

Appendix G Archaeology Assessment

**Proposed Nyngan Photovoltaic Solar Farm
Indigenous Archaeological and Cultural Heritage Assessment**

A report to ngenvironmental
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1. SUMMARY

1.1 Introduction

New South Wales Archaeology Pty Ltd has been commissioned by ngenvironmental to undertake an Indigenous archaeological and cultural heritage assessment of the proposed Nyngan Solar Farm. The Solar Farm will be located ca. one kilometre south of the Nyngan township.

The proposed Nyngan 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). Three 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 Tommy Ryan of the Nyngan Local Aboriginal Land Council (NLALC).

1.3 Description of Impact

Infigen Suntech Australia Pty Ltd (Infigen) proposes to construct a 100 megawatt capacity photovoltaic solar farm (solar farm) at Nyngan in central western New South Wales.

The solar farm would comprise a series of photovoltaic modules (PV arrays) mounted on fixed frames, and would occupy approximately 200 hectares. The Nyngan Solar Farm would connect to the existing Nyngan 132kV substation which is immediately adjacent to the solar farm.

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 132kV 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.
- 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 given that the installation of the solar panels is via a pole driven mechanism, the proposed impacts relating to construction is minimal and is not comprehensive

and extensive. The proposed impacts are therefore 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 sites searches, a literature review, field survey and analysis of results. Field work was undertaken in 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, which in the study area is expected to be in very 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 has been implemented during this study; the proposal area is comprised of a single landform, this being part of the Bogan floodplain. This landform is conceptualised as a Survey Unit and is utilised as a framework of 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 relevant NSW DECCW staff and 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 no previously recorded Aboriginal objects located within the proposed impact area (AHIMS #30670). The search area measured 72 km² and encompassed eastings 514000 –523000, and northings 6502000 –6510000. While no previously recorded Aboriginal objects are listed on AHIMS to be present in the proposal area, 27 sites are listed in the site search, most of which are located to the east and northwest of the Nyngan township. The majority of sites listed in the AHIMS search are scarred trees.

There are no previous archaeological studies known to have been conducted within the proposal area itself and few have been undertaken within the immediate local area. A recent survey conducted by NSW DECCW and the Nyngan Local Aboriginal Land Council resulted in the identification and recording of 180 sites (cf. Purcell: 2010). The construction of a relevant predictive model of Aboriginal site type and location is based on a review of research conducted across the broader region. This review suggests that the most common Aboriginal object recordings in the region are distributions of stone artefacts and scarred trees. In the region a

general correlation between different types of watercourses and the nature of the evidence of past Aboriginal occupation is evident. Higher artefact density sites are located near to permanent water sources and low density artefact distributions are found elsewhere. Rare site types include rock shelters, 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 encompasses a single landform comprised of a floodplain with level gradient and open aspect. The western boundary of the study area is located c. 1.2 kilometres east of the Bogan River. The proposal area surveyed during the assessment measures approximately 208 hectares in area. It is estimated that approximately 83 hectares of that area was subject to survey inspection. Ground exposures inspected are estimated to have measured approximately 4.92 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 2.25 hectares. Effective Survey Coverage is therefore relatively low and is calculated to have been 1.08% of the study area.

Two Aboriginal object locales were recorded during the field survey, each comprised of a single stone artefact. While the Effective Survey Coverage for the surveyed area is calculated to have been relatively low, many extensive areas of good ground exposure possessing reasonable archaeological visibility were distributed throughout the study area. These exposures enabled a reasonable characterisation of artefact distribution within the proposal area.

As noted above, the Aboriginal object locales recorded in the proposal area are two single and isolated stone artefacts; these are assessed to be of low archaeological significance. Undetected or subsurface stone artefacts are assessed to be present in very low density. The Effective Survey Coverage achieved during the survey is considered to have been 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. The proposal area is assessed to be low archaeological potential and 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 Nyngan 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 is via a pole driven mechanism, the proposed impacts relating to construction is minimal and is not comprehensive and extensive.

Given that both the two 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.

Since conducting the fieldwork for this project an additional area of possible proposed impacts has been added to the proposal. This area is situated to the east of the surveyed area. Based on the results of the investigation, and an extrapolation of these to the eastern area, it is predicted that the additional eastern area is of low archaeological sensitivity and potential. Nevertheless it is recommended below that if this area is to be impacted a field inspection should take place prior to construction in order to confirm its archaeological and cultural heritage status and to implement appropriate management strategies as necessary.

1.7 Mitigation and Management Strategies

Details of archaeological sensitivity, suitable management strategies and accompanying rationale for proposal area is 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.

Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, and the results of the study, it is concluded that the proposed impact areas do not warrant further investigation such as subsurface test excavation. The environmental context in which the impacts are proposed is 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 landform in question.

Given the nature and density of the of the artefact locales recorded in the proposal area and the low scientific significance rating they been accorded, unmitigated impacts is considered appropriate; a strategy of impact avoidance is not warranted in regard to these locales.

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 Effective Survey Coverage achieved during the field survey is considered to have been generally adequate for the purposes of determining the archaeological status of the proposal area.
- If impacts are proposed in the eastern area of the project site, which has not been subject to survey during this assessment, a field inspection should take place to confirm the archaeological status of that area.
- The two recorded Aboriginal object locales and the predicted very low density subsurface artefact distribution in the proposal area does not surpass archaeological significance thresholds which would act to preclude the proposed impacts.
- The two recorded Aboriginal object locales are assessed to be representative of a very low density distribution of stone artefacts. The archaeological significance of these locales is assessed to be low. Accordingly unmitigated impact is considered to be appropriate.
- There are no identified Indigenous archaeological and heritage constraints relating to the proposal.

