Appendix G Archaeological Assessment

Proposed Capital Photovoltaic Solar Farm
Archaeological and Cultural Heritage Assessment

A report to nghenvironmental
PO Box 470
Bega NSW 2550

September 2010

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

TABLE OF CONTENTS

List of Figures

List of Tables

1. SUMMARY

1.1 Introduction

New South Wales Archaeology Pty Ltd has been commissioned by nghenvironmental to undertake an Indigenous archaeological and cultural heritage assessment of the proposed Capital Solar Farm. The Solar Farm will be located near to the site of the Capital Wind Farm, situated c. 5.5 kilometres north-east of Bungendore.

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

1.2 Partnership with Aboriginal Communities

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

The field survey of the proposal area has been undertaken with the assistance of representatives of the Ngambri Local Aboriginal Land Council (NLALC) and the Buru Ngunawal Aboriginal Corporation.

1.3 Description of Impact

Infigen Suntech Australia Pty Ltd (Infigen) proposes to construct a 50 megawatt capacity photovoltaic solar farm (solar farm) north-east of the township of Bungendore.

The solar farm would comprise a series of photovoltaic modules (PV arrays) mounted on fixed frames, and would occupy part of a 220 hectare site. The Capital Solar Farm would connect to the existing Capital Wind Farm 330kV substation which is located at the northern extremity of the study area.

Project infrastructure for the proposed solar farm would include:

- A fixed photovoltaic solar module array (PV array), arranged in a series of rows between 1 and 3-4 metres above the ground, angled for maximum efficiency and supported by steel framing on steel posts fixed in the ground.
- Electrical connections between PV array and central inverters via underground or frame secured cabling.
- A series of central inverters and kiosk transformers distributed throughout the PV array.
- Electrical connection into the existing 330kV substation via an underground transmission line, including any required switchyard and substation augmentation.
- Internal access tracks and upgrades to existing roads, where required.
- Fencing and landscaping around the solar farm.
- Site office and Operations and Maintenance building.
- Research office.
- Additional temporary construction infrastructure such as a site compound and equipment laydown area.

The proposed works entail ground disturbance and accordingly the construction of the solar farm has the potential to cause impacts to any Aboriginal objects which may be present within the zones of direct impact. However, the proposed impacts are discrete in nature and will occupy a relatively small footprint within the overall area; accordingly impacts to the archaeological resource across the landscape can be considered to be partial in nature, rather than comprehensive.

1.4 Objectives and Methods

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

The investigation has included site searches, a literature review, field survey and analysis of results. Field work was undertaken in July and August 2010.

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

A landscape based approach and methodology has therefore been implemented during this study. The proposal area has been divided into 38 Survey Units, defined according to landform morphological type. Survey Units are utilised as a framework for recording, analysis and the formulation of management and mitigation strategies.

The New South Wales National Parks and Wildlife Service has prepared a draft document which provides a series of guidelines regarding the assessment and management of Aboriginal cultural heritage in New South Wales. This report has been prepared in accordance with these draft guidelines (NSW NPWS 1997). Additionally the study has been conducted in accordance with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (NSW DEC July 2005) which have been prepared specifically for development applications assessed under Part 3A of the Environmental Planning and Assessment Act 1979.

1.5 Heritage Context

A review of previous investigations in the area has been undertaken in order to define the existing information relating to Indigenous archaeology and heritage and to provide an analytical context to the assessment. In addition consultation has been undertaken with the registered Aboriginal stakeholders in regard to the archaeological context and potential of the study area.

A search of the NSW DECCW Aboriginal Heritage Information Management System (AHIMS) has indicated that there are two previously recorded Aboriginal objects located within the proposal area (AHIMS #30671). The search area measured 77 km^2 and encompassed eastings 722000 – 733000, and northings 6097000 – 610 4000. Twenty six previously recorded Aboriginal objects are listed on AHIMS to be present in the search area.

The two Aboriginal object locales listed on the AHIMS register as being present within the study area are Dry Creek 2 (57-2-0062) and Bridge Creek (57-2-0208). Dry Creek 2 was recorded by Packard (1988) while surveying for a proposed sand quarry access track which passed through the current study area. This locale was comprised of a low density artefact scatter of nine stone artefacts; the site is situated immediately to the south of the Dry Creek. Packard (1988)

subsequently conducted a test excavation programme at this site. Three stone artefacts were recovered (3/1sq m) indicating low density artefact distribution in this area. The site of this locale was relocated during the present survey. However no artefacts were identified and the area was found to be actively eroding.

The Bridge Creek locale is an isolated artefact, registered by Torres (site card 57-2-0208) in 1998. It consists of a broken hatchet head found on a flat near to Bridge Creek and within the study area. The context of this recording is unknown. However the artefact is indicated to have been removed from the area, possibly during a geological investigation in 1986, and the site card later submitted by Torres, a third party, in 1998. This locale was relocated during the current survey but no Aboriginal objects were identified.

A number of previous surveys have been conducted in the local region, principally in relation to the development of sand quarries and subdivisions. A predictive model of Aboriginal site type and location has been constructed for the proposal area based on a review of the previous research. This review suggests that the most common Aboriginal object recordings in the region are distributions of stone artefacts in surface exposures or subsurface contexts. In the region a general correlation between different types of watercourses and the nature of the evidence of past Aboriginal occupation is evident. There is also a similar association with sand deposits in the area which are indicated to have been the foci of Aboriginal campsites in the region. Higher artefact density sites are located near to permanent water sources and low density artefact distributions are found elsewhere. Rare site types include rock shelters, scarred trees, quarry and procurement sites, burials, stone arrangements, carved trees, contact sites and traditional story or other ceremonial places.

1.6 Results and Impact Assessment

The proposal area has been divided into 38 Survey Units comprised of crests, simple slopes, lower slopes, flats and drainage lines. At its closest point the southern boundary of the study area is located c. 0.2 kilometres northeast of Butmaroo Creek, a relatively reliable watercourse in the local district. The majority of the study area is currently used for grazing. The proposal area surveyed during the assessment measures approximately 226 hectares in area. It is estimated that approximately 114 hectares of that area was subject to survey inspection. Ground exposures inspected are estimated to have measured approximately 7.7 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 1.6 hectares. Effective Survey Coverage is therefore relatively low and is calculated to have been 1.9% of the study area.

A total of twelve Aboriginal object locales were recorded during the field survey. Four locales are comprised of isolated stone artefacts while eight contain very low density artefact distributions. All but three of these locales were found in close association (<10 m) with the drainage lines in the study area. In addition, two trees each of which had exposed heartwood (scars) were recorded and analysed. However, because of the irregular shape of the scarring it is assessed unlikely that these markings are of human origin. Nevertheless, as the trees are located outside the proposed areas of impact they will not be disturbed in the construction or operation of the solar farm.

The areas of the earlier recorded sites 57-2-0062 Dry Creek 2 (Packard 1988) and Bridge Creek (57-2-0208) were resurveyed, although no Aboriginal objects were evident in these locations.

The majority of artefact locales were recorded in very close proximity to the drainage lines in the study area. Subsurface excavation previously undertaken in this environmental context in the proposal area has indicated that artefact density is something in the order of three artefacts per one square metre (low density). The Effective Survey Coverage for the surveyed area is considered to have been relatively low at the time of survey, however based on a consideration of the predictive model, the proposal area is assessed to be of relatively low sensitivity and significance; that is, subsurface artefact density is likely to be low or very low.

The construction of the Capital Solar 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 Capital Solar 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 the proposed impacts relating to construction will be discrete in area and is not comprehensive.

Given that the recorded Aboriginal objects and the predicted undetected and subsurface artefacts are assessed to be of low significance, the impacts can be viewed as being of correspondingly low significance. This assessment forms the basis for the formulation of recommendations relating to the proposal.

1.7 Mitigation and Management Strategies

Details of archaeological sensitivity, suitable management strategies and accompanying rationale for the proposal area are outlined in Section 11 of this report.

The Aboriginal object locales recorded in the proposal area do not surpass scientific significance thresholds which would act to preclude the construction of the proposed solar farm. However it is noted that the majority of recorded Aboriginal object locales are located outside areas in which impacts are proposed.

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

Given the nature of the artefact locales recorded in the proposal area and the low scientific significance rating they have been accorded, unmitigated impacts is considered appropriate if necessary; a strategy of impact avoidance is not warranted in regard to these locales. Nevertheless as a form of overall impact mitigation in respect of the proposal it is recommended that wherever possible impacts are excluded from landforms situated within 50 – 75 metres of drainage lines.

1.8 Recommendations

Management and mitigation strategies are outlined and justified in Sections 11 and 12 of this report. The following recommendations are provided in summary form:

- The proposal area does not warrant further archaeological investigation such as subsurface test excavation; the field survey is considered to have been generally adequate for the purposes of determining the archaeological status of the proposal area.

- The recorded Aboriginal object locales and the predicted very low or low density subsurface artefact distribution in the proposal area does not surpass archaeological significance thresholds which would act to preclude proposed impacts. Accordingly there are no identified Indigenous archaeological constraints to the proposal.

- The recorded Aboriginal object locales are assessed to be representative of very low density distributions of stone artefacts. The archaeological significance of these locales is

assessed to be low. Accordingly unmitigated impact is considered to be appropriate if necessary.

- As a form of overall impact mitigation in respect of the proposal it is recommended that wherever possible impacts are excluded from landforms situated within 50 – 75 metres of drainage lines.

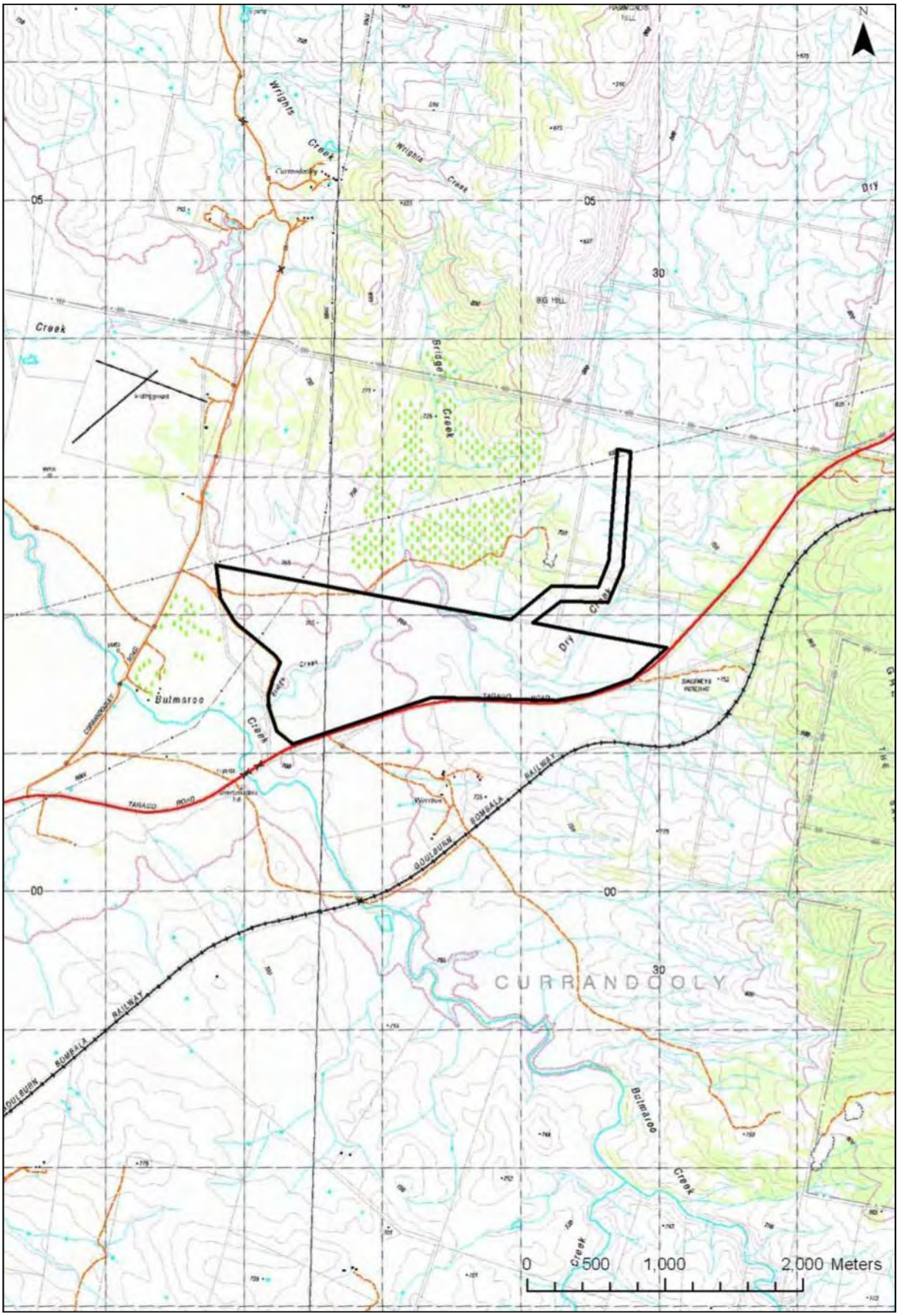

Figure 1 Location of the proposed Capital Solar Farm (Sutton 8727-1S & Boro 8827-4S 1:25000 topographic maps).

2. INTRODUCTION

2.1 Introduction

New South Wales Archaeology Pty Ltd has been commissioned by nghenvironmental to undertake an archaeological and heritage assessment of the proposed Capital Solar Farm. The Solar Farm will be located c. 5.5 kilometres north-east of the township of Bungendore on the Tarago-Bungendore Road (Figure 1).

The proposed Capital Solar Farm would occupy a 220 hectare site adjacent to the existing 67 turbine Capital Wind Farm and Capital Substation at 1279 Tarago Road, Bungendore (Lot 1 of DP658449, Lot 1 of DP 456698, Lots 1 and 2 of 1140319). The site is located in the Palerang Council Local Government Area, on land zoned 1(a) General Rural under the Local Environmental Plan. The site is a private agricultural landholding, currently used for grazing.

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

In accordance with the NSW NPWS guidelines for archaeological reporting (NSW NPWS 1997) and the NSW DECC Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (NSW DEC 2005) this report aims to document:

- The Aboriginal consultation process undertaken for the project and the involvement in the project of the Aboriginal community (Section 3);
- A description of the proposal and whether or not it has the potential to result in impacts to Aboriginal cultural heritage (Section 4);
- A description of the impact history of the proposal area (Section 4);
- The methodology implemented during the study (Section 5);
- The landscape and natural resources of the study area in order to establish background parameters (Section 6);
- A review of archaeological and relevant literature and heritage listings on the NSW DECCW Aboriginal Heritage Information Management System (Section 7);
- A synthesis of local and regional archaeology (Section 7);
- A predictive model of Aboriginal object type and location relevant to the proposal area (Section 7);
- The cultural and archaeological sensitivity of the landforms subject to proposed impacts (Section 7);
- The field survey results (Section 8);
- An assessment of the impact of the proposal on Aboriginal objects (Section 8);
- The legislative context (Section 9);
- The significance of Aboriginal objects (Section 10);
- A description and justification of the proposed management and mitigation strategies (Section 11); and
- A series of recommendations based on the results of the investigation (Sections 11 and 12).

