Appendix C – Aboriginal heritage assessment

Aboriginal Archaeological and Cultural Heritage Impact Assessment

Renew Estate Pty Ltd

21-Feb-2017

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Bomen Solar Farm

Aboriginal Archaeological and Cultural Heritage Impact Assessment

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Bomen Solar Farm

Aboriginal Archaeological and Cultural Heritage Impact Assessment

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Quality Information

Document Bomen Solar Farm

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Reviewed by Andrew McLaren

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			Name/Position	Signature
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Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by Renew Estate Pty Ltd (Renew Estate) to complete an Aboriginal Archaeological and Cultural Heritage Impact Assessment (AACHIA) for the proposed Bomen Solar Farm (BSF) (the Project), located in Bomen, New South Wales (Figure 1). This assessment forms part of an Environmental Impact Statement (EIS) being prepared by Renew Estate to support an application for State Significant Development (SSD) Approval under Division 4.1 of Part 4 of *the Environmental Planning and Assessment Act 1979* (EP&A Act) for Stage 1 of the Project.

The Secretary of the Director General of the NSW Department of Planning and Environment (DP&E) issued the Secretary's Environmental Assessment Requirements (SEARs) for the Project on 21 November 2017 (Appendix A). For heritage, the SEARs require the proponent to undertake:

- an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.

This AACHIA, which documents the results of AECOM's assessment, fulfils the Aboriginal heritage component of this requirement.

The study area for this AACHIA, shown on Figure 1 and Figure 2, comprises an irregularly shaped *c.*380 ha parcel of land located to the northeast of the city of Wagga Wagga, in the suburb of Bomen. The study area, as defined, encompasses all land required for the Project (the 'proposal site') as well as several adjoining sections of land, including the Bomen Axe Quarry, a registered Aboriginal place under the NPW Act 1974 (Lot 23, DP1085826). Registered as Lot 11 DP1130519 (part), Lot 2 DP590756 (part), part Lots 174 and 108 DP751405, Lots 109 and 110 DP751405, Lot 3 DP594679 (part), Lot 2 DP1228221 (part) and Lot 22 DP1085826 (part), land within the study area is currently, and was historically, used for cattle grazing and cropping. The study area falls wholly within the City of Wagga Wagga Local Government Area (LGA) and is situated in the Parish of Eunonoreenya in the County of Wynyard.

The proposed Project would consist of up to 120 megawatts of direct current (MWdc) solar generation equipment and associated infrastructure. The BSF would be in operation during daylight hours every day of the year for 30 years duration.

A search of the AHIMS database was undertaken on 30 November 2017 for a 10 x 10 km area centred on the study area. A total of 29 Aboriginal archaeological sites were identified within the search area comprising 20 open artefact sites (i.e., artefact scatters and isolated artefacts), six scarred trees, and three stone quarries. Consideration of the location of previously recorded sites indicates five are located within the study area including open artefact sites – 'BIF1' (AHIMS#56-1-0109/56-1-0111[1]), 'East Bomen IF1' (AHIMS#56-1-0045), 'East Bomen IF2' (AHIMS#56-1-0044), 'Bomen Solar IS01' (AHIMS#56-1-0437) and axe quarry site 'East Bomen 1' (AHIMS#56-1-0043).

A field team of two AECOM archaeologists (Geordie Oakes and Andrew McLaren) and four RAP representatives completed the archaeological survey of the study area over four days including 16, 17, 30 January and 7 February 2018. A total of nine new Aboriginal archaeological sites, comprising eight open artefact sites including six isolated artefact sites and two artefact scatters, and one potential Aboriginal scarred tree were recorded by AECOM during the archaeological survey. A further eight sites were recorded by RAPs participating in the survey.

Consideration of the location of sites related directly to solar development impacts indicated that eight open artefact sites comprising two artefact scatters and six isolated artefact sites will be wholly impacted by the Project. In addition, two corridor options are being considered for the transmission line easement. Consideration of the location of identified Aboriginal sites in relation to the proposed corridors indicates that Option 1 would result impacts to up to two isolated artefact sites and one isolated artefacts, and Option 2 would result in impacts to up to three isolated artefact sites with site BSF-IA4-18 potentially impacted by both options. It is noted that Renew Estate Pty Ltd has committed to not impacting the Bomen Axe Quarry and as such the proposed transmission line easement will avoid impacts to this site.

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A management strategy to address the impacts of the Project on the known Aboriginal archaeological resource of the study area is provided in Section 10.0. It is recommended that this strategy be detailed in an Aboriginal Cultural Heritage Management Plan (ACHMP) for the Project, prepared in consultation with RAPs, and to the satisfaction of OEH and DP&I. Subject to Development Consent under Part 4, Division 4.1 of EP&A Act, this ACHMP will guide the management of the known and potential Aboriginal archaeological resource of the study area, as well identified cultural values.

The ACHMP should contain procedures for consultation and involvement of RAPs in the management of Aboriginal cultural heritage values within the study area. In addition, the ACHMP will include details of proposed mitigation and management strategies of all Aboriginal sites, procedures for the identification and management of previously unrecorded sites, details of an appropriate long term management for any Aboriginal objects salvaged, details of an Aboriginal cultural heritage awareness program for all contractors and personnel associated with construction activities and compliance procedures. The key elements of the ACHMP would include the following, which area detailed in Section 10.0 of this report:

- An archaeological salvage program;
- Conservation of non-impacted sites;
- Aboriginal cultural heritage awareness training;
- Procedure for managing previously unrecorded Aboriginal archaeological evidence;
- Management of potential human remains;
- Completion of AHIMS site cards and
- Management of an Aboriginal site database.

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1.0 Introduction & Background

1.1 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by Renew Estate Pty Ltd (Renew Estate) to complete an Aboriginal Archaeological and Cultural Heritage Impact Assessment (AACHIA) for the proposed Bomen Solar Farm (BSF) (the Project), located in Bomen, New South Wales (Figure 1). This assessment forms part of an Environmental Impact Statement (EIS) being prepared by Renew Estate to support an application for State Significant Development (SSD) Approval under Division 4.1 of Part 4 of *the Environmental Planning and Assessment Act 1979* (EP&A Act) for Stage 1 of the Project.

This AACHIA documents the results of AECOM's assessment and has been compiled with reference to the NSW Office of Environment and Heritage's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011).

1.2 Study Area

The study area for this AACHIA, shown on Figure 1 and Figure 2, comprises an irregularly shaped *c.*380 ha parcel of land located to the northeast of the city of Wagga Wagga, in the suburb of Bomen. The study area, as defined, encompasses all land required for the Project (the 'proposal site') as well as several adjoining sections of land, including the Bomen Axe Quarry, a registered Aboriginal place under the NPW Act 1974 (Lot 23, DP1085826). Registered as Lot 11 DP1130519 (part), Lot 2 DP590756 (part), part Lots 174 and 108 DP751405, Lots 109 and 110 DP751405, Lot 3 DP594679 (part), Lot 2 DP1228221 (part) and Lot 22 DP1085826 (part), land within the study area is currently, and was historically, used for cattle grazing and cropping. The study area falls wholly within the City of Wagga Wagga Local Government Area (LGA) and is situated in the Parish of Eunonoreenya in the County of Wynyard.

1.3 The Project

The Project includes developing a 120 megawatt (MWdc) solar farm at Bomen (Figure 3). Subject to final detailed design, the primary components of the Project include:

- approximately 400,000 photovoltaic solar modules;
- approximately 4,500 trackers comprising single-axis tracking framing systems mounted on steel piles;
- up to 44 containerised power conversion stations containing electrical switchgear, inverters and medium voltage transformers (power conversion stations);
- new on-site electrical switchyard and substation;
- connection into the National Electricity Market via about 3.5 km of 132 kV overhead transmission line between the proposed on-site substation and the existing TransGrid Wagga North Substation. The transmission line may be overhead or underground, or a combination of both, subject to detailed design;
- battery storage system;
- control building including office, supervisory control and data acquisition (SCADA) systems, operation and maintenance facilities, spare parts and staff amenities serviced by septic systems and rainwater tanks;
- car park;
- internal DC and AC cabling for electrical reticulation;
- minor upgrade of the unsealed section of Trahairs Road, east of Byrnes Road, for site access (to be maintained as a single lane unsealed road);

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- internal all-weather access tracks;
- internal fire trail and bushfire asset protection zones;
- security fencing around the solar farm;
- vegetation screening – plantings along the site boundaries where required;
- meteorological stations; and
- subdivision of the following lots to allow the purchase of the required land for the proposal site:
    - Lot 11 DP1130519
    - Lot 2 DP590756
    - Lot 174 DP751405
    - Lot 108 DP751405.
- The single-axis tracking structures would orient the solar modules to follow the sun from east to west each day. The structures would be mounted on piles driven into the ground.

Groundcover vegetation would be managed by sheep grazing where possible, in conjunction with the measures detailed in bushfire management and environmental management plans.

The on-site substation would be in the north-western corner of the southern solar farm development area.

The connection to the electricity network would be through the existing TransGrid Wagga North Substation via a proposed 132kV transmission line about 3.5 km long. Two corridor options within which the transmission line and easement would be located are shown on Figure 3. The two transmission line corridor options shown are each 90 metres wide to allow for design flexibility during detailed design of the easements. The final width of the easements however will be significantly less than 90 metres. For any overhead sections of the transmission line, the easement width would be 30-45 metres, and the indicative height of the transmission line poles would be 30 metres. The easement width for any underground sections of the transmission line would likely be 7-11 metres.

Subject to planning and environmental approvals, the construction period is expected to be nine to 12 months from site establishment to commissioning, commencing in the third quarter of 2018.

The operational lifetime of the solar farm is 30 years, at which time the proposal would either be decommissioned, or continue to operate subject to further approval. Decommissioning would involve removing all above ground infrastructure and rehabilitating the site to allow it to be used for other purposes.

1.4 Secretary's Environmental Assessment Requirements (SEARs)

The Secretary of the Director General of the NSW Department of Planning and Environment (DP&E) issued the Secretary's Environmental Assessment Requirements (SEARs) for the Project on 21 November 2017 (Appendix A). For heritage, the SEARs require the proponent to undertake:

- an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.

This AACHIA, which documents the results of AECOM's assessment, fulfils the Aboriginal heritage component of this requirement.

1.5 Assessment Objectives

The overarching objectives of this AACHIA are as follows:

- to identify the Aboriginal cultural heritage values of the study area by way of background research, archaeological survey and test excavation, and consultation with Registered Aboriginal Parties (RAPs);

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- to assess the potential impact of the Project on the identified Aboriginal cultural heritage values of the study area;
- to provide an appropriate management strategy for avoiding or minimising potential harm to the identified Aboriginal cultural heritage values of the study area; and
- to compile an AACHIA report that will assist the Director-General of the DP&E in their assessment of the current SSD application.

1.6 Scope of Current Assessment

This assessment has been undertaken in accordance with OEH's *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011), *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a) and *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b). As such, its key requirements have been:

- to conduct a search of OEH's Aboriginal Heritage Information Management System (AHIMS);
- to review the landscape context of the study area, with specific consideration to its implications for past Aboriginal land use;
- to review relevant archaeological and ethnohistoric information for the study area and environs;
- to prepare a predictive model for the Aboriginal archaeological record of the study area;
- to undertake an archaeological field investigation;
- to identify, notify and register Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the study area;
- to provide RAPs with information about the scope of the proposed works and Aboriginal heritage assessment process;
- to facilitate a process whereby RAPs can:
  - contribute culturally appropriate information to the proposed assessment methodology;
  - provide information that will enable the cultural significance of Aboriginal objects and/or places within the study area to be determined; and
  - have input into the development of cultural heritage management options.
- to prepare and finalise an AACHIA with input from RAPs.

1.7 Project Team

Geordie Oakes (Senior Archaeologist, AECOM) managed all aspects of the Aboriginal heritage assessment detailed herein and was the primary author of this report. Dr Andrew McLaren (Senior Archaeologist, AECOM) assisted Geordie with reporting and fieldwork, and completed the lithic analysis.

Geordie holds a Bachelor of Arts (Honours) degree in historic and prehistoric Archaeology from Sydney University and a Graduate Certificate in Paleoanthropology from the University of New England. Geordie has over ten years of Australian Aboriginal cultural heritage management experience.

Andrew holds a Bachelor of Arts (Honours) degree from the University of Queensland, a Master of Cultural Heritage from Deakin University, and a PhD from the University of Cambridge in England and has over eight years of Australian Aboriginal cultural heritage management experience.

The archaeological survey was undertaken by a combined field team of two AECOM archaeologists (Oakes and McLaren) and RAP field representatives.

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1.8 Report Structure

This report contains eleven sections. This section - **Section 1.0** - has provided background information on the Project and assessment undertaken. The remainder of the report is structured as follows:

- **Section 2.0** outlines the statutory framework within which this assessment has been undertaken;
- **Section 3.0** details the Aboriginal community consultation program undertaken for this assessment;
- **Section 4.0** describes the existing environment of the study area and its associated archaeological implications;
- **Section 5.0** summarises relevant ethnohistoric information for the study area;
- **Section 6.0** describes the archaeological context of the study area on a regional and local scale. Predictions regarding the nature of the study area's Aboriginal archaeological record are also provided;
- **Section 7.0** describes the archaeological survey methodology;
- **Section 8.0** presents the survey results and test excavation;
- **Section 9.0** assess the archaeological (scientific) and cultural significance of Aboriginal sites within the study area;
- **Section 10.0** provides an assessment of the potential impacts of the Project on identified Aboriginal heritage values;
- **Section 10.0** details an appropriate management strategy for the identified Aboriginal heritage values of the study area; and
- **Section 11.0** lists the references cited in-text.

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Figure 1 Regional Context

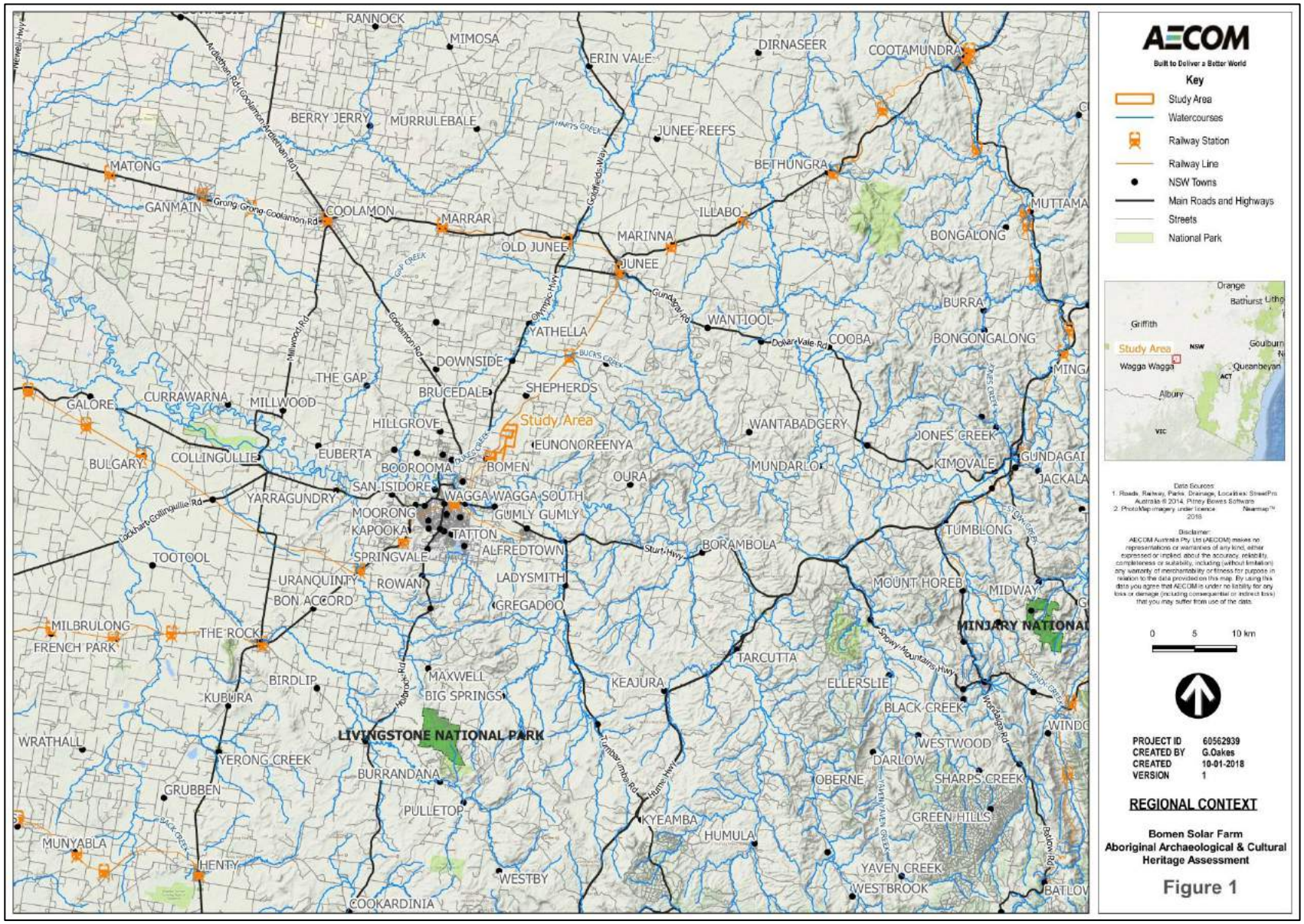

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Figure 2 Study Area

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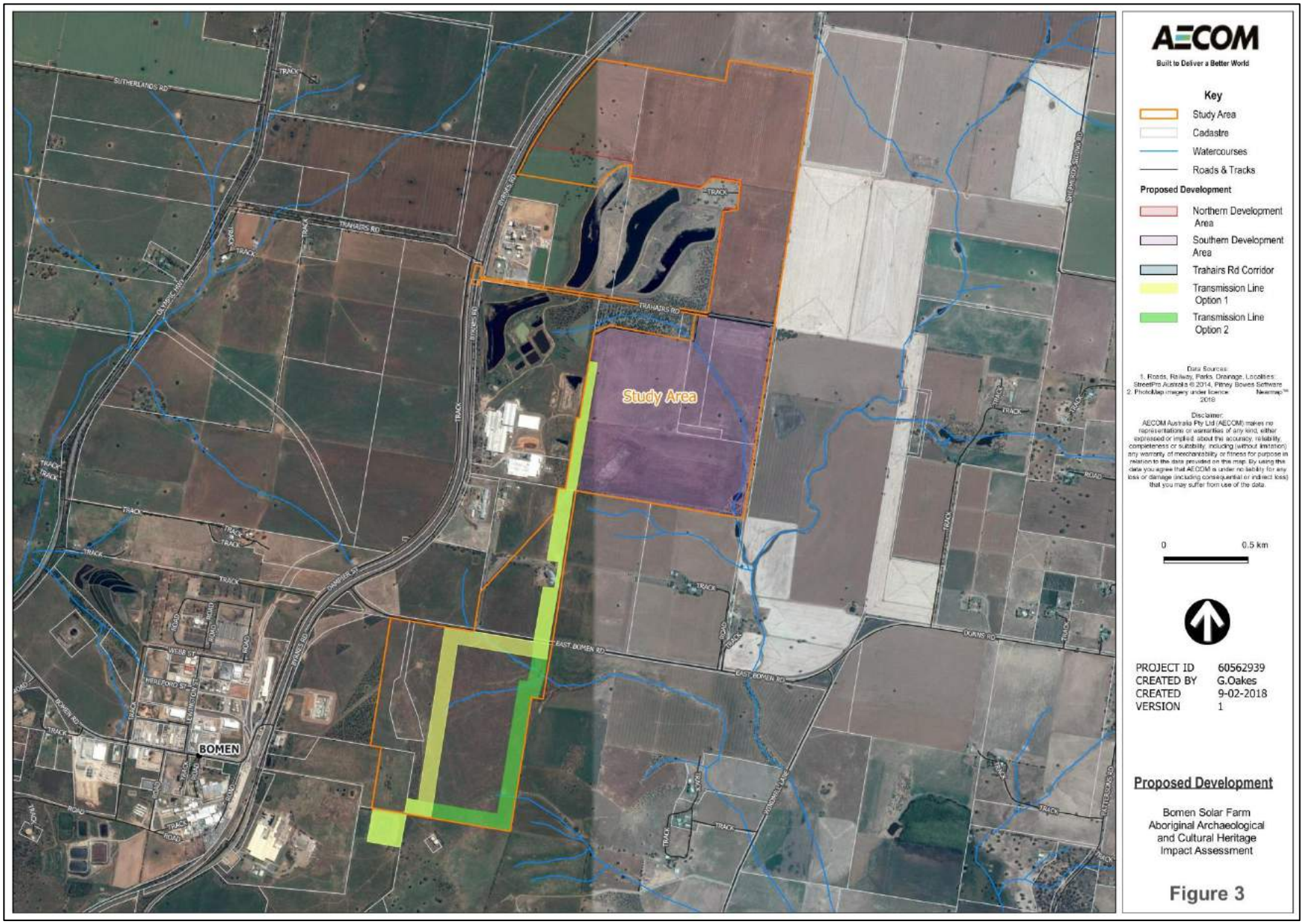
Figure 3 Proposed Development



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2.0 Applicable Policy & Legislation

2.1 Commonwealth Legislation

2.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (the ATSIHP Act) provides for the preservation and protection of places, areas and objects of particular significance to Indigenous Australians. The stated purpose of the ATSIHP Act is the *"preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition"* (Part I, Section 4).

Under the Act, '*Aboriginal tradition*' is defined as *"the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes any such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships"* (Part I, Section 3). A '*significant Aboriginal area*' is an area of land or water in Australia that is of *"particular significance to Aboriginals in accordance with Aboriginal tradition"* (Part I, Section 3). A '*significant Aboriginal object*', on the other hand, refers to an object (including Aboriginal remains) of like significance.

For the purposes of the Act, an area or object is considered to have been be injured or desecrated if:

a. In the case of an area:
   i. it is used or treated in a manner inconsistent with Aboriginal tradition;
   ii. the use or significance of the area in accordance with Aboriginal tradition is adversely affected; and
   iii. passage through, or over, or entry upon, the area by any person occurs in a manner inconsistent with Aboriginal tradition
b. in the case of an object:
   i. it is used or treated in a manner inconsistent with Aboriginal tradition.