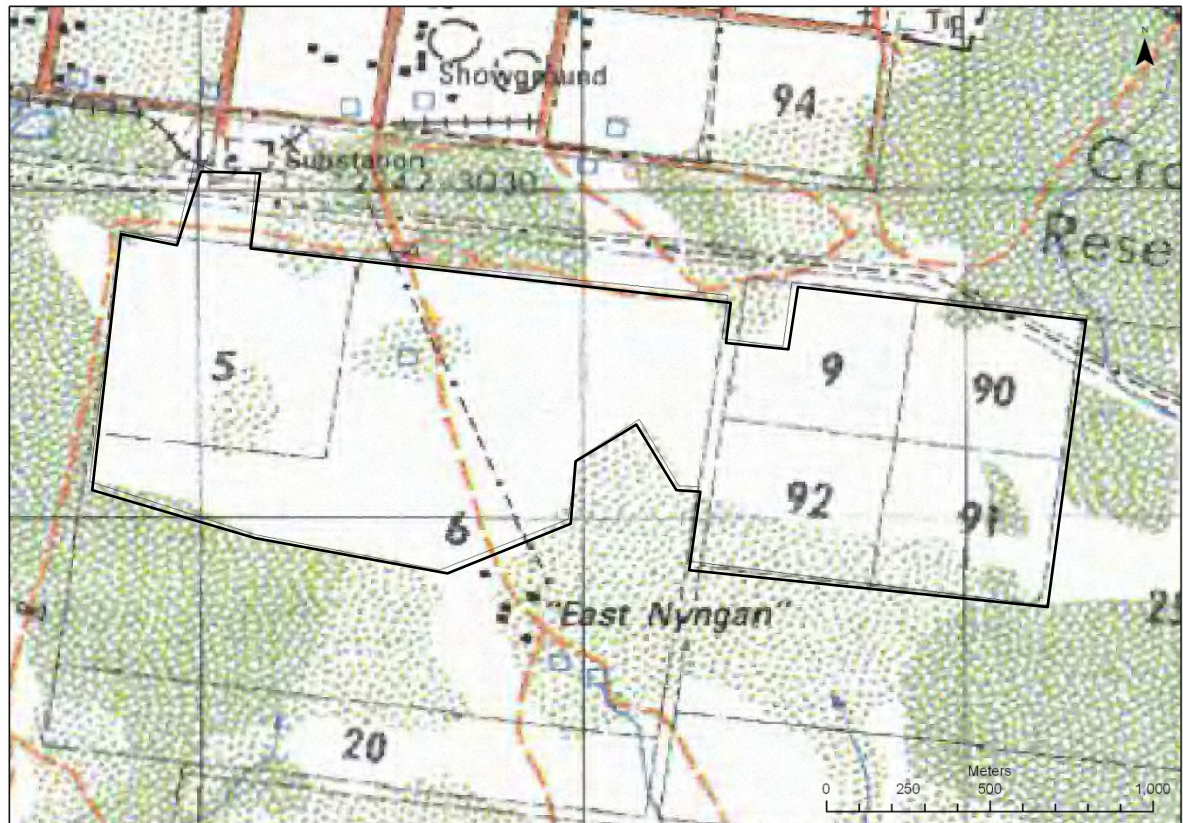


Figure 1. Location of the surveyed area of the proposed Nyngan Solar Farm.

2. INTRODUCTION

2.1 Introduction

New South Wales Archaeology Pty Ltd has been commissioned to undertake an archaeological and heritage assessment of the proposed Nyngan Solar Farm. The Solar Farm would be located south of the township (Figures 1 and 2).

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);
- The legislative context (Section 9);
- The significance of Aboriginal objects (Section 10);
- An assessment of the impact of the proposal on Aboriginal objects (Section 11);
- 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 and Tommy Ryan of the Nyngan Local Aboriginal Land Council. 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:

- Phil Purcell and Paul Houston: NSW DECCW – Dubbo;
- John Shipp: registered Aboriginal Stakeholder;
- Tommy and Leslie Ryan: Nyngan Local Aboriginal Land Council;
- Chris McGrath: Infigen; *and*
- Amy Webb, Nick Graham-Higgs and Dave Maynard: ngenvironmental.

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 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 ECP Dubbo office
- Nyngan 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)
- Bogan Shire Council
- the Central West 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 Nyngan Observer newspaper. The closing date for registration of interest was noted as 8th July 2010.

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:

Nyngan Local Aboriginal Land Council;
Central West Catchment Management Authority Aboriginal Reference Group; and
John Shipp.

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 first two parties on 5th July 2010, and to John Shipp on 13th July 2010. No written or verbal comments were received in response to these documents. However, Mr Tommy Ryan who assisted with the fieldwork conducted for this project provided valuable information in regard to the archaeological sensitivity and potential of the study area. Likewise Mr Shipp also provided useful information via email regarding the archaeological potential of the study area.

Stage 4. Reviewing the report.

For review and comment, a copy of the draft report was forwarded on 7th September 2010 to:

Nyngan Local Aboriginal Land Council;
Central West Catchment Management Authority Aboriginal Reference Group;
John Shipp.

The DECCW ACHCRP requirements provide a period of 28 days for registered Aboriginal parties to comment on the draft report. As of 26th October 2010 no response to the draft report has been received.

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 and vegetation clearing. It is noted however that remnant woodland located in the proposal area will not be impacted.

4.1 Impact History

The proposal site is largely cleared with some small remnant patches of vegetation and scattered trees. The site has been highly modified by past clearance, agricultural activities and has a long history of agricultural disturbance with the majority having been regularly cultivated for crops. The western section of the site has not been cultivated for the past 10 years and this has facilitated the re-colonisation of native grass, shrub species and weeds.