This project has been managed by Julie Dibden. The field work component of this project has been conducted by Andrew Pearce, NSW Archaeology Pty Ltd, Geoff Murray of the Ngambri Local Aboriginal Land Council and Wally Bell representing the Buru Ngunawal Aboriginal Corporation. This report has been written by Julie Dibden and Andrew Pearce.

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

- Jackie Taylor: NSW DECCW – Queanbeyan;
- Col Williams and Geoff Murray: Ngambri Local Aboriginal Land Council;
- Wally Bell: Buru Ngunawal Aboriginal Corporation;
- Sturt Daley: Capital Wind Farm
- Chris McGrath: Infigen; *and*
- Amy Webb, Nick Graham-Higgs and Dave Maynard: nghenvironmental.

3. PARTNERSHIP WITH THE ABORIGINAL COMMUNITY

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

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

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

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

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

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

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

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

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

The DECCW ACHCRP requirements outline four main consultation stages to be implemented in the course of consultation undertaken with Aboriginal people. In order to fulfil these consultation

requirements NSW Archaeology Pty Ltd, on behalf of the proponent, has followed the following procedure:

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

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

Written notification dated 16th June 2010, requesting a list of Aboriginal groups or persons who may have an interest in this project, has been forwarded to the following bodies:

- DECCW LHPS Queanbeyan office
- Ngambri Local Aboriginal Land Council
- 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)
- Palerang Council
- the Murrumbidgee Catchment Management Authority, requesting contact details for any established Aboriginal reference group.

In addition an advertisement was placed in the 23 June 2010 edition of the Bungendore Mirror newspaper. The closing date for registration of interest was noted as 8th July 2010.

Buru Ngunawal Aboriginal Corporation was also notified of the project on 24 June 2010 and invited to register an interest.

In response to the notifications outlined above and names of potentially interested parties forwarded by NSW DECCW, the following parties registered an interest in the project:

Ngambri Local Aboriginal Land Council;
Buru Ngunawal Aboriginal Corporation;
Colleen Dixon and Stan Dixon - Traditional Ngarigu Elders
Robert Young
Ngunawal Heritage Aboriginal Corporation
Carl and Tina Brown - King Browns Tribal Group

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

An outline of the scope of the project, the proposed cultural heritage assessment process and the heritage assessment methodology was forwarded to the above parties on varying dates, the latest being 6th August 2010. Geoff Murray of the Ngambri Local Aboriginal Land Council and Wally Bell representing the Buru Ngunawal Aboriginal Corporation assisted with the fieldwork conducted for this project and provided valuable information in regard to the archaeological sensitivity and potential of the study area.

It is noted that no registered Aboriginal parties responded either verbally or in writing to the proposed methodology or assessment process documents. Registered Aboriginal parties have been invited to provide cultural knowledge relevant to the proposal area, however none has been received.

Stage 4. Reviewing the report.

.

For review and comment, a copy of this draft report has been forwarded on 13th September 2010 to:

Ngambri Local Aboriginal Land Council;
Buru Ngunawal Aboriginal Corporation;
Colleen Dixon and Stan Dixon - Traditional Ngarigu Elders
Robert Young
Ngunawal Heritage Aboriginal Corporation
Carl and Tina Brown - King Browns Tribal Group

The DECCW ACHCRP requirements provide a period of 28 days for registered Aboriginal parties to review and comment on the draft report. The closing date for receipt of comment from registered Aboriginal parties was 11th October 2010.

Buru Ngunawal Aboriginal Corporation have responded to the report and their letter is appended to this report as Attachment 1. It is noted that Buru Ngunawal Aboriginal Corporation has endorsed the proposed overall mitigation strategy that wherever possible, impacts are excluded from areas within 50 -70 metres of creek lines.

As of 19th October 2010 no other registered Aboriginal parties had provided a response to the report or report recommendations, either verbally or in writing.

4. DESCRIPTION OF IMPACT

The information contained in this section of the report is provided in accordance with the NSW NPWS (1997) guidelines for archaeological survey reporting. A full description of the proposal and its potential impact on the landscape and heritage resource is described below. This information includes a summary of the impact history of the study area. These prior and existing land uses have caused significant changes to geomorphological processes in the area, with an associated effect on the archaeological resource.

Potential impacts to archaeology and heritage during the construction phase of the solar farm proposal relate to site preparation, operation of vehicles and machinery and the installation of infrastructure. This may involve earthworks and excavations. It is noted however that remnant woodland located in the proposal area will not be impacted.

An east-west oriented electrical transmission line is located north of the site. Ridgelines to the north are used for electricity generation by the 67 turbine Capital Wind Farm. A sand mining operation (Tegra Quarries) and a pine plantation are located immediately north of the site. The alluvium around Lake George is an aquifer supplying water to Bungendore and landholders. Other local land uses include rural subdivision, turf farming, a transport corridor and urban settlements.

4.1 Impact History

Given that the most common Aboriginal objects expected to be present within the proposal area are stone artefacts located in or on ground surfaces, the following review is focused on describing the impact to soils and soil profiles which has resulted from vegetation clearance and agricultural practice.

The proposal area of the Capital Solar Farm is situated on land that, since European occupation of the district, has predominantly been used for farming. The local area has been utilised for stock grazing since the mid 1820s, following Captain Richard Brooks' establishment of a cattle station in 1824 at Turallo Creek, four kilometres west of the study area (Barrow and Carr 1991). At this time the original vegetation is assumed to have been comprised of open woodland with areas of grassland. Selective clearing of this land would have taken place at this time in order to facilitate grazing.

Major impacts to the region occurred with the establishment of the Currawang Copper Mine, located some 20 kilometres north of the study area. Operating from 1865 to 1882, and again from 1897 to 1907, this mine had required large quantities of timber which was used to shore the mining shafts and to fuel its smelters. During each month of operation it consumed up to 1,500 tons of wood which was harvested from the surrounding countryside. To service this need many properties in the district were purchased for the sole purpose of sourcing timbers. Having exhausted the resource in the local area, wood was then required to be shipped in from as far afield as Mittagong, located over 100 kilometres away. As a result of these intensive activities, the district was substantially denuded of its original vegetation. So much so that in 1971 Hayden, when preparing a map of the native vegetation of New South Wales, considered that there was inadequate residual information to be able to accurately characterise the original vegetation communities of the broad area around Lake George (Lance 2000).

The majority of the proposal area is situated on predominantly treeless landforms comprised of grassland. There are however some stands of regrowth trees in the northern arm of the study area. The effects of a long history of grazing across the proposal area following the original clearance of vegetation would have resulted in accelerated erosion, primarily by water and wind, as well as soil compaction and disturbance due to stock treadage. In addition to grazing, much of

the proposal area has been cultivated for pasture improvement and fodder production (Michael Osborne – Landowner: pers. comm. July 2010).

As a result of the long history of grazing and cultivation the proposal area is located within a highly degraded landscape; similarly to other parts of Australia, vegetation, soils and geomorphological processes have been dramatically changed by clearing, cropping and grazing (Wasson *et al.* 1998). Tree clearance, the grazing of sheep and cultivation in the Southern Tablelands, has resulted in increased runoff and erosion, both on hill slopes and valley floors, much of which commenced very soon after initial European occupation (Wasson *et al.* 1998). These erosional processes have lead to significant changes to landscape processes.

While hillslope erosion (sheet and rill) and sediment accumulation in catchments of the region prior to European settlement is measurable, rates of erosion are considered to have been low (Olley *et al.* 2003). Similarly to stream incision and erosion, hillslope erosion increased significantly during the first 50 or so years of European occupation.

Valley floors are likely to have been severely eroded with changes to soil structure in the early years of grazing due to stock trampling, removal of vegetation (via grazing and drought processes – the period between 1830 -1850- was a time of below average rainfall) and within the drainage lines themselves, by the onset of gullying (Dorrough *et al.* 2004; Olley *et al.* 2003). It is recognised that the effects of grazing on soils is most pronounced where livestock congregate close to watering points (Lunt *et al.* 2007); both now with dams and previously, these watering points are generally situated within valleys.

The pre-European vegetation and landform context is reviewed in Section 6. The series of photos below show the erosional features currently present within the proposal area. Stream incision and widening is now present within the proposal area along valley floors. The majority of active channel and gully formation in the Southern Tablelands is believed to have occurred up until c. 1900.

Drainage lines within the proposal area would originally have been comprised predominantly of a chain of ponds stream system with irregularly interspersed bars stabilised by vegetation. However this drainage regime has been significantly altered since European occupation as the result of vegetation clearance which has facilitated ongoing channel incision progressing from downstream. In many areas creeklines are now deeply etched channels with terracing in several sections eroded as the result of over-bank stream flow. The continuing destabilisation of creek banks is currently visible, exacerbated by stock treadage in combination with water generated erosion. As a result of these processes the width of the original drainage channels has also been significantly enhanced (Plates 1 and 2).

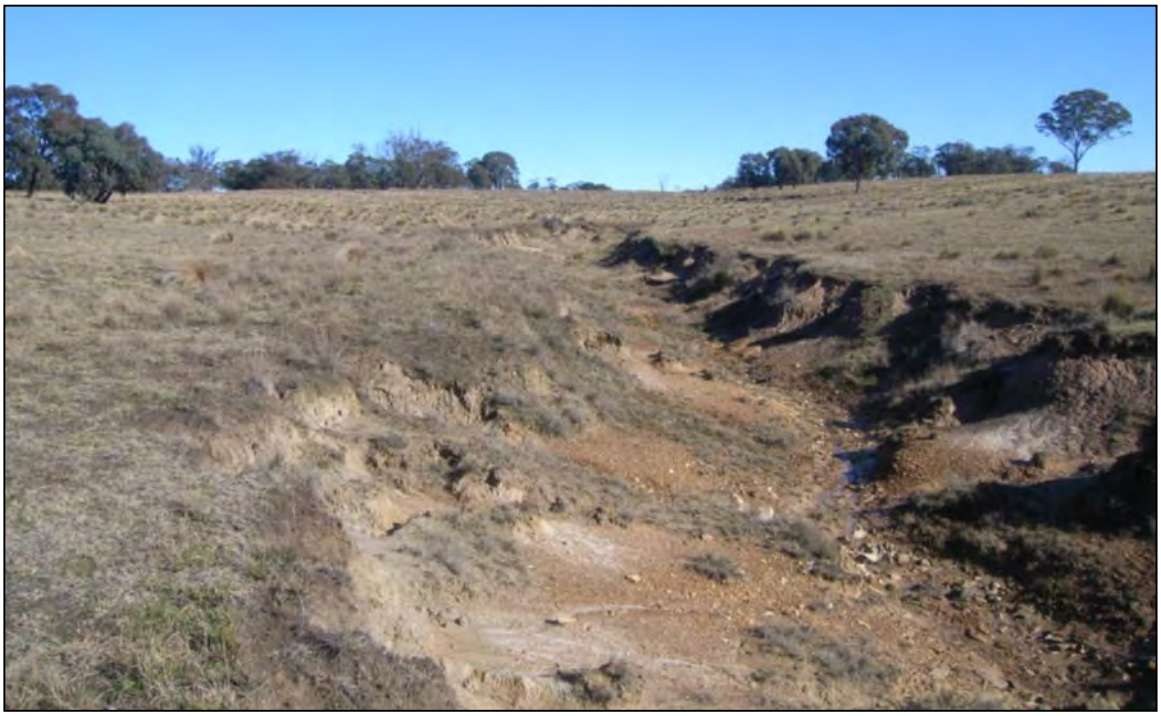

Plate 1. View of typical erosional scouring along drainage lines (tributary to Dry Creek), Survey Unit 8, looking west.

Plate 2. View of actively eroding creek bank (Bridge Creek), Survey Unit 30, looking southeast.

The land clearance and subsequent erosional processes are likely to have resulted in varying levels of prior impacts to Aboriginal objects. Aboriginal objects originally situated immediately adjacent to the creeklines will have been removed due to the severity of creek bank erosion. Trees hosting evidence of cultural scarring will likely to have been completely destroyed while Aboriginal objects located in or on the ground will have been disturbed and/or moved, resulting in some loss of their original depositional context (both spatially and vertically).

4.2 Proposed Impacts

Infigen proposes to construct a 50 megawatt capacity photovoltaic solar farm north-east of the township of Bungendore. The solar farm would comprise a series of photovoltaic modules (PV arrays) mounted on fixed frames, and the infrastructure and corresponding impact area would occupy approximately 100 hectares within the 220 ha subject site. The Capital Solar Farm would connect to the existing Capital Wind Farm 330kV substation which is located at the northern extremity of the study area (Figure 2).

Project infrastructure for the proposed solar farm would include:

- A fixed photovoltaic solar module array (PV array), arranged in a series of rows between 1 and 3-4 metres above the ground, angled for maximum efficiency and supported by steel framing on steel posts fixed in the ground.
- Electrical connections between PV array and central inverters via underground or frame secured cabling.
- A series of central inverters and kiosk transformers distributed throughout the PV array.
- Electrical connection into the existing 330kV substation via an overhead or underground transmission line, including any required switchyard and substation augmentation.
- Internal access tracks and upgrades to existing roads, where required.
- Fencing and landscaping around the solar farm.
- Site office and Operations and Maintenance building.
- Research office
- Additional temporary construction infrastructure such as a site compound and equipment laydown area.

The PV panel mounting structures would not require any significant earthworks or modification of landforms prior to installation. There are two options for the installation of the array support posts:

- approximately 50,000 steel posts would be installed to a depth of 2 to 3 metres using a pile driver; or
- approximately 30,000 steel posts with precast concrete footings would be installed on the natural ground surface or in shallow excavations.

A module mounting structure would be attached to the pylons to provide a solid support for the panels to be fixed to. Electrical cabling from each panel would be underslung beneath the panels to the end of each row.

Approximately twenty string distribution cabinets (DCUVs) would be located in each array block to receive and house electrical cabling from the panel rows, with one DCUV installed at ground level at the end of every two to three rows on average. Each array block would also contain approximately two main distribution cabinets (DCHVs), each receiving cabling from 10 DCUVs before connecting to one of the array block's inverters at the central inverter and kiosk transformer site. Access would be provided to each inverter/kiosk transformer site via a gravel track.

The PV panel system would produce power at a maximum of 1000 volts in direct current (DC). The power produced by the panels would need to be converted to alternating current (AC) before being fed into the electricity grid, which operates in AC. Inverters would be therefore be needed to convert the DC power generated to AC and transformers would be required to step up the voltage before feeding into the grid.

A total of approximately 64 inverters and 32 kiosk transformers would be installed at the site in groups (likely two) inverters and one kiosk transformer at the centre of each array block. Internal gravel access tracks would be provided to all inverter/kiosk transformer locations.

The inverters would be installed at the centre of each of the solar farm's array blocks. The inverters would convert the DC power produced by the PV panels to a low voltage 350V AC current, and feed it to an adjacent kiosk transformer. The inverters would be approximately 2.5 metres long and 1 metre wide. The inverters would be installed on a concrete slab of approximately the same length and width.

One 350V/33kV kiosk transformer would be installed adjacent to the inverters in each array block. The purpose of the kiosk transformers would be to step up the voltage from 350V to 33kV. Transformers would be approximately 4.3 metres long by 2.2 metres wide and would be installed in an outdoor enclosure on a concrete slab with an oil containment bund.

