structures spread across 17 properties (the Project site). One, or a combination of the layouts, would be used in the construction of the project. All proposed impact areas (both option layouts) have been subject to investigation in this heritage assessment.

The proposed wind farm is defined as a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979. This report addresses the Director-General's requirements (DGRs) for the preparation of the Environmental Assessment and documents the assessment process, findings, interpretation of results and recommendations.

The assessment has been conducted in accordance with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC 2005), the NSW Office of Environment and Heritage's (NSW OEH 2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*, the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW DECCW 2010a) and the NSW Heritage Manual.

A process of Aboriginal community consultation has been undertaken as a component of this assessment and has been conducted in accordance with the guidelines as set out in OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b). The process of consultation has been compliant with the *Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants* (NSW DEC 2004) in accordance with the provisions of the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC 2005). It is noted in particular that there were no late registrations of interest, but had there been, they would have been accommodated within the process of consultation. All relevant Local Aboriginal Land Councils (Orange, Mudgee and Bathurst LALC's) have been consulted in regard to the project and representatives of these three groups participated in the field survey. No heritage areas, objects or places were identified as a result of the process of Aboriginal community consultation undertaken for this project.

In regard to Indigenous heritage, the study has sought to identify and record Aboriginal cultural areas, objects or places, to assess the archaeological potential of the proposal area, and to formulate management recommendations based on the results of the background research, field survey and significance assessment.

A search of the NSW OEH Aboriginal Heritage Information Management System (AHIMS) has indicated that there are two previously recorded Aboriginal object sites located within the site search area, none of which, however, are within the Project site (AHIMS #45769: 28th June 2011). A review of previous cultural heritage assessments conducted in the region has been carried out. No heritage areas, objects or places were identified to be present in the proposed activity areas as a result of this review.

A cultural heritage and archaeological survey for Aboriginal areas, objects and places has been conducted in the proposed activity area. This work was undertaken in September 2011.

Aboriginal objects in the form of stone artefacts were recorded in a number of locales across the Project site. The majority of Survey Units in which artefact locales have been recorded are predicted to contain additional stone artefacts which, because of ground cover (grasses etc), were undetectable during field survey. The development of the wind farm project will, therefore, result in impacts to known stone artefact locales and undetected artefact distributions. However, the majority of Survey Units contain very low density artefact distributions and are assessed to be of generally low archaeological significance.

The proposed wind turbine envelope impact areas are located on landforms and terrain which is highly amorphous and generally undifferentiated in character. 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, by and large, either ephemeral or small soaks or springs. Accordingly, Aboriginal use of this landscape is predicted to have been generally 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. Given, in particular, the absence of abundant and permanent water, it is unlikely that the proposed wind turbine envelope area would have been used for long term habitation or large scale gatherings. Within the local region, the Crudine River valley may well have served to accommodate such activities. The transmission line easement which extends eastward from the wind turbine envelope crosses a section of the valley. However, the nature of power pole installation can be considered to be a low impact activity in that area.

It is concluded that the proposed impacts to the archaeological resource can be considered to be of low impact. It is also relevant to take into consideration that impacts will be discrete in nature and will occupy a relatively small footprint. The archaeological resource in the broader area (those areas which lie outside actual proposed impacts) will not sustain any impacts as a result of the proposal.

No Survey Units have been identified in the proposal area to warrant subsurface test excavation. Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, sub-surface Aboriginal objects with potential conservation values (the trigger for conducting subsurface testing) are not predicted to have a high probability of being present (*cf*. NSW DECCW 2010: 24). The environmental contexts in which the turbines (and associated impacts) are proposed, contain eroded and disturbed soils as a result of high levels of environmental degradation. Soils across the proposed activity areas are either absent and skeletal (ie lithosols) or very shallow, *that is*, there is **no** subsurface potential in the majority of proposed impact areas. Furthermore, proposed impacts are small-scale, discrete and primarily narrow, linear impacts, and, accordingly, the majority of the archaeological resource in the Project site will not be impacted. 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 excavation undertaken within the impact assessment and planning phase of the project is not considered to be necessary or warranted.

Searches of historical databases have been conducted to determine whether or not Non-Aboriginal heritage items are present in the proposed activity area. The searches of the *State Heritage Inventory*, *Australian Heritage Database*, and Bathurst Regional and Mid-Western Regional Local Government Area heritage schedules revealed that there are no European heritage items in the Project site.

During the field survey, a number of European structures were recorded, most of which are structures relating to sheep management and husbandry, and demonstrate the agricultural and

grazing heritage of the area. None of these items satisfy criteria to warrant heritage listing, however, none would be impacted during the construction of the wind farm. It is also noted that clearance, fencing and dams, all represent the efforts of successive generations of local farmers, most of whom continue to the farm the land in question. These, while not obviously heritage items, nevertheless not only are integral to current farming practice, but also are a component of the material heritage of the local area.

It is concluded that there are no heritage constraints, Aboriginal (cultural or archaeological) or European, with regard to the proposal. It is recommended, however, that wherever possible during construction, all ground surface impacts be kept to an absolute minimum in order to lessen the overall impact of the proposal to the Aboriginal objects, known and predicted, across the Project site. Likewise, with regard to European heritage, it is recommended that impacts do not occur to those items.

This assessment has been conducted by Julie Dibden (BA honours; PhD) and Andrew Pearce (BA Archaeology and Palaeoanthropology), NSW Archaeology Pty Ltd. We gratefully acknowledge the assistance provided to NSW Archaeology Pty Ltd during the course of this project by the following people:

- Orange LALC: Annette Steele and Chad Morgan;
- Mudgee LALC: Tony Lonsdale;
- Bathurst LALC: Tonilee Scott and Chantel Peters;
- Murong Gialinga Aboriginal and Torres Strait Islander Corporation: Debbie Foley, Larry Foley, Shannon Foley, Larry Flick Snr and Larry Flick Jnr;
- Siobhan Isherwood and Ed Mounsey, Wind Prospect CWP; *and*
- Property owners who assisted in various ways: Brenden Cole, Daryl Croake, Tony Price, Bob Price and John Hundy.

We would in particular like to acknowledge and pay our respects to the traditional owners of the country which is encompassed by the proposal.

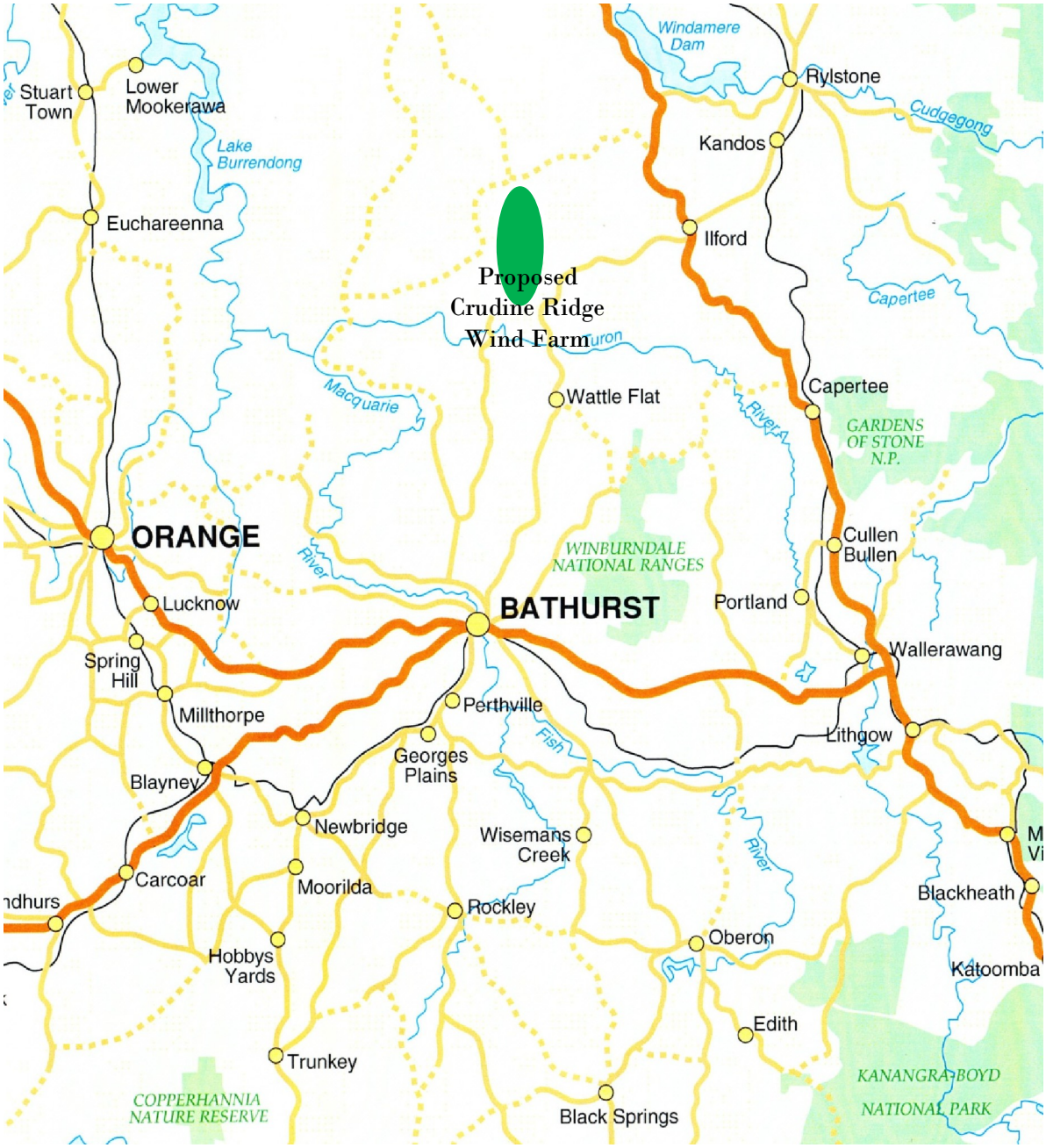

Figure 1 Location of the proposed Crudine Wind Farm in a regional context (approximate).

1. INTRODUCTION

1.1 Introduction

This document describes the archaeological and cultural heritage assessment undertaken in respect of the proposed Crudine Ridge Wind Farm. The proponent is Crudine Ridge Wind Farm Proprietary Limited, a company formed specifically for this project. The parent company is Wind Prospect CWP.

The Crudine Ridge Wind Farm would involve the construction and operation of up to 106 wind turbines generators (Figures 1 & 2). The turbines would be located on private properties which are currently utilised for farming, primarily the production of superfine wool.

The Wind Farm would have an installed capacity of approximately 165 MW, which is dependent on the final turbine model and layout selected. The project would connect to the TransGrid 132 kV overhead transmission line 15 kilometres east of the Crudine ridgeline. This connecting transmission line is considered a part of this Project and heritage assessment.

The proposed wind farm is defined as a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979. The Director General, Department of Planning, has issued requirements for the preparation of an Environmental Assessment in which it is stated that a heritage assessment is required to be prepared which addresses the potential impact of the proposal on Aboriginal (archaeological and cultural) and historic (European) heritage values.

The objective of the assessment is to address the DGR's for Aboriginal and European Heritage.