The proposal area is currently used for grazing cattle and sheep. The eastern section of the site has been entirely planted with exotic agricultural species. Native vegetation is virtually non-existent in this area and all trees have been removed.

The site has localised areas of disturbance in the form of fencing, roads and unformed vehicle tracks, electricity and Telstra easements, excavated dams and low profile, graded drainage channels which direct water to dams (Plate 1).

4.2 Proposed Impacts

Infigen proposes to construct a 100 megawatt capacity photovoltaic solar farm at Nyngan. The solar farm would comprise a series of photovoltaic modules (PV arrays) mounted on fixed frames, and would occupy approximately 200 hectares. The Nyngan Solar Farm would connect to the existing Nyngan 132kV substation which is immediately adjacent to the solar farm.

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. Poles will be installed via a pole driven mechanism and accordingly large scale excavation is not required.
- 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 132kV substation via an overhead or underground transmission line, including any required switchyard and substation augmentation (Plate 2).
- Internal access tracks and upgrades to existing roads, where required.
- Fencing and landscaping around the solar farm.
- Site office and Operations and Maintenance building.

- 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. 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.

4.3 Potential Impacts

Impacts will be located on land currently utilised for sheep and cattle grazing, and cultivation. Previous land use has resulted in relatively significant environmental impacts and a generally highly 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 (Plate 3).

However irrespective of prior impacts the proposed works entail ground disturbance and accordingly the project has the potential to cause additional impacts to any Aboriginal objects which may be present within the individual components of the proposal.



Plate 1. Drainage channel in western section of the proposal area; looking south.



Plate 2 Looking north to existing substation.



Plate 3 Large area of bare earth associated with vehicle usage and stock treadage.

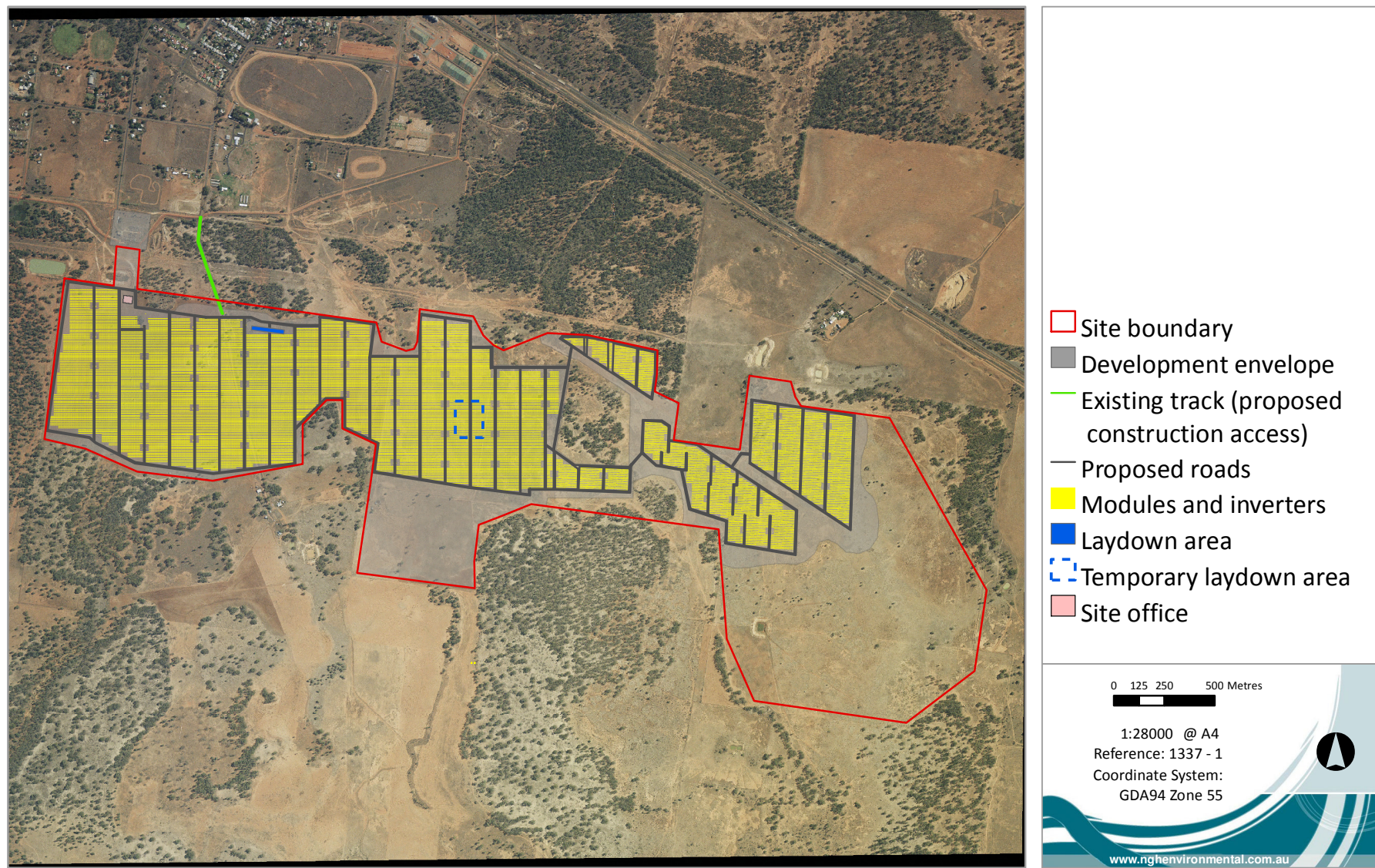


Figure 2. Proposed solar farm layout (supplied by client).