To export power it is necessary to electrically connect the solar farm to the NSW electricity grid. Electrical works for the proposal would include:

- Low voltage DC power cabling from PV panels to inverters and kiosk transformer in each array block;
- Underground or Overhead power reticulation cabling from kiosk transformers to the Capital 330kV substation at 33,000V (33kV), via switching station and control room;
- Onsite control and communications cabling;
- An onsite control room housing control and communications equipment.

The power produced by the PV panels would be transferred at a maximum of 1000V in DC along electrical cabling underslung beneath the panels of each row. From the end of each row, DC cabling would enter one of 20 string distribution cabinets, run underground to one of two main distribution cabinets, and then on to one of two inverters in each array block. The inverters would convert the DC power supply to AC before connecting to the kiosk transformer via further underground electrical cabling. The kiosk transformer would step up the voltage from 350V to reticulation voltage of 33kV.

Trenches approximately 0.4 metres wide and 0.8 metres deep would be dug to lay the underground DC cabling between panel row ends, DCUVs, DCHVs and inverters. Each kiosk transformer must be connected together at reticulation voltage, and then connected to the substation via switching gear and the control room. These connections would be made using underground reticulation cabling within the boundary of the solar farm and underground or overhead cabling from the solar farm to the substation.

Cable trenches would, where reasonable, be dug within or adjacent to the onsite roads to minimise any related ground disturbance. Underground 33kV cables would require a trench of approximately 0.4 metres wide and 0.8 metres deep.

A Construction Site Office would include several demountable buildings, and an amenities block located on site for the duration of construction. The site facilities would cover an area of 500m2 and would be fenced independent of the PV array site. A car parking area used for construction car parking would measure approximately 750m2.

An Operations and Maintenance Building incorporating a control room would be located at the north western corner of the PV array. These facilities would provide an office area for the site manager and house communications and control equipment, maintenance stores and staff amenities. The O&M building would be constructed on a concrete slab approximately 20 metres by 20 metres.

The proposal involves the construction of 10.4 kilometres of 4 metre wide hard packed gravel roads and 4 hectares of laydown areas that would also be hard packed with gravel.

4.3 Potential Impacts

Impacts will be located on land currently utilised for cattle grazing. Previous land use has resulted in relatively significant environmental impacts and a generally degraded landscape. European activated geomorphological processes and other natural processes associated with land degradation, will have caused significant prior impacts to Aboriginal objects within the proposal area.

However irrespective of prior impacts the proposed works entail ground disturbance and accordingly the construction of the solar farm has the potential to cause impacts to any Aboriginal objects which may be present within the zones of direct impact. Given the nature of the proposed installation of the solar modules, 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.

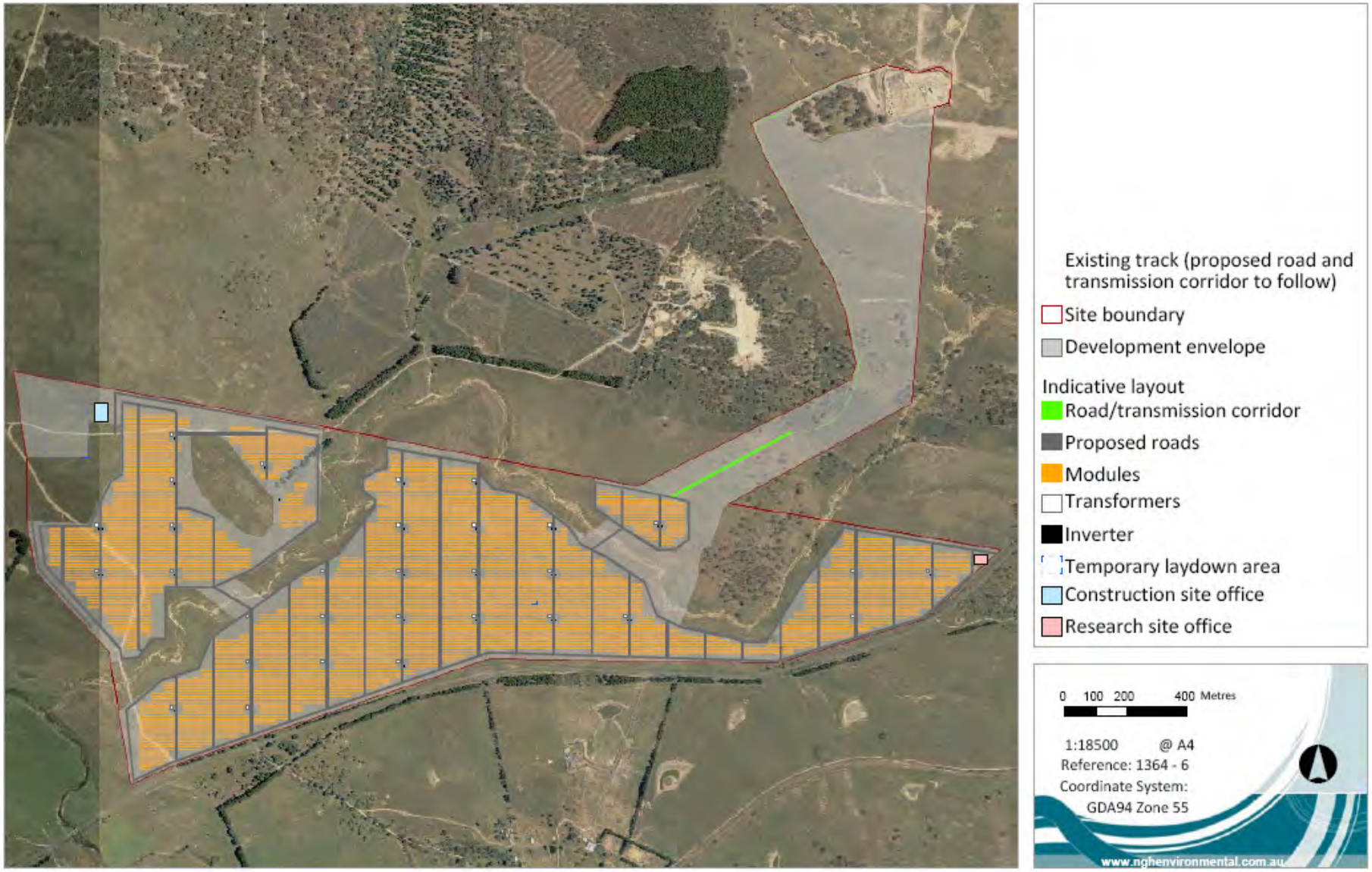

Figure 2 Proposed development layout (supplied by client).

5. STUDY METHODOLOGY

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

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

5.1 Literature Review

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

The following information sources were accessed for this study:

- NSW DECCW Aboriginal Heritage Information Management System;
- Relevant archaeological reports;
- Relevant topographic maps; and
- Mapping relating to proposed impacts.

5.2 Field Survey and Methodology

The field survey entailed a comprehensive pedestrian survey and was undertaken by three people over a three day period. Survey coverage is described in Section 8 of this report.

The field survey was aimed at locating Aboriginal objects. 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 survey methodology entailed walking transects across individual Survey Units with each surveyor situated ca. 20 – 30 m apart. Focusing on areas of ground exposure each Survey Unit was surveyed until the entire area had been systematically inspected. This methodology enabled direct visual inspection of as much of the ground surface of the proposal area as practicable.

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

The density and nature of the artefact distribution will vary across the landscape in accordance with a number of behavioural factors which resulted in artefact discard. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to analyse the variability in artefact density and nature across the landscape. Accordingly in this study while the artefact is the elementary unit recorded it is the Survey Unit which is utilised as a framework of recording, analysis, and management (*cf* Wandsnider and Camilli 1992). The study area has been divided into 38 Survey Units each of which have been defined according to broad landform morphological types.

In order to ensure consistency in data collection all field records were made in survey forms formulated specifically for the project. Two separate forms were used for recording Survey Unit data and Aboriginal Object data. The data collected forms the basis for the documentation of survey results outlined in Section 8. The variables recorded are defined below:

Survey Unit Variables

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

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

Slope class and value:
- Level 0 - 1%.
- Very gentle 1 - 3%.
- Gentle 3 – 10%.
- Moderately inclined 10 – 32%
- Steep 32 – 56%.

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

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

Survey coverage variables were also recorded; these are described further below in Section 5.3. The archaeological sensitivity of the Survey Unit was defined according to assessed artefact density.

Previous Landuse Impacts
The nature and extent of prior disturbance was recorded.

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 (GDA).

Locale specific assessments of survey coverage variables have been made. The prior disturbance to the locale has been noted. Artefact numbers in each locale have been recorded and a prediction of artefact density estimated, 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: <5 artefact per square metre;
- Low: between 5 and <20 artefacts per square metre.

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

5.3 Survey Coverage Variables

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

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

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

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

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

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

archaeological visibility therefore requires breaching of the ground surface to at least a depth of 10 cm.

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

6. LANDSCAPE CONTEXT

A consideration of the landscape is necessary in archaeological work in order to characterise and predict the nature of Aboriginal occupation across the land (NSW NPWS 1997). In Aboriginal society landscape could be both the embodiment of Ancestral Beings and the basis of a social geography and economic and technological endeavour. The various features and elements of the landscape are/were physical places that are known and understood within the context of social and cultural practice.

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

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

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

6.1 Topography, Geology and Vegetation

The proposal area is located approximately 5.5 kilometres north-east of the township of Bungendore and immediately on the northern side of the Tarago Road. The terrain is generally gently sloping to flat; the highest elevation is c. 765 m AHD at the northern end of the study area, while the lowest point is c. 690 m AHD towards the western boundary. The landform elements present are crests, flats, open depressions, lower slopes and simple slopes which generally face south to south-westerly.

The broader landscape in which the areas of impact are situated is comprised of gently rolling hills which fall towards the hindmost section of the valley floor associated Lake George. The study area is incised by lower order drainage lines. To the north first order minor convergent tributaries flow into Dry Creek from a small catchment area of c. nine square kilometres. Dry Creek joins Bridge Creek at a point adjacent to the study area. These streams are now deeply incised along their channel as the result of European vegetation clearance which has caused acceleration of erosional processes and resultant deep drainage line scouring. Bridge Creek flows into the third order Butmaroo Creek (formerly Deep Creek) situated at its closest point c. 200 metres southwest of the western end of the proposal area. Bridge Creek flows to the northwest and discharges into Lake George c. five kilometres from the study area.

The geology underlying the study area is comprised of the Devonian Ellenden Granite formation in the northern most section, with the remainder overlying geology of the Ordovician Adaminaby Group. The Ellenden Granite formation is made up of adamellite and gradiorite, while the Adaminaby Group geology principally manifests as greywackes and shales, with some slate. This suite is quartz rich, with the quality of quartz ranging from poor (for the purposes of knapping stone artefacts) to a small percentage of good quality stone.

A number of extensive aeolian sand deposits occur at the southeastern end of Lake George. Within the study area one section of yellow aeolian sand deposits is present on a simple slope in the western part of Survey Unit 11. This is located below an existing sand quarry that is outside the study area. Otherwise, soils in the study area are silty loams. Soils within the proposal area have suffered erosion over time, especially those areas within and bordering drainage depressions.

Low, sparse outcrops of greywacke occur across the proposal area, particularly scattered across minor crests in the southern and western end.

The majority of the proposal area is situated on treeless grassland. However some eucalypts, predominantly regrowth, are present as open stands principally located on the simple slopes and crests on the northern side of Dry Creek, or isolated trees scattered very sparsely throughout.

Summary

The proposal area possesses low biodiversity values. Potable water would generally have been absent in times of low rainfall, while a permanent supply of water would have been available five kilometres to the west at Lake George. The nearby Butmaroo Creek, at its closest point 200 metres southwest of the study area, would have been the nearest reasonably permanent source of water to the study area. Earlier studies have indicated that in the local area artefact densities decline with distance from Butmaroo Creek (Lance 2000: 8). The region experiences cold temperatures and strong winds. In an Aboriginal landuse context the area 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 artefact discarded can be expected to have been correspondingly limited in terms of artefact diversity and complexity.

Elevated level landforms, especially those located near to Lake George and other more permanent watercourses, are likely to have been utilised by Aboriginal people for camping while they occupied the local area. In particular, previous studies strongly indicate that sand deposits in proximity to water 'were foci for Aboriginal campsite activities' (Lance 1985: 7; Hughes, Barz and Hiscock 1984). These areas would have provided more habitable contexts and ready access to drinking water. Artefact discard is likely to have been greater in such areas reflecting more frequent and/or sustained occupation. It is possible that artefact diversity may also be greater in such areas.

7. ARCHAEOLOGICAL CONTEXT

7.1 Social Geography

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

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

During the Last Glacial Maximum at about 24 - 22,000 years ago, sea levels fell to about 130 metres 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.*

Human occupation of south east NSW dates from at least 20,000 years ago as evidenced by dated sites including the Burrill Lake rock shelter (Lampert 1971), Cloggs Cave (Flood 1980) and New Guinea 2 (Ossa *et al.* 1995). The Bulee Brook 2 and Bobs Cave sites in the south coast hinterland ranges, excavated by Boot (1994; 1996), provides evidence that occupation of this zone had occurred by at least 18,000 years ago.

Aborigines have lived in the broader Bungendore district for at least 21,000 years (Flood *et al.* 1987). In the south-eastern highlands the Birrigai rock-shelter has provided dates of occupation from 21,000±200 years BP (Flood *et al.* 1987: 16). During the Pleistocene the environment of the region would have been cold steppe grassland with vegetated shrubs and scattered groups of Eucalypts located in protected positions (Mulvaney and Kamminga 1999). Between 23,000 and 15,000 years ago harsh conditions prevailed and the mountain peaks were glaciated above 1900 metres; periglacial conditions were present to at least 1000 metres above sea level. Over time, the Aboriginal people experienced and adapted to steady and considerable changes in conditions associated with gradual climatic warming, including the alteration of vegetation and variation in the distribution of wildlife (Young 2000).

7.2 Previously Recorded Aboriginal Objects

A search of the NSW DECCW Aboriginal Heritage Management Information System has been conducted for this project on the 21st June 2010 (AHIMS #30671). The search area measured 77 km² and encompassed eastings 722000 – 733000, and northings 6097000 – 6104000.

Twenty-six Aboriginal objects are recorded on AHIMS as being present within the site search area, two of which are listed as being present within the study area. The AHIMS register only includes sites which have been reported to NSW NPWS/DECCW. Generally, sites are only

recorded during targeted surveys undertaken in either development or research contexts. Accordingly, this search cannot be considered to be an actual or exhaustive inventory of Aboriginal objects situated within the local area or indeed within the study area itself. The Aboriginal objects on AHIMS for the site search area are listed below in Table 1, and the location of those sites nearest to the study area is shown in Figure 3. It should be noted that sites recorded in AGD have been to converting to GDA.

The two Aboriginal object locales listed on the AHIMS register as being present within the study area are Dry Creek 2 (57-2-0062) and Bridge Creek (57-2-0208). Dry Creek 2 was recorded by Packard (1988) while surveying for a proposed sand quarry access track which passed through the current study area. This locale was comprised of a low density artefact scatter of nine stone artefacts; the site is situated immediately to the south of the Dry Creek. Packard (1988) subsequently conducted a test excavation programme at this site. Three stone artefacts were recovered (3/1sq m) indicating low density artefact distribution in this area. The site of this locale was relocated during the present survey. However no artefacts were identified and the area was found to be actively eroding.