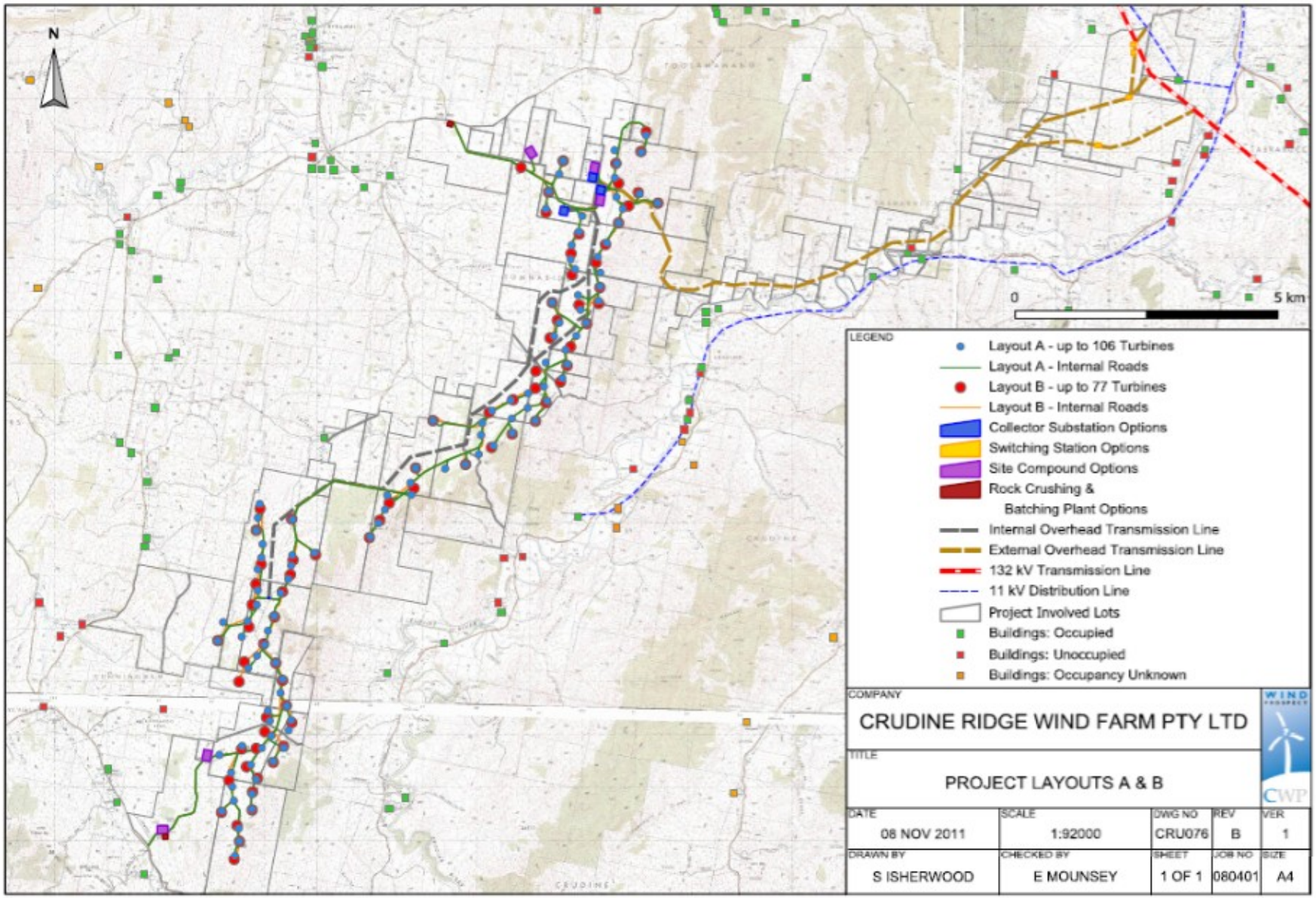

Figure 2 Proposed Layout Options 1 and 2.

2. CONSULTATION PROCESS

The Aboriginal consultation undertaken for this project has been conducted in accordance with the NSW OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b).

The process of consultation has been compliant with the *Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants* (NSW DEC 2004), in accordance with the provisions of the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC 2005). It is noted in particular that there were no late registrations of interest, but had there been, they would have been accommodated within the process of consultation. The three relevant Local Aboriginal Land Councils (Orange, Mudgee and Bathurst LALC's) were consulted and representatives from each group participated in the field survey.

2.1 Consultation

In order to identify, notify and register Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the Project site, the following procedure was implemented:

Written notification dated 14th June 2011, requesting a list of Aboriginal groups or persons who may have an interest, was forwarded to the following bodies:

- OEH (formally DECCW), Dubbo office;
- Orange and Mudgee Local Aboriginal Land Councils;
- 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);
- Mid-Western Regional Council;
- Bathurst Regional Council; *and*
- the Central West Catchment Management Authority, requesting contact details for any established Aboriginal reference group.

An advertisement was placed in the 16th June 2011 edition of the Western Advocate and Mudgee Guardian with a closing date for registration of interest noted as 30 June 2011 and 1st July 2011, respectively.

Following advice received from the NSW OEH, Teitzel & Partners, Bathurst Regional Council, Mid-Western Regional Council and the National Native Title Tribunal, written notification of the project was forwarded to the following:

- Darlina Verrills;
- David Maynard;
- Jean Thornton;
- Dhuuluu-Yala Aboriginal Corporation;
- Mingaan Aboriginal Corporation;
- Mr Neville Williams, Mooka;
- Wiradjuri Traditional Owners Central West Aboriginal Corporation
- Wiradjuri Council of Elders;
- Binjang Wellington Wiradjuri Heritage Surveys;
- Bathurst Local Aboriginal Consultative Committee;
- Ms Elaine Bugg, ICC Community Working Party;

- Ms Sally Beale, Towri Aboriginal Corporation;
- Ms Dianah Riley, Bathurst Aboriginal Community Working Party;
- Wanaruah LALC;
- Wellington LALC;
- Dubbo LALC;
- Gilgandra LALC;

In response to the notifications outlined above, 12 groups registered an interest in the project. However, because some registered Aboriginal parties did not wish their details to be generally disclosed, these groups are not listed in this report. Instead, their details have been forwarded to OEH in correspondence dated 15th August 2011. This correspondence also contained copies of letters of notification, advertisement and assessment process and methodology documents.

An outline of the scope of the project, the proposed cultural heritage assessment process and the heritage assessment methodology was forwarded to the various parties and/or individuals on varying dates, following receipt of their registration of interest. No responses were received from registered parties with regard to the consultation process and/or assessment methodology. No cultural information relating to the proposal area was received.

For review and comment, a copy of this draft report has been forwarded to the registered parties. Two Aboriginal parties provided a response and Wind Prospect CWP has addressed each of these. Given that one of the registered Aboriginal parties did not wish their details to be generally disclosed, correspondence relating to the draft report has been forwarded to OEH on the 21st March 2012 rather than documented in this report.

3. DESCRIPTION OF PROPOSED ACTIVITY

A full description of the proposal and its potential impact on the landscape and heritage resource is described below.

3.1 Proposed Impacts

The Project comprises a wind farm with two potential turbine layouts; one consisting of up to 106 wind turbines (Layout Option A) and the other up to 77 wind turbines (Layout Option B), together with ancillary structures spread over 17 different properties (the Project site). One or a combination of these layouts will be used in the construction of the Project, to be determined following final turbine selection post-consent. The impacts of both layouts are considered within this assessment.

The Project will have an installed capacity of approximately 165 MW, which is dependent on the final turbine model and layout selected. The Project will connect to the TransGrid 132 kV overhead transmission line 15 km east of the Crudine ridgeline. This connecting transmission line is considered as part of this Project and has been subject to assessment.

The Project is comprised of two 'Clusters' of wind turbines. The Pyramul Cluster generally incorporates the north of the Project, with the Sallys Flat Cluster incorporating the south of the Project. The project would consist of the following components:

- The installation of up to 106 wind turbines (Layout Option A) or up to 77 wind turbines (Layout Option B) with a maximum blade tip height of 160 m;
- A main collector substation (MCS) comprising cable marshalling, switchgear, high voltage transformers and associated protection and communications assets;
- A secondary collector substation (SCS) to be located within the Sallys Flat Cluster comprising cable marshalling, switchgear and medium voltage transformers;
- Site compound and lay down area (part temporary, part permanent), including site operations facilities and services buildings;
- Underground electrical interconnection lines (up to 132 kilovolt (kV) and control cables within each of the wind turbine Clusters, connecting to the main and secondary collector substations;
- Internal overhead electrical interconnection lines (up to 132 kV double circuit) and control cables between the main and secondary collector substations;
- A switching station to be located at the point of connection adjacent to the existing TransGrid owned 132 kV line, east of the Project;
- External overhead electrical interconnection lines (up to 132 kV double circuit) and associated communications cables between the main collector substation and the switching station;
- Access roads from the public roads to the turbine locations and substations;
- Crane hardstand areas for the erection, assembly, commissioning, maintenance, recommissioning and decommissioning of the wind turbines;
- Up to six permanent wind monitoring masts;
- Appropriate wind farm signage both during the construction and operational phases of the proposed development; and
- Mobile concrete batching plant(s) and rock crushing facilities.

The impacts relating to the construction of the proposed Crudine Ridge Wind Farm will result from the installation of wind turbines and associated infrastructure, including an on-site underground electrical cable network, overhead powerline, and a substation.

Site access roads would be required for construction and subsequent operation and maintenance. Where farm roads currently exist, these would be used. Turbine installation requires a footings area which typically measure ca. 15 x 15 m. However, a larger hardstand measuring approximately 45 x 45 m is generally prepared adjacent to each wind turbine for use by cranes during construction. A combination of overhead and underground electricity cabling would be used. The underground cable routes would generally be between the turbines, and where possible, would follow the route of the internal access roads.

The proposed works entail ground disturbance and, accordingly, the construction of the wind farm has the potential to cause impacts to any Aboriginal objects, areas and places, or Non-Aboriginal items which may be present within the zones of direct impact. Impacts will be generally confined to cleared areas currently utilised for grazing and cultivation and, where possible, existing access roads will be used for site access. Electrical connections and communications cabling will be installed adjacent to, or within access roads.

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.

3.2 Impacts Summary

Impacts would be located on land currently utilised for sheep and cattle grazing. Previous land uses in the region have resulted in reasonably 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.

The construction of the Crudine Ridge Wind Farm will result in substantial physical impacts to any Aboriginal objects which may be located within direct impact areas - *irrespective of their archaeological significance*. 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. The proposed Crudine Wind Farm is no exception in this regard and it would be impossible to have a development of this nature without causing direct physical impact.

However, with regard to Aboriginal object locales such as artefact scatters assessed to be of low significance, the impacts can be viewed as being correspondingly low. On the other hand, impacts to any object locales which are assessed to be of higher archaeological significance can be viewed as being correspondingly higher.

It is however emphasised that 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.

4. DESCRIPTION OF THE AREA

In this section of the report the subject area is defined and described.

4.1 Location and Physical Setting

The subject area is located in the Parishes of Toolamanang, Tunnabidgee, Cunningham and Tabrabucca, Zone 55, in the Mid Western Regional and Bathurst Regional Shire.

The proposed wind farm is located between grid references 742000 – 761000 (eastings) and 6343000 – 6357000 (northings).

The layout of the project is shown in Figure 2. The majority of the proposed turbines are located in a broad area measuring c. 16 kilometres north/south. This envelope is situated on an elevated, broad and undulating plateau, west of the Crudine River.

4.2 Landscape

The plateau landscape in which the wind turbine envelope is situated is predominantly comprised of gently undulating land, incised by low order drainage lines (Plates 1 & 2). The landform elements present include open depressions, simple slopes, and crests which have gradients that range between very gentle to gentle. The highest elevation in the turbine envelope is between 890 m to 1,000 m above sea level, Australian Height Datum (AHD). All drainage lines in the wind turbine envelope are ephemeral first to 2nd order tributary streams. The district in which the wind farm is located is on the eastern edge of the Lachlan Fold Belt and is underlain by sedimentary and granite rock.

The Project site is in the upper catchment of the Macquarie-Bogan River systems. The majority of the area drains to the west and north-west. Small ephemeral creeks and drainage lines drain into 3rd order steams including Stinking Water Creek, Tunnabidgee Creek, Long Gully Creek and Salters Creek. These streams then flow into Pyramul Creek, a major tributary of the upper reaches of the Macquarie River. Drainage from the north-eastern arm of the Project (transmission line and a switching station options) is to the east/south-east into the Crudine River via several ephemeral creeks and gullies. The Crudine River is a tributary of the Turon River, which then flows into the Macquarie River.

The area is in the South Western Slopes Biogeographic Region (far northern corner). The South Western Slopes botanical region is an intensively and extensively disturbed area of NSW. Given a combination of mainly flat to undulating country, fertile soils and reliable rainfall, European settlement proceeding rapidly between 1829 and 1845. This led to large scale modification of the landscape for cropping and grazing of domestic stock over the next 100 years (Burrows 1999).

The study area is largely cleared and used for stock grazing, primarily sheep. Remnant trees and stands of woodland characterise much of the area. The proposed activity areas are located in paddocks that have been almost entirely cleared of their original natural vegetation and habitats. Most of the land has been ploughed in the past, however, cropping no longer occurs. Due to past and present land use practices the landscape has experienced various levels of degradation which is evident with the presence of eroded gullies and clearing of trees.