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.
- The formulation of management and mitigation strategies ensuing from the above.

5.1 Literature Review

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

The following information sources were accessed for this study:

- NSW DECCW Aboriginal Heritage Information Management System;
- Relevant archaeological reports;
- 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 two people over a two 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. All trees located within the areas of direct impact were inspected for evidence of scarring.

Field survey was designed to assess the archaeological sensitivity of the entire proposal area. The survey methodology entailed walking parallel transects across individual paddocks with each surveyor situated ca. 20 metres apart. Each Survey Unit was surveyed until the entire area had been systematically inspected. This methodology enabled direct visual inspection of as much of the ground surface of the proposal area as practicable.

The approach to recording in the current study has been a ‘nonsite’ methodology: the elementary unit recorded is an artefact rather than a site (*cf* Dunnell 1993; Shott 1995). The rationale behind this approach is that artefacts may be directly observed however ‘sites’ are a construction within an interpretative process. Given that it can be expected that full archaeological visibility will not

be encountered during the survey the process of identifying site boundaries (if they exist at all) will not be possible.

The density and nature of the artefact distribution 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 encompassed one Survey Unit only which has been defined according to a broad landform morphological type.

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:

- Flat: - planar element, neither crest or depression and is level or very gently inclined.

Slope class and value:

- Level 0 - 1%.

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. 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 an arbitrary category as follows;

- Very low: <5 artefacts per square metre.

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 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 section provide information in regard to the landscape context of the study area.

6.1 Topography, geomorphology and vegetation

The Bogan River rises in the Harvey Ranges between Parkes and Peak Hill and flows northwest through a broad, flat landscape through Nyngan to join the Darling River near Bourke. The study area falls into the Darling Riverine Plains Bioregion, and the Bogan-Macquarie IBRA subregion. The characteristic landforms of this subregion include floodplains and channels of the Bogan and Macquarie Rivers. Soils are dominated by clays and vegetation by riparian communities, swamps and woodlands.

The site is located within the Bogan floodplain; it is flood prone and lies just to the south of the Nyngan Township levee bank. The majority of the site appears to be situated on heavier cracking clay soils associated with the Boggy Cowal Channels and Floodplains Mitchell Landscape. Elevation at the site ranges between approximately 170 metres and 180 metres AHD.

The proposal site is largely cleared with some small remnant patches of vegetation and scattered trees (Plate 4). It has been highly modified by past agricultural activities. Understorey vegetation is generally comprised of native grasses and Chenopod shrubs across the bulk of the site, excluding a large paddock in the centre of the site which has been cultivated and sown to crops. Native species diversity ranges from moderate in areas where shrubs are present to low where a few grass species become more dominant. Trees are predominately scattered and sparse across the site. Woodland patches and larger stands occur adjacent to the subject suite to the north, south east and west. Overstorey species are predominately Black Box (*Eucalyptus largiflorens*), Bimble Box (*E. populnea*) and Wilga (*Geijera parviflora*). To the east of the site Myall (*Acacia pendula*) is the main overstorey species. Areas of native vegetation are predominately derived from Black Box/Bimble Box woodland. Vegetation to the east of the subject site is derived from Myall woodland. Black Box woodland/forest on floodplain

communities contain 20 plant species known to have been utilised by Aboriginal people (NSW DECCW: 2010).

Summary

The proposal area is located c. 1.2 kilometre east of the Bogan River. The site contains no surface evidence of large relic drainage areas and tributaries. 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, resource gathering and travel through country. Such activities are likely to have resulted in low levels of artefact discard. The nature of stone artefacts discarded can be expected to have been correspondingly limited in terms of artefact diversity and complexity. Areas containing woodland will not be impacted in respect of the proposal and accordingly any scarred trees in those areas will not be affected by the development.



Plate 4 Northeast area of proposed site.

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 - 10°C lower; in southern Australia coldness, drought and winds acted to change the vegetation structure from forests to grass and shrublands (Mulvaney and Kamminga 1999: 115-116).

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

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

The study area is located within the Murray Darling Basin, one of Australia's largest drainage divisions. The basin includes the three largest rivers in Australia; the Murray River, the Darling River and the Murrumbidgee River. Aboriginal people have occupied the region for over 40,000 years, with early occupation focussed on the resources of freshwater lakes and rivers, and their floodplains. This occupation also occurred along various river channels that pre-date the present Murray-Darling river system (Murray-Darling Basin Ministerial Council 1987: 353). Archaeological evidence indicates that with the drying up of the lakes around 26,000 years BP before present) in response to changes in climatic conditions, Aboriginal people remained near major rivers. However by 4000 years BP there is evidence of a major increase in site numbers and more intensive occupation to what are today more marginal environments (MDBMC 1987:354).

According to Tindale (1974) the study area is situated within the Wongaibon territory which included the headwaters of the Bogan River encompassing present day Nyngan.

7.2 Previously Recorded Sites

A search of the NSW DECCW Aboriginal Heritage Management Information System has been conducted for this project on the 21st June 2010 (AHIMS #30670). The search area measured 72 km² and encompassed eastings 514000 –523000, and northings 6502000 –6510000.

Twenty-seven Aboriginal objects are recorded on AHIMS as being present within the site search area. However, there are no Aboriginal objects 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 converted to GDA.