The Bridge Creek locale is an isolated artefact, registered by Torres (site card 57-2-0208) in 1998. It consists of a broken hatchet head found on a flat near to Bridge Creek and within the study area. The context of this recording is unknown. However the artefact is indicated to have been removed from the area, possibly during a geological investigation in 1986, and the site card later submitted by Torres, a third party, in 1998. This locale was relocated during the current survey but no Aboriginal objects were identified.

Two Aboriginal object locales near to the proposal area and within the AHIMS search area were not returned in that search; Bridge Creek 1 (57-3-213) and Bridge Creek 2 (57-2-0061). Lance (1985) conducted a survey of a disturbed sand body at the 'Currandooly' property, c. 200 metres to the northwest of the study area, in relation to proposed sand quarrying. Following field survey, where no surface artefacts were located, Lance (1985) carried out subsurface testing at Bridge Creek 1. Backhoe excavation of 'a number' of pits was conducted in order to test for the presence of subsurface archaeological deposit. A sample of sand from each pit was tested, and in addition a 1 m^2 pit excavated so as to establish the context of the artefactual material. Artefacts were located in two pits only. From those two pits a total of 38 artefacts were retrieved from depths ranging from 20 to 80 cm, 34 of which were of quartz and 4 of silcrete. The depth at which artefacts were deposited was noted to be in two concentrations, between 30 – 40 cm and 50 – 60 cm. However, he noted that the context of the site was disturbed due to deflation of the sediments therein.

From this subsurface program Lance (1985) concluded that in the area of Bridge Creek the density of artefacts declined sharply to a very low level with distance from that creek. Accordingly he considered that 90% of the western sand deposit investigated, which was located furthest from Bridge Creek, was representative of 'background scatter' with a maximum density of one artefact per square metre. As such he assessed that this section of the sand feature was not archaeologically significant so that it did not warrant recording as a site. However expounding from the results of a single test pit which gave an artefact density of forty artefacts per square metre, Lance (1985) considered that the 10% of the sand body closest to Bridge Creek was of greater scientific significance, although by no means unique in the area.

Packard subsequently worked at this site as a part of his Doctoral research program (*cf.* Packard 1988). The developers had removed 15 cm of topsoil from the deposit leaving the upper levels of the site protected under c. 5 cm of disturbed sands. A total of 5635 artefacts were found at a mean density of 3.02/sq m. The area included archaeologically sterile areas with clusters of artefacts at significantly higher densities. More than 15 discrete 'workshops' were found with artefact densities reaching more than 300/sq m at some of these. Artefacts were excavated done to a depth of 60 cm below the cleared surface with artefact densities increasing rapidly with increased depth. The majority of artefacts were silcrete with quartz being the only other significant raw material. The assemblage was considered to be microblade with backed blades

and other retouched geometrics comprising 1.7 % of the total number. The site was estimated to be between 1000 – 4000 years old.

East of Bridge Creek 1 and to the north of Dry Creek 2, Bridge Creek 2 is located 250 metres north of the study area. It was recorded by Packard (1988) in relation to a sand extraction proposal. Bridge Creek 2 underwent subsurface investigation and was found to consist of a low density scatter of artefacts. Twenty eight artefacts were recovered from a total of ten 1 m^2 pits, calculated to a density of 3.7 artefacts per square metre. Packard (1988) considered that the reason this area had such low artefact density in comparison to other sites in the area such as Lance's (1985) BC1 findings was due to the gradient of the site (3° - 5°) and its distance from Butmaroo Creek (2 km).

Four sites located near to the northern end of the proposal area were recorded by Austral Archaeology (2005) during field survey for the Capital Wind Farm.

Hammond Hill 3 Isolated Find Capital Wind Farm (57-3-0392) is comprised of a single artefact on a crest, in an area which Austral predicted to have moderate to high subsurface potential.

Hammond Hill PAD 1 Capital Wind Farm (57-3-0394), comprised of three artefacts, was located on lower slopes west of a ridgeline in an erosional gully near to Wrights Creek. It was predicted that a distribution of subsurface artefacts would extend from this exposure towards the creekline.

CWF-AD-1 (57-3-0427) and CWF-AD-2 (57-3-0428), located near to a proposed substation site, were identified as areas of moderate to high archaeological potential during Austral Archaeology's (2005) field survey for the wind farm. These areas were subsequently excavated during a subsurface investigation program (Austral Archaeology 2009).

Ten stone artefacts were recovered from 26 test squares (measuring 1.2 m^2) at the CWF-AD-1 (57-3-0427) site. Of those test squares, six contained no artefacts. Artefact density for those test squares is calculated to be 0.32 artefacts per square metre. At the CWF-AD-2 (57-3-0428) site fourteen stone artefacts were recovered from 13 test squares, seven of which contained no artefacts. The artefact density across the 13 test squares is 0.89 artefacts per square metre. Austral (2009) determined that both sites contained particularly low artefact density, and accordingly were indicative of an area not often or extensively used by Aboriginal people.

Lakelands (57-2-0059) plots erroneously to the northwest of the study area. This site is located further west along the eastern shoreline of Lake George (Packard 1987).

Table 1 Aboriginal objects listed on NSW DECCW AHIMS search.

Site ID	Site name	Easting GDA	Northing GDA	Recorder	Site type
57-2-0020	Currandooly 2; Lake George	725513	6101584	Sullivan	Open campsite
57-2-0021	Currandooly 1; Lake George	726613	6100184	Sullivan	Open campsite
57-2-0058	North Bungendore	724213	6099484	Aiken, Packard	Open campsite
57-2-0059	Lakelands	726113	6102184	Packard	Open campsite
57-2-0062	Dry Ck 2	728513	6101984	Packard	Open campsite
57-2-0121	Bungendore Sands	723913	6101524	Packard	Open campsite
57-2-0208	Bridge Creek	727513	6101784	Torres	Isolated find
57-2-0451	PPA 1 (Petworth Park Aboriginal Site 1)	723842	6100818	Dearling	Artefact/s
57-2-0456	PPA 2 (Petworth Park Aboriginal Site 2)	723441	6101162	Saunders	Artefact/s
57-2-0457	PPA 3 (Petworth Park Aboriginal Site 3)	723938	6101141	Dearling	Artefact/s
57-2-0458	PPA 4 (Petworth Park Aboriginal Site 4)	722422	6101343	Dearling	Artefact/s
57-2-0459	PPA 5 (Petworth Park Aboriginal Site 5)	722427	6100700	Dearling	Artefact/s

Site ID	Site name	Easting GDA	Northing GDA	Recorder	Site type
57-2-0587	Grantham Park 1	724223	6102780	Paton	Artefact/s
57-2-0588	Grantham Park 2	724201	6103243	Paton	Artefact/s
57-2-0642	Grantham Park 3	724963	6102804	Paton	Artefact/s
57-3-0123	Butmaroo 1; Bungendore	731863	6097984	Allen, Jones, Thorne	Open campsite
57-3-0208	Dry Creek	730313	6102084	Packard	Open campsite
57-3-0209	Sand Hills 4	731513	6098584	Packard	Open campsite
57-3-0210	Sand Hills 3	732213	6098284	Packard	Open campsite
57-3-0211	Butmaroo 2	730513	6098484	Packard	Open campsite
57-3-0218	Sand Hills 1	732813	6101384	Packard	Open campsite
57-3-0391	Hammond Hill 2 Isolated Find Capital Wind Farm	730520	6103354	Mebberson, Matic	Artefact/s
57-3-0392	Hammond Hill 3 Isolated Find Capital Wind Farm	730604	6103290	Mebberson, Matic	Artefact/s
57-3-0394	Hammond Hill PAD 1 Capital Wind Farm	730103	6103285	Mebberson, Matic	PAD
57-3-0427	CWF-AD-1	730101	6103313	Raper	PAD
57-3-0428	CWF-AD-2	730054	6103347	Austral Archaeology	Artefact/s

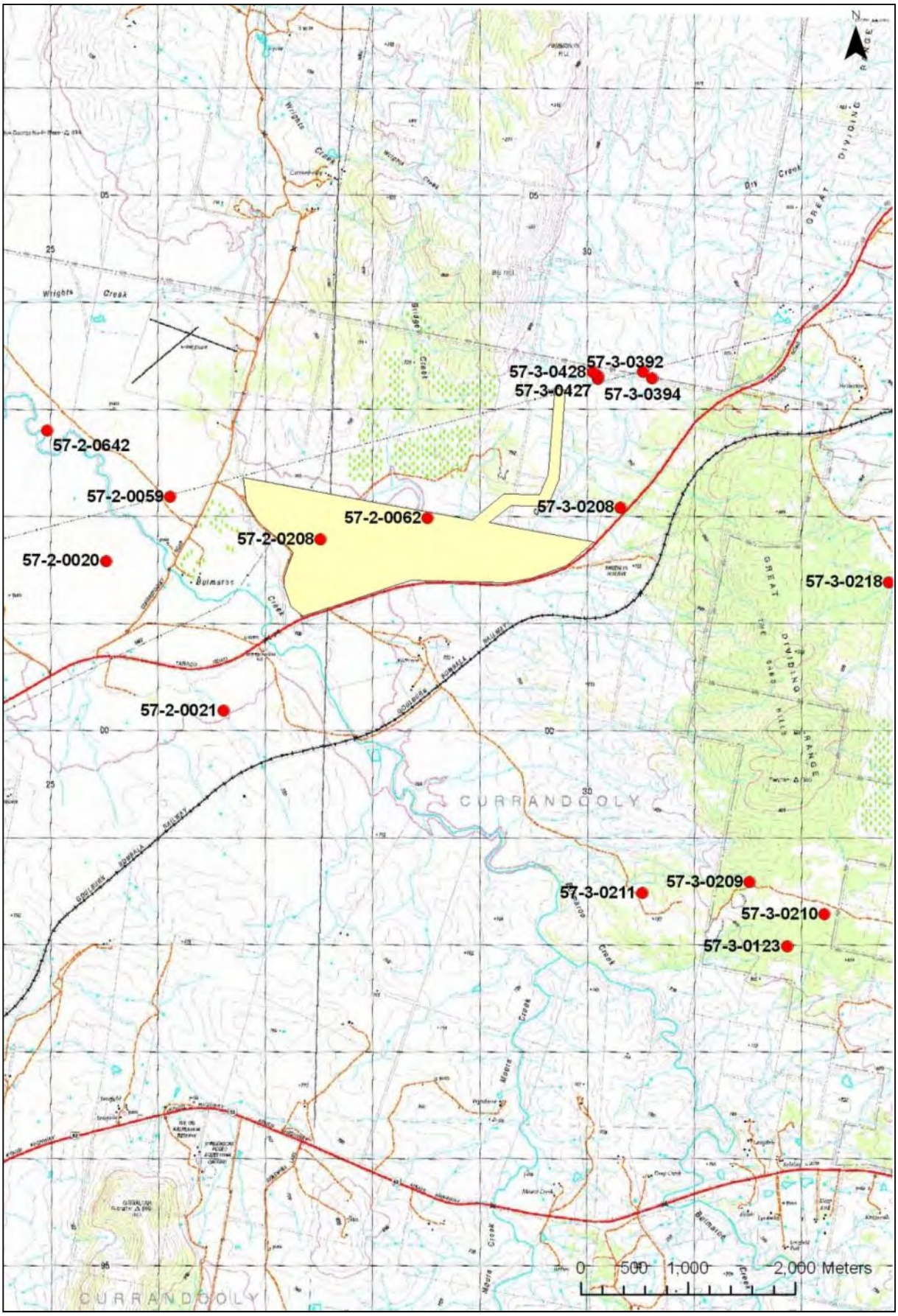

Figure 3 Location of previously recorded sites (Sutton 8727-1S & Boro 8827-4S 1:25000 topographic maps).

7.3 Archaeology – The Local Area

A number of archaeological investigations have been undertaken in the broader Bungendore region since the 1980s. While many of the earlier investigations were conducted in relation to sand mining operations in the district, more recent surveys have been associated with rural residential developments as well as the recent work associated with the Capital Wind Farm.

In 1984 Hughes, Barz and Hiscock undertook an investigation at the 'Bungendore Sands' quarry situated near to the southeast of Lake George. The sand quarry was formed from a two metre high relic beach ridge which covered an area 500 metres wide and 2.5 kilometres in length. Artefacts were recorded across the site, 427 in total, in very low to low density, averaging less than two artefacts per metre square. Quartz was found to be the dominant raw material. Thomas and Gillieson (nd) investigated an adjacent area but located no artefacts.

Packard (1986) investigated archaeological sites in sand deposits on the Southern Tablelands. The findings were that in the Lake George and other regions in the Southern Tablelands, sand deposits represented specific focus points for Aboriginal activities. Generally, sand deposits with a distinctly sloping surface were found to be less selected for use as campsites than those which were level, and low-lying deposits located close to rivers and lakes did not display as much evidence of Aboriginal occupation as did raised deposits near to large water sources. Overall, Packard (1986) suggests that in the region sand deposits have a significantly higher potential to be archaeologically sensitive compared to other open sites from the general landscape.

Packard (1987) as part of a doctorate research programme investigating the archaeology of the Southern Tablelands located two open camp sites. One at Ellenden, north of the study area, and the other at Lakelands near Lake George.

The South Red Hill 1 site at Ellenden was located on a relict beach ridge of Lake George approximately 300 metres away from the lake's edge. Artefactual material was distributed along the ridge for c. four kilometres in an area approximately 80 metres wide. The density of artefacts varied across the site from one artefact per m^2 to one artefact per 100 m^2. While the recorded artefact assemblage consisted of mainly flaked material, a small number of edge ground axes, hammerstone/anvil stones, unretouched flaked and quartz bipolar flakes were also noted. Quartz was the dominant raw material in conjunction with small amounts of fine grained siliceous and volcanic material.

The Lakelands site (57-2-0059) assemblage consisted of mainly flaked stone artefacts with densities ranging from five artefacts per m^2 to one artefact per 10 m^2. Quartz was the dominant raw material although. However a minor trend of increasing proportions of silcrete and fine grained siliceous material away from the lake was recognised. Artefact types included microblade/backed blades, unretouched quartz flakes, bipolar cores, edge ground axes and anvil/hammer stones.

Stone (1988) conducted a surface survey and subsurface investigations at a proposed sand extraction site adjacent to Turallo Creek. The study area consisted of a gently sloping sand ridge and part of the Turallo Creek floodplain. The findings were a low-density subsurface artefact scatter in which quartz was the dominant raw material with silcrete, quartzite, indurated mudstone and chert also represented.

Coates (1991) surveyed the proposed 126 hectare Elmslea East Estate subdivision on Tarago Road immediately to the north of Bungendore, part of which had previously been disturbed by sand mining. Coates (1991) recorded two small artefact scatters and two isolated finds. An intensive resurvey of stages 3 and 4 (Paton 2001) identified no additional sites. A 2002 investigation of the two sites recorded by Coates (1991) near Turallo Creek found no surface artefacts in either area (Saunders 2002), but a subsequent subsurface testing program along the Turallo Creek flats revealed a low-density Aboriginal site that extended the entire length of the Creek within the development area (Saunders 2004).