The majority of the proposed development is on the Ophir – Hargraves Plateau landscape, with only the north-eastern arm, comprising of transmission lines and three switching station options, extending over the Mount Horrible Plateau, Cope Hills Granite and Capertee Plateau landscapes (Mitchell 2002).

The entire wind turbine footprint is on the Ophir – Hargraves Plateau landscape. This landscape has general elevations of 500 to 1000 m with a local relief of 100 to 150 m. The landscape is described as subdued strike ridges and dissected plateau, while the overlying soil ranges from thin sandy loam to thin stony red texture-contrast soils on the slopes to yellow harsh texture-contrast soil with bleached A2 horizons in the valleys. Vegetation in this landscape ranges from woodland to open forest of eucalypt species (Mitchell 2002). While stands of trees exist in the proposal area, generally these areas are not within the development footprint, which, instead is situated on cleared paddocks. Paddocks are generally clean, however, in the south Biddy Bush infestations occur frequently (see Plate 1; middle distance).

The Mount Horrible Plateau has general elevations of 750 to 1300 m with a local relief of 250 m and is described as dissected plateau, with undulating hills and steep wooded ridges. Crests are composed of red gradational well-structured and red texture-contrast soils, while the lower slopes are composed of yellow earths on some sandstone or yellow texture-contrast soils with bleached A2 horizons. Broader creek lines are composed of dark clay loams and clays. Vegetation in this landscape is also dominated by eucalypts (Mitchell 2002). The undulating and rolling hills of the Cope Hills Granite has general elevations of 500 to 740 m with a local relief of 150 m. Soils are gritty gradational red earth and red texture-contrast soils. Forest vegetation includes eucalypts and black cypress pine (Mitchell 2002). The Capertee Plateau (800 to 1000 m) is the wide valleys and rolling hills found below the sandstone cliffs. Streamlines typically have a low gradient and are swampy. Soil profiles are generally shallow stony texture-contrast with gritty well drained A-horizons over tough yellow or grey poorly drained clays. Woodlands occur on the open valleys (*Angophora floribunda*, *Eucalyptus* spp. with a shrubby understorey and *Austrodanthonia* sp. (Wallaby Grass).

The proposed wind farm overlies the Hill End – Ngunnawal geological province, comprised of Silurian to early Devonian clastic sediments including shale, siltstone, sandstone and conglomerate, limestone and some felsic volcanics (Geoscience Australia 2011). The associated sub-provinces include the Hill End and Capertee. The majority of the wind farm infrastructure will be located on the Hill End sub-province, with only a small section of the north eastern arm (transmission lines and switching stations options) overlying the Capertee sub-province.

The characteristic terrain of the Hill End sub-province includes steep rolling hills and undulating low hills with exposed bedrock occurring on all slope classes. Slopes are susceptible to sheet, rill and gully erosion with drainage lines also prone to gullying. The most common soils arising from this geological province are Soloths and yellow Solodic Soils on footslopes and drainage lines and Shallow Red Podzolic Soils and shallow soils on the upper slopes and on steep terrain. Discontinuous alluvium can also be found along drainage lines (Murphy and Lawrie 1998). Associated soil landscapes of the Project area within this sub-province include Mullion Creek, Mookerawa and Burrendong. Typically Red Chromosols are found on the crests and upper- to mid-slopes of the project site, while Yellow Sodosols are found on the lower slopes and drainage lines (which may give way to Yellow Kandosols or massive earths). Rocky outcrops and shallow skeletal soils (siliceous sands and loams) are common on hill crests. Generally the upper slopes are well drained with the profiles becoming poorly and imperfectly drained downslope. The entire study area is rocky to very rocky. Low bedrock exposures are common and the soil is comprised of abundant coarse fragments (Plates 3 & 4).

The Capertee sub-province is predominantly a volcanic arc with substantial areas of limestone. Although the strata are strongly folded and steeply dipping the terrain is variable, ranging from rugged to undulating or rolling. Where the terrain is rugged and the slope is parallel to bedrock dip the overlying soils tends to be continuous, shallow and stony. When the slope cuts across the dip, steep slopes with frequent outcrops and angular float occur. Streams have meandering channels incised in alluvium and overlying bedrock. The typical soil types on mid-slope positions are Non-calcic Brown Soils. Where the terrain is more undulating the soils are deeper, medium

textured and moderately to highly fertile (Non-calcic Brown Soils and Euchrozems). Associated soil landscapes of the Project area within this sub-province include the Aarons Pass unit.

Plate 1 A typical view of the proposed wind farm topography in the south: SU2 looking north.

Plate 2 The topography of the north: SU9 looking south.

Plate 3 Low rocky exposures in SU9 – north end looking south.

Plate 4 View of ground showing typical coarse fragments in soil: SU1.

4.3 Summary

From a perspective of Aboriginal land use, the proposal area can be characterised as a marginal woodland resource zone. The plateau would have possessed limited biodiversity and a general lack of water; accordingly such country is likely to have been utilised by Aboriginal people for a limited range of activities which may have included hunting and gathering 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. Given the amorphous character of the landscape, artefacts are predicted to occur anywhere and may be generally continuous in distribution, albeit in very low density. However, the locations of springs and soaks may have been focal points in the plateau landscape; artefact distributions at these sites may reflect the local exploitation of these water sources.

By comparison, the Crudine valley between the hills is likely to have possessed greater levels of biodiversity given the likely presence of abundant and reliable water. Such areas are likely to have been utilised more frequently and possibly by greater numbers of individuals at any one time; certainly the valleys are likely to have been the favoured camp locations while people occupied the broader local area. Accordingly, the levels of artefact discard in valleys can be predicted to be correspondingly higher; artefact diversity and complexity may also be greater.

5. ABORIGINAL HERITAGE CONTEXT

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).

South-eastern Australia has been occupied since the late Pleistocene (Attenbrow 2004: 72; Boot 1996: 288; Lampert 1971: 9). The dated occupational sequence in the Sydney region extends back 30,000 years (JMcD CHM 2005: 3; and see Stockton and Holland 1974). Further to the south, Lampert (1971: 9) and Boot (1996: 288) have reported Pleistocene dates for occupation of the south coast and its hinterland, which extend back to ca. 20,000 years BP.

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 c. 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.*

A basic chronological sequence of human occupation in south-east Australia is the Eastern Regional Sequence, proposed by McCarthy (1964), and more recently refined by Lampert (1971: 68), Stockton and Holland (1974: 53), Attenbrow (2004: 72) and McDonald (1994; 2008a). McCarthy's (1964) three-phased sequence extends from the Pleistocene through to the late Holocene, and is based on observed changes over time in stone artefact assemblages. The phases identified by McCarthy were the Capertian, the Bondaian and Eloueran (the latter being the most recent). Later researchers such as Lampert (1971: 64) at Burrill Lake, and others, have found a general agreement with McCarthy's sequence. However, the sequence has undergone revision (Lampert 1971: 68). At Upper Mangrove Creek Catchment (UMCC), Attenbrow (2004: 72) identified four cultural phases based on changes in artefact typology and raw material in the stone artefact assemblages from four radiocarbon dated sites. These changes were considered with reference to other studies conducted in the south-east in defining the phases and assigning dates to them.

Attenbrow (2004: 72-75) identified the following broad sequence of change in the Upper Mangrove Creek catchment:

- Phase 1 (Capertian): ca. 11,200 – ca. 5,000 years BP: Assemblages consist primarily of flakes, cores and flakes pieces. Implements include amorphous flakes with retouch/usewear, dentated saws and small numbers of backed artefacts. Fine grained siliceous stone and quartz dominate assemblages.

- Phase 2 (Early Bondaian): ca. 5,000 – ca. 2,800 years BP: Backed artefacts become more archaeologically visible and ground-edge implements appear at ca. 4,000 years BP. Fine grained siliceous stone and quartz dominate assemblages.
- Phase 3 (Middle Bondaian): ca. 2,800 - ca. 1,600 years BP: Backed artefacts reach a peak in abundance. During this time quartz dominates assemblages.
- Phase 4 (Late Bondaian): ca. 1,600 years BP through to just after European occupation: Backed artefacts are rare, bipolar artefacts and ground-edge implements continue to increase in abundance; quartz continues to dominate raw material categories.

Regional, and sometimes local, variations in the assemblages of each phase of the regional sequence have been identified and, furthermore, each phase has been found to begin at slightly different times in different regions (Attenbrow 2004: 219). She argues that these differences are possibly due to local environmental conditions and local responses to climatic change, as well as to regional variations in social organisation, territoriality and subsistence patterns. In consideration of the absence of detailed archaeological investigation of the study area, extrapolating the evidence from elsewhere for use in this research necessarily requires caution.

While supporting the general sequence of change, archaeological enquiry undertaken since McCarthy proposed his regional sequence now considers the behavioural and demographic implications of observed change. Much attention has also been given to explaining phenomena such as the timing of initial site occupation and other indicators, such as changes in artefact numbers in sites. A picture of apparent intensity of site occupation during the mid to late Holocene has been explained in terms of a corresponding population increase (Hughes and Lampert 1982), and this notion has gained currency in the literature (see, however, Hiscock 1981, 1986; Attenbrow 1987, 2004; Boot 1996, 2002). Attenbrow (2002: 21; 2004) has devoted considerable attention to this issue, and concludes that distinguishing between behavioural (such as changes in technology or mobility patterns), and geomorphological and demographic change to account for observed changes in the archaeological record, is not straightforward. She argues that answers to these questions are still unresolved, and that at this time it is not known how populations may have grown or changed from the time of initial occupation.

5.1 Wiradjuri Country

The study area is situated within land, which today, is seen as having traditionally been occupied by the Wiradjuri peoples. This attribution of group relationship was made by Tindale (1974) based on notions of affiliation due to a shared language throughout a broadly distributed Aboriginal population. The Wiradjuri inhabited a widespread area which extended from the Great Dividing Range, west to the Macquarie, Lachlan and the Murrumbidgee rivers (Coe 1989). In so doing, their country encompassed three distinct geosystems: the tablelands in the east, the central western slopes, and to the west, the south-west plains.

Aboriginal occupation in the Darling Basin, which encompasses part of the Wiradjuri territory to the west, has been dated to 40,000 years (Haglund 1985). Closer to the study area, the earliest dated occupation in the immediate region being just over 7,000 years BP at Granites 2 shelter, about 50 km north-east of Manildra (Pearson 1981). A similar date was derived from the dating of the skeletal remains of a male individual found in a cave near Cowra (Pardoe and Webb 1986).

The early explorers and settlers noted considerable variation in the numbers of Aborigines that would gather for food procurement in the area during the different months of the year (Haglund 1985). The major rivers and associated tributaries were the focus of livelihood and supplied a variety of consistent and plentiful food including fish, water fowl and shellfish. On August 22, 1817, John Oxley, the first European to travel up the Macquarie River from the Wellington Valley, observed 'an abundance of fish and emus … swans and ducks' as well as very large mussels growing among the reeds in many stretches of the river (Oxley 1820).

Riverine resources were supplemented with kangaroos and emus. According to Thomas Mitchell, Surveyor-General of the Colony of NSW, possums formed a significant part of people's diet, as well as being used for making warm winter cloaks, arm bands and other items of clothing. Mitchell, who conducted several expeditions into the area in the 1830s and1840s, wrote that possums were found in the hollow trunks of upper branches of tall trees which were climbed by cutting notches into the trunks.

Vegetable foods formed a significant part of the diet. The Wiradjuri exploited daisy yams (Microseis scapigera) and a range of other roots and tubers, including lily and orchid tubers and Kurrajong roots (*Brachychiton populneum*) (Gott 1983, White 1986: 57-58). Kurrajong and Acacia seeds would be ground for flour, as would certain grass seeds, such as oat grass or kangaroo grass (*Themeda australis*).

Numerous studies have been undertaken, both in an academic and consultancy context, in the broader region of the Western Slopes and adjoining plains region of NSW. Consideration of a predictive model of site type and site location within a geographical context relevant to the study area can be made through recourse to these previous studies. From this a contextual and relevant assessment of the archaeological potential of the study area can be formed.