The ATSIHP Act can override state and territory laws in situations where a state or territory has approved an activity, but the Commonwealth Minister prevents the activity from occurring by making a declaration to protect an area or object. However, the Minister can only make a decision after receiving a legally valid application under the ATSIHP Act and, in the case of long term protection, after considering a report on the matter. Before making a declaration to protect an area or object in a state or territory, the Commonwealth Minister must consult the appropriate minister of that state or territory (Part 2, Section 13).

No declarations relevant to the study area have been made under the ATSIHP Act.

2.1.2 Native Title Act 1993

The *Native Title Act 1993* (NTA) provides for the recognition and protection of native title for Aboriginal peoples and Torres Strait Islanders. The NTA recognises native title for land over which native title has not been extinguished and where persons able to establish native title are able to prove continuous use, occupation or other classes of behaviour and actions consistent with a traditional cultural possession of those lands. It also makes provision for Indigenous Land Use Agreements (ILUA) to be formed as well as a framework for notification of Native Title Stakeholders for certain future acts on land where Native Title has not been extinguished.

Searches of the *Schedule of Applications (unregistered claimant applications*), *Register of Native Title Claims*, *National Native Title Register*, *Register of Indigenous Land Use Agreements* and *Notified Indigenous Land Use Agreements* were undertaken in January 2018, with no relevant listings identified for the study area.

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2.1.3 Environment Protection and Biodiversity Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) took effect on 16 July 2000. Under Part 9 of the EPBC Act, any action that is likely to have a significant impact on a matter of National Environmental Significance may only progress with approval of the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (SEWPAC). An action is defined as a project, development, undertaking, activity, series of activities, or alteration. An action will also require approval if:

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact;
- It is undertaken outside Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land; and
- It is undertaken by the Commonwealth and will have or is likely to have a significant impact.

The EPBC Act defines 'environment' as incorporating both natural and cultural environments and therefore includes Aboriginal heritage. Under the Act, protected heritage items are listed on the National Heritage List (items of significance to the nation) or the Commonwealth Heritage List (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE), which was closed in 2007 and is no longer a statutory list. Statutory references to the RNE in the EPBC Act were removed on 19 February 2012. However, the RNE remains an archive of over 13,000 heritage places throughout Australia.

Searches of the National Heritage List, Commonwealth Heritage List and RNE were undertaken in January 2018, with no relevant listings identified for the study area.

2.2 State Legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act), administered by DP&E, requires that consideration be given to environmental impacts as part of the land use planning process in NSW. In NSW, environmental impacts are interpreted as including impacts to Aboriginal and non-Aboriginal (i.e., European) cultural heritage.

Upon repeal of Part 3A of the EP&A Act on 1 October 2011, the *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011* inserted a new Division 4.1 into Part 4 of the EP&A Act. Division 4.1 provides a determination regime for State Significant Development (SSD). Section 89C of the EP&A Act stipulates that a development will be considered SSD if it declared to be such by the new *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP SRD).

Under Clause 8(1) of SEPP SRD, a development is declared to be State Significant Development if:

a. the development on the land concerned is, by the operation of an environmental planning instrument, permissible with development consent under Part 4 of the EP&A Act; and

b. the development is specified in Schedule 1 or 2 of SEPP SRD.

The Project is SSD as it meets both of these criteria, namely:

- it is permissible with development consent on the land on which it is located; and
- it is development that is specified in Schedule 1 of SEPP SRD.

Pursuant to Section 89J of the EP&A Act, Aboriginal Heritage Impact Permits (AHIPs) are not required for projects approved under Division 4.1 of Part 4 of the EP&A Act. Impacts to Aboriginal heritage values associated with approved SSD projects are typically managed under Aboriginal Cultural Heritage Management Plans (ACHMPs). ACHMPs are statutorily binding once approved by DP&E.

2.2.2 Aboriginal Land Rights Act 1983

The Aboriginal Land Rights Act 1983 (ALR Act) was established to return land in NSW to Aboriginal peoples through a process of lodging claims for certain Crown lands. The Act, administrated by the NSW Department of Aboriginal Affairs, is a compensatory regime which recognises that land is of

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spiritual, social, cultural and economic importance to Aboriginal people. The ALR Act establishes the NSW Aboriginal Land Council (NSWALC) and a network of over 120 autonomous Local Aboriginal Land Councils (LALCs) and requires these bodies to:

a. to take action to protect the culture and heritage of Aboriginal persons in the LALC's area, subject to any other law; and

b. to promote awareness in the community of the culture and heritage of Aboriginal persons in the LALC's area.

LALCs constituted under the ALR Act can make claims. The Registrar of the ALR Act has responsibility for maintaining the Register of Aboriginal Land Claims under section 166 of the Act. All land claims that have been made since the Act came into force in 1983 have been recorded in the Register.

Consultation with the Registrar of the ALR Act in November 2017 has indicated that the study area does not have any Registered Aboriginal Owners pursuant to Division 3 of the ALR Act.

2.2.3 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act), administered by OEH, is the primary legislation for the protection of Aboriginal cultural heritage in NSW. The NPW Act gives the Secretary of OEH responsibility for the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places', defined under the Act as follows:

- An *Aboriginal object* is any deposit, object or material evidence (that is not a handicraft made for sale) relating to Aboriginal habitation of NSW, before or during the occupation of that area by persons of non-Aboriginal extraction (and includes Aboriginal remains).
- An *Aboriginal place* is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects.

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them and includes a 'strict liability offence' for such harm. A 'strict liability offence' does not require someone to know that it is an Aboriginal object or place they are causing harm to in order to be prosecuted. Defences against the 'strict liability offence' in the NPW Act include the carrying out of certain 'Low Impact Activities', prescribed in Clause 80B of the *National Parks and Wildlife Amendment Regulation 2010* (NPW Regulation), and the demonstration of due diligence.

An AHIP issued under Section 90 of the NPW Act is required if impacts to Aboriginal objects and/or places cannot be avoided. An AHIP is a defence to a prosecution for harming Aboriginal objects and places if the harm was authorised by the AHIP and the conditions of that AHIP were not contravened. Consultation with Aboriginal communities is required under OEH policy when an application for an AHIP is considered and is an integral part of the process. AHIPs may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

As indicated in Section 2.2.1, pursuant to Section 89J of the EP&A Act, AHIPs are not required for projects approved under Division 4.1 of Part 4 of the EP&A Act, with impacts typically managed under ACHMPs. ACHMPs are statutorily binding once approved by DP&E.

Section 89A of the NPW Act requires notification of the location of Aboriginal sites within a reasonable time, with penalties for non-notification. Section 89A is binding in all instances, including Division 4.1 projects

2.3 Local Government

2.3.1 Wagga Wagga Local Environmental Plan 2010

Clause 5.10 of the *Wagga Wagga Local Environmental Plan 2010* (WWLEP 2010) provides specific provisions for the protection of heritage items, heritage conservation areas, archaeological relics, Aboriginal objects and Aboriginal places of heritage significance within the Wagga Wagga LGA.

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Under Section 2 of Clause 5.10 of the WWLEP 2010, development consent is required for any of the following:

a. demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):

   (i) a heritage item,

   (ii) an Aboriginal object,

   (iii) a building, work, relic or tree within a heritage conservation area,

b. (b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item,

c. (c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,

d. (d) disturbing or excavating an Aboriginal place of heritage significance,

e. (e) erecting a building on land:

   (i) on which a heritage item is located or that is within a heritage conservation area, or

   (ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,

f. (f) subdividing land:

   (i) on which a heritage item is located or that is within a heritage conservation area, or

   (ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance.

In relation to Aboriginal heritage, Section 8 of the WWLEP 2010 states the consent authority must, before granting consent under this clause to the carrying out of development in an Aboriginal place of heritage significance:

a. consider the effect of the proposed development on the heritage significance of the place and any Aboriginal object known or reasonably likely to be located at the place by means of an adequate investigation and assessment (which may involve consideration of a heritage impact statement), and

b. notify the local Aboriginal communities, in writing or in such other manner as may be appropriate, about the application and take into consideration any response received within 28 days after the notice is sent.

Schedule 5 of the WWLEP 2010 provides a list of heritage items, conservation areas and archaeological sites within the Wagga Wagga LGA. A review of the list indicates there are no Aboriginal objects or places of heritage significance located within the study area.

Subject to development consent under Division 4.1 of Part 4 of the EP&A Act, the planning controls required by the WWLEP 2010 will not apply to the Project.

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3.0 Aboriginal Community Consultation

Aboriginal community consultation acknowledges the right of Aboriginal people to be involved, through direct participation, on matters that directly affect their heritage. Involving Aboriginal people in all facets of the assessment process ensures that they are given adequate opportunity to share information about cultural values, and to actively participate in the development of appropriate management and/or mitigation measures. The successful identification, assessment and management of Aboriginal cultural heritage values are dependent on an inclusive and transparent consultation process.

Aboriginal community consultation for the current assessment was undertaken in accordance with OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a) (Consultation Requirements). The results of the consultation process undertaken are detailed below. Associated correspondence is provided in Appendices B to H.

3.1 Stage 1 - Notification and Registration

The aim of Stage 1 of the Consultation Requirements is to identify, notify and register Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the study area.

3.1.1 Consultation with Regulatory Agencies

Section 4.1.2 of the Consultation Requirements stipulates that proponents are responsible for ascertaining, from reasonable sources of information, the names of Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places. Proponents are required to compile a list of Aboriginal people who may have an interest for the proposed study area and hold knowledge relevant to determining the cultural significance of Aboriginal objects and/or places by writing to:

a. the relevant regional office of the NSW Office of Environment & Heritage (OEH);

b. the relevant Local Aboriginal Land Council(s);

c. the Registrar, Aboriginal Land Rights Act 1983 for a list of Aboriginal owners;

d. the National Native Title Tribunal for a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements;

e. Native Title Services Corporation Limited (NTSCORP Limited);

f. The relevant local council(s); and

g. The relevant catchment management authorities for contact details of any established Aboriginal reference group.

In accordance with this requirement, the following agencies were contacted via letter or email on 10 November 2017 requesting information on relevant Aboriginal persons and organisations (Appendix B):

- Office of Environment and Heritage;
- Wagga Wagga Local Aboriginal Land Council (Wagga LALC);
- Office of the Registrar, *Aboriginal Land Rights Act 1983* (NSW);
- NTSCORP Limited;
- Wagga Wagga City Council; and
- South East Local Land Services (SE LLS).

Responses were received from four agencies and are attached as Appendix C:

- OEH responded on 14 November 2017 providing the contact details for seven groups that may have an interest in the development;

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- Wagga Wagga City Council responded on 8 January 2017 indicating the Wagga LALC was the peak body representing Aboriginal people in the area;
- Office of Registrar responded on 21 November 2017 stating the study area does not have Registered Aboriginal Owners pursuant to Division 3 of the Aboriginal Land Rights Act 1983 (ALRA)' and suggesting we contact the Wagga LALC; and
- NTSCORP responded that their privacy guidelines restrict them from providing contact details to proponents.

3.1.2 Public Notification

Section 4.1.3 of the Consultation Requirements requires that, in addition to writing to the Aboriginal people identified by the agencies listed in Section 3.1.1, the proponent must also place a notice in the local newspaper circulating in the general location of the proposed project. The notification must outline the project and identify its location.

In accordance with this requirement, a public notice was placed in the Wagga Daily Advertiser on 14 November 2017 (Appendix D). The closing date for registration via this notice was 29 November 2017, which provided the necessary minimum 14-day period for expressions of interest.

One response to the notice was provided by Mark Saddler (Bundyi Aboriginal Cultural Knowledge) on 14 November 2017.

3.1.3 Invitations for Expressions of Interest

Section 4.1.3 of the Consultation Requirements requires that proponents must write to the Aboriginal people whose names were obtained through the regulatory agencies and the relevant Local Aboriginal Land Council(s) to notify them of the proposed project and invite them to register an interest in participating in a process of community consultation.

In accordance with this requirement, on 1 December 2017, a letter inviting expressions of interest and containing summary information on the project was sent to all Aboriginal persons and organisations identified by the regulatory agencies. A total of seven Aboriginal stakeholders were invited to register an interest in being consulted. No closing date for expressions of interest was issued and all stakeholders interested in the being consulted were included from this date to project finalisation.

A total of three organisations registered an interest in the assessment. Summary information on all RAPs, including registration dates, is provided in Table 1.

Table 1 Registered Aboriginal Parties

Organisation	Date of registration	Method	Contact Person
Bundyi Aboriginal Cultural Knowledge	14/11/2017	Email	Mark Saddler
Warrabinya Cultural Heritage and Assessment Group	26/11/2017	Email	Eddie Whyman
Yalmambira	11/12/2017	Email	Yalmambira

3.1.4 Notification of Registered Aboriginal Parties (RAPs)

Section 4.1.6 of the Consultation Requirements requires that the proponent make a record of the names of each Aboriginal person who registered an interest and provide a copy of that record, along with a copy of the EOI letter forwarded to the Aboriginal parties, to the relevant OEH regional office and LALC. Section 4.1.5 of the Consultation Requirements provides the opportunity for Aboriginal persons to withhold their details from being forwarded to these parties.

In accordance with these requirements, on 12 February 2018, a list of all RAPs that had not requested their details be withheld was forwarded to the relevant OEH regional office (Albury) and the Wagga Wagga LALC. A copy of the EOI letter sent out on 1 December 2017 and the newspaper advertisement was included in this correspondence (Appendix E).

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3.2 Stage 2 - Presentation of Information about Project

The aim of Stage 2 of the Consultation Requirements is to provide RAPs with information about the scope of the proposed project and the proposed cultural heritage assessment process.

For the current assessment, presentation of information about the study area and proposed development was provided to RAPs as part of the registration of interest process detailed in Section 3.1.3. Basic information on the proponent and proposed development was included in the Expression of Interest (EOI) letter mailed on 1 December 2017.

3.3 Stage 3 – Gathering Information about Cultural Significance

The aim of Stage 3 of the Consultation Requirements is to facilitate a process whereby RAPs can:

a. Contribute to culturally appropriate information gathering and the assessment methodology;

b. Provide information that will enable the cultural significance of Aboriginal objects and/or places on the proposed study area to be determined; and

c. To have input into the development of any cultural heritage management measures.

For current assessment, consultation with RAPs regarding the cultural heritage values of the study area included:

- A request with the draft assessment methodology for any initial comments regarding the Aboriginal cultural heritage values of the study area;
- Discussion of cultural heritage values during fieldwork; and
- The provision of a draft report to all RAPs for comment prior to finalisation.

3.3.1 Draft Assessment Methodology

Sections 4.3.1 and 4.3.2 of the Consultation Requirements require that the proponent present and/or provide the proposed methodology for the cultural heritage assessment to RAPs and that RAPs be given a minimum of 28 days to review and provide feedback on this methodology.

All RAPs for the current assessment were provided with a draft of AECOM's proposed assessment methodology as part of the EOI package sent out on 1 December 2017. RAPs were given a minimum of 28 days to review and provide feedback on this methodology (Appendix F).

No responses were received from RAPs relating to the draft methodology. No specific cultural heritage values relating to the study area were identified by RAP respondents.

3.3.2 Archaeological Survey

The following RAPs participated in the fieldwork component of this AACHIA:

Table 2 RAP field representatives by organisation

Registered Aboriginal Party	Field representative(s)
Bundyi Aboriginal Cultural Knowledge	Mark Saddler
Warrabinya Cultural Heritage and Assessment Group	Eddie Whyman, Brett Whyman
Yalmambira	Yalmambira

RAP field representatives involved in the visual inspection identified the following social or cultural values for the study area in conversation with AECOM archaeologists:

- Crests with granite outcrops would have been utilised for camping and as raw material sources by Aboriginal people travelling through the study area;
- Owing to generally poor visibility conditions, subsurface testing will be necessary to adequately characterise the Aboriginal archaeological record of the study area; and

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- Quartz is a locally and regionally common rock type in terms of flaked stone tool technologies.

3.4 Stage 4 - Review of Draft Assessment Report [TO BE UPDATED]:

The aim of Stage 4 of the Consultation Requirements is to prepare and finalise an AACHIA with input from RAPs.

In accordance with Section 4.4.2 of the Consultation Requirements, on xxxx all RAPs were sent a draft of this AACHIA for review and comment. The specified closing date for comments was xxxxxx, which provided the necessary minimum 28 day review period. However, all RAP comments were accepted up to submission of the AACHIA.

RAP responses are summarised in Table 3, with written responses attached as Appendix H. No other RAPs provided comment on the draft report.

Table 3 RAP responses to draft AACHIA

Registered Aboriginal Party	Date	Method	Summary of response	AECOM response

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4.0 Landscape Context

This section reviews the landscape context of the study area as a basis for predicting the character of past Aboriginal occupation within it and its associated archaeological record. Consideration of the landscape context of the study area is predicated on the now well established proposition that the nature and distribution of Aboriginal archaeological materials are closely connected to the environments in which they occur. Environmental variables such as topography, geology, hydrology and the composition of local floral and faunal communities will have played an important role in influencing how Aboriginal people moved within and utilised their respective Country. Amongst other things, these variables will have affected the availability of suitable campsites, drinking water, economic[2] plant and animal resources, and raw materials for the production of stone and organic implements. At the same time, an assessment of historical and contemporary land use activities, as well as geomorphic processes such as soil erosion and aggradation, is critical to understanding the formation and integrity of archaeological deposits, as well any assessments of Aboriginal archaeological sensitivity.

4.1 Physical Setting

The study area for this assessment, shown on Figure 2, comprises an irregularly shaped *c.*380 ha parcel of land located to the northeast of the Wagga Wagga suburb of Bomen. Registered as Lot 11 DP1130519 (part), Lot 2 DP590756 (part), part Lots 174 and 108 DP751405, Lots 109 and 110 DP751405, Lot 3 DP594679 (part), Lot 2 DP1228221 (part) and Lot 22 DP1085826 (part), land within the study area is currently, and was historically, used for cattle grazing and cropping.

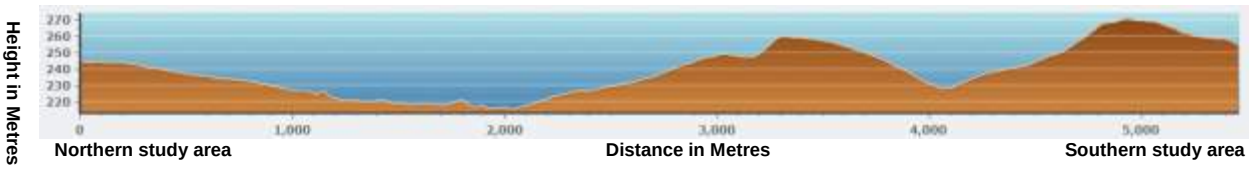
Reference to the Geographical Name Register (GNR) of NSW indicates that the study area falls wholly within the boundaries of City of Wagga Wagga LGA within the Parish of North Wagga Wagga in the County of Clarendon. Surrounding suburbs include Shepherds to the north, North Wagga Wagga to the south, Eunonoreenya to the east and Cartwrights Hill to the west.

4.2 Topography

The study area lies within the physiographic region referred to by Chen & McKane (1996) as the 'Bomen Rises and Low Hills', an area comprising undulating rises, minor low hills and long lower slopes. Land within the northern study area forms part of a north-south grading gently inclined simple slope that slopes towards an unnamed 3rd order watercourse located to the east of the study area. In the central portion of the study area, the topography comprises the middle and lower slope portions of a N-S trending ridgeline with two of its crests located partially within the southern section of the study area.

Elevations across the study area range from 200 m AHD in the eastern section of the study area to 270 m AHD associated with central summit of the southernmost crest, providing a total local relief of 70 m (Figure 4). Following Speight (2009), a breakdown of the relative representation of morphological landform units within the study area is provided in Table 4. Identified landform units, meanwhile, are shown on Figure 5.

Figure 4 Elevation Profile



[2] I.e., edible and/or otherwise useful (e.g., medicine, clothing)

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Table 4 Morphological landform units within the study area

Landform unit	Area (ha)	%
Simple slope	141	37.1
Lower	131.6	34.6
Middle	51.2	13.5
Upper	31.9	8.4
Crest	24.3	6.4
Total	380	100

4.3 Hydrology

The study area is located within the Murrumbidgee Catchment, a large (*c.* 84,000 km²) catchment in southern NSW encompassing the city of Canberra, as well as the urban centres of Wagga Wagga, Yass, Gundagai and Queanbeyan. The central and southern sections of the study area contain parts of several, unnamed ephemeral watercourses ranging in magnitude from 1st to 2nd order streams, following Strahler (1952), with the northern section containing no watercourses. Within the central section of the study area a 1st order ephemeral tributary is mapped as flowing to the southeast joining a larger 3rd order stream roughly 200 m east of the study area (Plate 1). In the southern section of the study area, portions of several 1st order and one 2nd order ephemeral tributaries likewise flow in south-easterly direction before joining the same 3rd order stream located outside the study area (Plate 2). This larger watercourse flows southward into the Murrumbidgee River *c.* 2.8 km to the south.

Plate 1 View south across the unnamed 1st order stream located in the central portion of the study area (Source: AECOM 2018)

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Plate 2 View east across of 2nd order stream located within the southern portion of the study area (Source: AECOM 2018)

4.4 Geology

The Bomen area is characterised by undulating rises, minor low hills and long lower slopes overlying Silurian aged granites on rises and thick clay sequences on most sideslopes and in drainage depressions (Chen & McKane, 1996). Reference to the 1:100,000 Geological Map Sheet for Wagga Wagga and the Kyeamba Valley (Raymond, 1996) indicates that the surface geology of the study area has been mapped as Collinguillie Granite (Sgc) of Silurian antiquity (Plate 3) characterised as strongly feldspar (i.e., containing colourless or pale-coloured crystals consisting of aluminosilicates of potassium, sodium, and calcium) (Plate 4), phyric (i.e., containing large crystals), containing mica (silicate minerals) and adamellite (also termed quartz monzonite).

Of particular note to the current assessment is the Bomen axe quarry and axe manufacturing site, located in the southern portion of the study area, on Lot 23 of DP 1085826 (Go Green Services, 2011; Navin Officer, 1998). Initially identified by Navin Officer (1998), this site provides evidence for the quarrying of a localised exposure of basalt cobbles associated with an unmapped basalt dyke or sill, as well on-site axe manufacture. Surface indications of the site, which is located on north-south trending ridgeline approximately 3 km north of the Murrumbidgee River, include approximately 500 artefacts spread across an area of *c*.150 x 70 m (10,500 m^2), with recorded artefacts including cores, primary flakes, secondary flakes and axe preforms (Go Green Services, 2011: 32). Artefacts within the site occur in close spatial association with exposed basalt cobbles, which outcrop across an area of *c*.120 x 70 m (8,400 m^2), exhibit a naturally rounded brown to red brown cortex with extensive iron oxide staining and range in size from 10 cm to 50 cm in maximum linear dimension. Smaller flaked materials within the site are reported as being concentrated along the crest of the ridgeline and as

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having a distribution suggestive of the presence of several variously discrete and merged working floors (Go Green Services, 2011: 32).