Navin and Officer (1993) investigated an Aboriginal site (57-2-0058) reported by National Heritage Studies (1991) in Stage 1 of the Buckingham Estate on the eastern side of Tarago Road to the south-east of the study area. The investigation involved surface survey and the collection of artefacts from large exposures caused by development work. This was followed by subsurface testing. Seventy-seven artefacts were retrieved from a thin aeolian sandsheet which covered the study area. Sixty-five of the artefacts were located in surface exposures, with the dominant raw material being milky quartz. The assemblage was described as being typical of those recorded in sand bodies associated with Lake George.

Saunders (2005) conducted an assessment of the proposed Petworth Park subdivision site located southwest of the study area. The area encompassed the flat plain which extends eastward from Lake George, and a ridgeline and elevated knoll. The land is drained by three ephemeral drainage lines. Four isolated artefacts and one small low density artefact scatter were recorded.

Austral Archaeology (2005) conducted a survey of the Capital Wind Farm located to the north of the proposal area. Two small artefact scatters and three isolated finds were recorded. In addition six areas of predicted archaeological deposit were recorded. Austral Archaeology (2009) subsequently conducted subsurface excavation at six locations. As noted in Section 7.2, excavation conducted in the vicinity of the substation retrieved phenomenally low densities of artefacts. Elsewhere at Groses Hill and Silo Hill, similarly low artefact densities were recorded, described by Austral Archaeology as being little more than 'background scatter'.

Lance (2009) documented the results of salvage carried out at Lot 31 of the Currandooly Lease adjacent to Butmaroo Creek and c. three kilometres west of the study area. The general objective of Lance's (2009) investigation was to characterise the nature of Aboriginal occupation of the site through analysis of the artefact assemblage. Two trenches were hand excavated, one measuring 11.5 m and comprising a total of 23 test pits measuring 50 x 50 cm. The other measured 46 m and was comprised 96 test pits measuring 50 x 50 cm. In addition an eight metre square open area was excavated and a third trench mechanically dug which entailed 12 m^3 of deposit. In total more than 5500 stone artefacts were recovered from the site. The range of materials and tool types present were interpreted to be indicative of a residential campsite rather than a focal point for specialised activities.

Most recently an archaeological assessment was undertaken at Lot 32, DP 634213 Grantham Park, 2.5 km west of the study area in relation to a sand mine quarry. During an initial field survey by Paton (2008) two Aboriginal sites were identified on slightly elevated terraces near to Butmaroo Creek. One was an isolate find while the other was an open artefact scatter. Subsurface investigations were subsequently conducted (Paton and Collins 2008) and ninety-five lithic items were recovered from 6 of 23 test pits. Sixty percent of the artefacts were of quartz and thirty percent of silcrete. The overall artefact density was low at 2.08 per m^2. Paton and Collins (2008) concluded that the focal point of activity in the area was immediately to the west, closer to Lake George, in Lot 31, which had been excavated by Lance (2009).

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

7.4 Predictive Model of Site Type and Location

The following prediction of site location takes into account the type of Aboriginal sites known to be present within the wider local area, the topography and water sources in the study area and the model of Aboriginal land usage based on archaeological evidence relevant to the Bungendore local area. 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. In the region sheltered contexts and areas of sand deposit are likely to have been utilised for camping. The detection of artefacts during a surface survey depends on whether or not the potential archaeological bearing soil profile is visible.

Given the environmental context of the proposed Solar Farm stone artefacts are predicted to be present in a variable density across the landscape. Given that the site is located away from reliable water and does not contain sand deposits (except for a minor area between the solar farm site and the substation) it is predicted that artefact density will be generally low. Based on subsurface excavation conducted by Austral Archaeology (2009) at the substation site this area can most reliably be determined to contain extremely low artefact density. Likewise the subsurface work conducted by Packard (1988) in the study area indicates that artefact density adjacent to Dry Creek is also very low. The broader area in which the majority of the solar farm infrastructure is proposed is amorphous slopes and crests located away from water; artefact density is predicted to be very low.

Grinding Grooves

Grinding grooves are found in rock surfaces and result from the manufacture and maintenance of ground edge tools. Grinding grooves are only found on sedimentary rocks such as sandstone. Given the absence of suitable rock exposures in the study area grinding groove sites are unlikely to be present. Portable whetstones have been recorded on the Monaro (*cf* Dibden 2004; Young 2000); given the absence of suitable bedrock stone, these artefacts will have been utilised for sharpening hatchets and other ground edge tools.

Burials sites

A number of different burial practices have been recorded in the Monaro including below ground burials covered with an earthen and stone mound, and within hollow trees and caves (Young 2000). Burials are generally only visible in areas where the deposit has been disturbed either by natural erosion or human activity. This site type is not usually found during field survey however there is low potential for their presence in the study area.

Rock Shelter Sites

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

Scarred and Carved Trees

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

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

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

Given previous clearance, while not out of the question, this site type is unlikely to have survived and therefore be extant in the study area.

Stone Quarry and Procurement Sites

A lithic quarry is the location of an exploited stone source (Hiscock & Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occur. Quarries are rare site types in the region. Given the nature of the geology this is unlikely to be present in the study area.

8. SURVEY RESULTS

8.1 Survey Coverage

The proposal area has been divided into 38 Survey Units. These Survey Units are described in Table 2; their location is shown in Figure 4.

The environmental context of the Survey Units is discussed in the following section.

The study area can be broadly divided into two environmental contexts. The first is a gently undulating hill system located on the northern side of Dry Creek. This area encompasses the northern arm of the proposal area extending south from Survey Unit 1 to Survey Unit 13 and also includes Survey Units 31 to 34. It takes in crests, simple slopes and 1st order drainage depressions as it falls away towards Dry Creek. For the most part the proposed impacts in this section of the study area entail the emplacement of a gravel road and underground power line which links the Solar Farm to the existing substation. However an area of solar panels and accompanying infrastructure are proposed to be installed in Survey Units 12 and 13.

The majority of this northern section of the study area is grassed, with patches of scattered trees. Survey Units 32, 33 and 34 have more consistent coverage of established eucalypts across a crest and accompanying simple slopes, however no impacts are proposed for these areas. The current landuse is cattle grazing. Prior to European occupation this area would have been open woodland which has subsequently been cleared. The site possesses evidence of minor wind and water erosion on crests and hillslopes, and ground surfaces are moderately disturbed as a result of a long history of clearance and grazing. Minor drainage depressions have been heavily scoured and eroded by water. The underlying geology is Ellenden Granite formation in SU1 and SU2, which then give way to Adaminaby Group greywacke and shale for the remainder of the study area. Soils are silty loams, with the exception of the north section of the western corner of SU11, which on this simple slope has evidence of some yellow aeolian sand deposit in an area below an existing sand quarry.

The proposed impact within this northern arm of the study area are assessed to represent a relatively low level of disturbance to the archaeology. The landforms present are generally amorphous features with low biodiversity values and an absence of any immediate potable water. These landforms are likely to have been utilised by Aboriginal people on occasional and generally limited basis for activities such as hunting and gathering forays and travel through country. Such activities are likely to have resulted in the discard of isolated and discrete clusters of stone artefacts in low densities only.

The second environmental context within the study area is comprised of a lower-lying valley floor system of flats, lower slopes, simple slopes and crests to the south of Dry Creek and taking in a section to the west of bridge Creek. This southern section makes up the bulk of the study area and is comprised of Survey Units 14 to 30 and Survey Units 35 to 38.

This section of the study area is entirely grassed, with very few trees. Its current landuse is cattle grazing, although as indicated by the landowner Michael Osborne (pers. Comm.. 2010) a substantial proportion of this area has been mechanically scoured (ripped) and cultivated repeatedly over time. Prior to European occupation this area is thought to have been predominantly grassland with some areas of open woodland which have since been subsequently clearance. The site possesses evidence of minor wind and water erosion on its broad landforms, but generally the open depressions and creekline have been substantially eroded from water action. The ground surfaces are moderately disturbed as a result of a long history of clearance, cultivation and grazing. The underlying geology is Adaminaby Group greywacke and shale, while the soils are silty loams.

The proposed impact areas within this low-lying section of the study area are assessed to represent a relatively low level of disturbance to the archaeology. The landforms present are generally amorphous features with low biodiversity values. The creeklines in this area are predominantly ephemeral, but potable water would have been available following periods of rain. These landforms are likely to have been utilised by Aboriginal people on occasion, but generally on a limited basis and for activities such as hunting and gathering forays and travel through country. Such activities are likely to have resulted in the discard of isolated and discrete clusters of stone artefacts in low densities only. Any focus of activity in this immediate area would have been near to the creek banks. However the stream channel has generally been heavily scoured and widened, so that artefacts originally deposited adjacent to the creeklines in those areas now eroded would have been removed.

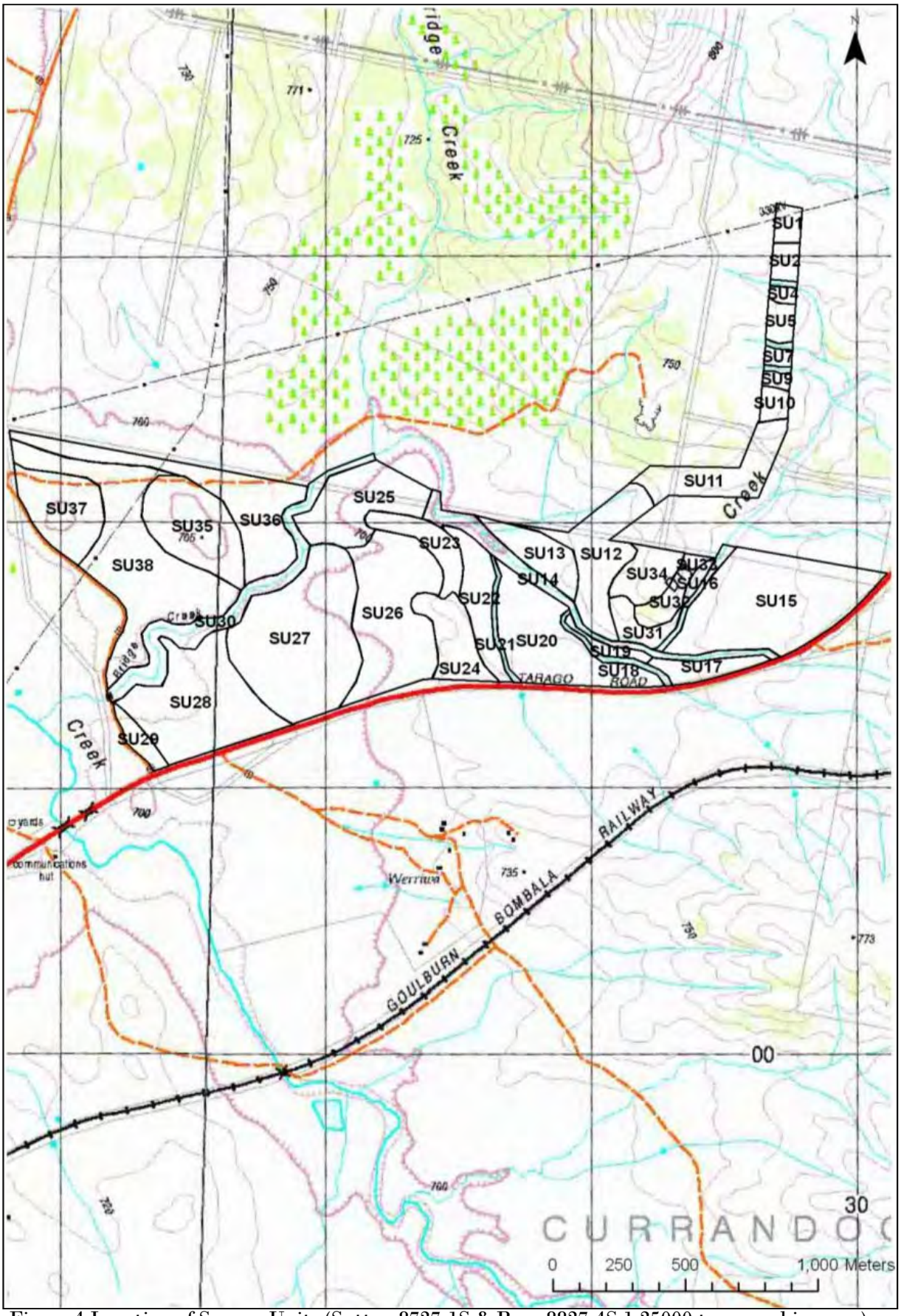

Figure 4 Location of Survey Units (Sutton 8727-1S & Boro 8827-4S 1:25000 topographic maps).

Table 2 Survey Unit descriptions.

SU	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
SU1	crest; broad	low biodiversity; grassland; 3.75 km from reliable water in Butmaroo Ck.	very gently inclined	open	granite	no rock outcrop	low	silty loam	Yes	eroded	wind; precipitation	low	very low
SU2	simple slope	low biodiversity; grassland; 3.3 km from reliable water in Butmaroo Ck.	gently inclined	S	granite	no rock outcrop	low	silty loam	Yes	eroded	wind; precipitation	low	very low
SU3	open depression	low biodiversity; grassland; 3.25 km from reliable water in Butmaroo Ck.	gently inclined	E	greywacke; shale	very slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation; stock treadage	moderate	very low
SU4	simple slope	low biodiversity; grassland; 3.2 km from reliable water in Butmaroo Ck.	gently inclined	NNE	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU5	crest; broad; sloping to E	low biodiversity; grassland; 3 km from reliable water in Butmaroo Ck.	gently inclined	open	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU6	open depression	low biodiversity; grassland; 2.8 km from reliable water in Butmaroo Ck.	gently inclined	ESE	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation; stock treadage	low	very low
SU7	crest; minor (c. 50 m wide); sloping to ESE	low biodiversity; grassland; 2.75 km from reliable water in Butmaroo Ck.	gently inclined	open	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU8	open depression	low biodiversity; grassland; 2.7 km from reliable water in Butmaroo Ck.	gently inclined	E	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation; stock treadage	low	very low
SU9	simple slope	low biodiversity; grassland; sparse trees; 2.6 km from reliable water in Butmaroo Ck.	gently inclined	ENE	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU10	Crest; broad (c. 100 m wide); sloping to E	low biodiversity; grassland; sparse trees; 2.6 km from reliable water in	gently inclined	open	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low