Pearson (1981) conducted a comprehensive study of the upper Macquarie region in relation to his PhD dissertation. In addition to carrying out extensive research of historical sources and reviewing ethnographic data, Pearson (1981) excavated three rock shelters and compiled information about other known archaeological sites in his study area. He determined that the Wiradjuri functioned primarily in small groups of variable size, dependent on the season. These groups were comprised of immediate relations, the smallest being the basic family unit, but groupings could coalesce to form a collective band of between 80-150 people during feasting in times of plentiful food, or for ceremony.

Between them, in smaller groups of up to 20 people, they exploited the resources of a common territory which had a radius of up to 65 km, but which was generally centred on a particular home base location that possessed a reliable watercourse (Pearson 1981). Pearson (1981) suggests that there may have been three distinct band territories in the local region, centred on Bathurst, Wellington and Mudgee/Rylstone. From this it may be deduced that the proposal area is likely to have been one locale within the range of a single Wiradjuri band. However, given the generally ephemeral nature of the local catchments and creek lines, the locus of that bands' place of habitation would be closer to a more permanent source of water such as, for example, the Cudgegong River.

Pearson (1981) developed a pattern of Aboriginal occupation through the analysis of site location attributes in relation to just over 40 recorded open campsites within four sample areas in the region. He found that archaeological sites could be grouped into two main types, occupation sites, and non-occupation sites, the latter including scarred or carved trees, ceremonial sites, grinding grooves and burial sites. Through analysis of the location of these sites he proposed the following model for the prediction of site location (Pearson 1981):

- The distance of sites from water ranged from 10 to 500 m. However larger sites were generally located nearer to water (Pearson's average distance from water being 90 m);
- Both good soil drainage and views over watercourses were important site location factors;
- Level ground, shelter from prevailing winds, and elevation above cold air (Pearson's average elevation being 9.1 m) also influenced site location;
- The majority of sites were situated in places that would originally have been comprised of open woodlands in order to source adequate fuel;

- Burial sites and grinding grooves were located as close to habitation as possible. However, grinding grooves occur only where there is suitable outcropping sandstone, and burial sites are generally found in areas where soils are of sufficient depth and penetrability for the purposes of interment;
- Ceremonial sites such as earth rings were situated away from campsites;
- Similarly, stone arrangements were also located away from campsites, in isolated places, and were more likely to be located on small hills or knolls, although they can also occur on flat land;
- Scarred or carved trees were distributed with no obvious patterning other than their proximity to watercourses, and in areas more frequently used for camps;
- Quarry sites were located where known outcrops of serviceable stone were reasonably accessible;
- Pearson suggests that Aboriginal campsites were rarely used for longer than three nights, and that sites with evidence of extensive archaeological deposit probably represent accumulations of material over a series of short visits.

5.2 Material Evidence

A search of the NSW Office of Environment and Heritage (OEH) Aboriginal Heritage Management Information System has been conducted for this project on the 28th June 2011 (AHIMS #45769). The search area measured 380 km² and encompassed eastings 741000 – 765000, and northings 6340000 – 6360000 (GDA).

Two previously recorded Aboriginal object sites are listed on the AHIMS register for the site search area, all of which are located outside the Project area (Table 1).

The AHIMS register only includes sites which have been reported to the NSW OEH. Accordingly, this search cannot be considered to be an actual or exhaustive inventory of Aboriginal sites situated within the local area. Generally, sites are only recorded during targeted surveys undertaken in either development or research contexts. It can be expected that additional sites will be present within the local area, but that to date, they have not been recorded and/or reported to NSW OEH.

The most common Aboriginal object recordings in the region are distributions of stone artefacts. Rare site types include rock shelters, 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 at least in part to variance in topography and ground surface geology.

Table 1 AHIMS site search.

Site ID	Name	Easting	Northing	Type
36-6-0794	Aarons Pass 1	762610 GDA	6360030 GDA	Open Site
36-6-0674	Crudine Creek	763400 AGD	6357000 AGD	Open Site

5.3 Predictive Model of Site Type and Location

There has been no previous archaeological work conducted in the local area.

Dominic Steele (2003) conducted a linear assessment along the Castlereagh Highway. It is noted that the landscape is not equivalent to that of the Project area, being lower in elevation and consisting of rolling hilly country, compared to the elevated plateau of the Project area. No Aboriginal object sites were recorded. However, one area of potential archaeological sensitivity was identified. The area was located adjacent to Crudine Creek and was assessed to possess

moderate Aboriginal archaeological sensitivity. It was predicted that the locality may have been subject in the past to short-term but repeated visitation by people moving to and from more desirable camping locations and that the archaeological evidence potentially associated with this watercourse is likely to occur in the form of low-density distributions of flaked stone artefacts related to successive short-term camping stopovers where limited foraging, site maintenance activities (such as stone knapping), and artefact discard occurred. This site has not been excavated.

Stone artefact scatters are the most common site type found within the region (Navin Officer Heritage Consultants 2005). Koettig (1985) found that larger and more complex sites are likely to occur in association with permanent watercourses, while sparse artefact scatters and evidence of intermittent and infrequent occupation will be located on landforms which are removed from permanent water sources, such as ridge tops or lower order ephemeral creeks. While this assertion was based on limited survey and analysis, it is possible that it is, nevertheless, generally correct.

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 ground surface 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. 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 wind farm, stone artefacts are predicted to be present in very low to low densities.

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 absence of suitable rock exposures in the study area grinding groove sites are unlikely to be present.

Burials sites

The potential for burials to be present in the proposal area is considered to be low given the high levels of previous disturbance related to agriculture.

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.

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).

Nevertheless, scarred trees are a relatively common site type in the region. There is, accordingly, potential for this site type to be present if trees of adequate age are present.

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. Within the study area itself the underlying geology is shale, none of which is suited to the manufacture of artefacts. However, quartz seams in the shale may well have been exploited locally.

Ceremonial Grounds

In south-eastern Australia ceremonial grounds were used in maturity rites associated with the initiation of youths. Bora grounds generally consisted of one or more circular rings defined by mounded earth, sand and/or rocks. This is a rare site type given the nature of the materials used in there construction; agricultural practices and land clearing is likely to remove surface evidence of these places. The identification of ceremonial grounds is often dependent on Aboriginal oral tradition and historical records. This site type is unlikely to be present in the proposal area.

6. EUROPEAN HERITAGE CONTEXT

6.1 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 determine, 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 stipulated that such grants should only be made 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 permitted without survey, nevertheless, 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 lands located beyond the immediate vicinity of Sydney began to mount. The ability to meet the demand for land became even more difficult, when in 1826, the administration of Sir Ralph Darling temporarily restricted land grants to the initial nineteen counties that had been created around Sydney. This area became known as the 'Limits of Location', and extended from Kempsey in the north, to Batemans Bay in the south, while its western boundary terminated at Wellington (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 licenses. 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. However, for many prospective landowners insufficient capital restricted their access to available lands, so that the majority of fertile lands 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.

6.2 Local History

By 1813 the colony's livestock herd, pastured on overstocked plains surrounding Sydney, had increased to some 26,000 head of cattle and 74,000 sheep. With drought and plagues of caterpillars further reducing feed, stock owners grew anxious to secure more grazing land and attention was drawn to what may lie inland of the Great Dividing Range. Following an expedition in 1813 by Lawson, Wentworth and Blaxland, who sighted good grazing grounds west of the range, Governor Macquarie instructed surveyor Evans to follow Lawson's marked route and explore further inland. In so doing, Evans became the first European to reach the western side of the Great Dividing Range, surveying to the Macquarie River and beyond the area of present-day Bathurst (McDonald 1968: 1-3).

Further encouraged by Evan's report of excellent grazing land to the west, Macquarie commissioned William Cox and a team of convicts to construct a road across the range. Remarkably, despite numerous areas of precipitous terrain, this task was achieved in less than six months. Thereafter, settlers began populating the area, bringing their livestock to graze on the open western plains. In 1816 Macquarie visited the newly opened district, at which time he selected the site for the township that became known as Bathurst (McDonald 1968: 3).

The following year Macquarie instructed Lieutenant John Oxley R.N, the Surveyor-General of New South Wales, to explore further to the west beyond Bathurst, in order to ascertain the course and nature of the river system which Evans had described (McDonald 1968: 3). Oxley was joined on this expedition by Surveyor Evans, as well as Botanist, Allan Cunningham and Mineralogist, William Parr. Although the party had intended to chart the course of the Lachlan River, difficult swampy conditions were encountered, so that eventually Oxley decided the party should return to Bathurst, but along the Macquarie River (Althofer 1985: 9).

Settlers and flocks of sheep immediately began to occupy the land west of the Diving Range and by 1819, the number of sheep beyond the range totaled 11,000 (Cox n.d.). It is sheep grazing which is still the dominant land use in the Pyramul and Crudine area.

Initially, it was the land around Bathurst which was occupied by the early settlers. By 1920, and with the onset of dry conditions and failing pasture, they began to look further afield for new land (Cox n.d.). Lieutenant Lawson, and others, including Aaron (of whom Aarons Pass is named), a 'native' guide, made their way north, via Sofala, then Tabrabucca Swamp and Aarons Pass, finally dropping down into the Cudgegong valley and the area now occupied by the township of Mudgee (Cox n.d.). The area (Mudgee) was considered good land and suitable for a settlement. It was George and Henry Cox and William Lawson, who brought cattle and settled. Being adjacent to the permanent waters of the Cudgegong and associated swamps, the land was likely to have been favoured country of the Aboriginal owners, and during the period of initial occupation and building, conflict with the settlers ensued (Cox n.d.).

Lawson's and Cox's properties were in effect self contained villages, and remained the only dwellings in the Mudgee area until 1833, when Mudgee as township began to develop. The site was surveyed for a village in 1836 (Pyramul Public School Centenary 1869 – 1969 n.d. [PPSC]).

The early settlement of Pyramul began with the first Crown land grant of 640 acres made in 1840 to Bathurst squatter George Suttor (PPSC), although existing paddocks and structures are shown on the purchase plan, indicating that the area had been already occupied.

The significant discovery of gold west of the Blue Mountains in 1851 occurred near to the proposal area at Hargreaves and with the opening up of the gold fields at Sofala and Hill End, large numbers of people came to the area during the 1850s (PPSC). When the alluvial gold was finished some turned to farming. According to the Pyramul Public School Centenary 1869 – 1969 (n. d.), Suttor's grant in 1840 was not the typical manner in which the land locally was developed. More typically, small parcels of land were sold at the site of Pyramul during the 1850s. In 1878 a reserve was set aside for a village at Pyramul, and given that a township did not grow, this was revoked in 1930. Nevertheless, Pyramul was once a larger village than it is currently. A review of Pyramul Public School Centenary 1869 – 1969 indicates that many of the families who currently own land in the Project area, have been in the area since the 1800s.

Pyramul has played a significant role in the Australian sheep industry. The sheep grown originally in Mudgee by the early settlers, were the origin of what has become known as the *Mudgee type* Merino (Swords & Bassingthwaite 1998). The plateau at Pyramul is one of a few locales in which local specialty wools have been produced. Cold high country produces finer wool and local families have been instrumental in creating a tradition of quality fine micron wool (Swords & Bassingthwaite 1998). Pyramul wool continually (and has done for a long period of time) wins the international award for the finest and best quality superfine wool.

6.3 Previously Recorded Heritage Items

Searches have been conducted for previous heritage listings in and around the 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 (13 January 2012) revealed that there are no historic items present in the proposed impact area.

The Crudine General Cemetery is listed as an Indicative Place.

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 was conducted on the 13th January 2012. Two items listed on the Mid-Western Regional LEP are located within the Pyramul and Crudine localities: The Catholic Cemetery at Pyramul and the Crudine school. Both items are located outside areas in which impacts are proposed.

6.4 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 applicable to the study area are listed in the table below (Table 2).

Table 2 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	Tree plantings

Australian Theme	NSW Theme	Local Theme
	landscape	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
		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

Australian Theme	NSW Theme	Local Theme
		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

6.5 Predictive Statements

The historical theme of direct relevance to this project is Agriculture and Pastoralism (see Table 2). 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 and the growing of crops have also been undertaken. There is a high potential for items associated with this theme to be present in the study area.

Potential heritage item types may include homesteads, shepherds huts, sheds (shearing, crutching etc), yards, fences, plough-lands, dams and roads. These items may be present as extant/standing features or ephemeral remnants. Such items may have archaeological research potential and historical/social significance.