Outside of the Bomen Axe quarry, stone suitable for flaked stone artefact manufacture is available in abundance across the study area in the form of surface scatters of angular, pebble to cobble-sized clasts of quartz derived from veins in the Collinguillie Granite. Repeated historic ploughing across paddocks within the study area is a likely contributor to the spread of quartz across the site dislodging it from granite cobbles and boulders and fracturing it.

Plate 3 Exposed granite boulders in the central portion of the study area (Source: AECOM 2018)

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Plate 4 Granite cobble with remnant quartz vein (Source: AECOM 2018)

Plate 5 Regularly identified quartz fragments within the study area (Source: AECOM 2018)

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4.5 Soils

Soils within the study area have been mapped by Chen & McKane, (1996) as belonging to the East Bomen (eb) and Glenmornan (gl) soil landscapes. Soils of the East Bomen soil landscape, which cover the entire northern part of the study area and pockets of the southern study area, have been characterised as shallow to moderately deep (40-150 cm) red Dermosols on crests and ridges, deep (80-20 cm) brown Dermosols on slopes and in drainage lines. Dominant 'A' horizon soils comprise dark to dull red, sandy to clay loams with mildly acidic pH levels (pH 5.0 – 5.5). 'B' horizon soils are dominated by reddish light clay with pH levels ranging from mildly acidic (pH 6.0) to neutral (pH 6.5).

Soils of the Glenmornan soils landscape occupy parts of southern study area associated with elevated terrain and have been characterised as shallow to moderately deep (40-100 cm) red Kandosols. Dominant 'A' horizon soils comprise dark sandy clay loams with pH levels ranging from mildly acidic (pH 5.5) to neutral (pH 6.0). 'B' horizon soils are dominated by brown sandy clay loams with mildly acidic pH levels (pH 5.0 – 5.5).

Plate 6 Exposed red silty soil profile on contour bank (Source: AECOM 2018)

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Figure 5 Landform & Hydrology

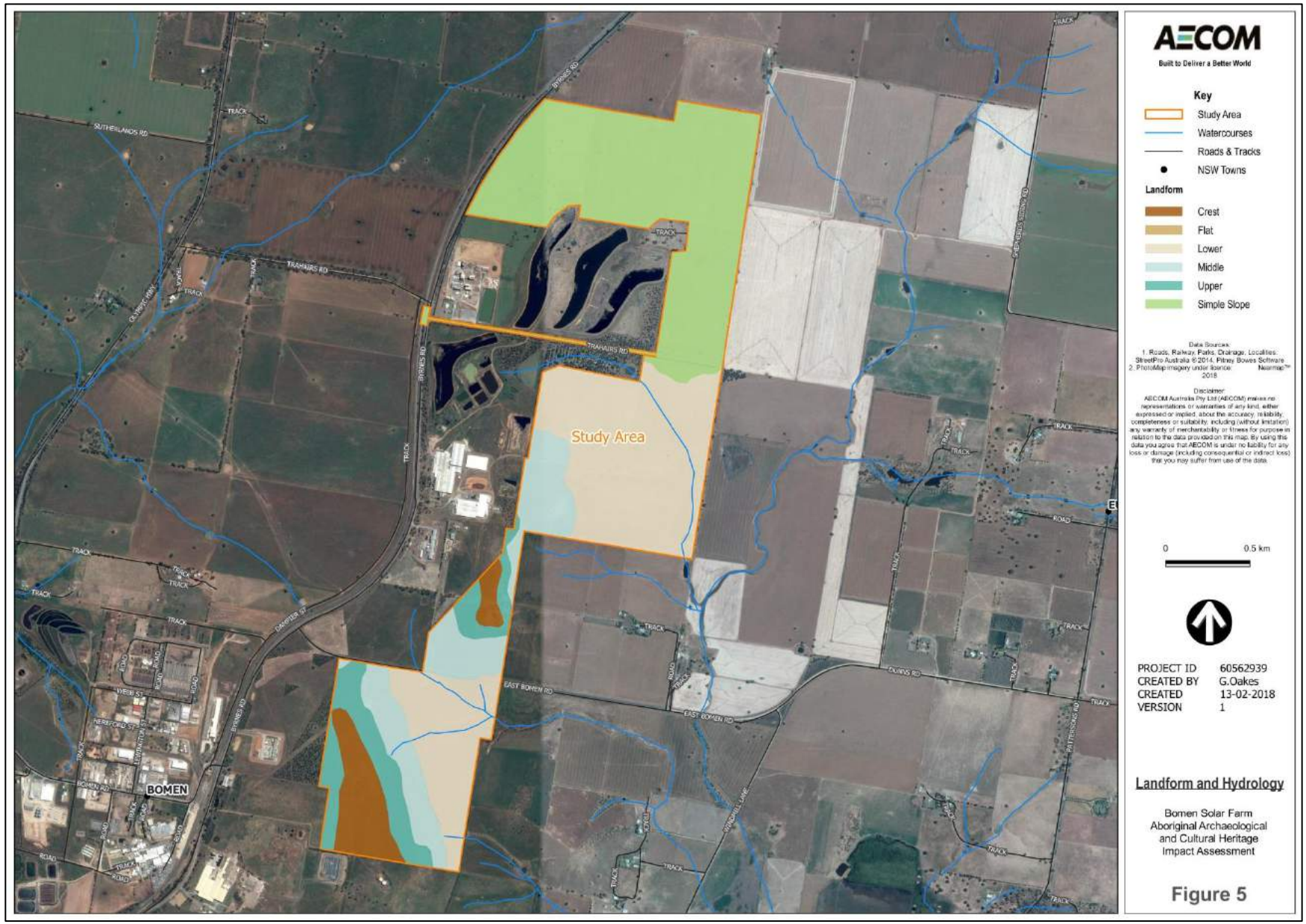

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Figure 6 Geology

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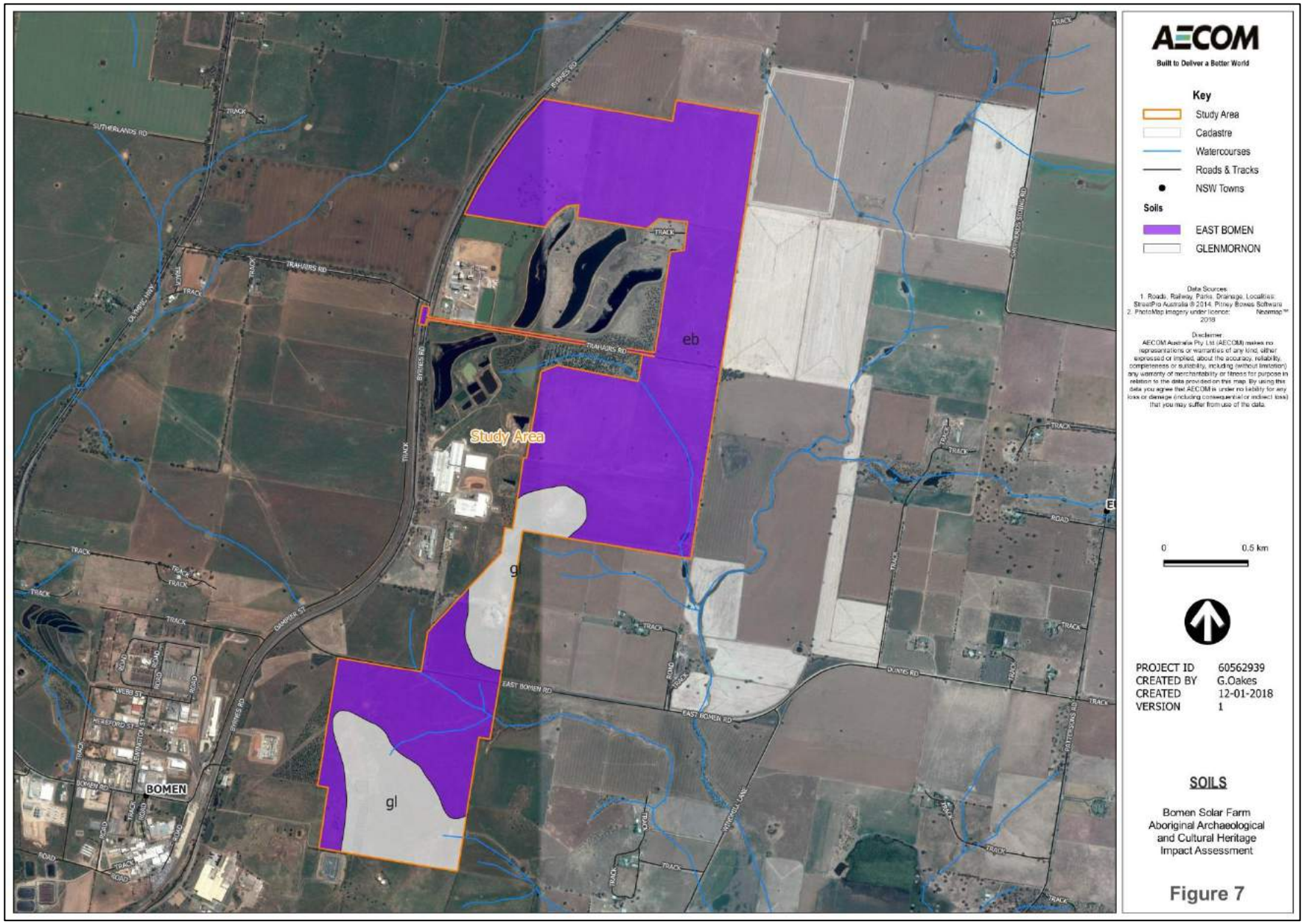
Figure 7 Soil Landscapes



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4.6 Flora & Fauna

Native vegetation within the study area has been extensively modified as a result and agricultural and pastoral land use activities, with the overwhelming majority cleared historically for grazing and/or cropping. Vegetation today consists predominantly of exotic grassland with scattered paddock trees. Nonetheless, field observations and available reference materials suggest that the pre- and early-post European settlement native vegetation regime of the site would have consisted primarily white box, yellow box and grey box on gentle slopes, and red stringybark and red gum on rocky and steeper slopes (Chen & McKane, 1996:5).

Historical clearance activities notwithstanding, it can be confidently asserted that the original vegetation communities of the study area and its environs will have supplied Aboriginal people camping within or travelling through the area with an extensive array of edible and otherwise useful plant species. Recorded native vegetation communities and locally occurring watercourses would likewise have supported a large and diverse range of economic terrestrial, aquatic and avian fauna.

4.7 Historical Context and Land Use

Explorers Charles Sturt and George Macleay were among the first Europeans to travel through the South West Slopes in the region of Wagga Wagga. Sturt's second expedition, taking place in 1829-30, traced the Murrumbidgee River to its junction with the Murray River and onto the mouth of the Murray at Lake Alexandrina (Sherry, 1999). The area was reported to have good pasture, particularly along the floodplains of the Murrumbidgee River. The first recorded settler in the Wagga Wagga region was Charles Tompson, a convict who arrived in the colony in 1804 and settled on the northern side of the river in 1832. Tompson, established the "Eunonyhareenyha" station on the northern bank of the Murrumbidgee River, east of central Wagga Wagga where he was known to use local Wiradjuri as labour (Montgomery, 2010). Within 15 years pastoralists, primarily running sheep and cattle, occupied most of the river frontages on the Murrumbidgee River. The village of Wagga Wagga was established in 1847 with the bridge over the Murrumbidgee River constructed in 1859 (Sherry, 1999).

Bomen is a northern suburb of Wagga Wagga, and contains a railway station on the Main Southern Line. Early Twentieth Century parish maps for the Parish of Eunanoreenya indicate that early landowners within the study area were Rob and Bruce Ronald and James McBain who together owned a significant portion of study area in the Nineteenth Century alongside Silvester Dowling who owned a small portion in the northwest (Figure 8).

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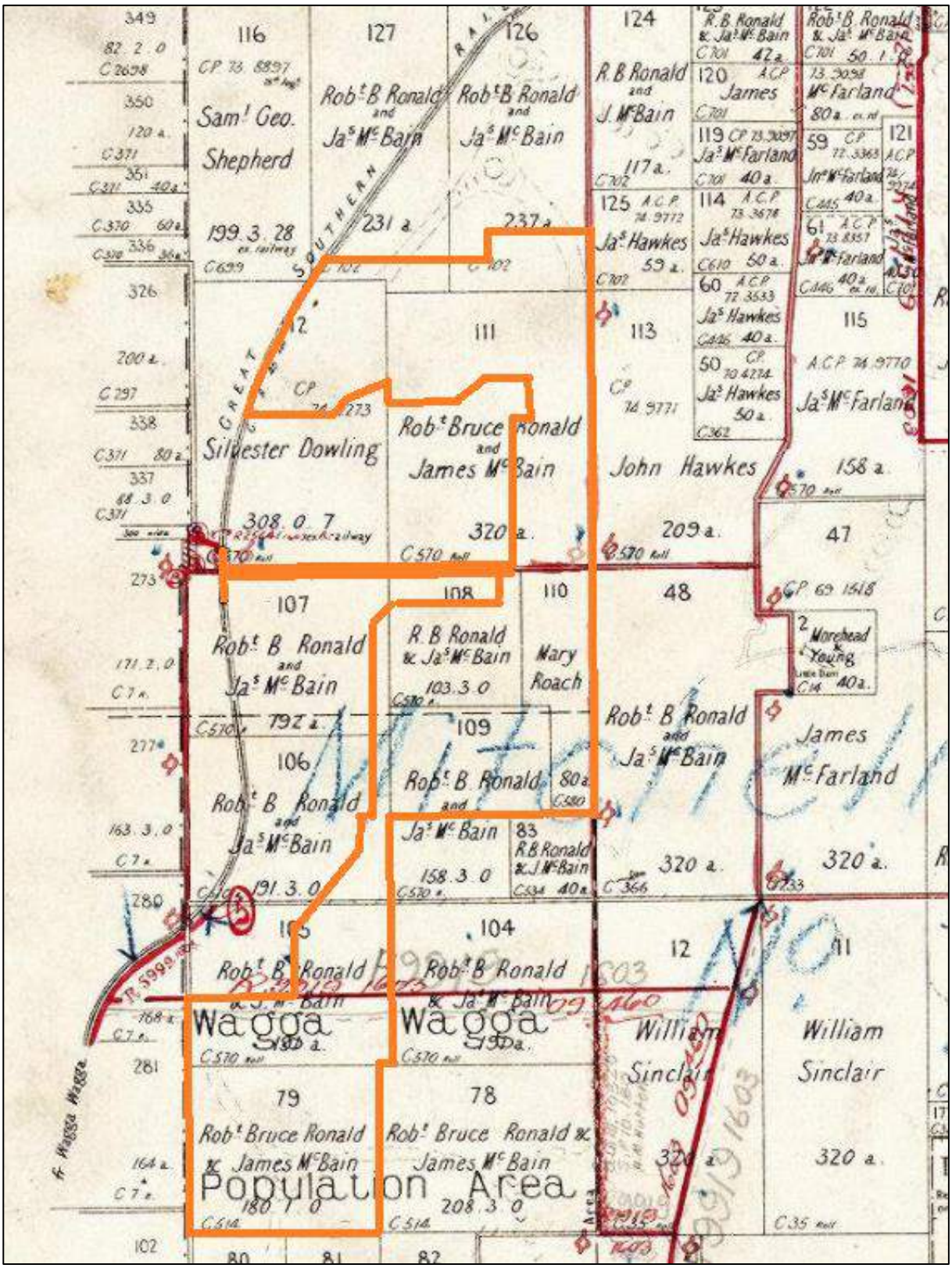
Figure 8 Eunonoreenya Parish map (study area in orange) (source: Department of Lands)



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Landuse within the study area from this early settlement period until today has focussed on cattle/sheep grazing and limited cropping. Historical aerials provide a framework for assessing the nature and extent of previous land disturbance across the study area. Examination of aerials from 1966 (Figure 9), 1971 (Figure 10), 1980 (Figure 11), 1990 (Figure 12), 1997 (Figure 13), 2003 (Figure 14), 2009 (Figure 15), provided below, attest to a range of land use activities and associated ground surface impacts across the site including:

- Extensive native vegetation clearance prior to 1966;
- Pastoral activities, including livestock grazing, fencing and the construction of a farm dams and access tracks prior to 1966;
- Construction of additional dams across the area post 1966 to 1990;
- Ploughing across the majority of the study area from 1971 to present;
- Excavation of large contour drains and dams across the southern section of the study area *c.*1990;
- Earthworks associated with the adjacent industrial development in the northern study area *c.*1997;
- Construction of an semi-industrial office facility including driveway in the centre of the study area *c.*1997;
- Heavy ploughing in the southwestern study area *c.*1997;
- Tree planting in the southwestern study area *c.*1997;
- Earthworks associated with the 1st and 2nd ephemeral drainage lines in the southern study area *c.*2003;
- Installation of a transmission line across the southern portion of the study area *c.* 1971; and
- Creekline erosions in areas adjacent to creeklines from 1966 to the present.

A disturbance map combining these various ground surface impacts in provided as Figure 16. Levels of disturbance are defined as:

- **High** - Severe disturbance to natural soil profiles including complete-to-near complete topsoil loss through erosion, earthworks, buildings, vehicle tracks and dams;
- **Moderate** - Cleared and/or grazed at some time, with ploughing also demonstrated; and
- **Low** - Cleared and/or grazed at some time, but apparently never ploughed.

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Figure 9 1966 aerial photograph of the study area (Source: Land & Property Information NSW)

Figure 10 1971 aerial photograph of the study area (Source: Land & Property Information NSW)

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Figure 11 1980 aerial photograph of the study area (Source: Land & Property Information NSW).

Figure 12 1990 aerial photograph of the study area (Source: Land & Property Information NSW)

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Figure 13 1997 aerial photograph of the study area (Source: Land & Property Information NSW)

Figure 14 2003 aerial photograph of the study area (Source: Land & Property Information NSW)

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Figure 15 2009 aerial photograph of the study area (Source: Land & Property Information NSW)

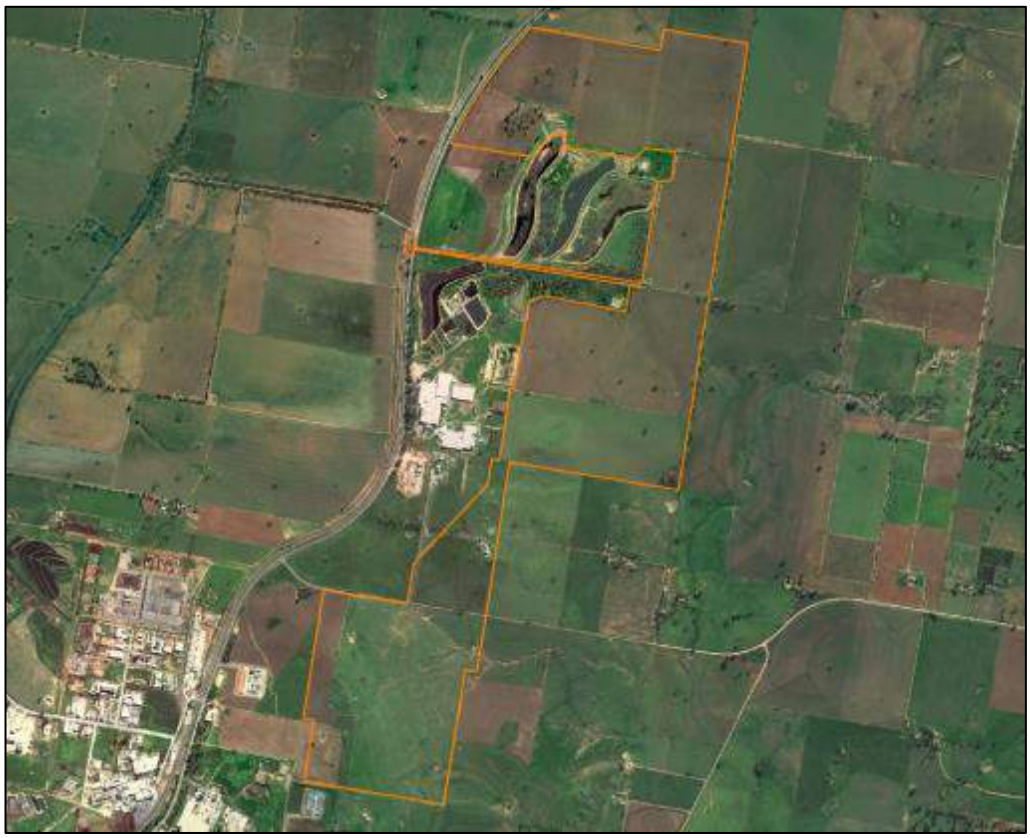

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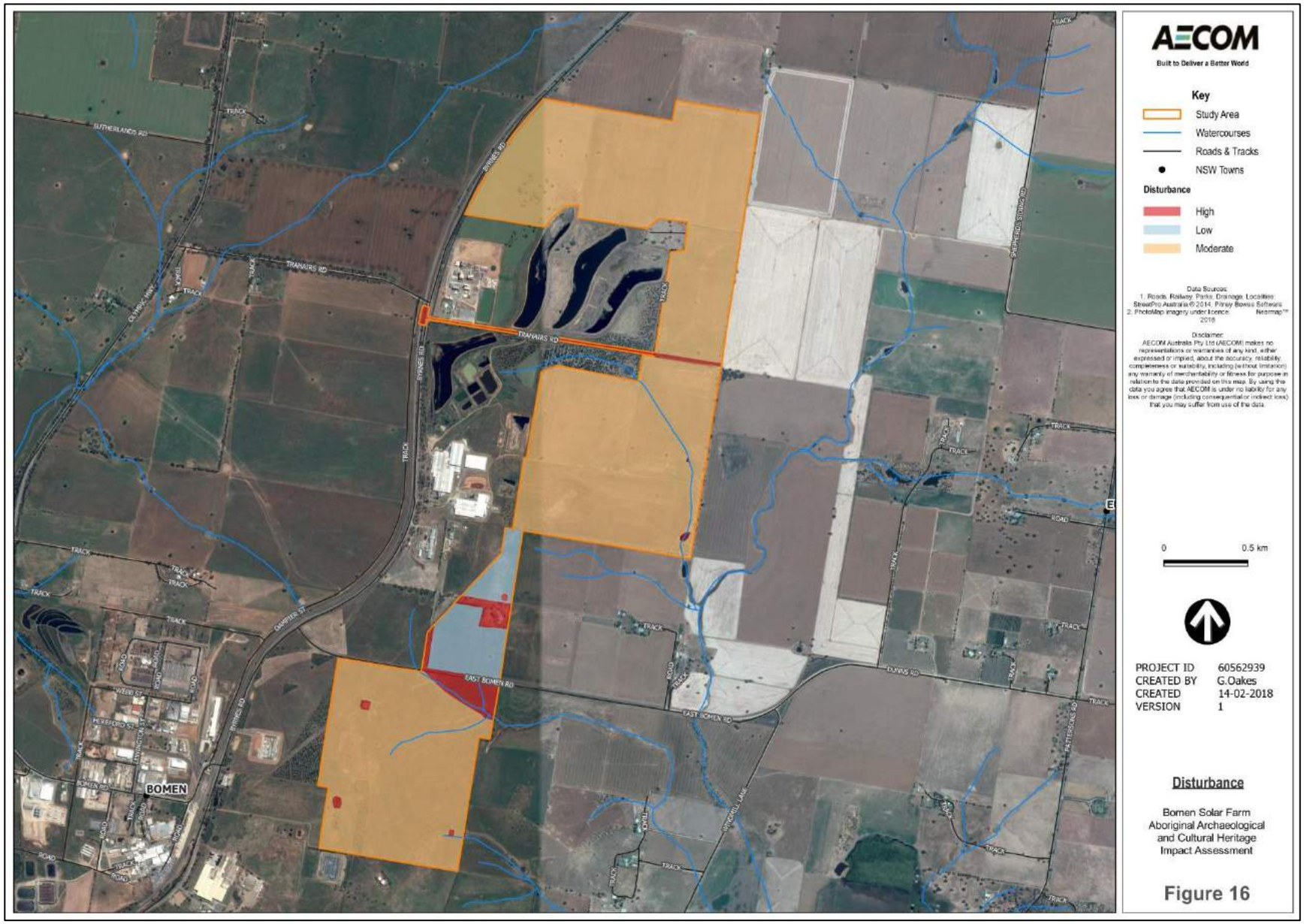
Figure 16 Land Disturbance