SU	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
		Butmaroo Ck.											
SU11	simple slope	low biodiversity; grassland; stands of trees; 2.2 km from reliable water in Butmaroo Ck.	gently inclined	SE	greywacke; shale; sand at western corner of SU	very slightly rocky	moderate	silty loam/ sand	Yes	eroded	wind; precipitation	low	very low
SU12	lower slope	low biodiversity; grassland; 1.8 km from reliable water in Butmaroo Ck.	very gently inclined	SW	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU13	flat	low biodiversity; grassland; adjacent to Dry Ck; 1.6 km from reliable water in Butmaroo Ck.	very gently inclined	S	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU14	open depression	low biodiversity; grassland; very sparse trees; ephemeral creekline; 1.5 km from reliable water in Butmaroo Ck.	very gently inclined	NW	greywacke; shale	rocky	moderate	silty loam	Yes	eroded	wind; precipitation; stock treadage	moderate	low
SU15	simple slope; gently undulating	low biodiversity; grassland; adjacent to Dry Ck; 1.9 km from reliable water in Butmaroo Ck.	very gently inclined	WSW	greywacke; shale	very slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU16	open depression	low biodiversity; grassland; ephemeral creekline; 1.9 km from reliable water in Butmaroo Ck.	very gently inclined	SW	greywacke; shale	slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation; stock treadage	moderate	low
SU17	simple slope; gently undulating	low biodiversity; grassland; sparse trees; adjacent to ephemeral creekline; 1.85 km from reliable water in Butmaroo Ck.	very gently inclined	WNW	greywacke; shale	very slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU18	open depression	low biodiversity; grassland; ephemeral	very gently inclined	NW	greywacke; shale	slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation; stock treadage	moderate	low

SU	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
		creekline; 1.7 km from reliable water in Butmaroo Ck.											
SU19	flat	low biodiversity; grassland; adjacent to Dry Ck; 1.6 km from reliable water in Butmaroo Ck.	level	open	greywacke; shale	very slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation	low	low
SU20	simple slope; gently undulating	low biodiversity; grassland; adjacent to Dry Ck; 1.4 km from reliable water in Butmaroo Ck.	very gently inclined	WNW	greywacke; shale	very slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU21	open depression	low biodiversity; grassland; ephemeral drainage line; 1.3 km from reliable water in Butmaroo Ck.	very gently inclined	N	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation; stock treadage	low	very low
SU22	simple slope; gently undulating	low biodiversity; grassland; adjacent to Dry Ck; 1.4 km from reliable water in Butmaroo Ck.	gently inclined	ENE	greywacke; shale	very slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU23	crest; broad, low set	low biodiversity; grassland; near to Dry Ck; 1.3 km from reliable water in Butmaroo Ck.	very gently inclined	open	greywacke; shale	very slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU24	crest	low biodiversity; grassland; 1.2 km from reliable water in Butmaroo Ck.	very gently inclined	open	greywacke; shale	slightly rocky	moderate	silty loam	Yes	eroded	wind; precipitation	low/ moderate	very low
SU25	simple slope; gently undulating	low biodiversity; grassland; adjacent to Bridge Ck; 1.25 km from reliable water in Butmaroo Ck.	very gently inclined	W	greywacke; shale	no rock outcrop	moderate	silty loam	Yes	eroded	wind; precipitation	low	very low
SU26	simple slope; gently undulating	low biodiversity; 800 m from reliable water in Butmaroo Ck.	gently inclined	W	greywacke; shale	no rock outcrop	moderate	silty loam	yes	eroded	wind; precipitation	low	very low

SU	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph-ology	Agents	Disturbance Levels	Predicted Artefact Density
SU27	lower slope	low biodiversity; grassland; adjacent to Bridge Ck; 600 m from reliable water in Butmaroo Ck.	level/ very gently inclined	W	greywacke; shale	no rock outcrop	moderate	silty loam	yes	eroded	wind; precipitation	low	very low
SU28	flat	low biodiversity; grassland; adjacent to Bridge Ck; 300 m from reliable water in Butmaroo Ck.	very gently inclined	open	greywacke; shale	no rock outcrop	moderate	silty loam	yes	eroded	wind; precipitation	low/ moderate	very low
SU29	simple slope	low biodiversity; grassland; adjacent to Bridge Ck; 250 m from reliable water in Butmaroo Ck.	very gently inclined	NE	greywacke; shale	slightly rocky	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low
SU30	open depression	low biodiversity; grassland; Bridge Ck; 250 m from reliable water in Butmaroo Ck.	gently inclined	NW	greywacke; shale	very slightly rocky	moderate	silty loam	yes	eroded	wind; precipitation; stock treadage	moderate	low
SU31	simple slope	low biodiversity; grassland; adjacent to Dry Ck; 2000 m from reliable water in Butmaroo Ck.	gently inclined	SW	greywacke; shale	very slightly rocky	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low
SU32	simple slope	low biodiversity; grassland with eucalypts; adjacent to Dry Ck; 2000 m from reliable water in Butmaroo Ck.	gently inclined	SE	greywacke; shale	slightly rocky	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low
SU33	simple slope	low biodiversity; grassland with eucalypts; adjacent to Dry Ck; 2500 m from reliable water in	steep	E	greywacke; shale	slightly rocky	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low

SU	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
		Butmaroo Ck.											
SU34	crest	low biodiversity; grassland with eucalypts; near to Dry Ck; 2200 m from reliable water in Butmaroo Ck.	gently inclined	open	greywacke; shale	slightly rocky	moderate	silty loam	yes	Eroded; in areas highly eroded	wind; precipitation	moderate	very low
SU35	crest	low biodiversity; grassland; 950 m from reliable water in Butmaroo Ck.	gently inclined	open	greywacke; shale	rocky	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low
SU36	lower slope	low biodiversity; grassland; 950 m from reliable water in Butmaroo Ck.	very gently inclined	SE	greywacke; shale	very slightly rocky	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low
SU37	crest	low biodiversity; grassland; 750 m from reliable water in Butmaroo Ck.	gently inclined	open	greywacke; shale	rocky	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low
SU38	flat	low biodiversity; grassland; 300 m from reliable water in Butmaroo Ck.	level	open	greywacke; shale	no rock outcrop	moderate	silty loam	yes	eroded	wind; precipitation	moderate	very low

The area surveyed during this assessment measured approximately 226 hectares in area (Table 3). It is estimated that approximately 114 hectares of that area was subject to survey inspection. Ground exposures inspected are estimated to have been approximately 7.7 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 1.9 hectares. Overall Effective Survey Coverage is therefore calculated to have been 0.85% of the total survey area.

Table 3 Survey Coverage Data.

SU	SU Area	Area Inspected %	Area Inspected sq m	Ground Exposure %	Ground Exposure sq m	Visibility %	Net Effective Exposure sq m	Effective Survey Coverage %
SU1	13960	60	8376	2	167	10	16	0.12
SU2	14338	60	8602	4	344	15	51	0.36
SU3	2253	60	1351	45	608	25	152	6.75
SU4	6052	60	3631	2	72	10	7	0.12
SU5	15223	60	9133	2	182	5	9	0.06
SU6	2572	60	1543	40	617	20	123	4.8
SU7	6857	60	4114	2	82	10	8	0.12
SU8	2305	60	1383	35	484	20	96	4.2
SU9	6304	60	3782	4	151	10	15	0.24
SU10	12760	50	6380	5	319	15	47	0.375
SU11	73814	60	44288	5	2214	10	221	0.3
SU12	94962	60	56977	3	1709	15	256	0.27
SU13	46208	50	23104	3	693	15	103	0.225
SU14	44915	55	24703	30	7410	35	2593	5.775
SU15	186944	50	93472	3	2804	10	280	0.15
SU16	9118	70	6382	30	1914	35	670	7.35
SU17	27652	50	13826	5	691	20	138	0.5
SU18	11215	70	7850	30	2355	50	1177	10.5
SU19	11226	70	7858	5	392	20	78	0.7
SU20	127824	50	63912	5	3195	15	479	0.375
SU21	9068	60	5440	1	54	5	2	0.03
SU22	53250	40	21300	8	1704	20	340	0.64
SU23	40748	40	16299	4	651	15	97	0.24
SU24	55131	50	27565	5	1378	15	206	0.375
SU25	85221	40	34088	5	1704	20	340	0.4
SU26	167635	40	67054	3	2011	15	301	0.18
SU27	230075	40	92030	7	6442	15	966	0.42
SU28	171666	40	68666.4	5	3433	15	514	0.3
SU29	17244	60	10346	15	1551	40	620	3.6
SU30	86002	90	77401	15	11610	40	4644	5.4
SU31	25222	40	10088	10	1008	20	201	0.8
SU32	27045	60	16227	8	1298	20	259	0.96
SU33	6678	50	3339	8	267	20	53	0.8
SU34	39895	50	19947	20	3989	60	2393	6
SU35	103578	60	62146	4	2485	10	248	0.24
SU36	126434	50	63217	3	1896	10	189	0.15
SU37	86996	60	52197	5	2609	15	391	0.45
SU38	220080	50	110040	6	6602	15	990	0.45
Total	**2268470**		**1148068**		**77111**		**19293**	**0.85**

8.2 Aboriginal Object Recordings

A total of 12 Aboriginal object locales have been recorded in the survey area (Table 4); their location is shown in Figure 5. Artefacts recorded are described in Table 5. It should be noted however that artefact locales SU16/L1 and SU30/L1 were recorded outside the study area. In addition the areas of the earlier recorded Aboriginal object locales Dry Creek 2 (57-2-0062) and Bridge Creek (57-2-0208) were resurveyed, although no artefacts were identified in these locations.

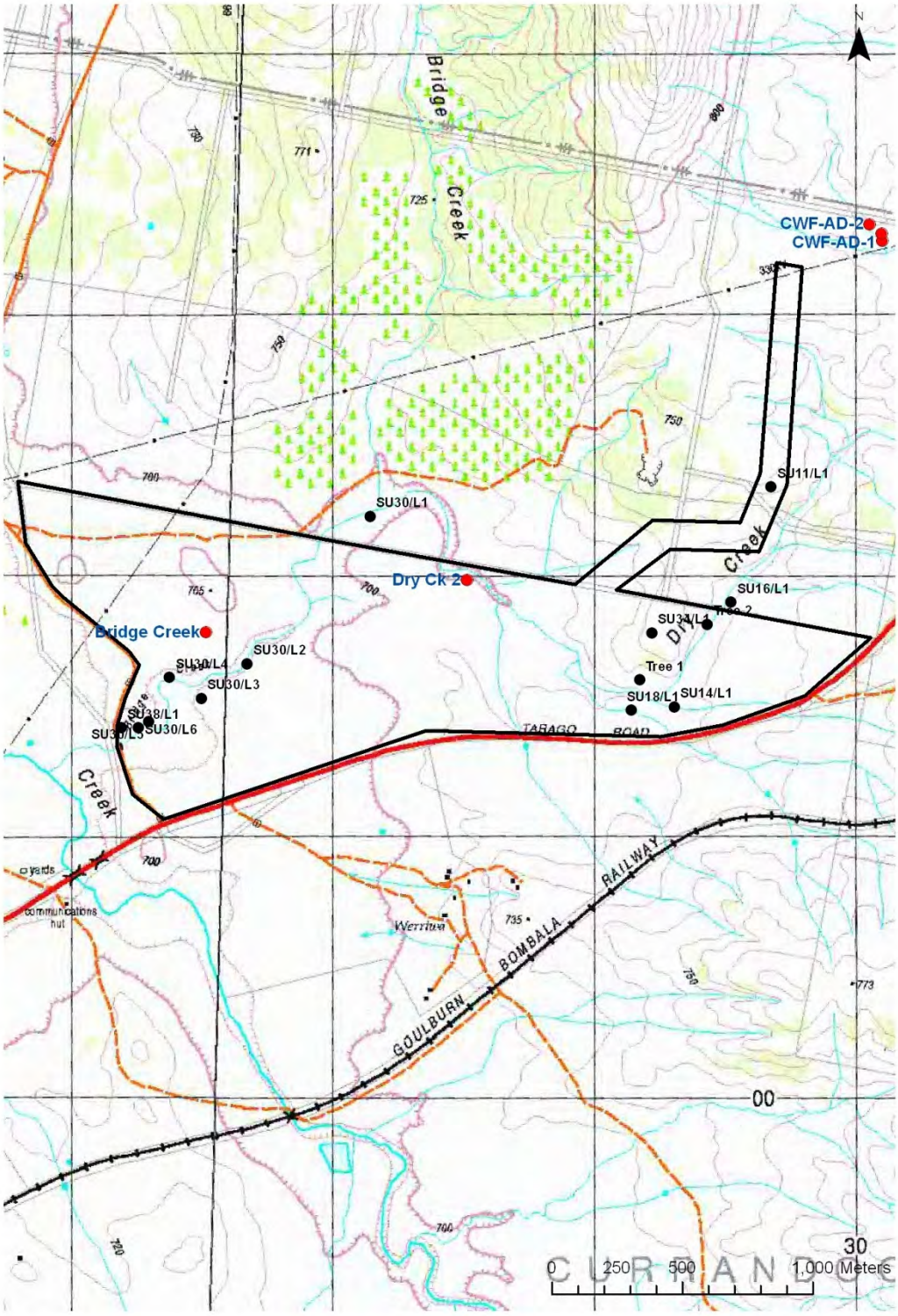

Figure 5 Previously recorded Aboriginal object locales (identified as red points), and Aboriginal object locales recorded during the current survey (identified as black points).

Table 4 Summary of Aboriginal object locales recorded in the survey area.

SU	Locale	Easting	Northing	Area	Exposure	Context	Exposure	Visibility	Artefact Number	Predicted Density	Integrity	Subsurface potential at site	Subsurface potential away from site	Impacts
SU11 (Plate 3)	L1	729677	6102342	40 x 15	bare earth; stock track area: 40 x 2 m	On gently sloping simple slope with south-easterly aspect	35	40	2	very low	moderately disturbed; eroding	Yes	Yes	Underground power cable; gravel road
SU14 (Plate 4)	L1	729307	6101500	5 x 2	eroded creek bank area: 10 x 10 m	On edge of drainage depression; aspect: NW; very gentle gradient	70	60	1	low	moderately disturbed; eroding	Yes	Yes	Possibly solar panels
SU14 (Plate 5)	Pre-recorded site 57-2-0062 Dry Creek 2	728513	6101984	40 x 25	eroded creek bank area: 25 x 15 m	On edge of drainage depression; aspect: NW; level gradient	40	50	0 Originally (1988) 9 quartz artefacts	low	disturbed; eroding	Yes	Yes	Impacts unlikely
SU16 (Plate 6)	L1	729524	6101901	15 x 8	eroded creek bank area: 15 x 3 m	On edge of drainage depression; aspect: SW; very gentle gradient	60	60	6	low	moderately disturbed; eroding	Yes	Yes	No impacts - outside of study area
SU18 (Plate 7)	L1	729143	6101487	15 x 3	eroded creek bank area: 15 x 1 m	On edge of drainage depression; aspect: open; level gradient	60	75	1	low	moderately disturbed; eroding	Yes	Yes	Possibly solar panels
SU30 (Plate 8)	L1	728143	6102229	80 x 15	eroded creek bank area: 70 x 10 m	On edge of drainage depression; aspect: W; very gentle gradient	70	60	7	low	disturbed; eroding	Yes	Yes	No impacts - outside of study area
SU30 (Plate 9)	L2	727672	6101665	30 x 4	eroded creek bank area: 25 x 2 m	On front of bank of a minor terrace at edge of drainage depression; aspect: W; very gentle gradient	85	60	1	low	disturbed; eroding	Yes	Yes	Impacts unlikely
SU30 (Plate 10)	L3	727496	6101532	40 x 5	eroded creek bank area: 30 x 3 m	On rear of bank of a minor terrace at edge of drainage depression; aspect: W; very gentle gradient	50	60	6	low	disturbed; eroding	Yes	Yes	Impacts unlikely
SU30 (Plate 11)	L4	727374	6101612	30 x 15	eroded creek bank area: 30 x 15	On edge of drainage depression; aspect: open; level gradient	50	60	8	low	disturbed; eroding	Yes	Yes	Impacts unlikely
SU30 (Plate 12)	L5	727294	6101443	25 x 10	eroded creek bank, stock track	On edge of drainage depression; aspect: open;	70	70	1	low	disturbed; eroding	Yes	Yes	Impacts unlikely

SU	Locale	Easting	Northing	Area	Exposure	Context	Exposure	Visibility	Artefact Number	Predicted Density	Integrity	Subsurface potential at site	Subsurface potential away from site	Impacts
					area: 25 x 10	level gradient								
SU30 (Plate 13)	L6	727256	6101419	10 x 1	eroded creek bank area: 30 x 1	On edge of drainage depression; aspect: open; level gradient	50	60	2	low	disturbed; eroding	Yes	Yes	Impacts unlikely
SU34 (Plate 14)	L1	729221	6101783	35 x 20	bare earth; stock track area: 40 x 30	On edge of crest aspect: W; very gentle gradient	70	80	4	very low	disturbed; eroding	Yes	Yes	Nil
SU38 (Plate 15)	L1	727189	6101419	15 x 15	excavated pit area: 15 x 15	Excavated pit on flat landform; aspect: open; level gradient	30	45	3	low	moderately disturbed	Yes	Yes	Solar panels
SU38	Pre-recorded site 57-2-0208 Bridge Creek	727513	6101784	-	-	-	-	-	1	low	moderately disturbed	Yes	Yes	Solar panels

Table 5 Description of recorded artefacts.