Summary

There is a high probability that potential heritage items might be present within the study area. The theme that such items are most likely to be associated is agriculture/pastoralism. Items may be present as extant/standing structures or ephemeral sites and ruins. The location of such items is difficult to predict. It should be noted that while there is a high 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.

7. FIELD SURVEY RESULTS

In accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*, the purpose of a field survey is to record the material traces and evidence of Aboriginal land use that are:

- Visible at or on the ground surface, or
- Exposed in section or visible as features (e.g. rock shelters with rock-art),

and to identify those areas where it can be inferred that, although not visible, material traces have a high likelihood of being present under the ground surface (DECCW 2010a: 12).

The field survey strategy, and results, are set out in this section of the report.

7.1 Sampling Strategy and Methods

The archaeological survey entailed a pedestrian traverse survey which was undertaken by five or six people (per day) over a seven day period.

The field survey was aimed at locating Aboriginal objects, areas and places, and European 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 proposal area. The wind turbine envelopes and transmission line (connecting to the grid) have been subject to assessment within a 200 metre wide corridor. The pedestrian survey methodology entailed walking parallel transects across individual Survey Units with each surveyor situated c. 10 – 20 metres apart. 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 in the study area 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 18 Survey Units, each of which have been defined according to broad landform morphological types (as defined below), discrete development envelopes and survey traverses.

The field recording and mapping has been conducted using a mobile GIS system. The location of Aboriginal objects, European heritage items and Survey Units has been made using ArcGIS software and a Trimble GPS. In order to ensure consistency in data collection, all field records were made in Microsoft Access databases formulated specifically for the Wind Farm project. Three separate forms were used for recording Survey Unit data, Aboriginal Object data and

Historical features data. The data collected forms the basis for the documentation of survey results. 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.

Gradient - Slope class and value:
- 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.
- Rocky - 10-20 % bedrock exposed.
- Very rocky - 20-50% 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 possible:
- eroded
- eroded or aggraded
- 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. The archaeological sensitivity of each Survey Unit was defined according to assessed artefact density as negligible, very low, 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 WGS84 readings 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.

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 south-east 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.

7.2 Survey Units

The development area has been divided into 18 Survey Units. These Survey Units are described in Table 3; their location is shown in Figures 3 - 5. Plates 5 - 21 illustrate the landscape context of the proposed activity areas.

The landscape in which the wind turbines are proposed is an exposed, elevated plateau. The majority of Survey Units are sections of large, broad amorphous landforms: crests and simple slopes. The scale of these is such that Aboriginal activities, generally, are likely to have occurred anywhere, rather than having been focused at a single locale. That is, nether the landforms themselves, nor specific areas within landforms, are likely to have been focal points of human activity in the landscape. The majority of turbines are located on broad crest landform elements. Access tracks traverse crests, simple slopes and cross drainage depressions. The entire proposal area generally possesses very thin or negligible soil profiles. Low rock outcrops occur frequently, and approximately 60 per cent of ground surfaces are comprised of coarse fragments of shattered shale bedrock.

The watercourses which drain the landforms are all low order streams. In proposed turbine areas, these are usually 1st order only and, accordingly, ephemeral and unlikely to hold water, even immediately after rain. However, in a few drainage lines, usually where dammed, springs appear to exist, and these are likely to have been exploited by Aboriginal people. It is notable that there are no swamps in the proposal area. Such features were present around Mudgee at the time of the earliest European settlement in the 1820s, and are likely to have been resource zones targeted by Aboriginal people.

Given the absence of abundant potable water and swamps in the proposed activity areas, it is predicted that Aboriginal land use would have been restricted to activities such as hunting and gathering forays conducted away from base camps and areas of more permanent habitations. The nature of such activities, is such, that associated artefact discard would generally be dispersed, and of low to very low density. Artefact complexity may also be generally restricted, reflecting the limited range of activities being undertaken in such areas.

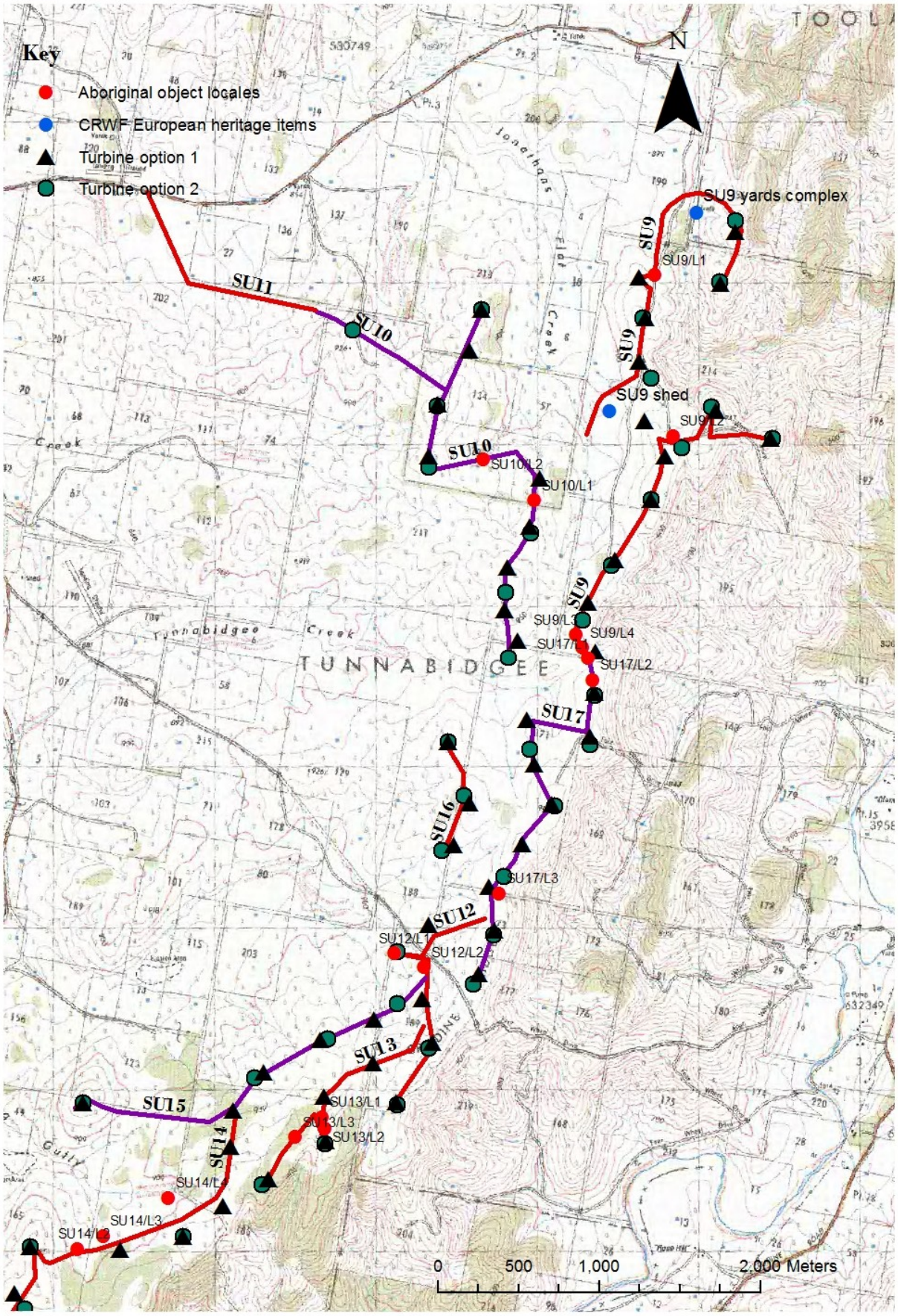

Figure 3 Location of Survey Units, Aboriginal object locales and European items: northern turbine envelope area.

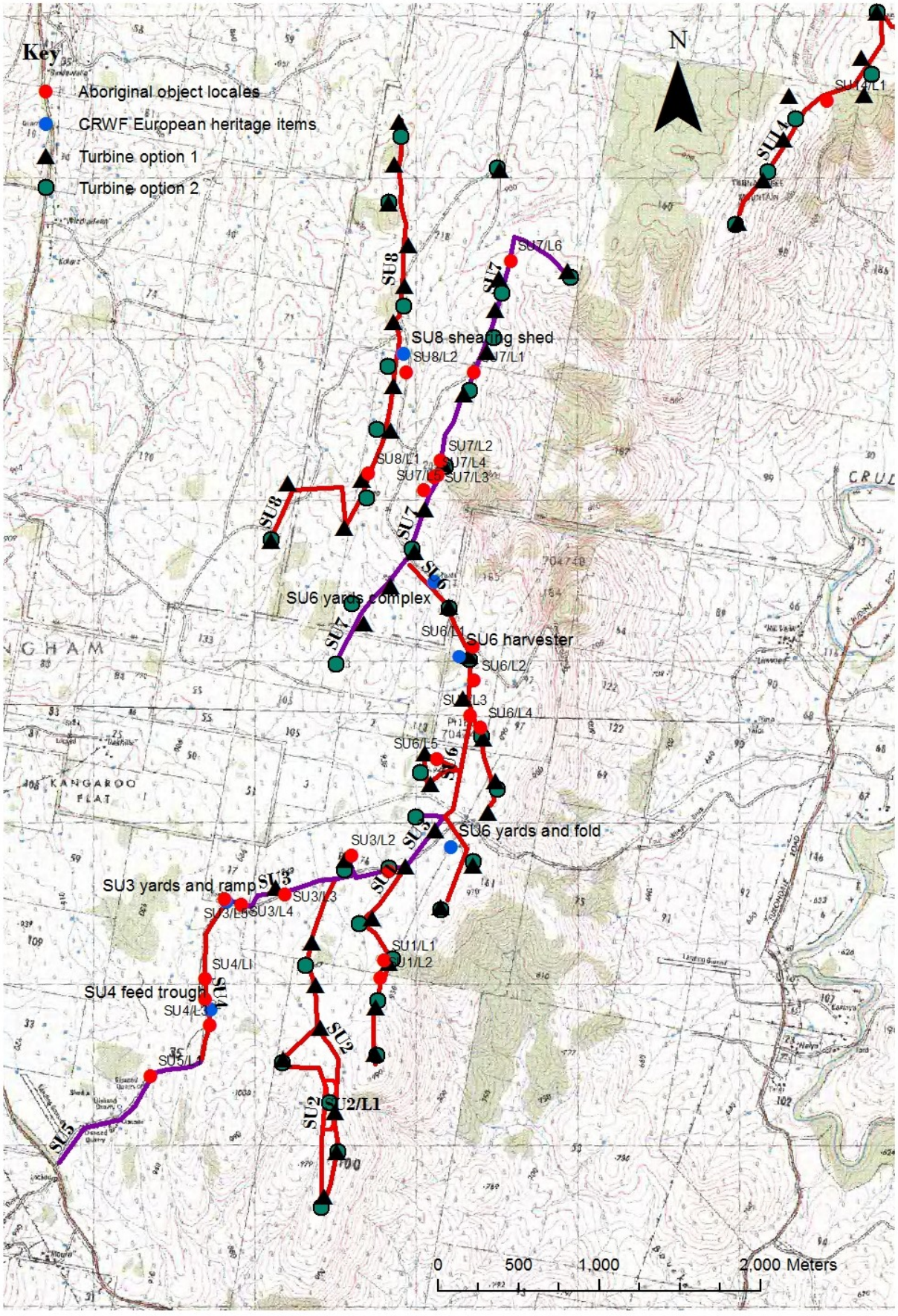

Figure 4 Location of Survey Units, Aboriginal object locales and European items: southern turbine envelope area.