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4.8 Key Observations

Key observations to be drawn from a review of the existing environment of the study area are as follows:

- The study area lies within the physiographic region referred to by Chen & McKane (1996) as the 'Bomen Rises and Low Hills', an area comprising undulating rises, minor low hills and long lower slopes.
- The central and southern sections of the study area contain parts of several, unnamed ephemeral watercourses ranging in magnitude from 1st to 2nd order streams, following Strahler (1952), with the northern section containing no watercourses.
- The Bomen area is characterised by undulating rises, minor low hills and long lower slopes overlying Silurian aged granites on rises and thick clay sequences on most sideslopes and in drainage depressions (Chen & McKane, 1996). Reference to the 1:100,000 Geological Map Sheet for Wagga Wagga and the Kyeamba Valley (Raymond, 1996) indicates that the surface geology of the study area has been mapped as Collinguillie Granite (Sgc) of Silurian antiquity characterised as strongly feldspar (i.e., containing colourless or pale-coloured crystals consisting of aluminosilicates of potassium, sodium, and calcium), phyric (i.e., containing large crystals), containing mica (silicate minerals) and adamellite (also termed quartz monzonite).
- Outside of the Bomen Axe quarry, stone suitable for flaked stone artefact manufacture is available in abundance across the study area in the form of surface scatters of angular, pebble to cobble-sized clasts of quartz derived from veins in the Collinguillie Granite. Repeated historic ploughing across paddocks within the study area is a likely contributor to the spread of quartz across the site dislodging it from granite cobbles and boulders and fracturing it.
- Prior to European settlement, the floral and faunal resources of the study area and environs will have been sufficient to facilitate intensive and/or repeated occupation by Aboriginal people.
- Examination of historical aerial imagery for the study area indicates a range of historical land use activities and associated ground surface impacts. Major activities/impacts include native vegetation clearance, the construction of farm dams, erosion and ploughing. However, the majority of land within the study area retains moderate integrity.

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5.0 Ethnohistoric Context

The study area falls within the traditional lands of the Wiradjuri-speaking peoples, the largest Aboriginal language group in NSW with a total area estimated to have covered over 60,000 square kilometres, stretching from Lithgow in the east, to Hay in the west, north to Nyngan and south to Albury. The name '*Wiradjuri'* comes from two Wiradjuri words: 'Juray' meaning 'having' and 'Wirraay' meaning 'no', translating into 'the people who have the word wirray for saying no' (Clayton & Barlow 1997; Hosking & McNicol 1993).

It is extremely difficult to estimate the exact population of the Wiradjuri nation at the time of European contact. Population estimates range from Coe's (1986) estimate of12,000 to Clayton's (1997) of 100,000 people. Clayton's argument for the larger population estimate is based on the considerable food resources available within Wiradjuri country, a factor which certainly played a significant role in limiting the upper reaches of the population. Arguably, the population of the Wiradjuri nation is likely to have fallen anywhere between the above range and fluctuated as a result of changing environmental factors such as long term temperature variations. The small pox epidemic which decimated Aboriginal communities around Sydney in 1789 as a result of European settlement must also be factored into any population estimates.

According to Clayton and Barlow (1997), the Wiradjuri are thought to have been divided into thirty separate family groups, scattered throughout the area and with only a few population concentrations (Spennemann, 2015:11). Semi-nomadic, the Wiradjuri moved their camps throughout their range of about 40 km in radius according to the availability of food resources throughout the seasons (A. McDonald 1993). Andrews (1920:35) explained that the Wiradjuri people "usually chose a cleared space for their camps, in the neighbourhood of water, as fish and birds were their principal articles of food" and "although these camps must have been continuously used for long periods by large numbers, but little trace is left (Andrews, 1920:35). In 1844, George Augustus Robinson counted 50 huts with about 250 inhabitants while travelling through the Albury area (Robinson, n.d.). Ethnographic evidence suggests that the Wiradjuri are likely to have employed two types of shelters. Small huts built from sheets of bark from surrounding gums, branches and bushes. En route to Albury in 1844, George Augustus Robinson noted a "large camp of natives in vicinity of crossing place" (Robinson, n.d). Robinson described the huts as a 'cross beam supported by two Y-shaped branches planted into the ground with sheets of bark hooked over the beam to provide a one-sided shelter'. The extent to which these shelter types were used is uncertain; however, it would be dependent upon the availability of both the materials for building huts and access to rockshelters (which are more commonly found at the eastern extent of Wiradjuri territory). Camp sites would often be some distance back from rivers or creeks, under trees and close to firewood (A. McDonald 1993).

The first recorded contact between Wiradjuri and Europeans in the Wagga Wagga area was between Captain Charles Sturt in 1829-30 travelling from Sydney to the Murrumbidgee River passing through the site of Wagga and a party of Wiradjuri men (Montgomery, 2010). Sturt (1833) describes his interaction with the party, writing the following:

"Although the fires of the natives had been frequent upon the river, none had, as yet, ventured to approach us, in consequence of some misunderstanding that had taken place between them and Mr. Stuckey's stockmen. Mr. Roberts' stockmen, however, brought a man and boy to us at this place in the afternoon, but I could not persuade them to accompany us on our journey – neither could I, although my native boy understood them perfectly, gain any particular information from them" (Sturt, 1833, p. 149).

Later Sturt's party was joined by two Wiradjuri men who later became known to the party by the names of Peter and Jemmie, who acted as their guides (Montgomery, 2010).

Large meetings of separate Wiradjuri groups were called Burbungs (Spennemann, 2015:11). Such meetings were held for major ceremonies, particularly initiations, and to deal with important matters of business between clans. The last recorded Burbung was held in southern Wiradjuri country in 1878 near Darling Point (Clayton and Barlow, 1997).The presence of ceremonial sites can be inferred based on historical accounts of corroborees in the wider area.

Available food resources in Wiradjuri country consisted of aquatic foods such as perch, Murray cod, shellfish, frogs and yabbies. Such foods would have been abundant in interior lake systems until

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around 26,000 years ago when lakes throughout the country began to dry out as a result of increased temperatures. Wiradjuri diet would have also included terrestrial fauna such as lizards, wallabies, and emu eggs. Vegetable foods such as edible grass seeds that were cut, dried, threshed, and ground with heavy grindstones, were also consumed. William Hovell noted in 1842 that "[i]n all the creaks [sic] there are Mussels , which the Natives get, by diving for, we always find the Shells, where they have had their fires". Andrews, 1920: 22) in describing Mungabareena, noted that it was "…the usual meeting place of the various tribes when on their annual visits to the mountains in search of the "bogong" or "bugong moths".

The material culture of the Wiradjuri consisted of a wide variety of hunting implements including wooden spears, boomerangs, fishing hooks, clubs and shields. Such hunting tools were common throughout south-eastern Australia (Attenbrow 2010). Spears were often tipped or barbed with small stone points knapped from available stone material. Wiradjuri people also employed nets and traps for fishing (Clayton and Barlow 1997). Canoes were widely used for fishing and were cut from the bark of yellow gums as were wooden dishes and shields.

During winter months, it was common for fur cloaks made from possum and kangaroo skins to be worn (McDonald 1993). These were made by rubbing the skins with a smooth heavy stone after they were scraped clean and dried, and stitching large numbers together (Clayton and Barlow 1997).

The Murrumbidgee River would have represented a key resource for Wiradjuri people, providing exploitable food supplies such as mussels, fishes, water birds and turtles. While these could be collected or caught, an individual approach would not have supplied sufficient volumes of food to sustain a larger population in the event of a ceremonial gathering.

In regards to spiritual beliefs, as Attenbrow (2010) notes, commonly held beliefs in southeastern Australia include the existence of a supreme creative being. For the Wiradjuri, as it was for other groups in southeastern Australia, the ancestral spiritual being Baiame (also spelt Baiami), was the great creator. Baiame played an important role in the life of young men and women of the Wiradjuri, and was responsible for the initiation of spiritual leaders. Baiame was believed to be present at Burbungs, where he was honoured and celebrated through the telling of creation stories.

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6.0 Archaeological Context

This section describes the archaeological context of the study area on a regional and local scale. Archaeological data of relevance to this area, including the results of previous archaeological investigations within and surrounding the study area, are reviewed in order to contextualise the results of the current assessment.

6.1 Regional Context

Available archaeological data for the South Western Slopes Bioregion (SWSB) and its immediate environs[3] suggest that Aboriginal people have likely occupied the SWSB since the late Pleistocene, with radiometric dates from the Lake Urana burial site on the eastern margin of the Riverine Plain, for example, indicating a 20 to 30 kyr age range for this site (Page et al., 1994). Compared with some other adjoining bioregions (e.g., the Sydney Basin and Riverina Bioregions), the Aboriginal archaeological record of the SWSB has seen only limited investigation, a product of comparatively minor development pressures and academic research interest. Nonetheless, recent decades have seen hundreds of Aboriginal archaeological investigations incorporating survey and/or excavations carried out across the SWSB, with the overwhelming majority occurring in development-impact contexts. Collectively, these investigations have revealed a rich and diverse record of past Aboriginal occupation, with thousands of Aboriginal archaeological sites now registered on the AHIMS database and Victorian Aboriginal Cultural Heritage Register and Information System (ACHRIS). While a detailed review of the Aboriginal archaeology of the SWSB is beyond the scope of this report, some key investigation themes are detailed in brief below.

6.1.1 Open Artefact Sites: Distribution & Contents

Surface and subsurface distributions of stone artefacts, variously referred to as open artefact sites, open sites and open campsites are the most common and widely distributed form of Aboriginal archaeological site across the SWSB. Other site types, such as rockshelters, shell middens, burials, fish traps, earth mounds, scarred trees, carved trees, quarries, grinding grooves and stone arrangements have also been identified but are comparatively rare. Accordingly, open artefact sites remain the most intensively investigated component of the Aboriginal archaeological record of the SWSB, with site distribution, geomorphology and the technology of associated flaked stone artefact assemblages, in particular, comprising key research topics (see, in particular, AECOM, 2010; English & Gay, 1995; Kelly, 1980; Kelly & Pollock, 2005; Knight, 2001; Long & Associates, 2010; Officer et al., 1998; OzArk, 2004, 2012; Pardoe, 2009a, 2009b; Paton, 1994; Pearson, 1981; Silcox, 1987a, 1987b; Witter, 1980, 1990).

Existing archaeological survey data for the SWSB indicate a strong trend for the presence of open artefact sites on landform elements adjacent to creeks, rivers and lakes (e.g., source-bordering dunes, creek flats, terraces, lower slopes and spur crests). Although this distribution pattern can be attributed in part to geomorphic dynamics and archaeological sampling bias, with fluvial erosion activity along watercourses, for example, resulting in higher levels of surface visibility and concentrated survey effort, an occupational emphasis on linear and area-based water features is supported by the results of several subsurface investigations (e.g., AECOM, 2016; Long & Associates, 2010; Kelly, 1980; Officer et al., 1998; OzArk, 2004; Pardoe, 2009a; Paton, 1994). Together with available survey data, the results of these investigations have demonstrated that assemblage size and complexity tend to vary significantly in relation to the landscape variables of landform and water permanency, with larger, more complex[4] assemblages occurring on landform elements adjacent to regionally and locally significant watercourses (e.g., the Murrumbidgee, Murray, Lachlan and Macquarie Rivers), as well as lakes (e.g., Lake Cowal). Outside of these contexts, surface and subsurface artefact distributions have typically been found to be sparse and discontinuous and are often referred to as ‘background scatter’, being “artefactual material which is insufficient in number or in association with other material to suggest focussed activity in a particular location” (Douglas and McDonald, 1993).

[3] I.e., the easternmost portion of the Riverina Bioregion and the northwestern portion of the Sydney Basin Bioregion, around Mudgee and Ulan.
[4] Those containing a wider variety of raw materials and technological types and/or higher mean artefact densities.

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Flaked stone artefacts dominate archaeological finds assemblages from investigated open artefact sites across the SWSB. Other stone artefacts, such as complete and broken grindstones, anvils, hammerstones and edge-ground hatchet heads[5] have also been recorded though comparatively infrequently. Faunal remains have likewise proven elusive (but see Witter (1978) for an example). Associated archaeological features, meanwhile, have included knapping floors[6], hearths and ground ovens, with knapping floors comprising activity areas "where primacy was given the systematic reduction of stone, with or without additional activities being carried out" (White, 1997: 8). Where identified, hearths and ground ovens have taken the form of surface or subsurface concentrations of burnt clay and/or charcoal or heat retainers (for examples see Bell, 2002; Pardoe, 2009b; Witter, 1980).

6.1.2 Flaked Stone Artefact Technology

Virtually indestructible, flaked stone artefacts are a ubiquitous element of the Aboriginal archaeological record of the SWSB and, as such, have assumed a prominent position in archaeological reconstructions of past Aboriginal land use across this region. Studies of excavated and surface collected stone artefact assemblages to date have ranged from basic descriptive accounts of assemblage composition[7] to detailed attribute analyses. Notable excavated and surface collected assemblages include those recovered from sites, PADs and landscapes investigated by Officer et al. (1998), AECOM (2016, in prep), Andrew Long & Associates (2010), Ozark (2004, 2012), Kelly (1980), Silcox (1987a, 1987b), Witter (1978, 2004), Cane (1995) and Pardoe (2009a, 2009b).

Available technological and typological data for surface collected and excavated flaked stone artefact assemblages from the SWSB suggest that the overwhelming majority of these assemblages belong to what is known as the 'Australian small-tool tradition', a term coined by Gould (1969) to describe what was then thought to be the first appearance, in the mid-Holocene[8], of a new suite of flaked stone tool forms in the Aboriginal archaeological record of Australia, including backed artefacts, adzes and points (both unifacially and bifacially flaked). Complex, hierarchically-organised reduction sequences associated with the production of these tools contrast markedly with the simple sequences of earlier periods (Moore, 2011). Tools of the Australian small-tool tradition, it has been suggested, formed part of a portable, standardised and multifunctional tool kit aimed specifically at risk reduction (Hiscock, 1994, 2002, 2006). Stone artefact assemblages from late Pleistocene and early Holocene contexts, in contrast, are described by archaeologists as belonging to the 'Australian core tool and scraper tradition', a term first used by Bowler *et al.* (1970) to describe the Pleistocene assemblages recovered from Lake Mungo in western New South Wales. Bowler *et al.* (1970) saw the main components of these assemblages - core tools, steep-edged scrapers and flat scrapers - as characteristic of early Australian Aboriginal assemblages and as being of a distinctly different character to those associated with the proceeding small-tool tradition.

In southeastern Australia, the Australian 'small-tool' and 'core tool and scraper' traditions are most commonly described in terms of McCarthy's (1967) Eastern Regional Sequence (ESR) of stone tool assemblages, with 'Capertian' assemblages assigned to the latter tradition and 'Bondaian' assemblages, the former. Based on appreciable changes in the composition of chipped stone artefact assemblages over time, the ERS hypothesises a three phase sequence of 'Capertian' (earliest), 'Bondaian' and 'Eloueran' (most recent) assemblages and was developed on the basis of McCarthy's (1948, 1964) pioneering analyses of stratified flaked stone assemblages from the Lapstone Creek rockshelter, on the lower slopes of the Blue Mountains eastern escarpment, and the Capertee 3 rockshelter in the Capertee Valley north of Lithgow. At present, the most widely cited characterisation of the ERS is that of a four-phase sequence beginning with the Pre-Bondaian (McCarthy's Capertian) and moving successively through the Early, Middle and Late phases of the Bondaian, the last of which equates to McCarthy's (1967) Eloueran phase. The tripartite division of the Bondaian is based principally on the presence/absence and relative abundance of backed artefacts (Attenbrow, 2010:

[5] Note that some hatchet-heads were manufactured on unifacially or bifacially-flaked blanks
[6] Note that these features have also been referred to as 'flaking floors' and 'workshops'.

[7] I.e., with respect to the relative representation of different artefact types and raw materials
[8] More recent research into the chronology of backed artefacts and points in Australia (e.g., Hiscock & Attenbrow 1998, 2004; Hiscock 1993b) has demonstrated a long history of production and use for these implement types, with both types now known to have been produced, albeit in small numbers, in the early Holocene and likely in the late Pleistocene as well.

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101). However, other factors, such as changes in the abundance of bipolar artefacts and different stone materials, as well as the presence/absence of ground implements are also relevant.

Flaked stone artefact assemblages from excavated and surface collected/recorded open artefact sites across the SWSB attest to the exploitation of a diverse range of lithic raw materials, with a degree of sub-regional variability in raw material use also apparent (see, for example, Cane, 1995; Pardoe, 2009b). However, as a general observation, artefacts manufactured out of quartz - both milky and crystal - overwhelmingly dominate the region's existing stone artefact record. Other, less commonly exploited raw materials represented in excavated and surface collected/recorded assemblages include materials such as silcrete, quartzite, chert, chalcedony, silicified tuff, chalcedony and fine-to-coarse-grained volcanics (e.g,. rhyolite and basalt). Alongside quartz, these materials occur variously in a number of geological formations and units across the SWSB. Notably, cortical data for analysed flaked stone artefact assemblages indicate the exploitation of both primary (i.e., outcrop) and secondary (i.e., fluvial gravel deposits) raw material sources.

To date, procurement evidence at documented Aboriginal quarry sites across the SWSB has consisted of surface scatters of flaked stone artefacts in direct spatial association with naturally-occurring exposures of lithic raw materials (e.g., Brayshaw, 1987; Go Green Services, 2011; Smith, 1987). Quarries with topographic indicators of 'open cut' mining activities, such as localised circular/semi-circular depressions or trenches (cf. Binns & McBryde, 1972; Jones & White, 1988; McBryde, 1973, 1984), have yet to be identified. Of particular note to the current assessment is the Bomen axe quarry and axe manufacturing site, located in the southern portion of the study area, on Lot 23 of DP 1085826 (Go Green Services, 2011; Navin Officer, 1998). Initially identified by Navin Officer (1998), this site provides evidence for the quarrying of a localised exposure of basalt cobbles associated with an unmapped basalt dyke or sill, as well on-site axe manufacture. Surface indications of the site, which is located on north-south trending ridgeline approximately 3 km north of the Murrumbidgee River, include approximately 500 artefacts spread across an area of *c*.150 x 70 m (10,500 m^2), with recorded artefacts including cores, primary flakes, secondary flakes and axe preforms (Go Green Services, 2011: 32). Artefacts within the site occur in close spatial association with exposed basalt cobbles, which outcrop across an area of *c*.120 x 70 m (8,400 m^2), exhibit a naturally rounded brown to red brown cortex with extensive iron oxide staining and range in size from 10 cm to 50 cm in maximum linear dimension. Smaller flaked materials within the site are reported as being concentrated along the crest of the ridgeline and as having a distribution suggestive of the presence of several variously discrete and merged working floors ((Go Green Services, 2011: 32).

In contrast to the adjoining Sydney Basin and Southeastern Highlands Bioregions, existing analyses of excavated flaked stone artefact assemblages from the SWSB have largely omitted any consideration of the issue of diachronic changes in lithic raw material use, a product of generally small assemblage sizes and a lack of associated radiometric dates. To date, the only notable assessment of this issue was undertaken by OzArk (2004) as part of their analysis of a sizeable lithic assemblage (n = 2,484) recovered from a source-bordering sand dune adjacent to the Cudgegong River, west of the township of Gulgong, in the northernmost portion of the SWSB. While quartz was the dominant raw material in this assemblage, accounting for 79.4% of the assemblage by count, analysis of the vertical distribution of raw materials within the sand body at this location revealed relatively higher frequencies of 'silicified tuff / FGS' in deeper spits (OzArk, 2004: 76, Fig. 24).