Site ID	Site name	Easting GDA	Northing GDA	Recorder	Site type
27-4-0001	Nyngan	518078	6509173	Gresser	Open campsite
27-4-0011	Mitchell Highway	520613	6507284	Bluff	Scarred tree
27-4-0012	Mitchell Highway	520713	6507184	Bluff	Scarred tree
27-4-0013	Mitchell Highway	521113	6507184	Bluff	Scarred tree
27-4-0014	Mitchell Highway	521213	6507084	Bluff	Scarred tree
27-4-0015	Mitchell Highway	521213	6507084	Bluff	Scarred tree
27-4-0016	Mitchell Highway	521213	6507084	Bluff	Scarred tree
27-4-0017	Mitchell Highway	521213	6507084	Bluff	Scarred tree
27-4-0018	Mitchell Highway	521713	6506984	Bluff	Scarred tree
27-4-0019	Mitchell Highway	522313	6506384	Bluff	Scarred tree
27-4-0020	Mitchell Highway	523013	6506184	Bluff	Scarred tree
27-4-0207	Nyngan Township 1	520763	6506863	Shipp	Tree
27-4-0208	Nyngan Township 2	520629	6506941	Shipp	Tree
27-4-0209	Nyngan Township 3	520542	6506965	Shipp	Tree
27-4-0210	Nyngan Township 4	520523	6506985	Shipp	Tree
27-4-0211	Nyngan Township 5	520175	6507616	Shipp	Tree
27-4-0212	Nyngan Township 6	520179	6507216	Shipp	Tree
27-4-0213	Nyngan Township 7	520246	6507265	Shipp	Tree
27-4-0214	Nyngan Township 8	520300	6507255	Shipp	Tree
27-4-0215	Nyngan Township 9	520321	6507234	Shipp	Tree
27-4-0216	Nyngan Township 10	520369	6507236	Shipp	Tree
27-4-0217	Nyngan Township 11	520410	6507241	Shipp	Tree
27-4-0218	Nyngan Township 12	520456	6507062	Shipp	Tree
27-4-0219	Nyngan Township 13	520562	6507105	Shipp	Tree
27-4-0220	Nyngan Township 14	520642	6507067	Shipp	Tree
27-4-0234	Land Claim 7397	517000	6508815	Nyngan LALC	Tree
27-4-0235	Land Claim 7402	514851	6507866	Nyngan LALC	Tree

Table 1. Aboriginal objects listed on NSW DECCW AHIMS search.

The most common Aboriginal object recordings in the region are distributions of stone artefacts and scarred trees. In and around Nyngan, scarred trees clearly are the most common site type. Rare site types include rock shelters, scarred trees, quarry and procurement sites, burials, stone arrangements, carved trees and traditional story or other ceremonial places. The distribution of each site type is related at least in part to variance in topography, ground surface geology and water.