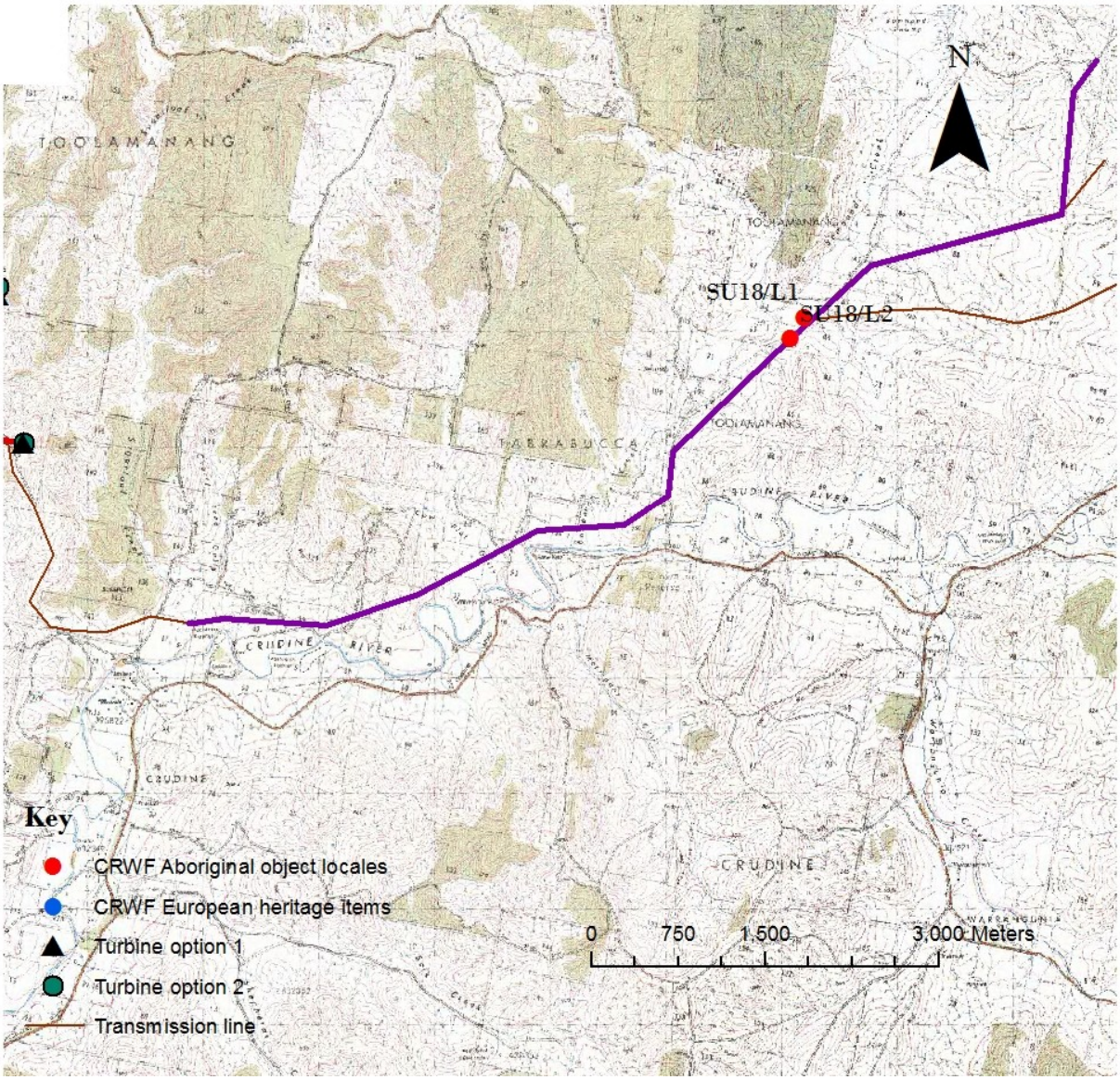

Figure 5 Location of Survey Unit 18, Aboriginal object locales: Transmission line.

Plate 5 Survey Unit 1 looking south; note rocky exposures and bare earth; note rocky knoll in distance.

Plate 6 Top of rocky knoll at south-east end of Survey Unit 1; note reduced ground exposure.

Plate 7 South end of Survey Unit 2; note rocky exposures and reduced ground exposure.

Plate 8 Survey Unit 4 looking south.

Plate 9 Survey Unit 5 looking south-west.

Plate 10 Survey Unit 6 looking south.

Plate 11 Survey Unit 7 looking south.

Plate 12 Survey Unit 8 looking south.

Plate 13 Survey Unit 9 looking 210°. Note steep fall to the Crudine to the east (in mid distance).

Plate 14 Survey Unit 10 looking south.

Plate 15 Survey Unit 12 looking south.

Plate 16 Survey Unit 13 looking south.

Plate 17 Survey Unit 14 (south end) looking south.

Plate 18 Survey Unit 16 looking 130°.

Plate 19 Survey Unit 17 looking south.

Plate 20 Survey Unit 18 (east end) looking south-west.

Plate 21 Survey Unit 18 long east along the Crudine valley.

Table 3 Survey Unit descriptions.

Survey Unit	Proposed impacts	Landform	Rock abundance	Soil	Geomorphology	Disturbance	Predicted artefact density
SU1 Plate 5 Plate 6	Wind turbine envelope	Plateau - Crest Broad undulating landform with prominent rocky knoll on east side	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol: extensive exposures of bare earth except for rocky knoll in SE (see plate 6)	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing	Very low; soil is shallow & there is very limited potential for deposit
SU2 Plate 7	Wind turbine envelope	Plateau – Crest: Broad undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol: extensive exposures of bare earth; except for south end (see Plate 7)	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing	Very low; soil is shallow & there is very limited potential for deposit
SU3	Wind turbine envelope, access and site compound	Plateau - crest Broad undulating landform with minor drainage lines	Rocky; rock present as 30% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol: extensive exposures of bare earth	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing	Very low; soil is shallow & there is very limited potential for deposit
SU4 Plate 8	Site access	Plateau – simple slope	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol: extensive exposures of bare earth	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance, water diversion, vehicle use & stock grazing	Very low; soil is shallow & there is very limited potential for deposit
SU5 Plate 9	Site access, site compound and rock crushing plant	Plateau – crest Undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops. High quartz background	Skeletal, lithosol: extensive exposures of bare earth	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance, quarrying -dams, vehicle use & stock grazing. Imported fill at south end	Very low; soil is shallow & there is very limited potential for deposit
SU6 Plate 10	Wind turbine envelope	Plateau - Crest Broad undulating landform with prominent rocky knolls on east side	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol: extensive exposures of bare earth except for rocky knolls on east side	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing. Previous cultivation.	Very low; soil is shallow & there is very limited potential for deposit
SU7 Plate 11	Wind turbine envelope	Plateau - Crest Broad undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol: extensive exposures of bare earth	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit

Survey Unit	Proposed impacts	Landform	Rock abundance	Soil	Geomorphology	Disturbance	Predicted artefact density
SU8 Plate 12	Wind turbine envelope	Plateau - Crest Undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops including quartz	Skeletal, lithosol: extensive exposures of bare earth	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit
SU9 Plate 13	Wind turbine envelope	Plateau - Crest Broad undulating landform with series of knolls on east side.	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops including quartz	Skeletal, lithosol	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit
SU10 Plate 14	Wind turbine envelope, access and site compound	Plateau - crest Broad undulating landform with minor drainage lines	Rocky; rock present as 50% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol: exposures of bare earth	Eroded; wind, precipitation - sheet flow; human and animal. High sheet and gully erosion in drainage lines	High: mechanical clearance & stock grazing	Very low; soil is shallow & there is very limited potential for deposit
SU11	Access and rock crushing	Simple slope with minor drainage lines	Rocky; rock present as 30% coarse fragments: shale shatter with minor above-ground outcrops including quartz	Loam	Aggraded and eroded	Moderate: clearance and farming, including cultivation	Very low; there is potential for deposit
SU12 Plate 15	Wind turbine envelope	Plateau - Crest Broad undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter	Skeletal, lithosol with some quartz background	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit except in drainage lines
SU13 Plate 16	Wind turbine envelope	Plateau - Crest Broad undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol with some quartz background	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit
SU14 Plate 17	Wind turbine envelope	Plateau - Crest Generally broad undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit

Survey Unit	Proposed impacts	Landform	Rock abundance	Soil	Geomorphology	Disturbance	Predicted artefact density
SU15	Wind turbine envelope	Plateau - Crest Broad undulating landform	Rocky; rock present as 40% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit
SU16 Plate 18	Wind turbine envelope	Plateau - Crest Broad undulating landform	Rocky; rock present as 50% coarse fragments: shale shatter with minor above-ground outcrops	Skeletal, lithosol	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit
SU17 Plate 19	Wind turbine envelope	Plateau - Crest Broad undulating landform	Rocky; rock present as 60% coarse fragments: shale shatter with minor above-ground outcrops including quartz	Skeletal, lithosol	Eroded; wind, precipitation - sheet flow; human and animal	High: mechanical clearance & stock grazing.	Very low; soil is shallow & there is very limited potential for deposit
SU18 Plate 20 & 21	Transmission line	Rolling hills: gentle to steep.	Generally rocky, shale and conglomerate pebbles	Deep loams in valleys and skeletal generally on hills (crests and slopes)	Aggraded and eroded	High: clearance, and farming, including cultivation	Very low; potential for deposit on flats, but limited on hills.

7.3 Survey Results, Analysis and Discussion

A development corridor measuring 52 kilometres long by approximately 200 metres wide (c. 1040.96 hectares – see Table 4), was inspected during the field survey. Accordingly, the total area subject to archaeological assessment measured. It is estimated that approximately 217.37 hectares of that area was subject to actual visual perusal of ground surfaces. All wind turbine envelopes were surveyed, however, overhead transmission line corridors were subject to sampled survey only.

At the time of the field survey ground exposure was reasonably high, particularly in the south. The geomorphological context was found to be eroded in the majority of areas (except for drainage lines which were both eroded and aggraded). Where ground surfaces were breached, exposures usually presented a relatively complete view of archaeological visibility (i.e. the potential artefact bearing context). In the majority of areas archaeological visibility was usually estimated to be c. 90 per cent.

Ground exposures encountered are estimated to have measured c. 51.0369 hectares in area. Of that area, archaeological visibility is estimated to have been c. 45.5929 hectares. Effective Survey Coverage (ESC) is calculated to have been 4.4% of the surveyed area.

During the survey 44 Aboriginal object locales with stone artefacts were recorded (see Table 5 and Appendix 1). All artefact locales have been calculated to be very low density artefact distributions (taking into consideration ground exposure and archaeological visibility). However, it is noted that while every effort was made to record ground exposure and archaeological visibility accurately, these estimations are inherently problematic and, accordingly, comparisons of artefact density between locales may not be sensible.

Generally, the artefact locales are considered to be representative of the artefact distribution and density within the entire Survey Unit in which they are situated. That is, they do not appear to be representative of discrete artefact locales but instead, they form part of the very low density 'background scatter' which is present across the landscape. The behavioural context of their deposition (or discard) would seem to be spatially unfocused.

However, some locales do seem to be more discrete and, furthermore, these are tethered to particular areas. There is some tendency for these locales to be on the eastern side of the plateau and, also, to be associated with springs. Artefact locales which have these characteristics are: SU2/L1 (particularly that part which is close to the dam), SU7/L3, SU7/L4, SU13/2.

Most artefacts are made from tuff (sometimes referred to as indurated mudstone). Minor frequencies of other materials occur including quartz, quartzite, chert and silcrete. It is highly probably that quartz is under-represented in the recordings. In some Survey Units quartz background was high and, accordingly, detecting artefacts made from that material was difficult under survey conditions. The predominance of tuff is not unusual, given the location of the area on the western fringe of the Sydney Basin (Jo Kamminga pers. comm. Dec 2011). The majority of artefacts are flakes, flake fragments and other debitage such as cores. However, numerous retouched artefacts and flakes with usewear were recorded indicating some complexity in artefact related activities.

All artefact locales are highly disturbed, primarily by erosional process likely to be initiated by agricultural activities, intensive grazing and so on. The majority are located on skeletal lithosols and they do not have the potential to contain archaeological deposit.

Table 4 Survey coverage data.