While located outside of the SWSB, excavated assemblages from rockshelter sites located in close proximity to the northeastern boundary of this region (e.g., Bobadeen 1 (Moore, 1970); Botobolar 5 (Pearson, 1981); SG5 (White, 2001)) have likewise demonstrated change over time in the relative importance of different raw materials, namely, quartz and fine-grained siliceous materials (i.e., chert, silicified tuff and FGS). At Bobadeen 1 and Botobolar 5, low relative frequencies of quartz in the deepest or oldest spits were observed to give way to higher frequencies that subsequently declined again over time, albeit gradually (see OzArk, 2004: 76, Fig. 24). A different pattern, meanwhile, was apparent for the SG5 rockshelter assemblage, with quartz dominant in the site's bottom three (i.e., Spits 7-10) and upper four (i.e., Spits 1-4) spits, potentially of Early Bondaian and Late Bondaian association respectively, and 'chert'[9] dominant in Spits 5-6, potentially of Middle Bondaian association.

[9] Note that White (2001: 22) used the term 'chert' as a "very wide ranging term" for fine-grained siliceous materials, including chert and silicified tuff.

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In the Southeastern Highlands, archaeological considerations of change over time in raw material usage to date have focused on change over the course of the mid-to-late Holocene (e.g., Flood, 1980; Hughes et al., 2014; but see Flood et al., 1987 for a longer term perspective). As recently highlighted by Hughes et al. (2014), several excavated sites from across this region, which borders the SWSB to the east, have yielded flaked stone artefact assemblages that document a change from 'early' silcrete or chert-dominated assemblages with moderate to high frequencies of backed artefacts and low frequencies of bipolar artefacts to 'later' quartz-dominated assemblages with high proportions of bipolar artefacts and few backed artefacts. At Nardoo, near Lake George, and Yankee Hat Shelter 2, in the Namadgi National Park, Flood (1980) placed the transition between these distinctive 'industries' as occurring about 900 cal. BP. At Hanging Rockshelter Shelter 1, also in the Namadgi National Park, the transition was suggested to have occurred even later, at around 500-300 cal. BP (Flood, 1980). Packard (1986), in summarising the results of Jones and Allen's 1983 investigation of the 'Butmaroo 1' site, southeast of Lake George, cites a date range of 500-1,000 BP for the site's upper quartz-dominant assemblage and a range of 3,000-4000 BP for an underlying assemblage "of silcrete and quartz artefacts with backed blades made on both raw materials". More recently, Hughes et al. (2014: 30-31) cited a minimum age of "2,400 ya" for the 'early' silcrete and backed artefact-rich / bipolar-poor assemblage recovered from the eastern ridge of the 'WE-1' site, located on the Woolshed Embankment at the northern end of Lake George. A quartz and bipolar-rich 'later' assemblage recovered from the western ridge, in contrast, was argued to post-date 1300 cal. BP (Hughes et al., 2014: 31).

Backed artefacts, scrapers and cores dominate the "formed" components of dated and undated Bondaian stone artefact assemblages from the SWBS. Other implements types, such as unifacially and bifacially-flaked pebble tools (i.e., 'choppers'), notched flakes, edge-ground hatchet heads, points, burins and miscellaneous retouched flakes, have also been recorded, albeit relatively infrequently. Excavated and surface collected / recorded assemblages of backed artefact assemblages from the region include the main three categories of this implement type, namely, Bondi points, geometric microliths and elouera. Scrapers, meanwhile, have been identified in a wide range of shapes and sizes. Recovered cores indicate the use of both freehand percussion and bipolar reduction, with cores flaked via freehand percussion indicating the application of a variety of core reduction methods.

6.1.3 Quartz Flaking: Problems of Artefact & Site Identification

As highlighted in Section 6.1.2, artefacts manufactured out of quartz dominate the existing open artefact site record of the SWSB, with other lithic raw materials, such as chert, quartzite and silcrete, typically comprising only minor components of excavated and surface collected / recorded assemblages. Despite its ubiquity, as a raw material for the production of stone artefacts, quartz has and continues to pose a number of analytical and interpretive challenges for archaeologists working in the SWSB, challenges faced and discussed at length by numerous other Australian and international researchers working in quartz-rich environments (e.g., Dickson, 1977; Driscoll, 2011; Hiscock, 1982; Holdaway & Stern, 2004; Knight, 1991; Moore, 1997, 2000; Tallavaara et al., 2010). While Aboriginal knappers in the SWSB routinely utilised quartz for flaked stone tool production, the internal characteristics of this material are such that the patterned conchoidal features used by archaeologists to identify Aboriginal quartz artefacts are often poorly expressed, making positive site identification difficult and hampering efforts to draw robust behavioural inferences from the analysis of predominantly small, quartz-dominated assemblages (Witter, 2004).

Moore (1997: 270), like many other Australian researchers, has argued that sorting culturally modified quartz items from naturally-fractured ones, is a "very difficult" task. Building on early replicative and archaeological studies by researchers such as Dickson (1977), Hiscock (1982) and Knight (1991), the results of Moore's (1997) experimental study of Aboriginal quartz reduction, a study "implemented as a preliminary attempt to define characteristics that can be used to differentiate quartz debris produced exclusively by human action from quartz debris produced by both natural (modern) human action" (Moore 1997: 271), are of particular relevance to the SWSB and current assessment.

Prior to Moore's study (1997), the identification and classification of quartz artefacts in Australian lithic studies had rarely been examined in detail. As highlighted by Moore (1997: 272-3), before this time, the most common approach to identifying quartz flakes in potential Aboriginal assemblages involved searching for the same attributes used to identify flakes in other raw materials, with two of the most commonly cited attributes being a striking platform and bulb of percussion. Dickson (1977: 110), for example, identified quartz flakes in his replicated assemblage as those that met "the usual

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[conchoidal] specifications". Similarly, Bird (1995: 18), in his analysis of the flaked stone assemblage recovered from Mount Talbot 1 rockshelter in the Southern Wimmera of Victoria, identified flakes of all raw materials, including quartz, on the basis of "any of the defining characteristics of conchoidal fracture". Brown (1993: 264), too, identified quartz flakes at Mannalargenna Cave on Prime Seal Island in Bass Strait, as those exhibiting a striking platform and bulb of percussion. Other scholars, however, have stressed that conchoidal attributes in quartz are either poorly developed or absent altogether. Bowdler (1984: 112), for example, in her analysis of quartz artefacts from Cave Bay cave on Hunter Island, Tasmania, stressed that bulbs of percussion and striking platforms were extremely rare and, as a consequence, assigned the term 'flake' to all lithics which appeared to have been flakes, split or broken. In a similar fashion, Vanderwal (1984), in his analysis of a series of large quartz assemblages from coastal Tasmania, identified as flakes all "relatively flat" quartz fragments with "at least one sharp edge". Witter (1990), meanwhile, has argued that materials such as quartz "do not fracture conchoidally" (cf. Dickson, 1977; Hiscock, 1982: 38)

Working from this basis, Moore's (1997) study involved a series of quartz reduction experiments aimed at the development of a set criteria for the identification of quartz artefacts. Approximately 20 unmodified milky quartz pebbles from a number of inland locations throughout northeastern Tasmania were reduced via freehand percussion using a medium-sized metasedimentary beach cobble hammerstone. All objective flake and/or shatter products were subsequently examined to identify potential impact characteristics. Based on this examination, Moore (1997: 277) identified several variables which he argued should, in combination, "prove reliable for identifying quartz debris that is clearly cultural in origin". The first variable relates to the angularity of fragments produced during quartz reduction. Moore observed that the majority of fragments produced during his reduction experiments exhibited at least one margin created by two planes intersecting at an acute angle (<90°). Residual quartz exposures examined in unaltered settings, in contrast, were typically dominated by small quartz pebbles with faces orientated closer to 90° to each other. The faces in question also tended to be uniformly damaged and/or rounded due to soil abrasion (Moore, 1997: 277). Nonetheless, given the ubiquity of angular quartz fragments in areas subject to modern disturbance, Moore has stressed that "angularity alone is not a sufficient criterion for declaring a concentration of quartz cultural in origin" (Moore, 1997: 284)

The second variable identified by Moore (1997) concerns the morphology of flake striking platforms produced during freehand quartz reduction. These, Moore (1997: 277) suggests, will typically exhibit a platform angle between 45° and "somewhat less than 90°" and will be between 0.5 and 2.5cm in width. Flakes created by bipolar reduction, he qualifies, will not exhibit the above morphology, with this form of reduction typically resulting in dorsal platform shattering and other diagnostic shatter characteristic, including 'annular cracks', 'ring cracks' and 'linear striation-like features' (Moore, 1997: 278-83). Annular cracks appear within a circular area surrounding the point of percussion (up to 0.5 cm but typically <0.3cm) and are most readily identifiable on cores. Radial cracks, in contrast, radiate out from the point of percussion and are typically orientated more-or-less at right angles to the annular cracks. Both features, Moore (1997: 281) proposes, combine "in such a way as to produce considerable quantities of percussion shatter" during quartz core reduction. Finally, Moore notes that linear striation-like features are often visible on the ventral surface of quartz flakes, radiating out from the point of percussion, and relate to the propagation of the fracture front following impact (Moore, 1997: 282)

The above attributes notwithstanding, the results of Moore's (1997) own replication experiments reinforce the difficulties encountered by archaeologists attempting to identify and analyse quartz assemblages. When classified based upon the presence or absence of the conchoidal features described above, approximately 85% to 90% of the replicated quartz debris from Moore's quartz cobble reduction 'events' lacked such features. Indeed, Moore (1997: 284) was himself forced to conclude that "most or all of this debris will be inseparable from natural quartz in settings where cultural reduction is mixed with naturally deteriorated quartz". The percentage of fragments with conchoidal features was uniformly low, ranging from 9.6% to 15.9%.

Outside of the technological attributes described above, Moore (1997: 276) has argued that the "context of a potential Aboriginal quartz scatter should be the first consideration of the field archaeologist". Where identified in areas known to contain no naturally occurring quartz, the likelihood that a scatter is, in fact, cultural in origin is high (Moore, 1997: 285). Conversely, quartz scatters identified in areas known to contain an abundance of quartz must be treated with caution and their constituent fragments carefully examined for conchoidal fracture attributes.

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6.1.4 Aboriginal Burial Practices

Compared with the 'lower', 'central' and 'upper' portions of the Murray River system (after Littleton, 1998), which fall largely or exclusively within the Riverina and Murray Darling Depression Bioregions and contain numerous much-studied Aboriginal burial sites (Figure 17), including the internationally renowned Lake Mungo burials, the nature, distribution and chronology of Aboriginal burial sites in the SWSB has received little analytical or interpretive attention. Nonetheless, Aboriginal burials do feature prominently in the published and unpublished archaeological literature of this region, a product both their high cultural significance to contemporary Aboriginal people and the national archaeological significance of Aboriginal burial sites within the Murray River corridor (see, for example, discussions in Hiscock, 2008: 223-228; Lourandos, 1997; Mulvaney & Kamminga, 1999).

Previously identified Aboriginal burial sites within and immediately adjacent to SWSB have included single and multiple internments and been identified, or reported as occurring in, riverine, hillslope and lakeshore contexts (Bowdler, 1976; Kayandel Archaeological Services, 2007; Page et al., 1994; Pardoe, 1990, 2009b; Paton & Hughes, 1984). Notable examples include the Taronga Drive burial at Cowra (Pardoe, 1990), dated to between 100 and 150 years ago, the Lake Urana burial, dated to between 20 and 30 kyr (Page et al., 1994) and the four burials identified in the Roseleigh Sand Dune, near Albury (Bowdler, 1976; Paton & Hughes, 1984). Skeletal remains associated with 'misadventure', as opposed to formal burial, have also been identified (Pardoe & Webb, 1986). No cemeteries are known. However, it should be noted that there remains high potential for their identification in the future, with source-bordering dunes associated with the Murrumbidgee, Murray, Lachlan and Macquarie Rivers, in particular, representing prime potential burial locations.

At present, the Lake Urana burial, located on the eastern margin of the Riverine Plain, remains the oldest known burial site within the immediate vicinity of the SWSB. Thermoluminescence (TL) dates for the stratum containing the human remains at this site (i.e., 25.6±7.3 kyr and 32.4±8.0 kyr), which occurred in a lunette at the southern end of the lake, indicated a 20 to 30 kyr age range (Page et al., 1994: 43). While partially destroyed by quarrying activities, analysis of the Lake Urana remains identified these as belonging to an adult female aged between 35 and 40 years old (Page et al., 39-41). No burial goods were identified in association with the skeletal remains at the time of the original find. However, additional archaeological materials, consisting of "two large grindstones and numerous amorphous quartzite artefacts" were identified at the site during a subsequent detailed survey (Page et al. 1994: 39). The spatial relationship of these finds to the original burial remains unclear. However, it is noted that the site has been referred to as both a burial and occupation site (Page et al., 1994). Notably, TL dates on beach and lunette deposits at Lake Urana suggest that the period between *c*.30 and 25 kyr was one of full freshwater lake conditions, with associated faunal resources, which would have included marsupials, reptiles, emu eggs, mussels and fish, capable of supporting human occupation (Page et al., 1994: 43).

While based exclusively on burial and skeletal datasets from areas to the west of the SWSB, broader-scale archaeological interpretations of the mortuary record of the Murray River corridor are also of note here (e.g., Hiscock, 2008; Littleton & Allen, 2007; Pardoe, 1988, 1990b, 1995, 2003; Webb, 1987, 1995). Drawing on various lines of evidence, including burials, human biology, ecological patterning and historical documentation, Pardoe (1988) proposed a still influential cultural model of social and territorial organisation based on the concept of exclusion. Central to this model is the idea that Aboriginal societies within the Murray River corridor were based on strict territorial boundaries, with social organization based on corporate, localised and unilineal descent groups (Pardoe & Martin, 2001: 44). Pardoe argued that Murray River cemeteries represent territorial markers, with increasing numbers of these sites, as well as greater burial densities within some, suggestive of population increase through time. Extreme levels of biological variation along Murray River corridor, as evidenced in skeletal remains, have similarly been attributed by Pardoe (1990b) to the existence of large, high-density populations occupying relatively small territories.

Like Pardoe, Webb (1987, 1995) identified the central Murray as an area occupied by sedentary groups living under high population densities. Unusually high frequencies of pathological skeletal conditions in this area, Webb (1987) argued, could be attributed to relatively high levels of aggregation and sedentism, with both variables creating living conditions in which intestinal parasites and infectious diseases were common (but see Robertson, 2003). More recently, Littleton and Allen (2007) have challenged the concept of cemeteries as symbols of bounded territories or common group identify, arguing that these sites were not exclusively or continuously used by single sedentary groups

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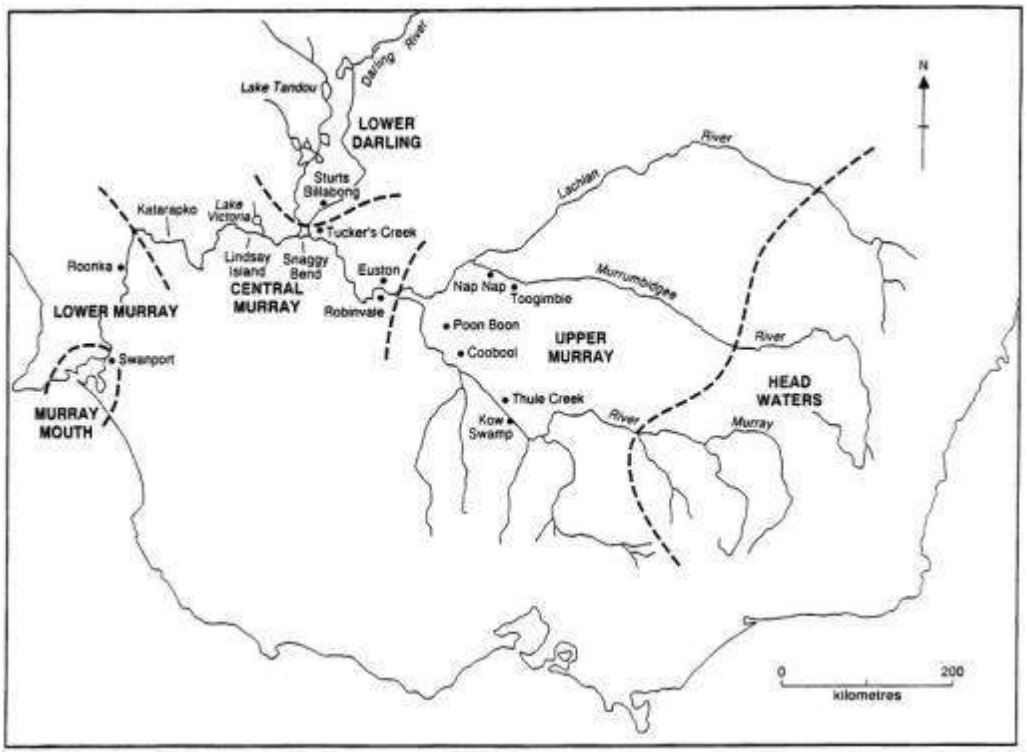
of people but rather, were used by multiple groups moving flexibly across the land. Utilising the concept of persistent place use (after Schlanger, 1992), Littleton and Allen (2007) contend that the existence of cemeteries within the Murray River corridor need not be linked to increased territorialism, as hypothesised by Pardoe (1988). Instead, the existence of such sites is best interpreted as a product of the structured re-use of particular locations over long periods of time, with the groups involved sharing similar ideas about what constituted a suitable location for burials and initial burial activities at each site focusing and restructuring their successive use (Littleton and Allen, 2007: 295-296). Finally, attention is drawn to Hiscock's (2008: 227-228) suggestion that variations in cemetery abundance and grave densities within the Murray River corridor need not be linked to population size or growth but may instead reflect factors such as taphonomic bias and changing local cultural practices.

Figure 17 Map of the Murray Basin showing burial sites with more than 20 burials (from Littleton, 1998: 2, Fig. 1)



6.1.5 Chronology of Occupation

Evidence for late Pleistocene/early Holocene Aboriginal occupation of the SWSB has proven elusive, with potential occupation evidence from these periods obtained from only a handful of sites. Documented examples include open artefact site BY/6, located on a creek terrace or floodplain adjacent to Jeralgambah Creek, east of Illabo (Witter, 1980), open artefact site 36-2-106, located on a source bordering dune adjacent to Cudgegong River, west of Gulgong (OzArk, 2004), and the 'PAD 3A' site, located on a right bank terrace of the Murray River, in Albury (Kelly & Pollock, 2005). The paucity of 'early' occupation evidence in the region stands in contrast to regions to the west (i.e., the Riverina and Marling Darling Depression Bioregions), which contain numerous sites with Late Pleistocene to early Holocene components (Hiscock, 2008; Pardoe, 2003; Pardoe & Martin, 2001).

No radiometric dates are available for the BY/6 or Cudgegong River sites, with the former identified as a "potential Pleistocene site" on the basis of its geomorphic setting and the identification, within and near it, of two flaked stone artefacts of possible Pleistocene/early Holocene antiquity (Witter, 1980:). Potential pre-Bondaian occupation of the source bordering dune adjacent to the Cudgegong River, meanwhile, was inferred on the basis the technological and typological characteristics of the flaked stone artefact assemblage recovered from this site, with the 'lower' component of the assemblage, obtained from deeper spits, showing relatively higher frequencies of siliceous tuff / FGS and other technical features consistent with an 'early' date (see Ozark, 2004: 69-72). Archaeological excavations at the 'PAD 3A' site in Albury, documented in Kerry and Pollock (2005), were undertaken as a follow-up to an earlier subsurface investigation which identified an isolated stone artefact in the upper portion

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of a previously undescribed 'sand stratum' commencing at *c*.90 cm BGL. TL dating of a soil sample from this stratum, obtained from a depth of 1 m BGL, returned an age of 12,000±0.7 ka (AL01). Kelly and Pollock (2005) report the recovery of additional four potential quartz artefacts from the sand stratum in question, none of which exhibited strong technological attributes of human manufacture. However, all were considered to comprise manuports.

In stark contrast to the late Pleistocene/early Holocene, evidence for mid-to-late Holocene Aboriginal occupation of the SWSB abounds, with numerous excavated and surface collected sites producing assemblages that can be confidently assigned to these periods on the basis of radiometric dates and/or their typological/technological profiles (e.g.,). While radiometric dates are available for a number of sites, the largely undated open site record of the SWSB has led to a reliance on the dating of excavated archaeological finds assemblages through relative means, specifically, through consideration of the typological and technological composition of associated flaked stone artefact assemblages. While offering a useful chronological framework within which to assess diachronic changes in stone artefact technologies and raw material use, the largely undated and palimpsest character of the open site record of the SWSB represents a significant analytical and interpretive obstacle for period-specific reconstructions of Aboriginal mobility regimes (cf. Cowan, 1999).

While evidence for Late Pleistocene / Early Holocene occupation of the study region has been difficult to identify, geomorphic contexts favourable to the preservation of 'early' occupation deposits are well represented within the SWSB. Outside of rockshelters, which make up only a minor component of the known Aboriginal archaeological record of the SWSB, documented examples have included creek and river terraces, as well as source bordering dunes.

6.1.6 Occupation Models

Of-cited occupation models for the SWSB include those formulated by Witter (1980) and Pearson (1981). Witter's (1980) model, developed as part of an archaeological assessment of a proposed natural gas pipeline route between Wagga Wagga and Young, identified two "cultural adaptions" for the broader study region, namely, a "Riverine Oriented Cultural Adaption" and a "Plateau Oriented Cultural Adaption". The former, Witter (1980) proposed, would have focused on the abundant floral and faunal resources of the Murray, Darling and Murrumbidgee River ecosystems. In riverine contexts, root staples such as *Typha* and *Triglochia procera* would have been supplemented by freshwater faunal resources such as mussels, yabbies and fish. Witter (1980) suggested that the principal archaeological indicator of this adaption are the remains of "cooking pits" (i.e., hearths / ground ovens), which were used to bake the roots of aquatic plants.

For the region between Wagga Wagga and Junee, which encompasses the current Project area, Witter's (1980) Riverine Oriented Cultural Adaption holds that, excluding periods of flooding, occupation would have been concentrated in red gum woodlands (Eucalyptus camaldulensis) on alluvial flats adjacent to watercourses. Such areas "would have provided an abundant source of aquatic and semi-aquatic plant flood in the form of roots and tubers" as well as "shelter from the open plains and reduced heat radiation during the night" (Witter, 1980: 11). For the region between Junee and Young, Witter's Plateau Oriented Cultural Adaption holds that, while occupation in this region was still focused on watercourses, a wider variety of landform elements would have been utilised, including ridges and other elevated landform elements. Use of such landforms may have been prompted by the development of cold air traps in valley bottoms (Witter, 1980: 12).