Locale	Type	Size (size class unless otherwise indicated)	Material	Comments
SU11/L1	Flake fragment	3	White quartz	
SU11/L1	Broken pebble manuport	74 x 36 x 41mm	Brown quartzite	No usewear; 40% pebble cortex
SU14/L1	Distal flake portion	4	Brown silcrete	
SU16/L1	Distal flake portion	6	Grey silcrete	Longitudinally split
SU16/L1	Flake	2	White quartz	
SU16/L1	Flake	4	Grey chert	
SU16/L1	Flake fragment	2	White quartz	
SU16/L1	Flake	4	Black chert	
SU16/L1	Medial flake portion	4	Grey quartzite	
SU18/L1	Backed artefact	3	Grey chert	Medial flake portion; backed along 1 chord
SU30/L1	Flake	2	Grey silcrete	
SU30/L1	Flake	4	Grey silcrete	
SU30/L1	Proximal flake portion	2	Grey silcrete	
SU30/L1	Flake fragment	2	Grey silcrete	
SU30/L1	Flake fragment	4	Grey silcrete	
SU30/L1	Flake fragment	4	White quartz	
SU30/L1	Flake	4	Grey quartzite	
SU30/L2	Flake	3	Grey silcrete	
SU30/L3	Core	6	Grey silcrete	4 flake scars; 1 rotation; 30% pebble cortex
SU30/L3	Distal flake portion	3	Brown silcrete	
SU30/L3	Flake fragment	3	Brown silcrete	
SU30/L3	Proximal flake portion	2	Brown silcrete	
SU30/L3	Flake	2	Brown silcrete	
SU30/L3	Medial flake portion	3	Brown silcrete	
SU30/L4	Flake fragment	3	White quartz	
SU30/L4	Flake	2	White quartz	
SU30/L4	Flake fragment	2	White quartz	
SU30/L4	Flake	2	White quartz	
SU30/L4	Flake	4	White quartz	
SU30/L4	Flake	2	White quartz	
SU30/L4	Flake	2	White quartz	
SU30/L4	Broken pebble	11	Metasedimentary	Crushing at one end 45 x 20 mm; abraded usewear - area 20 x 20 mm
SU30/L5	Flake	4	Brown volcanic	
SU30/L6	Distal flake portion	2	White quartz	
SU30/L6	Flake fragment	3	White quartz	
SU35/L1	Flake	4	White quartz	
SU35/L1	Flake	5	White quartz	
SU35/L1	Distal flake portion	4	Grey silcrete	
SU35/L1	Flake	5	Grey silcrete	
SU38/L1	Core	5	White quartz	4 negative flake scars
SU38/L1	Flake fragment	3	White quartz	
SU38/L1	Ground edge hatchet fragment	33 x 27 x 6 mm	Grey volcanic	Discoid chip with ground edge on 1 side; most probably broken piece from ground edged hatchet

Plate 3. SU11/L1 looking northeast.

Plate 4. SU14/L1 looking east.

Plate 5. SU14 - pre-recorded site Dry Creek 2 (Packard 1988) looking southwest.

Plate 6. SU16/L1 looking northeast.

Plate 7. SU18/L1 looking east.

Plate 8. SU30/L1 looking north.

Plate 9. SU30/L2 looking north.

Plate 10. SU30/L3 looking south.

Plate 11. SU30/L4 southwest.

Plate 12. SU30/L5 looking southwest.

Plate 13. SU30/L6 looking south.

Plate 14. SU35/L1 looking northeast.

Plate 15. SU38/L1 looking west.

In addition to the Aboriginal object locales recorded during the field survey two trees, each of which had exposed heartwood (scars), were recorded and analysed. However, because of the irregular shape of the scarring it is assessed unlikely that these markings are of human origin. Nevertheless, as the trees are located outside the proposed areas of impact they will not be disturbed in the construction or operation of the solar farm. The trees are described below.

SU31/Tree 1 729174e 6101603n GDA

This tree is a Brittle Gum (*Eucalyptus mannifera*) located in Survey Unit 31, amongst a stand of trees of similar age and type (Plate 16). The tree is c. 15 m tall. It has an asymmetrical area of exposed heartwood scarring that measures 900 cm in length and 41 cm in width, the base of which is located 1.38 m above the ground. The tree has a circumference of 2.2 m at the point of scarring. There are no incision marks on the exposed heartwood

Plate 16. SU31/Tree1

SU33/Tree 2 729433e 6101816n GDA

This tree, also a Brittle Gum (*E. mannifera*), is located in Survey Unit 33 immediately adjacent to the creekline (Plate 17). A significant area of the trees' root system nearest to the creek has been exposed and undermined by erosion. The tree is c 13 m tall. It is divided into two main trunks from just above its base, with an area of exposed heartwood on the upper surface of one of the trunks as it angles away from the vertical. The area of exposed heartwood measures 215 cm in length and tapers inwards from its widest point of 60 cm at its base to its narrowest point, 28 cm, at its upper limit. The lowest point of the exposed area is located 1.80 m above the ground. The tree has a circumference of 2.9 m at the point of scarring. There are no incision marks on the exposed heartwood.

Plate 17. SU33/Tree2

8.3 Discussion

All but three artefact locales recorded during the survey were located in an open depression environmental context on eroding creek banks. Of the exceptions, Survey Unit 11/Locale 1 is a very low density artefact scatter comprised of two artefacts located 40 metres apart on a stock track on a gently inclined simple slope. Survey Unit 35/Locale 1 is a low density artefact scatter comprised of four artefacts located in an area of exposure on a crest. Survey Unit 38/Locale 1 is a low density artefact scatter comprised of three artefacts located in an area of exposure created by the previous excavation of a c. 15 metre wide circular pit.

It is noted that artefacts were not recorded in the majority (#32) of the Survey Units. However, it is expected that stone artefacts are likely to be present in most, if not all these Survey Units, though it is assessed that artefact density will be very low. The survey results are therefore believed to be not only the product of generally low visibility variables in landforms located away from the more active erosional edges of drainage depressions, but also a reflection of the very low densities of artefacts distributed on the amorphous flats, lower slopes, simple slopes and low-lying crests. This pattern of artefact density and distribution is generally consistent with the predictive model of site type and location applicable to the area.

Also of note is that while artefacts were located adjacent to the drainage depressions these were at low density. During field survey these landforms afforded consistent areas of breached ground surfaces and accordingly numerous exposures with good archaeological visibility. Artefact distribution on the fringes of these creeklines would be expected to be greater than areas set at some distance away. However the drainage depressions are low-lying, and this result is in keeping with the predictive model of site type and location relevant to the local area, in which it is considered that camp site locations in the vicinity of reliable water are likely to have been on elevated landforms above cold air drainage.

The majority of artefacts recorded are flaking debitage made predominantly from quartz, but also included silcrete, fine grain volcanic material, chert and quartzite (Table 5). quartz regularly features as the most frequently recorded raw material in the region. Quartz is available locally as a component of the Adaminaby Group greywacke and shale bedrock, but the majority of the

local quartz inspected was of relatively poor quality. Two artefacts, one pebble and one silcrete core, possessed pebble cortex.

As already noted the majority of artefacts recorded are representative of flaking debitage. Most of the artefacts recorded are the product of hard hammer percussion flaking. No bipolar flaked artefacts were observed.

As well as flaking debitage one retouched chert artefact, one broken pebble manuport with no evidence of usewear, and one broken pebble with usewear evidence were recorded. In addition a fragment, most probably from the cutting edge of a ground edged hatchet, was recorded.

8.4 Impact Assessment

As noted above, the Aboriginal object locales recorded in the proposal area (including previously recorded sites) include isolated stone artefacts and very low density artefact scatters; these are assessed to be of low archaeological significance. Undetected or subsurface stone artefacts are assessed to be present in either very low or low density distributions.

The Effective Survey Coverage achieved during the survey is considered to have been low however sufficient to characterise the nature of artefact distribution in the study area. The survey results are therefore assessed to be a relatively accurate reflection of the artefact density in the proposal area. Accordingly, based on the relevant predictive model of site distribution for the area, and the results of the field survey, artefact density in the study area is assessed to be very low or low. The stone artefact distributions in the proposal area are assessed to be of low archaeological significance.

The construction of the Solar Farm will result in 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 Capital Solar 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 given that the installation of the solar panels has such a small footprint, the proposed impacts relating to construction is minimal and is not comprehensive and extensive.

However given that the recorded Aboriginal objects and the predicted undetected and subsurface artefacts are assessed to be of low significance, the impacts can be viewed as being of correspondingly low significance. This assessment forms the basis for the formulation of recommendation relating to the proposal.

9. STATUTORY CONTEXT

The Environmental Planning and Assessment Act 1979

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

Part 3A of the Environmental Planning and Assessment Act 1979

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

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

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

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

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

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

10. 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.

10.1 Significance Assessment Criteria

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.

10.2 Significance Value of the Aboriginal Objects in the Study Area

The scientific significance of the recorded Aboriginal artefact locales in the project area are listed below in Table 6:

Table 6 Archaeological significance assessment of recorded Aboriginal object locales.

SU	Locale	Artefact Number	Predicted Density	Integrity	Subsurface potential at site	Subsurface potential away from site	Significance	Criteria
SU11	L1	2	very low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted very low artefact density in Survey Unit
SU14	L1	1	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU14	Pre-recorded site 57-2-0062 Dry Creek 2	Originally (1988) 9 quartz artefacts – none relocated during survey	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common site type; not a common implement Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU16	L1	6	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU18	L1	1	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU30	L1	7	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU30	L2	1	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common site type; however one artefact not a common implement Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit

SU	Locale	Artefact Number	Predicted Density	Integrity	Subsurface potential at site	Subsurface potential away from site	Significance	Criteria
SU30	L3	6	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU30	L4	8	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU30	L5	1	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU30	L6	2	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU35	L1	4	very low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU38	L1	3	low	moderately disturbed; eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit
SU38	Pre-recorded site 57-2-0208 Bridge Creek	1	low	moderately disturbed	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted low artefact density in Survey Unit

11. MITIGATION AND MANAGEMENT STRATEGIES

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

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

12.1 Management and Mitigation Strategies

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 can be appropriate in certain situations. Such situations generally arise when the proposed development is expected to involve ground disturbance in areas which are assessed to have potential to contain high density artefactual material and when the Effective Survey Coverage achieved during a survey of a project area is low due to ground cover, vegetation etc.

No Survey Units have been identified in the proposal area to warrant further archaeological investigation in order to formulate appropriate management and mitigation strategies. Based on a consideration of the predictive model of site type applicable to the environmental context in which impacts are proposed the archaeological potential of the proposed impact areas does not warrant further investigation.

The environmental contexts in which the proposed solar farm is situated are not predicted to contain artefact densities sufficient to warrant test excavation. Furthermore the proposed impacts are not broadscale, but of a nature that will substantially leave intact any archaeological deposit that may be present. It is considered that with 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. Similar results are reflected in the findings of a number of subsurface investigations that have previously been undertaken in the local area. Accordingly a program of subsurface testing is not considered to be necessary or warranted.

Conservation

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

In the case at hand, avoidance of impacts (or minimisation of impacts) in regard to some artefacts locales is considered to be desirable if at all possible. The artefact locales in question are identified in the table below (Table 7).

Mitigated Impacts

Mitigated impact usually takes the form of partial impacts only (ie conservation of part of an Aboriginal artefact locale or Survey Unit) and/or salvage in the form of further research and archaeological analysis prior to impacts. Such a management strategy is generally appropriate when Aboriginal objects are assessed to be of moderate or high significance to the scientific

and/or Aboriginal community and when avoidance of impacts and hence full conservation is not feasible. Salvage can include the surface collection or subsurface excavation of Aboriginal objects and subsequent research and analysis.

It is assessed that the archaeological resource in the proposal area does not surpass significance thresholds which would warrant any form of impact mitigation.

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 is simply not feasible.

Avoidance of impacts (or minimisation of impacts) in regard to some artefacts locales is considered to be desirable *if at all possible*. However the Aboriginal object locales identified have been assessed to be of low archaeological significance. Given the nature and artefact density of the artefact locales recorded in the proposal area and the low scientific significance rating they been accorded, if impacts are proposed, unmitigated impact is appropriate.

Proposed management and mitigation strategies

The table below summarises the management and mitigation strategies considered to be relevant to proposal area. Management and mitigation strategies are addressed in relation to all Survey Units recorded during the study (noting that most Survey Units do not contain Aboriginal object locales) and also for individual locales located within each Survey Unit. The recommended management strategy listed for each Survey Unit (as highlighted in table) and Aboriginal object locale is selected from the various management options as discussed above. Finally the rationale behind each recommendation is outlined, taking into consideration the nature of the Aboriginal object and its archaeological significance rating.

The Aboriginal object locales recorded in the proposal area do not surpass scientific significance thresholds which would act to preclude the construction of the proposed solar farm. Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, and the results of the study, it is concluded that the proposed impact area does not warrant further investigation such as subsurface test excavation. The environmental context in which the impacts are proposed is predicted to contain either very low or low artefact density. It is considered that subsurface testing is unlikely to produce results different to predictions made in respect of the archaeological potential of the landform in question.

Given the nature of the artefact locales recorded in the proposal area and the low scientific significance rating they have been accorded, unmitigated impacts is considered appropriate if necessary; a strategy of impact avoidance is not warranted in regard to these locales. Nevertheless as a form of overall impact mitigation in respect of the proposal it is recommended that wherever possible impacts are excluded from landforms situated within 50 – 75 metres of drainage lines.

Table 7 Recommended management strategies relating to Survey Units (as highlighted in left column) and Aboriginal object locales in the proposal area.