SU	Length m	SU area sq m	Area Inspected %	Area Inspected sq m	Ground Exposure ave. %	Ground Exposure sq m	Visibility ave. %	Net Effective Exposure sq m	Effective Survey Coverage ave. %	Predicted artefact density	Results
SU1	1420	284000	30	85200	50	42600	90	38340	13.5	Very low	SU1/L1 SU1/L2
SU2	3560	712000	40	284800	40	113920	90	102528	14.4	Very low	SU2/L1
SU3	1900	380000	20	76000	40	30400	90	27360	7.2	Very low	SU3/L1 SU3/L2 SU3/L3 SU3/L4 SU3/L5
SU4	1040	208000	20	41600	50	20800	90	18720	9	Very low	SU4/L1 SU4/L2 SU4/L3
SU5	1150	230000	20	46000	50	23000	90	20700	9	Very low	SU5/L1
SU6	3480	696000	30	208800	40	83520	90	75168	10.8	Very low	SU6/L1 SU6/L2 SU6/L3 SU6/L4 SU6/L5
SU7	2330	466000	20	93200	40	37280	90	33552	7.2	Very low	SU7/L1 SU7/L2 SU7/L3 SU7/L4 SU7/L5 SU7/L6
SU8	3500	700000	30	210000	30	63000	90	56700	8.1	Very low	SU8/L1 SU8/L2
SU9	5220	1044000	30	313200	10	31320	90	28188	2.7	Very low	SU9/L1 SU9/L2 SU9/L3

SU	Length m	SU area sq m	Area Inspected %	Area Inspected sq m	Ground Exposure ave. %	Ground Exposure sq m	Visibility ave. %	Net Effective Exposure sq m	Effective Survey Coverage ave. %	Predicted artefact density	Results
											SU9/L4
SU10	3880	776000	10	77600	10	7760	90	6984	0.9	Very low	SU10/L1 SU10/L2
SU11	1420	284000	10	28400	20	5680	60	3408	1.2	Very low	nil
SU12	1839	367800	20	73560	5	3678	90	3310.2	0.9	Very low	SU12/L1 SU12/L2
SU13	1880	376000	20	75200	5	3760	90	3384	0.9	Very low	SU13/L1 SU13/L2 SU13/L3
SU14	3366	673200	20	134640	5	6732	80	5385.6	0.8	Very low	SU14/L1 SU14/L2 SU14/L3 SU14/L4
SU15	2496	499200	10	49920	5	2496	90	2246.4	0.45	Very low	nil
SU16	710	142000	10	14200	5	710	90	639	0.45	Very low	nil
SU17	2607	521400	30	156420	15	23463	90	21116.7	4.05	Very low	SU17/L1 SU17/L2 SU17/L3
SU18	10250	2050000	10	205000	5	10250	80	8200	0.4	Very low	SU18/L1 SU18/L2
Total	52048	10409600		2173740		510369		455929.9	4.4		

Table 5 Summary of Aboriginal object locales recorded during the survey.

ID	Easting	Northing	Contents
SU1/L1	743920	6344335	3 stone artefacts in 625 sq m area
SU1/L2	743895	6344227	4 stone artefacts in 400 sq m area
SU2/L1	743574	6343444	c. 50 stone artefacts in 21,000 sq m area
SU3/L1	743944	6344890	2 stone artefacts in 400 sq m area
SU3/L2	743718	6344986	3 stone artefacts in 400 sq m area
SU3/L3	743303	6344743	2 stone artefacts in 50 sq m area
SU3/L4	743032	6344681	4 stone artefacts in 105 sq m area
SU3/L5	742930	6344713	3 stone artefacts in 8 sq m area
SU4/L1	742809	6344220	3 stone artefacts in 4 sq m area
SU4/L2	742812	6344095	4 stone artefacts in 900 sq m area
SU4/L3	742836	6343932	1 stone artefact
SU5/L1	742470	6343620	3 stone artefacts in 12 sq m area
SU6/L1	744467	6346283	6 stone artefacts in 225 sq m area
SU6/L2	744477	6346069	3 stone artefacts in 200 sq m area
SU6/L3	744451	6345854	10 stone artefacts in 75 sq m area
SU6/L4	744514	6345775	8 stone artefacts in 2400 sq m area
SU6/L5	744247	6345583	2 stone artefacts in 300 sq m area
SU7/L1	744472	6347983	1 stone artefact
SU7/L2	744270	6347436	7 stone artefacts in 1,600 sq m area
SU7/L3	744248	6347345	5 stone artefacts in 100 sq m area
SU7/L4	744229	6347331	13 stone artefacts in 600 sq m area
SU7/L5	744166	6347252	2 stone artefacts in 8 sq m area
SU7/L6	744702	6348674	1 stone artefact
SU8/L1	743822	6347354	1 stone artefact
SU8/L2	744053	6347984	1 stone artefact
SU9/L1	750844	6356236	1 stone artefact
SU9/L2	750955	6355239	1 stone artefact
SU9/L3	750357	6354009	1 stone artefact
SU9/L4	750396	6353928	1 stone artefact
SU10/L1	750098	6354842	1 stone artefact
SU10/L2	749783	6355096	2 stone artefacts in 300 sq m area
SU12/L1	749227	6352034	4 stone artefacts in 400 sq m area
SU12/L2	749414	6351947	2 stone artefacts in 50 sq m area
SU13/L1	748780	6351021	3 stone artefacts in 100 sq m area
SU13/L2	748798	6350947	c. 50 stone artefacts in 1,200 sq m area
SU13/L3	748614	6350897	2 stone artefacts in 3 sq m area
SU14/L1	746665	6349665	1 stone artefact
SU14/L2	747267	6350205	2 stone artefacts in 1 sq m area
SU14/L3	747424	6350286	1 stone artefact
SU14/L4	747827	6350521	14 stone artefacts in 1,375 sq m area
SU17/L1	750430	6353858	3 stone artefacts in 8 sq m area
SU17/L2	750460	6353723	1 stone artefact
SU17/L3	749878	6352403	1 stone artefact
SU18/L1	758305	6356311	1 stone artefact
SU18/L2	758186	6356129	4 stone artefacts in 20 sq m area

7.4 Impact Assessment

The recorded artefact locales are unlikely to represent the sum total of Aboriginal objects in the proposed activity area. It is believed that the proposal area is likely to contain stone artefacts across the entire area, in a virtual continuum. However, any unrecorded stone artefacts, either in surveyed areas or in adjacent terrain, are predicted to be present in very low or 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 the report illustrate this). During the field survey, no landforms (or areas within landforms), were identified that are likely to have been significant 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 generally 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.

The survey results confirm the predictions of very low density artefact distribution. Furthermore, given the highly erosional context of the majority of areas, all artefact locales are significantly disturbed and do not possess archaeological deposit.

Accordingly, it is concluded that the proposed impacts to the archaeological resource can be considered to be of correspondingly low significance. It is also relevant to take into consideration that impacts will be discrete in nature and will occupy a relatively small footprint. 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.

7.5 Survey Results – European

Much of the proposal area is land that has been in the hands of current landowning families for many generations. Eight European items have been recorded during the survey, all of which are located outside areas of proposed impact. All items are associated with animal husbandry and most are sheep sheds and yards, some of which are still in use (Appendix 2). Of particular interest is the Sunshine harvester, which implies that the plateau was cultivated in the early to mid 1900's. Given the skeletal nature of soils now, cultivation would not have been predicted to have taken place.

No homesteads or dwellings of any kind (e.g. shepherds huts) were recorded in the proposal area. This absence implies that the area has always been used as 'back country' for grazing only.

The European items demonstrate the agricultural and grazing heritage of the landowning families of the area. It is noted that clearance, fencing and dams, all represent the efforts of successive generations of these families. These, while not obviously heritage items, nevertheless, are not only integral to current farming practice, but also are a component of the material heritage of the local area.

8. 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 located within the study area.

8.1 Significance Assessment Criteria – Aboriginal Heritage

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.

8.2 Significance Value of the Aboriginal Objects in the Study Area

In order to assess the criteria of archaeological significance, and also to consider the criteria of rarity, consideration can be given to the distribution of stone artefacts across the continent. There are two estimates of the quantity of accumulated stone artefacts in Australia (Wright 1983:118; Kamminga 1991:14, 2002). Wright estimated an average of 500,000 débitage items and 24,000 finished tools per square kilometre, which equates to a total of about 180 billion finished stone tools and four trillion stone débitage items in Australia. Kamminga's estimates, which were determined from a different set of variables, provide a conservative estimate of 200 billion stone tools and 40 million tonnes of flaking débitage (see Kamminga 1991:14; 2002). These two estimates are similar, and suggest that the actual number of stone tools and items of flaking débitage in Australia is in the trillions. The stone artefacts distributed in the proposal area cannot therefore, be considered to be rare.

The vast majority of stone artefacts found in Australia comprise flaking debris (termed débitage) from stone tool making. While it can be reasonably inferred from a range of ethnographic and archaeological evidence that discarded stone artefacts and flaking debris was not valued by the maker, in certain circumstances these objects may to varying degrees have archaeological research potential and/or Aboriginal social value. However, only in very exceptional circumstances is archaeological research potential high for particular sites (Kamminga, J. pers. comm. June 2009). All recorded artefacts are representative of debitage except for several retouched artefacts (backed artefacts) and flakes with usewear. Accordingly the artefact distribution is similar in content to many other lithic scatters in the local area and wider region; the artefact assemblage is therefore common under the criteria of representativeness.

The scientific significance of the recorded Aboriginal artefact locales in the project area is low. However, the cultural value and significance of these locales is generally high for the Aboriginal community. Certainly during the field survey, the representatives of the Aboriginal community expressed their interest in regard particularly to locales (e.g. SU7/L4 & SU13/L2) that contained higher numbers of artefacts.

8.3 Significance Assessment Criteria – European Items

The NSW Heritage Office and Planning NSW have defined a set of criteria and methodology for the assessment of cultural heritage significance for items and places, where these do not include Aboriginal heritage from the pre-contact period (NSW Heritage Office & DUAP 1996, NSW Heritage Office 2001, Heritage Council of NSW 2008).

The Heritage Council of NSW recognises the following four levels of significance for heritage in NSW:
- Local
- State
- National
- World

These four levels refer to the context in which a heritage item is important and does not refer to a ranking of significance. A heritage item may have significance at more than one level; items of local significance are by far the most common in New South Wales and make the greatest contribution to our living historic environment (Heritage Council of NSW 2008).

The following heritage assessment criteria are those set out for Listing on the State Heritage Register. In many cases items will be significant under only one or two criteria. The State

Heritage Register was established under Part 3A of the Heritage Act (as amended in 1999) for listing of items of environmental heritage which are of state heritage significance. Environmental heritage means those places, buildings, works, relics, moveable objects, and precincts, of state or local heritage significance (section 4, Heritage Act 1977).
An item will be considered to be of State (or local) heritage significance if, in the opinion of the Heritage Council of NSW, it meets one or more of the following criteria:

Criterion (a) an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area) – known as *historic significance*;

Criterion (b) an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area) – known as *historic associations*;

Criterion (c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area) – known as *aesthetic* or *technical significance*;

Criterion (d) an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons– known as *social significance*;

Criterion (e) an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area) – known as *research potential* or *educational significance*;

Criterion (f) an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area) – known as *rarity*;

Criterion (g) an item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or cultural or natural environments (or a class of the local areas) – known as *representative significance.*

An item is not to be excluded from the Register on the ground that items with similar characteristics have already been listed on the Register. Only particularly complex items or places will be significant under all criteria.

In using these criteria it is important to assess the values first, then the local or State context in which they may be significant. In instances where a heritage item is complex and/or comprises numerous elements a hierarchy of significance may be useful in assigning significance to individual elements or areas of a site as different components of a place may make a different relative contribution to its heritage value. For example, loss of integrity or condition may diminish significance. In some cases it is constructive to note the relative contribution of an item or its components. Table 6 below provides a guide to ascribing relative values for components of an individual item.

Table 6 Significance grading – Non-Indigenous heritage

Grading	Justification	Status
Exceptional	Rare or outstanding item of local or State significance. High degree of intactness Item can be interpreted relatively easily.	Fulfils criteria for local or State listing.

Grading	Justification	Status
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from significance.	Fulfils criteria for local or State listing.
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or State listing.
Little	Alterations detract from significance. Difficult to interpret.	Does not fulfil criteria for local or State listing.
Intrusive	Damaging to the item's heritage significance.	Does not fulfil criteria for local or State listing.

8.4 Significance Assessment – European Items

The heritage items recorded during this survey have been assessed against the State Heritage Register criteria and have been guided by the NSW Heritage Office update *Assessing Heritage Significance* (2001) and the Heritage Council of NSW update *Levels of Heritage Significance* (2008).

None of the European items satisfy the appropriate criteria to warrant heritage listing.

9. MITIGATION AND MANAGEMENT STRATEGIES

The aim of this study has been to identify Aboriginal areas, objects and places, and European 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 Non-Aboriginal heritage items are listed and discussed.