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

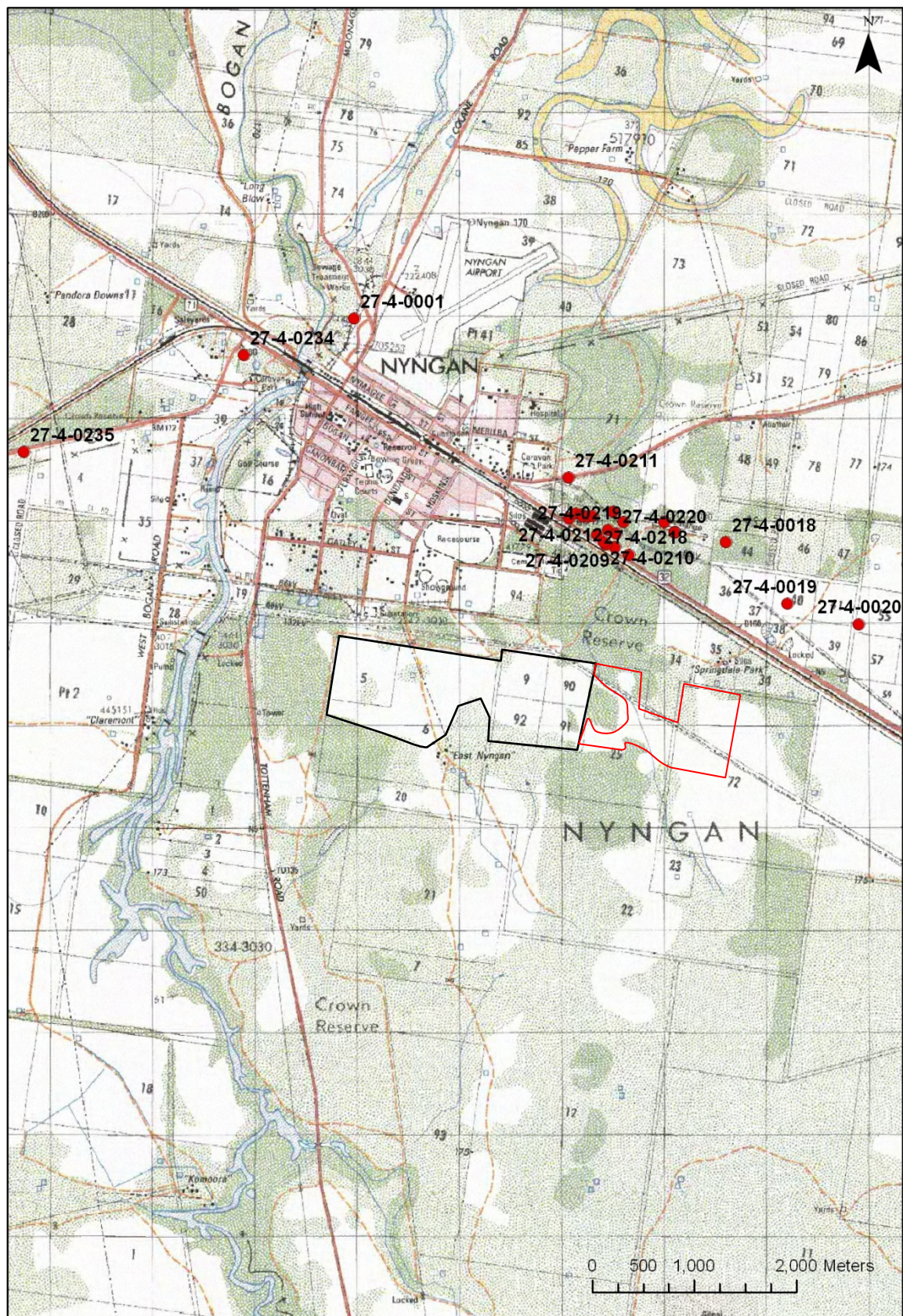


Figure 3. Location of sites as per the AHIMS site search in respect of the proposed solar farm. Note area to east in red outline was added to the project after the completion of fieldwork and has not been surveyed.

7.3 Archaeology – The local area

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

Although no academic investigations have been conducted that specifically examine the district, some academic research studies have been undertaken within the broader region. These focus on regions reasonably near to the study area, and encompass areas that possess comparable environmental and topographic contexts. Accordingly, the results of these studies may be applied to the current study as corollaries for inferred patterns of Aboriginal land usage prior to European occupation.

Pearson (1981) conducted a comprehensive study of the upper Macquarie region in relation to his PhD dissertation. In addition to carrying out extensive research of historical sources and reviewing ethnographic data, Pearson (1981) excavated three rock shelters and compiled information about other known archaeological sites in his study area.

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

- The distance of sites from water ranged from 10 to 500 m. However larger sites were generally located nearer to water (Pearson's average distance from water being 90 m);
- Both good soil drainage and views over watercourses were important site location factors;
- Level ground, shelter from prevailing winds, and elevation above cold air (Pearson's average elevation being 9.1 m) also influenced site location;
- The majority of sites were situated in places that would originally have been comprised of open woodlands in order to source adequate fuel;
- Burial sites and grinding grooves were located as close to habitation as possible. However grinding grooves occur only where there is suitable outcropping sandstone, and burial sites are generally found in areas where soils are of sufficient depth and penetrability for the purposes of interment;
- Ceremonial sites such as earth rings were situated away from campsites;
- Similarly, stone arrangements were also located away from campsites, in isolated places, and were more likely to be located on small hills or knolls, although they can also occur on flat land;
- Scarred or carved trees were distributed with no obvious patterning other than their proximity to watercourses, and in areas more frequently used for camps;
- Quarry sites were located where known outcrops of serviceable stone were reasonably accessible;
- Pearson suggests that Aboriginal campsites were rarely used for longer than three nights and that sites with evidence of extensive archaeological deposit probably represent accumulations of material over a series of short visits.

Koettig (1985) undertook a comprehensive study relating to Aboriginal occupation of the Dubbo area. Following a desktop review, Koettig (1985) commenced a systematic survey of a variety of landform units and stream orders so as to ascertain the relationship of site type and site location to specific environmental settings within three principal physiographic zones.

As a result of this study Koettig (1985) proposed that:

- Aboriginal sites will be distributed throughout all landscape units.
- Open artefact scatters, scarred or carved trees and grinding grooves are the most common site types.
- The location and comparative size of sites is principally determined by environmental and social influences. While site location dictated by social determinants cannot be predicted, some modelling of site type and site location in relation to environmental factors may be made. Those factors include:

Proximity to water:- although sites were found in all landscape settings including hills and ridges distant from water, the largest campsites were located close to permanent water.

Availability of food resources:- While the widest range of foods was found along major watercourses in association with the available permanent water, some foods were seasonal and located away from permanent watercourses.

Geological formation:- Certain site types occur in particular settings. Grinding grooves are located where there are suitable sandstone outcrops, while quarries are found where there is a useable and accessible stone resource. Burials are most likely to be found in sandy deposits such as those that exist on alluvial flats.

A desktop study Aboriginal site distribution in the Lachlan CMA (NSW DECC 2007) has relevance to the local Nyngan area (Phil Purcell NSW DECCW: pers. comm. 2010). This review indicates that the single most determining factor influencing the distribution of sites across the landscape is water. Sites and higher artefact density is strongly tethered to water sources with average of sites distance from water being 294 metres (NSW DECC 2007). On the Lachlan Plains the average distance of sites from water was found to be 117 metres.

Tommy Ryan of the Nyngan Local Aboriginal Land Council has indicated that the proposal area is of extremely low archaeological potential and that locally, sites would most likely be situated in closer proximity to the Bogan River. Mr Ryan also noted that given that the site has been cleared and cultivated for decades, anything that may once have been present would now be destroyed. John Shipp, registered stakeholder, has conducted extensive surveys in the Nyngan area, resulting in the recording of many scarred trees, artefacts and hearths. He advises that these site types have the potential to be present, except for the areas that have been cultivated.

Phil Purcell (NSW DECCW: 2010) conducted a desktop assessment of two alternative locations for solar farms at Nyngan. The Bogan riverine landscape was identified as containing a number of landform categories frequently associated with Aboriginal occupation. These features include relic drainage lines and tributaries which occur on the floodplain away from the main river channel.

Based on the above review and a consideration of the topography, geomorphology and hydrology 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 type of sites known to occur in the region and the potential for their presence within the study area are listed as follows:

Stone Artefacts

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

Given the distance from the river and lack of old drainage channels stone artefacts are predicted to be present in the proposal area in very low density only.

Hearths

Hearths are the remains of cooking fires. In western NSW they are often made from stone or termite mound material. There is low potential for this site type to be present in the proposal area given its distance from the river.