Formulated as part of a wide-ranging investigation into pre- and post-contact Aboriginal occupation in the upper Macquarie River region, Pearson's (1981) land use model was based, in part, on an analysis of archaeological site distribution within four selected sample areas, including the Mudgee-Cooyal and Wellington areas. Consistent with the results of more recent site distribution analyses, Pearson (1981) found that the size of Aboriginal camp sites in his dataset (n = 42), defined by him as "the area of ground covered with a reasonable density of artefacts", increased as distance from water decreased. In other words, larger sites were concentrated along watercourses. While acknowledging that several factors may have been responsible for this trend, Pearson (1981: 94) identified the spatial and economic[10] requirements of larger groups as potentially important factors. Away from creeklines, in areas of hilly or undulating terrain, Pearson (1981: 99) identified a preference for dry, well-drained

[10] I.e., with respect to water

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locations, with the majority of sites also sheltered from prevailing winds (or located near such shelter) and/or offering commanding views over nearby watercourses.

Drawing the various strands of his analysis together, Pearson (1981: 101) concluded that the "desirable features" of a camp site within the selected sample areas were accessibility to water, good drainage, favourable elevation, the presence of level ground, a sunny leeward aspect and adequate fuel. Landform contexts identified by Pearson (1981:101) as meeting these needs included gentle (i.e., low gradient) hillslopes and undulating ground, flat areas on ridges (particularly at lower elevations), river flats and creek banks, with the last two offering "accessibility to water but few of the other desirable features" (Pearson, 1981: 101). While pertinent to camp site selection, Pearson (1981: 101) cautioned that the location of non-occupational sites, such as quarries, burials, grinding groove and ceremonial sites, was likely based on different locational principles.

Together with available ethnohistorical records, the results of the above-described site distribution analysis were used by Pearson (1981) to infer a picture of "traditional Aboriginal settlement patterns" for the upper Macquarie region as a whole. According to Pearson (1981: 118-119), the region appears to have supported a relatively small Aboriginal population that was, at least at contact, broken into three 'clans' centred around the Wellington, Mudgee-Rylstone and Bathurst areas respectively. Relations between these clans, each of which contained a number of smaller, self-sufficient groups (i.e., bands) for the purposes of day-to-day subsistence, varied from friendly to "warlike" (Pearson, 1981: 119). Individual bands moved camp regularly, with the length of stay in any one location limited by factors such as the availability and attractiveness of food and other economic resources, camp hygiene, ceremonial obligations and "a desire for a change of scene" (Pearson, 1981: 119). Low gradient, well-drained landform elements close to water were favoured as camp sites, with differences in group size influencing the location of a camp in relation to water. Individual clan territories will have included a central, highly productive sub-region, with other, less productive sub-regions around it (Pearson, 1981: 119-120).

6.1.7 Archaeological Site Distribution

Aboriginal site distribution across the SWSB has been linked to a variety of environmental factors. Amongst other variables, these have included proximity to water, stream order, proximity to economic plant and animal resources, landform and geology (e.g., AECOM, 2016; English & Gay, 1995; Smith, 1992; Witter, 1980). Based as they are on archaeological datasets from differing assessment areas and environmental contexts, existing predictive models / statements for the region unsurprisingly vary in their particulars. Nonetheless, several reoccurring observations regarding site distribution can be identified. These include the following:

- Most sites are located within 100 m of an exploitable water source;
- Artefact density varies significantly with water permanency, with larger, more complex sites occurring in association with higher order watercourses, as well as lakes, wetlands and springs;
- Artefact density varies significantly with landform, the highest densities occurring on low gradient landform elements adjacent to watercourses;
- Sand bordering dunes associated with the region's major river systems are prime landforms for the identification of Aboriginal archaeological materials, particularly burials.
- Aboriginal archaeological sites within the SWSB cannot be adequately characterized on the basis of surface evidence alone. Most areas, regardless of surface indications, contain subsurface archaeological deposit(s), albeit of highly variable character.
- Trends in artefact density and distribution indicate long-term, large scale patterns. Short term models of settlement organization are insufficient to account for observed artefact distributions;
- Artefact distributions do not form bounded 'sites' but rather 'landscapes';
- Social and/or symbolic factors may have influenced site selection along with the distributions of economic and other resources.

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6.2 Local Archaeological Context

6.2.1 Previous Archaeological Investigations within the Study Area

Five previous Aboriginal archaeological field investigations have been undertaken within the study area. Investigations to date have been restricted to pedestrian survey, with surveys undertaken by Navin Officer Heritage Consultants Pty Ltd (1998), Kelleher Nightingale Consulting Pty Ltd (2008), Go Green Services (2011), AECOM (2010) and ngh Environmental (2016). The results of these investigations are summarised in brief below.

In 1998, Navin Officer completed archaeological survey across the southern portion of the study area as part of the proposed Bomen power plant project. The report for this assessment is not available from the OEH, however a search of the AHIMS database indicates that three Aboriginal sites were identified within the current study area. These included isolated artefact sites 'East Bomen IF1' (AHIMS#56-1-0045) and 'East Bomen IF2' (AHIMS#56-1-0044), as well as axe quarry site 'East Bomen 1' (AHIMS#56-1-0043). According to the site card, East Bomen 1 is located in Wagga Wagga City Council property on the crest and upper slope and is associated with outcropping basalt and granite. Officer and Navin (1998: 16) note that 'the site provides evidence for the on-site procurement of basalt rock through the flaking of naturally occurring surface cobbles, and subsequent on-site reduction of this flaked material to form axe (or hatchet) preforms'.

In 2008, Kelleher and Nightingale (KNC) completed an Aboriginal heritage assessment of eight regions in Wagga Wagga, including Bomen as part of the Wagga Wagga Local Environment Study. During their limited archaeological survey in Bomen they identified a single isolated artefact site 'BIF1' (AHIMS#56-1-0109/56-1-0111[11]) comprising a mudstone flake. In addition to limited survey, KNC undertook sensitivity mapping for Bomen noting that upper hillslopes and crests with granite outcrops, undulating flats, and drainage lines were highly or moderately to highly sensitive, while ridges and crests were moderately sensitive, and upper, middle and lower slope were of low or low to moderate sensitivity.

In 2010, AECOM completed an Aboriginal heritage assessment for the Bethungra to Wagga Wagga (Bomen) APA gas pipeline. During the archaeological survey a total of 36 Aboriginal sites were identified – six isolated artefacts and 30 low density artefact scatters. Of the sites identified, two thirds (n=23; 70%) were found within 50 m of a water source with the remainder (n=11; 30%) identified further than 50m from the nearest water source. The proposed alignment of the pipeline traversed the central section of the current study area which was subject to archaeological survey resulting in the identification of an artefact scatter site (APA 36) comprising three quartz cores and five quartz flakes on a hill crest with an exposed granite boulder outcrop. APA 36 is located approximately 35 m from the study area.

In 2011, Go Green Services undertook an inspection of axe quarry site 'East Bomen 1' (AHIMS#56-1-0043) as part of a proposal to have the site declared an Aboriginal Place. Go Green Services, alongside members of the local Aboriginal community completed a significance assessment for the site finding that it had high scientific, educational and cultural significance. Subsequently, a submission to register the site as an Aboriginal place was made to the Minister in 2012 which was approved on 23 March 2012.

In 2016, ngh Environmental undertook a due diligence assessment for a proposed solar energy system (not associated with the current assessment). As part of the assessment, ngh Environmental Pty Ltd completed targeted archaeological survey within the study area resulting in the identification of one Aboriginal site – artefact scatter site 'Bomen Solar IS01' (AHIMS#56-1-0437) comprising two quartz flakes located in the centre of the study area.

6.2.2 AHIMS Database

A search of the AHIMS database was undertaken on 30 November 2017 for a 10 x 10 km area centred on the study area. A total of 29 Aboriginal archaeological sites were identified within the search area comprising 20 open artefact sites (i.e., artefact scatters and isolated artefacts), six scarred trees, and three stone quarries. Consideration of the location of previously recorded sites indicates five are located within the study area including open artefact sites – 'BIF1' (AHIMS#56-1-0109/56-1-

[11] 56-1-0111 is a duplicate record for 56-1-0109

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0111[12]), 'East Bomen IF1' (AHIMS#56-1-0045), 'East Bomen IF2' (AHIMS#56-1-0044), 'Bomen Solar IS01' (AHIMS#56-1-0437) and axe quarry site 'East Bomen 1' (AHIMS#56-1-0043). Site details are provided in the table below with their locations shown on Figure 18.

Table 5 AHIMS sites within the study area

AHIMS Site ID	Site name	AHIMS Centroid Coordinates (MGA 55)		Site type	Current AHIMS status	Reference
56-1-0109	BIF1	540719	6120812	Isolated artefact	Valid	Kelleher Nightingale Consulting Pty Ltd (2008)
56-1-0045	East Bomen IF1	539405	6119039	Isolated artefact	Valid	Navin Officer Heritage Consultants Pty Ltd (1998)
56-1-0044	East Bomen IF2	538670	6118650	Isolated artefact	Valid	Navin Officer Heritage Consultants Pty Ltd (1998)
56-1-0043	East Bomen 1	538635	6119129	Axe quarry	Valid	Navin Officer Heritage Consultants Pty Ltd (1998)
56-1-0437	Bomen Solar IS01	540564	6120660	Isolated artefact	Valid	ngh Environmental, (2016)

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Figure 18 AHIMS Registered Aboriginal Sites

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6.3 Archaeological Predictions

A review of the existing archaeological and environmental context of the study area suggests that material evidence of past Aboriginal activity within the area is likely to be restricted to flaked stone artefacts in surface and subsurface contexts and scarred trees where mature trees remain. Accordingly, key predictions for the study area's Aboriginal archaeological record are as follows:

- The dominant raw material for flaked stone artefact production within the study area will be quartz;
- Flaked stone artefact assemblages will be dominated by flake and non-flake debitage items (sensu Andrefsky 2005), with formed objects (i.e., cores and retouched implements) comparatively poorly represented;
- Raw material sources suitable for knapping, in the form of quartz and basalt, may be present on crests and ridgelines. Evidence of quarrying may be present at these locations.
- Tool types of demonstrated chronological significance will be restricted to backed artefacts and/or edge-ground hatchet heads;
- Potential exists for the presence of modified or carved Aboriginal scarred trees where mature trees are present; and
- Subsurface artefact distribution across the study area will vary significantly in relation to proximity to water.

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7.0 Archaeological Survey and Test Excavation

7.1 Survey

7.1.1 Aim and Objectives

The aim of the archaeological survey was to identify, record and map Aboriginal heritage values within the study area. These values include both the tangible remains of past Aboriginal activity (i.e. archaeological evidence) as well as intangible cultural values. To achieve these aims, the following specific survey objectives were developed:

- to comprehensively survey, by pedestrian transects, land within the study area.
- to identify and record Aboriginal archaeological sites within the study area.
- to inspect, where appropriate, areas of known or potential Aboriginal cultural value, including AHIMS sites, and areas identified by RAP representatives.
- to obtain sufficient data to facilitate the development of appropriate management and mitigation measures for identified Aboriginal sites and areas of archaeological sensitivity.

7.1.2 Methodology

A field team of two AECOM archaeologists (Geordie Oakes and Andrew McLaren) and four RAPs representatives completed the archaeological survey of the study area over four days including 16, 17, 30 January and 7 February 2018. A list of representatives who participated in the archaeological survey is provided in Section 3.0**.**

All survey was conducted on foot, with a total of 15 transects executed across the study area. The location of each transect completed during survey, including start and end points, was recorded using one of two handheld differential GPS units, with associated transect data (e.g., GSV and GI ratings) entered directly into the same unit upon the completion of each transect.

7.1.3 Site Definition

The definition, in spatial terms, of Aboriginal archaeological sites is a topic of considerable importance to modern cultural heritage management and one that has generated significant discussion in Australian archaeology (e.g., Doleman 2008; Holdaway, 1993; Holdaway et al. 1998, 2000; MacDonald & Davidson 1998; McNiven 1992; Robins 1997; Shiner 2008). Aboriginal archaeological sites can be broadly defined as places in the landscape that retain physical evidence of past Aboriginal activity. Such evidence, of course, can assume a range of forms, depending on the nature of the activity or activities that produced it, and can vary dramatically in quantity and extent. Some Aboriginal archaeological sites are, by their very nature, easy to define in spatial terms, with scarred trees and rockshelters, for example, readily distinguishable from their surrounding landscapes. Difficulties arise, however, for sites whose present-day physical extent is, more often than not, a product of geomorphic processes, as opposed to the actions of Aboriginal people in the past.

Although relevant to a variety of site types, geomorphic processes such as soil erosion and aggradation, are of particular relevance to identification and definition of surface scatters of stone artefacts, commonly referred to as ‘open camp sites’ or ‘artefact scatters’. It is, for example, now widely accepted that the archaeological visibility of such sites is, in most instances at least, entirely dependent on the operation of such processes, which will have acted variously to expose, conceal or remove completely associated archaeological materials (Dean-Jones & Mitchell 1993; Fanning et al. 2008, 2009; Shiner 2008). As demonstrated by countless large-scale excavations projects in south-eastern Australia, surface artefacts invariably represent only a fraction of the total number of artefacts present within these sites, with the majority occurring in subsurface contexts. Artefact exposure, unsurprisingly, is highest on erosional surfaces and lowest on depositional ones. At the same time, in many areas, surface artefacts have been shown to form part of more-or-less continuous subsurface distributions of artefacts, albeit with highly variable artefact densities linked to environmental variables such as stream order and landform.

Such evidence poses a significant analytical and interpretive dilemma. Defining sites on the basis of surface artefacts alone is clearly problematic, with modern site boundaries invariably reflecting the size

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and distribution of surface exposures as opposed to the actions of Aboriginal people in the past. Nonetheless, for pragmatic reasons, this is the most commonly used approach, with 'distance' and 'density-based' definitions dominating. In NSW, two of the most commonly employed distance-definitions are '*two artefacts within 50m of each other*' and '*two artefacts within 100 m of each other*'. Neither definition is derived from a particular theoretical approach or body of empirical research - they are simply pragmatic devices for site definition. Definitions based on artefact density also vary in their particulars. However, one of most commonly used definitions is that which isolates, within an arbitrarily defined 'background scatter' of one artefact/100 m², higher density clusters that are subsequently defined as 'sites'.

Non-site or distributional archaeology offers an alternative approach to distance and density-based site definitions (Ebert 1992; Foley 1981), with individual artefacts, not sites, treated as the basic units of analysis (for published Australian examples see Doelman 2008; Holdaway et al. 2000; McNiven 1992; Robins 1997; Shiner 2008). While recognising the interpretive potential of non-site approaches with respect to data analysis and discussion, their implementation in the context of cultural heritage management studies is difficult. Here, the identification of 'sites' is required for reasons of recording (i.e., their entry into site databases such as AHIMS) as well as ease of relocation, protection, and ongoing management. The identification of spatially-discrete 'sites', therefore, offers the most pragmatic approach to Aboriginal heritage management in impact assessment contexts (but see McDonald 1996 for a different approach).

For this assessment, the '*two artefacts within 100 m of each other*' definition has been adopted.

7.2 Survey Results

7.2.1 Survey Coverage and Effective Coverage

As indicated in Section 7.1.2 and shown on Figure 19, a total of 15 pedestrian transects were completed over the study area. While all parts of the study area and all landforms were investigated, recorded transect data indicate that a total survey coverage of approximately 204.1 ha, representing around 53.7% of the total study area, was achieved.

Effective coverage estimates for each transect completed during survey, shown in Table 6, are, for the most part reasonable, with 13 exceeding 10%. Ground Surface Visibility (GSV) across the study area was generally good, ranging from 30-90% due to historic ploughing. Areas of enhanced GSV comprised erosion exposures and ploughed fields. Calculation of the total effective coverage achieved for the current survey indicates that around 22.9% (*c*.46.8 ha) of the survey area could be effectively surveyed for surface Aboriginal archaeological materials.

Table 6 Effective coverage data for the current survey

Survey Unit	Landform Units	Survey Unit Area (ha)	Visibility %	Exposure %	Effective coverage (ha)	Effective coverage %
Transect 1	Simple slope	9.4	60	20	1.1	12
Transect 2	Simple slope	11.5	60	30	2.1	18
Transect 3	Simple slope	17.1	60	40	4.1	24
Transect 4	Simple slope	18.4	60	30	3.3	18
Transect 5	Simple slope	15.0	60	30	2.7	18
Transect 6	Simple slope, lower slope	18.2	60	40	4.4	24
Transect 7	Lower slope, middle slope	15.6	60	40	3.7	24
Transect 8	Middle slope, lower slope	11.7	90	90	9.5	81
Transect 9	Lower slope	18.2	30	20	1.1	6

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Survey Unit	Landform Units	Survey Unit Area (ha)	Visibility %	Exposure %	Effective coverage (ha)	Effective coverage %
Transect 10	Middle slope, upper slope, crest	11.0	40	20	0.9	8
Transect 11	Lower slope	3.9	50	50	1.0	25
Transect 12	Lower slope, middle slope, upper slope, crest	27.5	50	50	6.9	25
Transect 13	Lower slope, middle slope, upper slope, crest	8.0	50	50	2.0	25
Transect 14	Middle slope, upper slope, crest	9.7	50	50	2.4	25
Transect 15	Upper slope, crest	8.9	60	30	1.6	18
Total		**204.1**	**-**	**-**	**46.8**	**22.9**

7.3 Surface Artefacts

A total of 36 individual stone artefacts were recorded during the archaeological survey. A simplified typological breakdown of the recorded assemblage (Table 7) shows that half the assemblage consists of non-flake debitage items (i.e., angular shatter) (n=18; 50%). Flake debitage items include complete flakes (n=3, 8.3%), proximal flakes (n=2, 5.6%) and flake shatter fragments (n=7, 19.4%). Formed objects (i.e, cores) make up the remainder of the assemblage (n=6, 16.7%). Quartz was the only raw material recorded. Recovered artefacts were generally small, with an average maximum linear dimension of 17.9±15.7 mm (range: 1.5-70.7 mm) (Table 8).

Cortex is poorly represented in the survey assemblage, with only one artefact retaining cortex at discard. Identified cores include four multidirectional cores and two unidirectional cores. All were manufactured on indeterminate blanks.

Table 7 Simplified typological breakdown of artefacts

Type	Quartz	% Total
Complete flakes	3	8.3
Flake shatter	7	19.4
Proximal flakes	2	5.6
Angular shatter	18	50
Cores	6	16.7
Total (n)	**36**	**100**

Table 8 Descriptive statistics for the size of artefacts

Attribute	N	Mean	StDev	Min	Max
MLD (mm)	36	17.85	15.2	1.5	70.7

7.4 Sites

A total of 22 Aboriginal archaeological sites, comprising 20 open artefact sites (i.e., artefact scatters and isolated artefacts), one axe quarry and one potential scarred tree have been identified within the study area. These include:

- Five previously recorded AHIMS sites;
- Nine new sites recorded by AECOM; and

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- Eight new sites recorded by RAPs.

The nine new Aboriginal archaeological sites recorded by AECOM comprised eight open artefact sites (i.e., six isolated artefact sites and two artefact scatters) and one potential Aboriginal scarred tree. All of these sites are new sites and will be registered on AHIMS. Site details are provided in Table 9 below and their locations shown on Figure 20.

The eight new sites recorded by the RAPs were registered on AHIMS following the survey (refer Section 7.4.3.

Table 9 Aboriginal archaeological sites within the study area recorded by AECOM

AHIMS Site ID	Site name	AHIMS Centroid Coordinates (zone 55)		Site type
		MGAE	MGAN	
Pending	BSF-IA1-18	540540	6120503	Isolated artefact
Pending	BSF-IA2-18	540296	6120389	Isolated artefact
Pending	BSF-IA3-18	539719	6120405	Isolated artefact
Pending	BSF-IA4-18	539610	6120399	Isolated artefact
Pending	BSF-IA5-18	539038	6119280	Isolated artefact
Pending	BSF-IA6-18	538832	6118773	Isolated artefact
Pending	BSF-AS1-18	540261	6120725	Artefact scatter
Pending	BSF-AS2-18	540681	6120545	Artefact scatter
Pending	BSF-ST1-18	540947	6122877	Scarred tree

7.4.1 Open Artefact Sites

A total of eight open artefact sites, comprising six isolated artefacts and two artefact scatters, were recorded by AECOM during the archaeological survey. Site descriptions are provided below.