SU	Locale	Artefact density (predicted and as per analysis of ESC)	Impacts	Significance	Recommended management strategy	Rationale
SU1	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU2	Nil recordings	very low	Underground power cable;	n/a	No constraints to impacts in SU	Predicted very low density artefact

SU	Locale	Artefact density (predicted and as per analysis of ESC)	Impacts	Significance	Recommended management strategy	Rationale
			gravel road		**Unmitigated impacts**	distribution.
SU3	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU4	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU5	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU6	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU7	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU8	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU9	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU10	Nil recordings	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU11	-	very low	Underground power cable; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU11	L1	very low	Underground power cable; gravel road	Low local scientific significance	No constraints to impacts in locale **Unmitigated impacts**	Very low density artefact distribution. Archaeological significance assessed to be low.
SU12	Nil recordings	very low	Underground power cable; gravel road; solar panels; cable trench; boundary fence	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU13	Nil recordings	low	Underground power cable; gravel road; solar panels; cable trench; boundary fence	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted low density artefact distribution.
SU14	-	low	Solar panels; boundary fence; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted low density artefact distribution.
SU14	L1	low	Possibly solar panels	Low local scientific significance	No constraints to impacts in locale **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU14	Pre-recorded site 57-2-0062 Dry Creek 2	low	Impacts unlikely	Low local scientific significance	No constraints to impacts in locale **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU15	Nil recordings	very low	Solar panels; transformers; boundary fence; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.

SU	Locale	Artefact density (predicted and as per analysis of ESC)	Impacts	Significance	Recommended management strategy	Rationale
SU16	-	low	Nil	n/a	No constraints to impacts in SU if proposed **Unmitigated impacts**	Predicted low density artefact distribution.
SU16	L1	low	Outside of study area	Low local scientific significance	**n/a**	n/a however: Low density artefact distribution. Archaeological significance assessed to be low.
SU17	Nil recordings	very low	Solar panels; boundary fence; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU18	-	low	Solar panels; boundary fence; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Very low density artefact distribution.
SU18	L1	low	Possibly solar panels	Low local scientific significance	No constraints to impacts in SU if proposed **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU19	Nil recordings	low	Solar panels; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted low density artefact distribution.
SU20	Nil recordings	very low	Solar panels; transformer; boundary fence; gravel road; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU21	Nil recordings	very low	Solar panels; transformer; gravel road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU22	Nil recordings	very low	Solar panels; temporary laydown area; gravel road; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU23	Nil recordings	very low	Solar panels; transformer; gravel road; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU24	Nil recordings	very low	Solar panels; transformer; temporary laydown area; gravel road; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU25	Nil recordings	very low	Solar panels; transformer; boundary fence; gravel road; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU26	Nil recordings	very low	Solar panels; transformers; cable trench; gravel road; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU27	Nil recordings	very low	Solar panels; transformer; boundary fence; gravel road; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU28	Nil recordings	very low	Solar panels; transformer; boundary fence;	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.

SU	Locale	Artefact density (predicted and as per analysis of ESC)	Impacts	Significance	Recommended management strategy	Rationale
			gravel road; cable trench			
SU29	Nil recordings	very low	Boundary fence	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU30	-	low	Cable trench; road	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted low density artefact distribution.
SU30	L1	low	Outside of study area	Low local scientific significance	Avoid impacts if possible No constraints to impacts in SU if proposed **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU30	L2	low	Impacts unlikely	Low local scientific significance	Avoid impacts if possible No constraints to impacts in SU if proposed **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU30	L3	low	Impacts unlikely	Low local scientific significance	Avoid impacts if possible No constraints to impacts in SU if proposed **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU30	L4	low	Impacts unlikely	Low local scientific significance	Avoid impacts if possible No constraints to impacts in SU if proposed **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU30	L5	low	Impacts unlikely	Low local scientific significance	Avoid impacts if possible No constraints to impacts in SU if proposed **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU30	L6	low	Impacts unlikely	Low local scientific significance	Avoid impacts if possible No constraints to impacts in SU if proposed **Unmitigated impacts**	Low density artefact distribution. Archaeological significance assessed to be low.
SU31	Nil recordings	very low	Nil	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU32	Nil recordings	very low	Nil	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU33	Nil recordings	very low	Nil	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU34	-	very low	Nil	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU34	L1	very low	Nil	Low local scientific significance	**n/a**	n/a however: Very low density artefact distribution. Archaeological significance assessed to be low.
SU35	Nil recordings	very low	Nil	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU36	Nil recordings	very low	Solar panels; transformer; boundary fence; cable trench; laydown area;	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.

SU	Locale	Artefact density (predicted and as per analysis of ESC)	Impacts	Significance	Recommended management strategy	Rationale
			site office; ; gravel road existing road diversion; cable trench			
SU37	Nil recordings	very low	Laydown area; boundary fence	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU38	**-**	very low	Solar panels; transformers; boundary fence; cable trench; laydown area; ; gravel road existing road diversion; cable trench	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU38	L1	very low	Solar panels	Low local scientific significance	No constraints to impacts in SU **Unmitigated impacts**	Very low density artefact distribution. Archaeological significance assessed to be low.
SU38	Pre-recorded site 57-2-0208 Bridge Creek	very low	Solar panels	Low local scientific significance	No constraints to impacts in SU Unmitigated impacts	Very low density artefact distribution. Archaeological significance assessed to be low.

12. RECOMMENDATIONS

The following recommendations are made on the basis of:

- A consideration of the Part 3A amendment to the Environmental Planning and Assessment Act (see Section 10 Statutory Information).

- The results of the investigation as documented in this report.

- Consideration of the type of development proposed and the limited nature of proposed impacts.

Management and mitigation strategies are outlined and justified in Section 11 of this report. The following recommendations are provided in summary form:

1. Management and mitigation recommendations are listed in respect of each Survey Unit and Aboriginal object locale in Section 11 of this report. The table in Section 11 should form the basis for implementing management and mitigation strategies prior to and during construction.

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

3. The recorded Aboriginal object locales and the predicted very low or low density subsurface artefact distribution in the proposal area does not surpass archaeological significance thresholds which would act to preclude proposed impacts. Accordingly there are no identified Indigenous archaeological constraints to the proposal.

4. The recorded Aboriginal object locales are assessed to be representative of very low density distributions of stone artefacts. The archaeological significance of these locales is assessed to be low. Accordingly unmitigated impact is considered to be appropriate if necessary.

5. As a form of overall impact mitigation in respect of the proposal it is recommended that wherever possible impacts are excluded from landforms situated within 50 – 75 metres of drainage lines.

13. REFERENCES

Austral Archaeology 2005 *Proposed Capital Wind Farm Tarago Region, NSW. Aboriginal Archaeological and Cultural Heritage Assessment.* For Connell Wagner Pty Ltd on Behalf of Renewable Power Ventures.

Austral Archaeology 2009 *Proposed Capital Wind Farm Tarago Region, NSW. Aboriginal Archaeological Excavation Report.* Draft Report. For Renewable Power Ventures.

Barrow, G and M Carr. 1991 Old Bungendore - Changing Times in an Australian Village. Dagraja Press, Canberra 1991.

Boot, P. 1994 Recent Research into the Prehistory of the Hinterland of the South Coast of New South Wales. In Sullivan, M, Brockwell, S. and Webb, A. (eds) *Archaeology in the North: Proceedings of the 1993 Australian Archaeological Association Conference.* NARU: Darwin.

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

Coates, I. 1991 Elmslea East Environmental Study Aboriginal Archaeological Site Survey. Report to Yarrowlumla Shire Council.

Dorrough, J., A Yen, V. Turner, S. Clark, J. Crosthwaite and J. Hirth 2004 Livestock grazing management and biodiversity conservation in Australian temperate grassy landscapes. *Australian Journal of Agricultural Research.* Vol 55; pp 279 – 295.

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

Flood, J. 1980 *The Moth Hunters - Aboriginal prehistory of the Australian Alps.* Australian Institute of Aboriginal Studies: Canberra.

Flood, J., David, B., Magee, J. & English, B. 1987 Birrigai: A Pleistocene Site in south-eastern highlands. *Archaeology in Oceania.* 22: 9-26.

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

Howitt, A. 1904 *The Native Tribes of South East Australia.* London: Macmillan & Co Limited.

Hughes, P., Barz, R., and Hiscock P. 1984 *An Archaeological Investigation of the Bungendore Sands Quarry, Lake George, NSW.* Unpublished report to Corkhill Bros Pty Ltd.

Lampert, R. 1971 *Burrill Lake and Currarong: Coastal Sites in Southern New South Wales.* Terra Australia 1 Department of Prehistory. ANU: Canberra.

Lance, A. 1985 An Archaeological Survey of a Proposed Sand Quarry on the 'Currandooly Lease', via Bungendore, NSW. Unpublished Report to Canberra Wash Sand Pty Ltd.

Lance, A. 2000 Currandooly Site Studies. Work in Progress.

Lance, A. 2009 A Review of *In Situ* Occupation Deposits at the Bungendore Sands Quarry, New South Wales. A Report to Canberra Sand and Gravel.

Lunt, I., D. Eldridge, J. Morgan and G. Witt 2007 A framework to predict the effects of livestock grazing and grazing exclusion on conservation values in natural ecosystems in Australia. *Australian Journal of Botany.* Vol 55; No 4; pp 401 -415.

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

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

Natural Heritage Studies 1991 Buckingham archaeological survey. Report to Gutteridge, Haskins and Davy.

Navin, K. & Officer, K. 1993 Archaeological Investigation Buckingham Estate, North Bungendore, NSW. Report to McCann and Associates Pty Ltd.

New South Wales National Parks and Wildlife Service 1997 DRAFT *Aboriginal cultural heritage standards and guidelines kit*.

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

New South Wales Department of Environment, Climate Change and Water 2010 *Aboriginal cultural heritage consultation requirements for proponents 2010*.

Olley, J. and R. Wasson 2003 Changes in the flux of sediment in the Upper Murrumbidgee catchment, Southeastern Australia, since European settlement. *Hydrological Processes*. Vol 17; pp 3307 – 3320.

Osborne, M. July 2010 personal communication.

Ossa, P., Marshall, B. & Webb, C. 1995 New Guinea 2 cave: A Pleistocene site on the Snowy River, Victoria. *Archaeology in Oceania* 30(1):22-35.

Packard, P. 1986 Archaeological Sites in Sand Deposits on the Southern Tablelands. A Report to NPWS of NSW.

Packard, P. 1987 National Parks and Wildlife Service Standard Site Recording Forms for NPWS #57-2-60 South Red Hill 1, #57-2-59 Lakelands 1 recorded by Packard, Prehistory R.S.Pac.S., Australian National University, Canberra ACT.

Packard, P. 1988 Archaeological Investigation of a Proposed Sand Extraction Area at Bridge Creek Near Southeast Lake George, NSW. Unpublished Report to Canberra Wash Sand Pty Ltd.

Paton, R. 2001 Report of an Archaeological Survey of Stages 3 and 4 of the Elmslea Estate Near Bungendore, NSW. Report to W P Brown and Partners Pty Ltd.

Paton, R. 2008 An Archaeological Assessment of Lot 32 DP 634213 Grantham Park, NSW.

Paton, R and Collins, S. 2008 Subsurface Investigations at Lot 32, DP 634213, Grantham Park, NSW.

Saunders, P. 2002 Elmslea Estate, Bungendore, Aboriginal Archaeological Assessment. Report to Elmslea Land Development Pty Ltd.

Saunders, P. 2004 Elmslea Estate, Bungendore, Archaeological Subsurface Testing Program. Report to Elmslea Land Development Pty Ltd.

Saunders, P. 2005 Proposed Subdivision Lot 4 DP 583957, 'Petworth Park' Bungendore NSW Archaeological Assessment. Report to Bill Swan and Associates.

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

Stone, T. 1988 An Archaeological Assessment of a Proposed Sand Extraction Site Adjacent to Turallo Creek near Bungendore, NSW. Unpublished Report to Coffey and Partners.

Thomas, I and Gillieson, D. No Date. An Archaeological Survey of a Proposed Sand Quarry at Bungendore. Report to Canberra Washed Sands Pty Ltd.

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.

Wasson, R., R. Mazari, B Starr and G. Clifton 1998 The recent history of erosion and sedimentation on the Southern Tablelands of southeastern Australia: sediment flux dominated by channel incision. *Geomorphology* Vol: 24; pp 291 – 308.

Appendix 1. Letter received from Buru Ngunawal Aboriginal Corporation

BURU NGUNAWAL ABORIGINAL CORPORATION

ABN : 24 059 704 833

29 September 2010

nghenvironmental
PO Box 470
Bega NSW 2550

C/- NSW Archaeology Pty Ltd
PO Box 2135
Central Tilba NSW 2546

Attention: Andrew Pearce

Aboriginal Cultural Heritage Investigation – Capital Solar Farm

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

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

Field work was undertaken in July and August 2010 by our representative accompanied by Mr Andrew Pearce, archaeologist from NSW Archaeology Pty Ltd.

The following comment is provided in relation to the each of the recommendations under Section 12. Recommendations in the draft report.

A summary of the recommendations is set out below with our comment:

1. *Management and mitigation recommendations are listed in respect of each Survey Unit and Aboriginal object locale in Section 11 of this report. The table in Section 11 should form the basis for implementing management and mitigation strategies prior to and during construction.*

   It should be noted that the table is indicative of the scientific rationale for the assessment of culturally significant objects that were located during the field work. Consideration must be given to the how the Traditional Aboriginal people feel about the already conceived idea that it is okay to proceed with the project whilst destroying our culture. The question then needs to be asked is "Why bother undertaking an investigation", when it is already a forgone conclusion that works will go ahead no matter what the findings.

PO Box 6900, CHARNWOOD ACT 2615 Ph: 02 62591672 Fax: 02 6258 1264 Email: walbell@bigpond.net.au

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

   This recommendation would be accepted on the condition that identified sites and objects are guaranteed to not be impacted by works.

3. *The recorded Aboriginal object locales and the predicted very low or low density subsurface artefact distribution in the proposal area does not surpass archaeological significance thresholds which would act to preclude proposed impacts. Accordingly there are no identified Indigenous archaeological constraints to the proposal.*

   It is hard to comprehend and agree to this point as how are archaeological significance thresholds determined and applied in this instance which always seems to be determined to be of a "*predicted very low or low density subsurface artefact distribution*" as cultural significance must also be applied to keep the investigation in context.

4. *The recorded Aboriginal object locales are assessed to be representative of very low density distributions of stone artefacts. The archaeological significance of these locales is assessed to be low. Accordingly unmitigated impact is considered to be appropriate if necessary.*

   Again agreement is hard to apply to this point as again the archaeological significance must be weighed up against the cultural significance otherwise it defeats the purpose of undertaking the investigation in the first place.

5. *As a form of overall impact mitigation in respect of the proposal it is recommended that wherever possible impacts are excluded from landforms situated within 50 – 75 metres of drainage lines.*

   We agree with this point as the majority of the artefactual materials identified were located within the confines of the drainage lines, creeklines and sediment erosion areas.

Yours faithfully

Wally Bell (Ngunawal TC)
Chair

PO Box 6900, CHARNWOOD ACT 2615 Ph: 02 62591672 Fax: 02 6258 1264 Email: walbell@bigpond.net.au