Grinding Grooves

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

Burials sites

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

Rock Shelter Sites

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

Scarred and Carved Trees

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

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

Scarred trees are a common site type in the local area. There is accordingly potential for this site type to be present if trees of adequate age are present.

Stone Quarry and Procurement Sites

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

Ceremonial Grounds

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

8. SURVEY RESULTS

8.1 Survey Coverage

The study area is located immediately to the south of the township of Nyngan. It is situated within the Darling Riverine Plains bioregion on the Bogan River floodplain. The landform which comprises the study area is a flat with level gradient and open aspect that forms part of the alluvial floodplain associated with the Bogan River. The western boundary of the study area is located c 1.2 kilometres east of the Bogan River.

The area has undergone relatively high levels of prior disturbance associated with agriculture. Following the original clearance of vegetation, subsequent farming practices have impacted almost the entire proposal area. These impacts include ploughing and fencing, the creation of mechanically graded roads and unformed internal tracks, the installation of electricity and Telstra service lines and ongoing grazing. In addition, dam construction and the creation of minor mechanically made drainage channels have been established. Previous farming practices are assessed to have caused high levels of impact ground surfaces and to any Aboriginal sites which may once have been present.

The trees scattered throughout the proposal area and its surrounds are predominately Black Box, with some Bimble Box. The majority of these trees are regrowth, estimated to be around 50 years old, however, while there are some older trees which may be in the order of 100 - 150 years plus. All trees located within areas of direct impact were inspected during the survey and no evidence of Aboriginal scarring is evident.

At the time of field survey one paddock was under cultivation while some other areas possessed a reasonably consistent coverage of vegetation. Survey was focused on areas of ground exposure which were found to be present along most fence lines, in areas of unformed vehicle tracks, and in bare earth patches which were distributed reasonably consistently throughout. Archaeological visibility within many areas of ground exposure was moderate as the result of the ground surface being penetrated by ploughing, vehicle traffic, weathering and stock treadage.

The study area measures c. 208 hectares in size. It is estimated that approximately 83 hectares of that area was subject to survey inspection. Ground exposures inspected are estimated to have been 4.92 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 2.25 hectares. Effective Survey Coverage is therefore calculated to have been 1.08% of the proposal area.

8.2 Aboriginal Object Recordings

The following Aboriginal object locales were recorded during the survey; their location is shown in Figure 4:

Survey Unit 1/Locale 1

519444e 6505424n GDA

One stone artefact was recorded in an area of exposure adjacent to a fence line (Plate 5). The broad area measures 50 x 10 m, of which 70% was ground exposure, possessing 20% archaeological visibility. The effective survey coverage is relatively high and given that one artefact only was recorded artefact density is assessed to be very low.

The recorded artefact is a brown/red variegated chert flake; size class 3 (less than 3 cm in overall dimensions).

The site is likely to contain additional artefacts in a subsurface context in very low densities. The area is eroding due to water, wind, vehicle traffic and animal treadage.



Plate 5. SU1/L1 looking south.

Survey Unit 1/Locale 2

518634e 6505537n GDA

One stone artefact was recorded in an area of bare earth exposure (Plate 6). The area where the artefact is located measures 50 x 10 m, of which 80% was ground exposure, possessing 60% archaeological visibility. The effective survey coverage is relatively high and given that one artefact only was recorded artefact density is assessed to be very low.

The recorded artefact is a mottled grey silcrete flake; size class 2.

The site is likely to contain additional artefacts in a subsurface context in very low densities. Furthermore the site area has been cultivated and eroding due to water, wind and animal agents.



Plate 6. SU1/L2 looking southwest.

8.3 Impact Assessment

Two Aboriginal object locales were recorded during the field survey, each comprised of a single stone artefact. While the Effective Survey Coverage for the surveyed area is calculated to have been relatively low at the time of survey, many extensive areas of good ground exposure possessing reasonable archaeological visibility were distributed throughout the study area. These exposures enabled a reasonable characterisation of artefact distribution within the proposal area.

As noted above, the Aboriginal object locales recorded in the proposal area are two single and isolated stone artefacts; these are assessed to be of low archaeological significance. Undetected or subsurface stone artefacts are assessed to be present in very low density. The Effective Survey Coverage achieved during the survey is considered to have been 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. The proposal area is assessed to be low archaeological potential and 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 Nyngan 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 is via a pole driven mechanism, the proposed impacts relating to construction is minimal and is not comprehensive and extensive.

Given that both the two 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.

Since conducting the fieldwork for this project an additional area of possible proposed impacts has been added to the proposal (see Figure 3). This area is situated to the east of the surveyed area. Based on the results of the investigation, and an extrapolation of these to the eastern area, it is predicted that the additional eastern area is of low archaeological sensitivity and potential. Nevertheless it is recommended that if this area is to be impacted a field inspection should take place prior to construction in order to confirm its archaeological and cultural heritage status and to implement appropriate management strategies as necessary.