Table 10 BSF-IA1-18

Site Name: BSF-IA1-18 **Site type**: Isolated artefact **Co-ordinates**: 540540mE 6120503mN GDA 94 (Zone 55) **Landform**: Lower slope **Distance to creekline**: 130 m **Dimensions**: 1 x 1 m **Artefacts**: 1 (quartz unidirectional core) **PAD**: None **Scientific significance:** Low

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Plate 7 View east of BSF-IA1-18

Plate 8 Quartz unidirectional core

Table 11 BSF-IA2-18

Site Name: BSF-IA2-18
Site type: Isolated artefact
Co-ordinates: 540296mE 6120389mN GDA 94 (Zone 55)
Landform: Lower slope
Distance to creekline: 330 m
Dimensions: 1 x 1 m
Artefacts: 1 (complete quartz flake)
PAD: None
Scientific significance: Low

Plate 9 View south of BSF-IA2-18

Plate 10 Complete quartz flake

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Table 12 BSF-IA3-18

Site Name: BSF-IA3-18
Site type: Isolated artefact
Co-ordinates: 539719mE 6120405mN GDA 94 (Zone 55)
Landform: Middle slope
Distance to creekline: 890 m
Dimensions: 1 x 1 m
Artefacts: 1 (quartz angular shatter)
PAD: None
Scientific significance: Low

Plate 11 View east of BSF-IA3-18

Plate 12 Quartz angular shatter

Table 13 BSF-IA4-18

Site Name: BSF-IA4-18
Site type: Isolated artefact
Co-ordinates: 539610mE 6120399mN GDA 94 (Zone 55)
Landform: Crest
Distance to creekline: 320 m
Dimensions: 1 x 1 m
Artefacts: 1 (quartz flake shatter)
PAD: None
Scientific significance: Low

Plate 13 View northeast of BSF-IA4-18

Plate 14 Quartz flake shatter

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Table 14 BSF-IA5-18

Site Name: BSF-IA5-18
Site type: Isolated artefact
Co-ordinates: 539038mE 6119280mN GDA 94 (Zone 55)
Landform: Lower slope
Distance to creekline: 110 m
Dimensions: 1 m²
Artefacts: 1 (quartz multidirectional core)
PAD: None
Scientific significance: Low

Plate 15 View south of BSF-IA5-18

Plate 16 Quartz multidirectional core

Table 15 BSF-IA6-18

Site Name: BSF-IA6-18
Site type: Isolated artefact
Co-ordinates: 5388324mE 6118773mN GDA 94 (Zone 55)
Landform: Crest
Distance to creekline: 420 m
Dimensions: 1 m²
Artefacts: 1 (unidirectional core)
PAD: None
Scientific significance: Low

Plate 17 View east of BSF-IA6-18

Plate 18 Quartz unidirectional core

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Table 16 BSF-AS1-18

Site Name: BSF-AS1-18
Site type: Artefact scatter
Co-ordinates: 540261mE 6120725mN GDA 94 (Zone 55)
Landform: Lower slope
Distance to creekline: 420 m
Dimensions: 20 x 10 m
Artefacts: 2 (1 x quartz flake shatter, 1x quartz angular shatter)
PAD: None
Scientific significance: Low

Plate 19 View west of BSF-AS1-18

Plate 20 Quartz angular shatter

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Table 17 BSF-AS2-18

Site Name: BSF-AS2-18
Site type: Artefact scatter
Co-ordinates: 540681mE 6120545mN GDA 94 (Zone 55)
Landform: Lower slope
Distance to creekline: 0 m
Dimensions: 270 x 210 m
Artefacts: 8 (5 x quartz angular shatter, 1 x quartz unidirectional core, 1 x quartz multidirectional core, 1 x quartz proximal flake)
PAD: None
Scientific significance: Low

Plate 21 View north of BSF-AS2-18

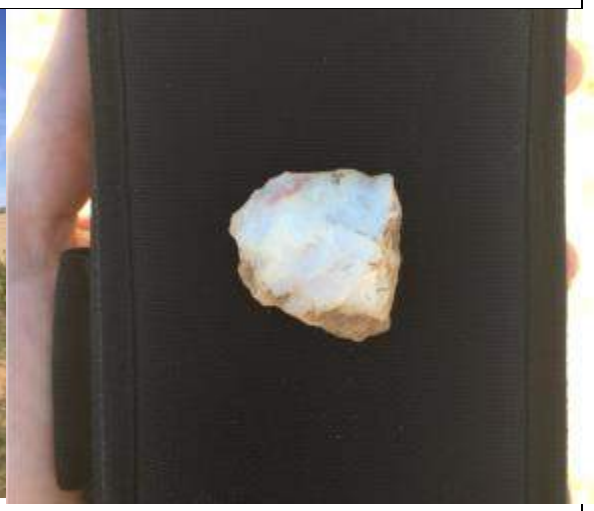

Plate 22 Quartz multidirectional core

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7.4.2 Potential Scarred Trees

One scar-bearing tree was identified during the archaeological survey. This tree, which was recorded at the request of RAPs has been classified as a potential scarred tree. Details of the tree and scar are provided below.

Table 18 BSF-ST1-18

Site Name: BSF-ST1-18
Site type: Potential scarred tree
Co-ordinates: 540947mE 6122877mN GDA 94 (Zone 55)
Landform: Simple slope
Distance to creekline: 250 m
Tree type: Eucalypt
Scar length: 150 cm, **Scar width**: 35 cm
Condition: Good

Plate 23 View of BSF-ST1-18 looking east

Plate 24 View of BSF-ST1-18 looking east

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7.4.3 RAP Recorded Sites

In addition to the above sites recorded by AECOM, a RAP group participating in the survey identified and registered on AHIMS (post-survey) several sites within the study area. Site details from the AHIMS register are provided in Table 19.

Table 19 RAP Recorded Sites

AHIMS Site ID	Site name	AHIMS Centroid Coordinates (MGA 55)		Site type	Current AHIMS status	Reference
56-1-0543	Bomen 540568	540568	6120270	Open artefact site	Valid	Mark Saddler
56-1-0536	Bomen 539015	539015	6119445	Open artefact site	Valid	Mark Saddler
56-1-0535	Bomen 539004	539004	6119382	Open artefact site	Valid	Mark Saddler
56-1-0034	Bomen 538732	638732	6119148	Open artefact site	Valid	Mark Saddler
56-1-0538	Bomen 539071	539071	6118591	Open artefact site	Valid	Mark Saddler
56-1-0532	Bomen 539085	539085	6118460	Open artefact site	Valid	Mark Saddler
56-1-0533	Bomen 539070	539070	6118506	Open artefact site	Valid	Mark Saddler
56-1-0537	Bomen 539072	539072	6119150	Open artefact site	Valid	Mark Saddler

7.5 Spatial Distribution

The distribution of Aboriginal archaeological materials within any given landscape can be assessed from two analytical positions. The first, known as a site-based approach, utilises the 'site' as the basic unit of analysis whilst the second, referred to as a non-site approach, utilises the individual artefact as the unit of analysis.

The non-site approach is employed here as a means of assessing the relationship of recorded artefacts to the environmental variables of distance to water and landform.

7.5.1 Distance to Watercourse

The proximity and permanency of potable water sources are routinely cited as key determinants of Aboriginal settlement patterns. Accordingly, Table 20 tabulates the relationship of these variables to recorded artefact locations within the proposal site. In terms of distance to water, as indicated, the highest count of artefacts were identified within the 101-200 m distance range of a creekline (52.8%, n = 19) followed by the 0-100 m range (30.6%, n=11). The majority of artefacts (83.3%, n=30) are located less than 200 m from a creekline.

All artefacts and sites are associated with lower order (i.e., 1st order) streams. Nonetheless, first order creeklines within the study area are unlikely to have been a source of permanent potable water, unlike 3rd and 4th order streams.

Table 20: Relationship between watercourses distance/stream order and artefact/site counts

Distance to Water Source (m)	Creekline Order				Total	% of Total
	1	2	3	4		
0 – 100	11	-	-	-	**11**	30.6

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Distance to Water Source (m)	Creekline Order				Total	% of Total
	1	2	3	4		
101 – 200	19	-	-	-	**19**	52.8
201 – 300	2	-	-	-	**2**	5.6
301 – 400	0	-	-	-	**0**	0
401 – 500	4	-	-	-	**4**	11.1
Total	**36**	**0**	**0**	**0**	**36**	-
% of Total vs. Stream Order	**100**	**0**	**0**	**0**	-	**100.1**

7.5.1.1 Landform Analysis

Examination of the distribution of recorded artefacts in relation to landform indicates a trend towards higher artefact counts on lower slopes (47.2%, n=17) followed by upper slopes (33.3%, n=33.3) and mid-slopes (16.7%, n=6).

Table 21 Artefact distribution in relation to landform

Landform Type	No. of Artefacts	%
Crest	1	2.8
Upper slope	12	33.3
Middle slope	6	16.7
Lower slope	17	47.2
Total	**36**	**100**

7.6 Archaeological Sensitivity: Subsurface Archaeological Potential

Subsurface archaeological potential is addressed in the context of this assessment by the concept of 'archaeological sensitivity'. Figure 21 provides archaeological sensitivity mapping based on four key factors including the nature and extent of visible surface artefacts across the study area, a review of the findings of previous archaeological investigations in analogous landforms in the surrounding area, on-site observations of post-depositional processes and historic ground surface disturbances. Using these variables, the level of archaeological sensitivity has been graded into three categories: nil, low and high. These ratings have then been applied to the study area to assess levels of potential subsurface deposit (Table 22**)**.

As shown on Figure 22, the majority of the study area has been assessed as being of low archaeological sensitivity. Areas of low sensitivity have been associated with areas of slope within the study area as well as those areas subjected to historic disturbances such as ploughing. Areas of high archaeological sensitivity have been linked to crests and creekline flats. Areas of nil archaeological sensitivity area are associated with areas of gross disturbance.

Table 22 Rating scheme for archaeological sensitivity

Rating	Definition	Finding
Nil	Land with no potential for subsurface archaeological deposit(s) due to past ground disturbance(s).	Areas of damming, built structures and roads have been identified as having no potential for subsurface deposit
Low	Subsurface archaeological deposit(s) may be present. Relative to areas of high sensitivity, lower artefact counts, densities and assemblage richness values expected. Integrity of deposit(s) will be dependent on the nature of	The majority of the study area has been assessed as being of low archaeological sensitivity due to slope and historic disturbance such as ploughing.

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Rating	Definition	Finding
	localised land disturbances.	
High	Subsurface archaeological deposit(s) may be present. Relative to areas of low sensitivity, higher artefact counts, densities and assemblage richness values expected. Integrity of deposit(s) will be dependent on the nature of localised land disturbances.	Areas of high archaeological sensitivity have been linked to crests and creekline flats within the study area.

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Figure 19 Survey Coverage

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Figure 20 Recorded Aboriginal Artefacts

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Figure 21 All Aboriginal Sites

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Figure 22 Areas of Archaeological Sensitivity

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7.7 Archaeological Test Excavation

7.7.1 Purpose, Sampling Strategy & Methods

In view of the findings of the archaeological survey detailed above, a two day program of archaeological test excavation focusing on the 1st order creekline was completed on 6 and 7 February 2018. The area was selected for further investigation on the basis of in-field conversations between AECOM's archaeologists and RAP field representatives, with both parties concluding that landform elements adjacent to this watercourse held good potential for the presence subsurface archaeological deposit. Test excavation was not undertaken within the southern section of the study area identified as archaeologically sensitive where a 132kV transmission line is proposed, due to the route option and final alignment having not been selected. If required, archaeological test excavation in this area would be undertaken post-approval as a condition of the Aboriginal Cultural Heritage Management Plan (ACHMP).

In accordance with Requirement 3.1 of the Code Practice, the overarching objective of the test excavation program undertaken was to collect information about the nature and extent of subsurface Aboriginal objects along the 1st order tributary. A notification was provided to OEH for the proposed testing program on 23 January 2017.

Archaeological test excavation was undertaken in two phases. Phase 1 of the test excavation program involved the excavation of 20 50 x 50 cm (0.25 m²) test pits along two transects positioned parallel to, and on either side of, the 1st order tributary (Figure 22). Test pits were placed at 20 m intervals along each transect.

Phase 2 of the test excavation program involved a 0.75m² expansion around TP#3 (total excavation area = 1 m²), to better characterise the nature and extent of the subsurface archaeological deposit in this area.

In accordance with the Code of Practice, all test pits were hand excavated as 50 x 50 cm units, with 5 cm spits employed during the excavation of the first Phase 1 test pit (TP#1) and 10 cm spits thereafter. Test pits were excavated to the base of extant A horizon soils. All excavated sediment was wet-sieved on-site through 5mm wire-mesh sieves. All definite and potential cultural lithic items were collected at the sieves and bagged by square and spit.

Representative profiles in all Phase 1 test pits and Phase 2 open plan excavations were photographed, with test pit stratigraphy recorded on pro forma test pit recording sheets using standard sedimentological terms and criteria (after McDonald & Isbell 2009). All pits were backfilled after excavation.

7.7.2 Phase 1 Testing

As indicated in Section 7.7.1, a total of 20 50 x 50 cm (0.25 m²) test pits were hand as part of Phase 1 of the archaeological test excavation program. The locations of excavated test pits are shown on Figure 23. All test pits were excavated within the lower slope landform. Detail on the locations, artefactual contents and stratigraphy of all Phase 1 test pits is provided in Appendix I.

7.7.2.1 Phase 1 - Soils & Stratigraphy

In general soils observed within Phase 1 pits were texturally and spatially consistent with those described by Chen & McKane, (1996) for the East Bomen landscape with excavations revealing simple texture contrast or duplex soil profiles with clay loam A-horizon soils or 'biomantles' (sensu Paton et al. 1995) overlying B-horizon clays . In general, extant A soil horizons comprised with dark reddish brown silty clay loams (5YR 3/3), with underlying B clay horizons consisting reddish brown light clays (5YR 4/6).

Ironstone content within the biomantle components of excavated soil profiles across the study area was highly variable, with some pits yielding abundant rounded to subrounded nodules and others few to none. Quartz gravel was also present within excavated soil profiles but in fewer number than ironstone (). Evidence of bioturbation, in the form of roots, back-filled burrows and worms, was observed throughout sampled A soil horizons.

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Modern materials, comprising fragmentary items of glass and ceramic fragments were recovered from seven test pits (TPs #7, #9, #10, #11, #12, #14, and #20) representing 35% of all test pits. The majority of modern material was recovered from the top 10 cm of excavated deposits. Mean thickness of excavated A Horizon soils across the study area was 19.85 cm, with no discernible distribution patterning evident.

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Plate 25 Representative soil profile in Phase 1 test pit TP#9 (Source: AECOM 2018)

Plate 26 Representative soil profile in Phase 1 test pit TP#15 (Source: AECOM 2018)

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Plate 27 Ironstone and quartz gravel from TP#3 (Source: AECOM 2018)

7.7.2.2 Phase 1 Lithic Assemblage

A total of 22 lithic items which satisfied technical criteria for identification as artefacts, were recovered from Phase 1 test pits. A simplified typological breakdown of the recovered artefact assemblage (Table 23) which has a total combined weight of 15.35 g, shows that it is dominated by flake debitage which accounts for 72.7% (n=16) of the assemblage. Flake debitage items include complete flakes (n=2, 9.1%), proximal flakes (n=6, 27.3%) and flake shatter (n=8, 36.4%). Non-flake debitage items (i.e, angular shatter) account for the remainder of the assemblage (n=6, 27.3%). No formed objects (i.e, cores or tools) are present in the assemblage. Quartz was the dominant raw material recovered, accounting for 90.9% (n=20) of the assemblage with the remaining specimens manufactured from silicified FGS (Fine Grain Siliceous material) (n=2, 9.1%). Recovered artefacts are generally small, with an average maximum linear dimension of 13.1±.5.35 mm (range: 7.3-29.1 mm) and average weight of 0.8±1.1 g (range: 0.09-4.57 g) (Table 23).

Table 23 Simplified typological breakdown of artefactual component of Phase 1 lithic assemblage

Type	Quartz	FGS	Total (n)	% Total
Complete flakes	2	-	2	9.1
Flake shatter	7	1	8	36.4
Proximal flake	5	1	6	27.3
Angular shatter	6	-	6	27.2
Total (n)	**20**	**2**	**22**	**-**
% Total (n)	90.9	9.1	-	-

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Type	Quartz	FGS	Total (n)	% Total
Total (wght, gm)	**15.35**	**1.96**	**17.31**	**-**
% Total (wght, gm)	88.68	11.32	-	-

Table 24 Descriptive statistics for the size and weight of artefacts recovered from Phase 1 pits

Attribute	N	Mean	StDev	Min	Max
MLD (mm)	22	13.1	5.35	7.3	29.1
Weight (g)	22	0.8	1.1	0.09	4.57

As indicated, a total of 22 stone artefacts were recovered from 20 Phase 1 test pits, providing an average overall density of 4.4 artefacts/m². Distribution data for all Phase 1 test pits indicate that the majority (n = 12, 60%) of pits contained no artefacts with two test pits containing one artefact, two with two artefacts, one with three artefacts, two with four artefacts and one with five artefacts (Table 25).

Table 25 Summary of Phase 1 artefact distribution (all pits)

Number of artefacts per test pit								
0	1	2	3	4	5	Total m²	Total no. of artefacts	Average density per m²
12	2	2	1	2	1	4	10	2.5

7.7.3 Phase 2 Testing

7.7.3.1 TP#3 Expansion Excavation

As indicated in Section 7.7.1, Phase 2 of the test excavation program involved small (0.75 m²) expansion excavation around TP#3 resulting in total of 1 m² of excavation (Plate 28). Expansion excavation was undertaken to further investigate the artefactual deposit identified at this location. This involved an additional three contiguous 0.25 m^2 units adjacent to the original pit, with each unit assigned a unique alpha-numeric identifier to facilitate post-excavation analysis. All units were excavated in 10 cm spits to clay subsoil at a maximum depth of 20 cm below ground surface. A total of seven additional artefacts were identified in TP#3 bringing the total to 10 artefacts (i.e., 10 artefacts per m^2). Summary data on the Phase 2 expansion excavation is provided in Table 26.

Table 26 Summary data for Phase 2 expansion of TP#3

Phase 1 test pit	Landform unit	No. of artefacts in Phase 1 pit	Number of extension squares	Total area (m^2)	No. of artefacts recovered from expansion squares	Total artefacts	Mean artefact density/m²
3	Lower slope	3	3	1	7	10	10

As shown on Figure 23, the TP#3 expansion excavation was located on the simpler slope landform on the western site of the watercourse. Vegetation in the area consists principally of exotic grassland. As well as historical native vegetation clearance, additional impacts to the integrity of the ground surface surrounding TP#3 included historic ploughing.

7.7.3.2 Soils and Stratigraphy

The field-classified soils exposed by the TP#3 expansion excavation revealed a simple shallow texture contrast or duplex soil profile. This comprised a reddish brown clay loam (5 YR 3/3) A horizon. A horizon soils overlay a B horizon comprising reddish brown (5 YR 4/6) silty clay. The boundary to the underlying B horizon was clear (<5 cm). A photographed section is provided in Plate 28. Common to abundant fine roots and ironstone gravel (fine to coarse, 2-20 mm) were present in the A portion of the

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profile which extended to a maximum depth of approximately 20 cm below ground level. One fragment of glass was recovered from the top 0-10 cm of the deposit.

Plate 28 Phase 2 test pit TP#3 (Source: AECOM 2008)

7.7.4 Phase 1 and 2 Lithic Assemblage

A total of 29 lithic items which satisfied technical criteria for identification as artefacts were recovered from both Phase 1 and Phase 2 test pits. A detailed breakdown of lithic data is provided in Appendix J. A simplified typological breakdown of the recovered lithic assemblage (Table 27), which has a total combined weight of 26.3 g, shows that it is dominated by flake debitage which accounts for 62% (n=18) of the assemblage. Flake debitage items include complete flakes (n=2, 6.9%), proximal flakes (n=6, 24.1%) and flake shatter (n=, 31%). Non-flake debitage items (i.e, angular shatter) account for the remainder of the assemblage (n=10, 34.5%). Formed objects (i.e, cores or tools) are limited to one multidirectional core. Quartz was the dominant raw material recovered, accounting for 90.1% (n=27) of the assemblage. Both remaining specimens were manufactured from silicified FGS (Fine Grain Siliceous material) (n=2, 6.1%).

Recovered artefacts are generally small, with an average maximum linear dimension of 13.4±.6.2 mm (range: 7.3-31.4 mm) and average weight of 1±1.7 g (range: 0.09-7.97 g). The heaviest artefact recovered during the excavation program - a quartz multidirectional core weighing 7.97 g and measuring 31.4 (L) x 24.2 (W) x 10.2 (T) - came from TP#3 extension pit 3B.

Cortex is poorly represented in the artefactual assemblage, with only two artefacts retaining cortical surfaces. However, given the origin of locally available quartz clasts (i.e., quartz veins in granite), this is unsurprising. No retouched implements or tools were identified in the assemblage.

All artefacts were recovered from the western side of the creekline.

Table 27 Simplified typological breakdown of the artefactual component of Phase 1& 2 lithic assemblage

Type	Quartz	FGS	Total (n)	% Total
Complete flakes	2	-	2	6.9
Flake shatter	8	1	9	31

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Type	Quartz	FGS	Total (n)	% Total
Proximal flake	6	1	7	24.1
Angular shatter	10	-	10	34.5
Multidirectional core	1	-	1	3.5
Total (n)	**27**	**2**	**29**	**-**
% Total (n)	93.1	6.9	100	-
Total (wght, gm)	**26.3**	**1.96**	**28.26**	**-**
% Total (wght, gm)	93.1	6.9	-	-

Table 28 Descriptive statistics for the size and weight of artefacts recovered from Phase 1 & 2 test pits

Attribute	N	Mean	StDev	Min	Max
MLD (mm)	29	13.4	6.2	7.3	31.4
Weight (g)	46	1	1.7	0.09	7.97

7.8 Summary of Results

A summary of the key findings of the program of archaeological survey and test excavation undertaken within the Project area is provided below:

- Observed soils within the study area were texturally and spatially consistent with those described by Chen & McKane, (1996) for the East Bomen landscape with excavations revealing simple texture contrast or duplex soil profiles with clay loam A-horizon soils or 'biomantles' (sensu Paton et al. 1995) overlying B-horizon clays . In general, extant A soil horizons comprised with dark reddish brown silty clay loams (5YR 3/3), with underlying B clay horizons consisting reddish brown light clays (5YR 4/6);
- A total of 36 individual stone surface artefacts were recorded during the archaeological survey. Approximately, half the assemblage is comprised of non-flake debitage (i.e., angular shatter) (n=18; 50%) with the remainder comprising flake debitage items (n=12, 33.3%) and two cores (n=6, 16.7%). Quartz was the only raw material recorded, accounting for 100% (n=36) of the assemblage. Recovered artefacts are generally small, with an average maximum linear dimension of 17.85±15.7 mm (range: 1.5-70.7 mm).
- A total of nine Aboriginal archaeological surface sites, comprising eight open artefact sites including six isolated artefact sites and two artefact scatters, and one potential Aboriginal scarred tree were recorded during the archaeological survey.
- The majority of surface artefacts (83.3%, n=30) were identified within 200 m of a watercourse.
- The largest counts of surface artefacts (47.2%, n=17) were identified on the lower slope landform.
- Phase 1 archaeological test excavation of 20 x 0.25 m² test pits resulted in the recovery of 22 lithic items which satisfied technical criteria for identification as artefacts. Recovered artefacts comprised flake debitage 72.7% (n=16) and non-flake debitage items (i.e, angular shatter) (n=6, 27.3%). No formed objects (i.e, cores or tools) are present in the assemblage. Quartz was the dominant raw material recovered, accounting for 90.9% (n=20) of the assemblage with the remaining specimens manufactured from silicified FGS (Fine Grain Siliceous material) (n=2, 9.1%). Recovered artefacts are generally small, with an average maximum linear dimension of 13.1±.5.35 mm (range: 7.3-29.1 mm) and average weight of 0.8±1.1 g (range: 0.09-4.57 g).
- Phase 2 expansion test pits around TP #3, which was expanded to 1m² resulting in a total to 10 artefacts (i.e., 10 artefacts per m^2) for TP#3.
- A total of 29 lithic items which satisfied technical criteria for identification as artefacts were recovered from both Phase 1 and Phase 2 test pits. Recovered artefacts included flake debitage 62% (n=18), non-flake debitage items (n=10, 34.5%) and one multidirectional core. Recovered

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artefacts are generally small, with an average maximum linear dimension of 13.4±.6.2 mm (range: 7.3-31.4 mm) and average weight of 1±1.7 g (range: 0.09-7.97 g). The heaviest artefact recovered during the excavation program - a silcrete multidirectional core weighing 7.97 g and measuring 31.4 (L) x 24.2 (W) x 10.2 (T) - came from TP#3 extension pit 3B.