9.1 Management and Mitigation Strategies – Aboriginal Objects

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: 24).

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. Soils across the proposed activity areas are either absent and skeletal (ie lithosols) or very shallow. They are not predicted to contain artefact density sufficient to warrant test excavation. Furthermore, proposed impacts are small-scale, discrete and primarily narrow, linear impacts. 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, 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.

No Aboriginal object locales have been assessed to be of sufficient archaeological significance to warrant the implementation of a strategy of conservation. It is specifically noted that it would be generally meaningless to implement a strategy of conservation or impact avoidance in regard

to the recorded Aboriginal object locales in the proposed impact area. It would be almost certainly the case that if components of the project were re-routed to avoid certain Aboriginal object locales, other (undetected and unrecorded due to ground cover etc.) Aboriginal objects would, instead, be impacted. However, it is recommended (see further below) that all ground disturbance works associated with construction, be kept to an absolute minimum in order to ensure as little impact as possible to the archaeological resource which is located across the landscape.

Mitigated Impacts

Mitigated impact usually takes the form of partial impacts only (i.e. conservation of part of an 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 object locales warrant, from an archaeological point of view, a strategy of impact mitigation in the form of salvage. However, given their generally high cultural significance, a strategy of impact mitigation would be appropriate. An appropriate form of impact mitigation would be to minimise impacts to ground surfaces as much as feasible to ensure as little impact as possible to Aboriginal objects which are known and predicted to be present in the proposed activity area. It would also be culturally appropriate to salvage artefacts from certain sites.

Accordingly, it is appropriate to implement practical measures that may be taken to protect and conserve Aboriginal objects in the Project area.

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.

All Aboriginal object locales have been assessed to be of low archaeological significance and, accordingly, unmitigated impacts are appropriate. However, as indicated above, given their generally high cultural significance, a strategy of impact mitigation (i.e. limiting the extent of impacts and possible salvage of artefacts from some sites) would be appropriate.

9.2 Management and Mitigation Strategies – European Items

The eight European heritage items are all located outside areas of proposed impacts. However, strategies should be implemented to ensure that inadvertent impacts do not occur during construction.

10. RECOMMENDATIONS

The following recommendations are made on the basis of:

- A consideration of the Part 3A amendment to the Environmental Planning and Assessment Act.
- The results of the investigation as documented in this report.
- Consideration of the impact assessment conducted in this study.
- Consideration of the type of development proposed and the nature of proposed impacts.

Management and mitigation strategies are outlined and justified in Section 9 of this report. The following recommendations are provided in summary form:

1. None of the Survey Units, Aboriginal object locales or European heritage items in the proposal area has been assessed to surpass archaeological significance thresholds which would act to preclude the proposed wind farm.

2. No Survey Units or artefact locales have been identified in the proposal area to warrant further archaeological investigation such as subsurface test excavation. Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, sub-surface Aboriginal objects with potential conservation values (the trigger for conducting subsurface testing) are not predicted to have a high probability of being present (*cf.* NSW DECCW 2010: 24). The environmental contexts in which the turbines (and associated impacts) are proposed contain eroded and disturbed soils as a result of high levels of environmental degradation. Soils across the proposed activity areas are either absent and skeletal (ie lithosols) or very shallow, *that is*, there is no or very limited subsurface potential in the majority of proposed impact areas.

3. It is recommended that ground disturbance impacts associated with the construction of the wind farm 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.

4. The proponent should, in consultation with an archaeologist, develop a Cultural Heritage Management Protocol, which documents the procedures to be followed for impact management and/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 Office and Environment and Heritage.

5. 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.

6. The proponent should ensure that Aboriginal Site Impact Recording Forms are completed (and submitted to the NSW OEH) for each Aboriginal object site harmed during construction of the wind farm.

11. REFERENCES

Attenbrow, V. 1987 The Upper Mangrove Creek Catchment. A Study of Quantitative Changes in the Archaeological Record. Unpublished PhD thesis, University of Sydney.

Attenbrow, V. 2002 *Sydney's Aboriginal Past: Investigating the archaeological and historical records*. University of New South Wales Press, Sydney.

Attenbrow, V. 2004 *What's changing: population size or land use patterns? The archaeology of Upper Mangrove Creek, Sydney Basin*. Pandanus Books, Canberra.

Boot, P. 1996 Pleistocene Sites in the South Coast Hinterland of New South Wales. *Tempus* Vol. 6; pp. 275 - 288.

Boot, P. 2002 Didthul, Gulaga and Wadbilliga: An archaeological study of the Aboriginals of the New South Wales South Coast hinterland. Unpublished PhD thesis, The Australian National University.

Branagan, D. and G. Packham 2000 *Field Geology of New South Wales*. NSW Department of Mineral Resources: Sydney.

Burrows, G. E. 1999 A survey of 25 remnant vegetation sites in the South Western Slopes, NSW. *Cunninghamia* 6 (2); 283-314.

Cannon, M. 1988 *Life in the Country*. Viking O'Neill: Melbourne.

Carter, C. 1994 *The Archaeology of the Robertson Land Acts*. Unpublished BA Honours Thesis, Australian National University.

Coe, M. 1989 Windradyne : a Wiradjuri Koorie. Aboriginal Studies Press, Canberra.

Cook, K. and Garvey, D. 1999 *The Glint of Gold: a History and Tourist Guide of the Goldfields of the Central West of New South Wales*. Genlin Investments, Orange, N.S.W.

Cox, G.H.F *History of Mudgee*, no date; no publication details.

Dominic Steele Consulting Archaeology 2003 *Aboriginal archaeological survey and assessment report. Reconstruction of a 14.18 km stretch of the Castlereagh highway, north of Lithgow*. Report for the RTA.

Dunnell, R. 1993 The Notion Site in J. Rossignol and L. Wandsnider (eds) *Space, Time and Archaeological Landscapes*. New York: Plenum, pgs 21-41.

Eco Logical Australia 2011 Crudine Ridge Wind Farm – Water and Soil Assessment. Prepared for Wind Prospect CWP Pty Ltd.

Geoscience Australia 2011 Australian Stratigraphic Names Database, Available: www.ga.gov,au.

Gott, B. 1983. Murnong – Microseris scapigera: a study of a staple food of Victorian Aborigines. *Australian Aboriginal Studies* 1983/2: 2-18.

Haglund, L. 1985 Assessment of the Prehistoric Heritage in the Mudgee Shire.

Heritage Council of New South Wales 2008 *Levels of Heritage Significance*, Heritage Office, NSW Department of Planning, Sydney.

Heritage Office and Department of Urban Affairs and Planning 1996 *Regional histories: regional histories of New South Wales*, Department of Urban Affairs and Planning, Sydney.

Hiscock, P. 1981 Comments of the use of chipped stone artefacts as a measure of 'intensity of site usage'. *Australian Archaeology*. Vol. 13; pp. 30 – 34.

Hiscock, P. 1986 Technological change in the Hunter River valley and the interpretation of late Holocene change in Australia. *Archaeology in Oceania*. Vol. 21; No. 1; pp. 40 – 50.

Hiscock, P. & Mitchell, S. 1993 *Stone Artefact Quarries and Reduction Sites in Australia: Towards a Type Profile*. AGPS: Canberra.

Hughes, P. & R. Lampert 1982 Prehistoric population changes in southern coastal New South Wales. In S. Bowdler (ed.). *Coastal Archaeology in Eastern Australian: Proceedings of the 1980 Valla Conference on Australian Prehistory*. pp. 16 – 28. Occasional Papers in Prehistory 11. Department of Prehistory Research School of Pacific Studies, Australian National University, Canberra.

Jeans, D. N. 1966 *A Historical Geography of New South Wales*. Reed Education: Sydney.

Kamminga, J. 1991 Report on the Archaeological Collection, National Museum of Australia. Report to the National Museum of Australia, Canberra. April 1991. (3 vols).

Kamminga, J. 2002 Affidavit dated 18 June 2002, for Case No. 40171 of 2002 in the Land and Environment Court of New South Wales.

Kamminga, Jo. Personal communication 19th June 2009.

Kamminga, Jo. Personal communication Dec 2011.

Koettig, M. 1985 Assessment of Aboriginal Sites in the Dubbo City area. Report to Dubbo City Council.

Kovac M. & Lawrie J.A. 1990 Soil Landscapes of the Bathurst 1:250 000 Sheet, Soil Conservation Service of NSW, Sydney.

Lampert, R. 1971 *Burrill Lake and Currarong: Coastal Sites in Southern New South Wales*. Terra Australia 1. Department of Prehistory, Research School of Pacific Studies. Australian National University, Canberra

Lourandos, H. 1997 *Continent of Hunter Gatherers* Cambridge University Press: Cambridge.

McCarthy, F. D. 1964 The archaeology of the Capertee Valley, New South Wales. *Records of the Australian Museum*. Vol. 26, No. 6, pp. 197-246.

McDonald. J. 2008 *Dreamtime Superhighway: Sydney Basin Rock Art and Prehistoric Information Exchange*. Terra Australis 27.

McDonald, R. Isbell, R, Speight, J. Walker, J. and M. Hopkins 1998 *Australian Soil and Land Survey Field Handbook*. CSIRO Australia.

Mitchell P. 2002 Descriptions for NSW (Mitchell) Landscapes, Version 2, NSW Department of Environment and Climate Change.

Molony, J. 1988 *The Penguin History of Australia*. Penguin: Melbourne.

Mulvaney, J. and J. Kamminga 1999 *Prehistory of Australia*. Allen and Unwin: St Leonards.

Murphy B.W. & Lawrie J.W. 1998 Soil Landscapes of the Dubbo 1:250 000 Sheet (Dubbo, Wellington, Gulgong, Mudgee), Department of Land and Water Conservation of NSW, Sydney.

Navin Officer Heritage Consultants Pty Ltd 2005 *Wilpinjong Coal Project Appendix F Aboriginal Cultural Heritage Assessment*. A report prepared for Wilpinjong Coal Pty Limited.

NSW Department of Environment, Climate Change and Water 2010a Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.

NSW Department of Environment, Climate Change and Water 2010b Aboriginal cultural heritage consultation requirements for proponents.

New South Wales Department of Environment and Conservation 2004 *Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants*.

New South Wales Department of Environment and Conservation 2005 DRAFT *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*.

New South Wales Heritage Office and Department of Urban Affairs 1996 *Heritage Assessments, NSW Heritage Manual*, HO/DUAP, Sydney.

New South Wales Heritage Office 2001 *Assessing Heritage Significance*, HO/DUAP, Sydney.

Pardoe, C. And Webb, S. 1986 Prehistoric Human Skeletal Remains from Cowra and the Macquarie Marsh, New South Wales. *Australian Archaeology* 22:7-26

Pearson, M. 1981 Seen Through Different Eyes: Changing Land Use and Settlement Patterns in the Upper Macquarie River Region of NSW from Prehistoric Times to 1860. Ph.D. Thesis, Department of Prehistory and Anthropology, Australian National University, Canberra.

Perry, T. M. 1965 *Australia's First Frontier*. Melbourne University Press: Melbourne.

Pyramul Public School Centenary 1869 – 1969 no author, no date.

Shaw, A. 1970 *The Economic Development of Australia*. Longman: London.

Shott, M. 1995 Reliability of Archaeological Records on Cultivated Surfaces: A Michigan Case Study. *Journal of Archaeological Field Archaeology*. Vol 22; pgs 475 – 490.

Stockton, E. D. & W. Holland 1974 Cultural sites and their environment in the Blue Mountains. *Archaeology and Physical Anthropology in Oceania*. Vol. 9; pp. 36 – 65.

Swords, D and P. Bassingthwaite 1998 *They Made Their Own Way. A Collection of Reminiscences of Some Senior Mudgee and District Residents*. Crawfrd House Publishing, Bathurst.

Tindale, N. 1974 *Aboriginal Tribes of Australia*. ANU Press, Canberra.

Wandsnider, L. and E. Camilli 1992 The Character of Surface Archaeological Deposits and Its Influence on Survey Accuracy. *Journal of Field Archaeology*. Vol. 19 pgs 169 - 188.

Wright, R. 1983 Stone implements. In G. Connah (ed.), *Australian field archaeology: a guide to techniques*. Australian Institute of Aboriginal Studies, Canberra, pp. 110-25.