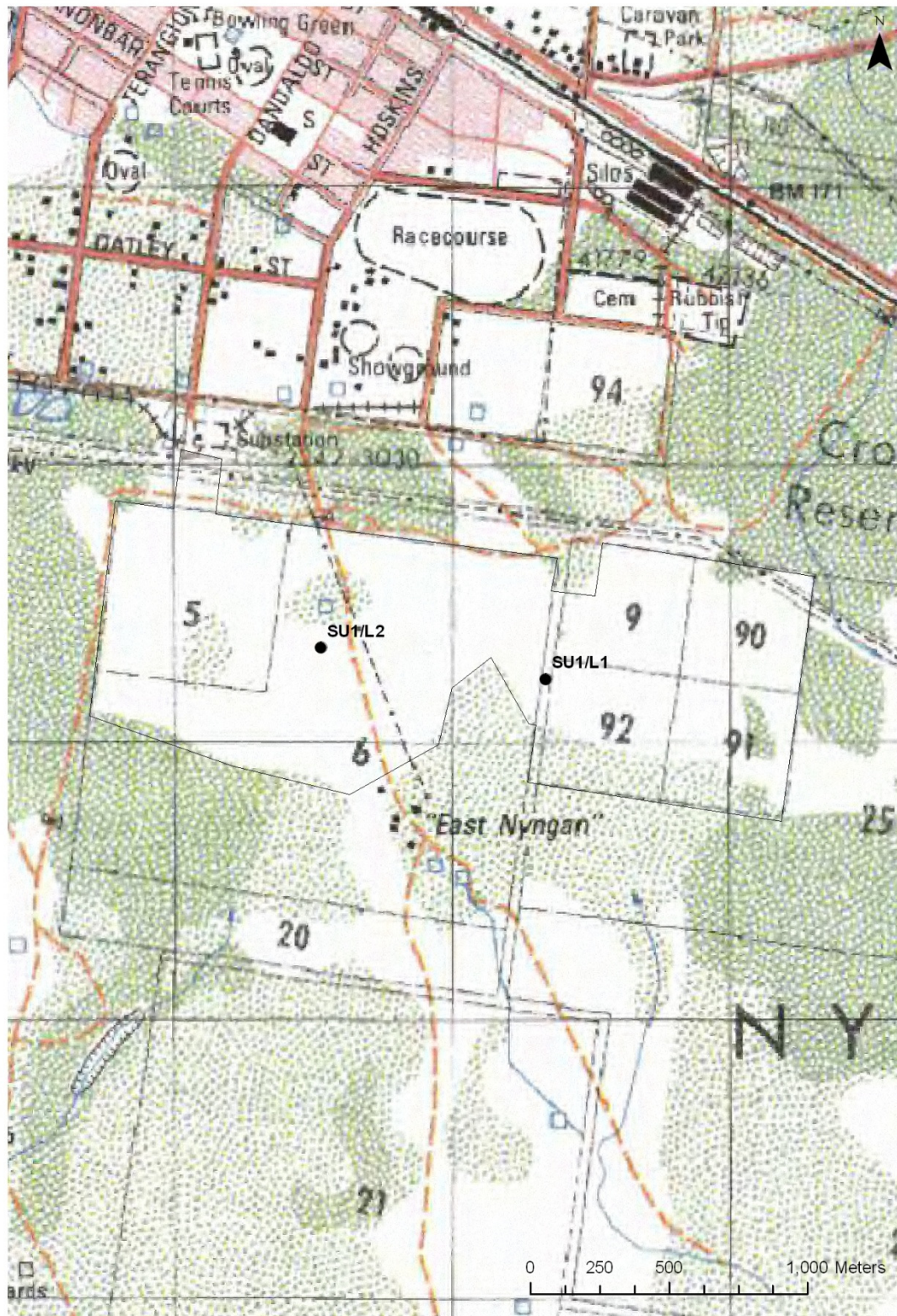


Figure 4. Location of Aboriginal object locales recorded in the proposal area.

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 2:

Table 2. Archaeological significance assessment of recorded Aboriginal object locales.

Artefact locale recordings	Subsurface potential: (predicted artefact density)	Significance	Criteria
SU1/L1	Subsurface potential; deep alluvial deposit: very low density	Low local scientific significance	Common Aboriginal site type Low educational value Low aesthetic value Low research potential: predicted very low artefact density in subsurface context
SU1/L2	Subsurface potential; deep alluvial deposit: very low density	Low local scientific significance	Common Aboriginal site type Low educational value Low aesthetic value Low research potential: predicted very low artefact density in subsurface context

11. MITIGATION AND MANAGEMENT STRATEGIES

The aim of this study has been to identify Aboriginal objects and to predict the archaeological potential within the proposal area, 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 the broader proposal area is discussed.

11.1 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 areas of the proposal area have been identified which 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 context in which impacts are proposed contain highly disturbed soils as a result of high levels of environmental degradation, and also are not predicted to contain artefact density sufficient to warrant test excavation. Accordingly a program of subsurface testing undertaken within the impact assessment and planning phase of the project is not considered to be necessary or warranted.

Conservation

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

In the case at hand, avoidance of impacts (or minimisation of impacts) in regard to the recorded artefacts locales is not considered to be warranted.

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 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.

The Aboriginal object locales identified have been assessed to be of low archaeological significance. In addition any undetected or subsurface artefacts are likewise assessed to be of low archaeological sensitivity. Given the nature and artefact density in the proposal area and the low scientific significance rating they been accorded, unmitigated impacts are appropriate.

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 nature of proposed impacts.
- Advice provided from Nyngan Local Aboriginal Land Council.

The following recommendations are provided:

- The proposal area does not warrant further archaeological investigation such as subsurface test excavation; the Effective Survey Coverage achieved during the field survey is considered to have been generally adequate for the purposes of determining the archaeological status of the proposal area.
- If impacts are proposed in the eastern area of the project site, which has not been subject to survey during this assessment, a field inspection should take place to confirm the archaeological status of that area.
- The two recorded Aboriginal object locales and the predicted very low density subsurface artefact distribution in the proposal area does not surpass archaeological significance thresholds which would act to preclude the proposed impacts.
- The two recorded Aboriginal object locales are assessed to be representative of a very low density distribution of stone artefacts. The archaeological significance of these locales is assessed to be low. Accordingly unmitigated impact is considered to be appropriate.
- There are no identified Indigenous archaeological and heritage constraints relating to the proposal.

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