- Quartz was the dominant raw material recovered during the test excavation, accounting for 90.1% (n=27) of the assemblage. Both remaining specimens were manufactured from silicified FGS (Fine Grain Siliceous material) (n=2, 6.1%).
- No retouched implements or tools were identified in the assemblage.
- All artefacts recovered during the test excavation were from the western side of the creekline.
- The total mean artefact density for the Phase 1 testing program is 4.4 artefacts/m². The total mean artefact density for TP#3 is 10 artefacts/m².
- All subsurface artefacts recovered during the test excavation program are associated with surface artefact site BSF-AS2-18 identified during the archaeological survey.

7.9 Discussion

As indicated in Section 7.7.1, the overarching objective of the survey and test excavation program undertaken for the current investigation was to collect information about the nature and extent of surface and subsurface Aboriginal objects across the study area. In recognition of limited GSV conditions across the study area and the potential for parts of the study area to contain intact subsurface archaeological deposit, a two phase test excavation program was undertaken in an area of archaeological sensitivity identified during the archaeological survey. The results of both data-sets are discussed below.

While acknowledging issues surrounding ground surface visibility across the study area, the overall pattern of surface artefact distribution revealed during the survey is one suggestive of variability in Aboriginal use of the study area with an emphasis on the utilisation of the central and southern sections of the study area. The majority of surface artefacts (83.3%, n=30) were found associated with a watercourse suggesting a focus of Aboriginal use of these areas. However, the low densities of artefactual material found associated with these sites are consistent with what Douglas and McDonald (1993) have described as “background scatter”, being “artefactual material which is insufficient in number or in association with other material to suggest focussed activity in a particular location”, and might reasonably be interpreted as products of small-scale or limited episodes of lithic discard (sensu Jo McDonald CHM 2005a: 129-30).

Likewise, the overall pattern of subsurface artefactual distribution demonstrated by Phase 1 testing is one indicating limited use of the land associated with the 1st order creekline subject to testing. Artefact densities recovered from all test pits (i.e., 4.4 artefacts/m²) are interpreted as low density deposit or background scatter resulting from limited episodes of lithic discard. No knapping floors were intercepted during the program of test excavation.

The location of the recovered artefacts suggest Aboriginal use of the 1st order creekline. Today, the creekline could be described as being unsuitable for sustained occupation as a result of lacking permanent water. Indeed, the creek largely comprises a wide depression without a central channel and no water. Prior to European settlement, this creekline was likely somewhat similar, only flowing during heavy rain events and unlikely being suitable for persistent Aboriginal occupation.

7.10 Evaluation of Predictive Model

Table 29 provides an evaluation of the predictive model provided in Section 6.3.

Table 29: Evaluation of Predictive Model

Prediction	Survey Result
The dominant raw material for flaked stone artefact production within the study area will be quartz, with chert the second most common	The results of the assessment support this prediction.

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Prediction	Survey Result
material.	
Flaked stone artefact assemblages will be dominated by flake and non-flake debitage items (*sensu* Andrefsky 2005), with formed objects (i.e., cores and retouched implements) comparatively poorly represented.	The results of the archaeological survey support this prediction.
Raw material sources suitable for knapping, in the form of quartz and granite, may be present on crests and ridgelines with exposed granite boulders and cobbles. Evidence of quarrying may be present at these locations.	The results of the archaeological survey support this prediction.
Tool types of demonstrated chronological significance will be restricted to backed artefacts and/or edge-ground hatchet heads;	No tools were identified during the archaeological survey.
Scarred trees may occur where original remnant vegetation remains.	The results of the archaeological survey support this prediction.
Subsurface artefact distribution across the study area will vary significantly in relation to proximity to water.	The results of the archaeological survey support this prediction.

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Figure 23 Test Pit Locations & Results

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8.0 Significance Assessment

8.1 Principles of Assessment

Heritage sites hold value for different communities in a variety of different ways. All sites are not equally significant and thus not equally worthy of conservation and management (Pearson & Sullivan 1995: 17). One of the primary responsibilities of cultural heritage practitioners, therefore, is to determine which sites are worthy of preservation and management (and why) and, conversely, which are not (and why) (Smith & Burke 2007: 227). This process is known as *the assessment of cultural significance* and, as highlighted by Pearson and Sullivan (1995: 127), incorporates two interrelated and interdependent components. The first involves identifying, through documentary, physical or oral evidence, the elements that make a heritage site significant, as well as the type(s) of significance it manifests. The second involves determining the degree of value that the site holds for society (i.e., its cultural significance) (Pearson & Sullivan 1995: 126).

In Australia, the primary guide to the assessment of cultural significance is the *Australian ICOMOS Charter for Places of Cultural Significance* (1999), informally known as *The Burra Charter*, which defines cultural significance as the "aesthetic, historic, scientific, social or spiritual value for past, present or future generations" of a site or place (ICOMOS 1999: 2). Under the Burra Charter model, the cultural significance of a heritage site or place is assessed in terms of its aesthetic, historic, scientific and social values, none of which are mutually exclusive (Table 30). Establishing cultural significance under the Burra Charter model involves assessing all information relevant to an understanding of the site and its fabric (i.e., its *physical* make-up) (ICOMOS 1999: 12). The assessment of cultural significance and the preparation of a statement of cultural significance are critical prerequisites to making decisions about the management of any heritage site or place (ICOMOS 1999: 11).

With respect to Aboriginal heritage, it is possible to identify two major streams in the overall significance assessment process: the assessment of *scientific value(s)* by archaeologists and the assessment of *social (or cultural) value(s)* by Aboriginal people. Each is considered separately below.

Table 30 Values relevant to determining cultural significance, as defined by The Burra Charter (ICOMOS 1999).

Value	Definition
Aesthetic	"Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, colour, texture and material of the fabric; the smells and sounds associated with the place and its use" (ICOMOS 1999: 12).
Historic	"Historic value encompasses the history of aesthetics, science and society...[a] place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may have historic value as the site of an important event" (ICOMOS 1999: 12).
Scientific	"The scientific or research value of a place will depend on the importance of the data involved, on its rarity, quality or representativeness, and on the degree to which the place may contribute further substantial information" (ICOMOS 1999:12).
Social	"Social value embraces the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a majority or minority group" (ICOMOS 1999: 12).

8.2 Scientific Value

Scientific value refers to the importance of a place in terms of its rarity, representativeness and the extent to which it may contribute further information (i.e., its research potential) (OEH 2011: 9).

8.2.1 Rarity and Representativeness

Rarity and r*epresentativeness* are related concepts. Rarity refers to the relative uniqueness of a site within its local and regional context. The scientific significance of a site is assessed as higher if it is

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unique or rare within either context. Conversely, it is considered to be of lower significance if it is common in one or both. The concept of representativeness, meanwhile, refers to the question of whether or not a site is "a good example of its type, illustrating clearly the attributes of its significance" (Burke & Smith 2004: 247). Representativeness is an important criterion as one of the primary goals of cultural heritage management is to preserve for future generations a representative sample of all archaeological site types in their full range of environmental contexts.

In common with rarity, assessments of representativeness within a region are dependent on the state of current knowledge concerning the number and type of archaeological sites present within that region[13]. This is a critical point, for as suggested by Kuskie (2000) and others (e.g., Bowdler 1981; Godwin 2011; Pearson & Sullivan 1995), the absence across most of Australia of regional-scale quantitative data for Aboriginal sites and places represents a major constraint in assessments of representativeness and rarity. As stressed by Bowdler (1981) some 30 years ago, detailed regional-scale assessments of the Aboriginal archaeological record of Australia are required to address this issue.

8.2.2 Research Potential

Research potential can be defined as the potential of an archaeological site to address what Bowdler (1981: 129) has referred to as "timely and specific research questions". These questions may relate to any number of issues concerning past human lifeways and environments and, as suggested by Bowdler's quote, will inevitably reflect current trends or problems in academic research (Burke & Smith 2004: 249). For their part, Bowdler and Bickford (1984: 23-4) suggest that the research potential of an archaeological site can be determined by answering the following series of questions:

1. Can the site contribute knowledge which no other resource can?
2. Can the site contribute knowledge which no other such site can?
3. Is this knowledge relevant to general questions about human history or other substantiative subjects?

Several criteria can be used to assess the research potential of an archaeological site. Particularly important in the context of Aboriginal archaeology are the intactness or integrity of the site in question, its complexity and its potential for archaeological deposit (NPWS 1997: 7). The connectedness of the site to other sites or natural landscape features may also be relevant.

Integrity refers to the extent to which a site has been disturbed by natural and/or anthropogenic phenomena and includes both the state of preservation of particular remains (e.g., animal bones, plant remains) and, where applicable, stratigraphic integrity. Assessments of archaeological integrity are predicated on the notion that undisturbed or minimally disturbed sites are likely to yield higher quality archaeological and/or environmental data than those whose integrity has been significantly compromised by natural and/or anthropogenic phenomena. Establishing levels of preservation or integrity in the context of a surface survey is difficult. Nonetheless, useful rating schemes are available for 'open' sites (Coutts & Witter 1977: 34) and scarred trees (Long 2003).

The *complexity* of a site refers primarily to the nature or character of the artefactual materials or features that constitute it but also includes site structure (e.g., the physical size of the site, spatial patterning in observed cultural materials). In the case of open artefact sites, for example, the principal criteria used to assess complexity are the site's size (i.e., number of artefacts and/or spatial extent), the presence, range and frequency of artefact and raw material types, and the presence of features such as hearths.

Potential for archaeological deposit refers to the potential of a site to contain subsurface archaeological evidence which may, through controlled excavation and analysis, assist in answering questions that are of contemporary archaeological interest. Assessing subsurface potential in the absence of subsurface investigation is difficult. Nonetheless, consideration of a range of factors, including the integrity of the site, the complexity of extant surface evidence, the nature of the local geomorphology (as established through surface observations and documentary research) and the results of previous archaeological excavations in the area, will help inform assessment of this criterion.

[13] There is, of course, a temporal fluidity to this criterion (i.e., as knowledge of the Aboriginal archaeology of a region increases, assessed levels of representativeness may change, a point of equal relevance to rarity).

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Connectedness concerns the relationship between archaeological sites within a given area and may be expressed through a combination of factors such as site location, type and contents. It may, for example, be possible to establish a connection between a stone quarry and hatchet found nearby. Demonstrating connectedness archaeologically, however, is far from straightforward, especially when dealing with surface evidence alone. Ultimately, this difficulty rests with the need to demonstrate contemporaneity between sites that may have been created hundreds, if not thousands, of years apart. As Shiner (2008: 13) has observed, "much of the surface archaeological record documents the accumulation of materials from multiple behavioural episodes occurring over long periods of discontinuous time". Contemporaneity, then, needs to be demonstrated not assumed.

8.2.3 Identification Process for Current Assessment

For the current assessment, information on the scientific values of the study area has been obtained through a review of existing environmental and archaeological data for the study area, as detailed in Sections 4.0, and 5.0, and archaeological survey across the study area described in Section 7.2.

8.3 Assessment of Scientific Significance

An assessment of the scientific significance of newly recorded sites by AECOM is presented in Table 31 below. The significance rating is offered on the basis of the assessed research potential, rarity and representativeness on a local and regional scale.

Table 31 Scientific significance assessment

Site	Scientific significance ranking	Justification
BSF-IA1-18	Low	***Complexity*** • Single quartz unidirectional core. • Locally and regionally common artefact type (i.e., core). • Locally and regionally common raw material (i.e., quartz). ***Integrity*** • Moderate ground surface disturbance from vegetation clearance and ploughing. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Isolated artefact sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.
BSF-IA2-18	Low	***Complexity*** • Single quartz complete flake. • Locally and regionally common artefact type (i.e., complete flake). • No formed objects (*sensu* Brumm et al., 2010). • Locally and regionally common raw material (i.e., quartz). ***Integrity*** • Moderate ground surface disturbance from vegetation clearance and ploughing. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Isolated artefact sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.
BSF-IA3-18	Low	***Complexity*** • Single quartz angular shatter piece. • Locally and regionally common artefact type (i.e., angular shatter). • No formed objects (*sensu* Brumm et al., 2010).

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Site	Scientific significance ranking	Justification
		• Locally and regionally common raw material (i.e., quartz). ***Integrity*** • Moderate ground surface disturbance from vegetation clearance and ploughing. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Isolated artefact sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.
BSF-IA4-18	Low	***Complexity*** • Single quartz flake shatter piece. • Locally and regionally common artefact type (i.e., angular shatter). • No formed objects (*sensu* Brumm et al., 2010). • Locally and regionally common raw material (i.e., quartz). ***Integrity*** • Moderate ground surface disturbance from vegetation clearance. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Isolated artefact sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.
BSF-IA5-18	Low	***Complexity*** • Single quartz multidirectional core • Locally and regionally common artefact types (i.e., core). • Locally and regionally common raw material (i.e., quartz). ***Integrity*** • Moderate ground surface disturbance from vegetation clearance and ploughing. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Low density artefact scatter sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.
BSF-IA6-18	Low	***Complexity*** • Single quartz unidirectional core • Locally and regionally common artefact types (i.e., core). • Locally and regionally common raw material (i.e., quartz). ***Integrity*** • Moderate ground surface disturbance from vegetation clearance and ploughing. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Low density artefact scatter sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.

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Site	Scientific significance ranking	Justification
BSF-AS1-18	Low	***Complexity*** • One quartz flake shatter and one quartz angular shatter piece. • Locally and regionally common artefact types (i.e., flake shatter and angular shatter). • No formed objects (*sensu* Brumm et al., 2010). • Locally and regionally common raw material (i.e., quartz). ***Integrity*** • Moderate ground surface disturbance from vegetation clearance and ploughing. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Low density artefact scatter sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.
BSF-AS2-18	Low	***Complexity*** • Eight artefacts including five quartz angular shatter pieces, one quartz unidirectional core, one quartz multidirectional core, one quartz proximal flake. • Locally and regionally common artefact types (i.e., cores, flake and non-flake debitage. • Two formed objects i.e., one unidirectional core and one multidirectional core (*sensu* Brumm et al., 2010). • Locally and regionally common raw materials (i.e., quartz). ***Integrity*** • Severe ground surface disturbance from vegetation clearance, erosion and access track construction. ***Potential for deposit*** • Archaeological deposit not anticipated. ***Rarity and representativeness*** • Low density artefact scatter sites are a locally and regionally common site type. • Poor example of its type. Open artefact sites with greater integrity are known on a local and regional scale and offer comparable/higher research potential.
BSF-ST1-18	N/A	• SSF-ST1-18 is unlikely to contribute knowledge not available from another resource or site. While in good condition, it is a poor example of its type.

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8.4 Cultural Value [TO BE COMPLETED]

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9.0 Impact Assessment

9.1 Summary of Proposed Impacts

The Project includes developing a 120 MWdc solar farm at Bomen (Figure 3). Subject to final detailed design, the primary components of the Project include:

- approximately 400,000 photovoltaic solar modules;
- approximately 4,500 trackers comprising single-axis tracking framing systems mounted on steel piles;
- up to 44 containerised power conversion stations containing electrical switchgear, inverters and medium voltage transformers (power conversion stations);
- new on-site electrical switchyard and substation;
- connection into the National Electricity Market via about 3.5 km of 132 kV overhead transmission line between the proposed on-site substation and the existing TransGrid Wagga North Substation. The transmission line may be overhead or underground, or a combination of both, subject to detailed design;
- battery storage system;
- control building including office, supervisory control and data acquisition (SCADA) systems, operation and maintenance facilities, spare parts and staff amenities serviced by septic systems and rainwater tanks;
- car park;
- internal DC and AC cabling for electrical reticulation;
- minor upgrade of the unsealed section of Trahairs Road, east of Byrnes Road, for site access (to be maintained as a single lane unsealed road);
- internal all-weather access tracks;
- internal fire trail and bushfire asset protection zones;
- security fencing around the solar farm;
- vegetation screening – plantings along the site boundaries where required;
- meteorological stations; and
- subdivision of the following lots to allow the purchase of the required land for the proposal site:
    - Lot 11 DP1130519
    - Lot 2 DP590756
    - Lot 174 DP751405
    - Lot 108 DP751405.

The single-axis tracking structures would orient the solar modules to follow the sun from east to west each day. The structures would be mounted on piles driven into the ground.

Groundcover vegetation would be managed by sheep grazing where possible, in conjunction with the measures detailed in bushfire management and environmental management plans.

The on-site substation would be in the north-western corner of the southern solar farm development area.

The connection to the electricity network would be through the existing TransGrid Wagga North Substation via a proposed 132kV transmission line about 3.5 km long. Two corridor options within which the transmission line and easement would be located are shown on Figure 3. The two transmission line corridor options shown are each 90 metres wide to allow for design flexibility during

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detailed design of the easements. The final width of the easements however will be significantly less than 90 metres. For any overhead sections of the transmission line, the easement width would be 30-45 metres, and the indicative height of the transmission line poles would be 30 metres. The easement width for any underground sections of the transmission line would likely be 7-11 metres.

Subject to planning and environmental approvals, the construction period is expected to be nine to 12 months from site establishment to commissioning, commencing in the third quarter of 2018.

The operational lifetime of the solar farm is 30 years, at which time the proposal would either be decommissioned, or continue to operate subject to further approval. Decommissioning would involve removing all above ground infrastructure and rehabilitating the site to allow it to be used for other purposes.

9.2 Impacts to Identified Aboriginal Sites

A total of 22 previously and newly recorded Aboriginal archaeological sites comprising 20 open artefact sites (i.e., artefact scatters and isolated artefacts), one axe quarry and one potential scarred tree have been identified within the study area.

9.2.1 Solar Development Area

Consideration of the location of sites related directly to solar development impacts indicated that eight open artefact sites comprising two artefact scatters and six isolated artefact sites will be wholly impacted by the Project. Table 32 presents a list of impacted sites.

Table 32 Impacted sites

AHIMS Site ID	Site name	AHIMS Centroid Coordinates (zone 55)		Site type
		MGAE	MGAN	
Pending	BSF-IA1-18	540540	6120503	Isolated artefact
Pending	BSF-IA2-18	540296	6120389	Isolated artefact
Pending	BSF-IA3-18	539719	6120405	Isolated artefact
Pending	BSF-AS1-18	540261	6120725	Artefact scatter
Pending	BSF-AS2-18	540681	6120545	Artefact scatter
56-1-0043	Bomen 538732	638732	6119148	Isolated artefact
56-1-0109	BIF1	540719	6120812	Isolated artefact
56-1-0437	Bomen Solar IS01	540564	6120660	Isolated artefact

It is noted that potential scarred tree site BSF-ST1-18 is located on the northern fenceline within the area mapped as Northern Development Area. However, Renew Estate has committed to ensuring this site will not be impacted.

9.2.2 Transmission Line

As discussed above, two corridor options are being considered for the transmission line easement (Figure 3). Consideration of the location of identified Aboriginal sites in relation to the proposed corridors indicates that Option 1 would result impacts to up to three isolated artefact sites and Option 2 would result in impacts to up to three isolated artefact sites with site BSF-IA4-18 potentially impacted by both options. Table 32 presents a list of potentially impacted sites for each option.

It is noted that Renew Estate Pty Ltd has committed to not impacting the Bomen Axe Quarry and as such the proposed transmission line easement will avoid impacts to this site.

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Table 33 Impacted sites

AHIMS Site ID	Site name	AHIMS Centroid Coordinates (zone 55)		Site type
		MGAE	MGAN	
Option 1				
Pending	BSF-IA4-18	539610	6120399	Isolated artefact
Pending	BSF-IA6-18	538832	6118773	Isolated artefact
56-1-0536	Bomen 539015	539015	6119445	Artefact scatter
Option 2				
Pending	BSF-IA4-18	539610	6120399	Isolated artefact
56-1-0045	East Bomen IF1	539405	6119039	Isolated artefact
56-1-0532	Bomen 539085	539085	6118460	Open artefact site

9.3 Cumulative Impact Assessment

9.3.1 Assessment of Ecologically Sustainable Development (ESD)

In NSW, the NPW Act provides the legislative framework for the protection of Aboriginal objects and places. Section 2A(2) of the NPW Act stipulates that such protection is to be achieved by applying the principles of Ecologically Sustainable Development (ESD). ESD requires the integration of economic and environmental considerations (including cultural heritage) in decision-making processes and, in the context of Aboriginal cultural heritage, can be achieved through the implementation of two key principles: intergenerational equity and the precautionary principle.

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity and productivity of the environment for the benefit of future generations. With regards to Aboriginal heritage, intergenerational equity can be assessed in terms of cumulative impacts to Aboriginal objects and places in a region. Central to any assessment of intergenerational equity is the proposition that regions with fewer Aboriginal objects and places necessarily retain fewer opportunities for future generations of Aboriginal people to enjoy their cultural heritage. Accordingly, information regarding the known and potential Aboriginal heritage resource of a given region is critical to any assessment of intergenerational equity.

The precautionary principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation. In NSW, the precautionary principle is relevant to OEH's consideration of potential impacts to Aboriginal cultural heritage in situations where:

- the proposed development involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places; and
- there is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

In these instances, OEH has indicated that a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce damage to Aboriginal objects and/or places. In addition to these measures, a cumulative impact assessment should be undertaken to gain an understanding and appreciation of the impacts development will have on NSW's Aboriginal cultural heritage resource.

It should be noted that the results of cumulative impact assessments undertaken for cultural heritage sites and places, Aboriginal or otherwise, must be interpreted with caution, not least because they are

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based (in part) on heritage datasets that are inevitably incomplete and contain various inconsistencies and errors. Godwin (2011), in particular, has questioned the value of cumulative impact assessments to cultural heritage management in Australia, arguing that the 'fundamentals' necessary for undertaking such assessments simply do not exist. The 'fundamentals' Godwin is referring are robust regional and national data sets for measuring proposed impacts and the determination of acceptable scientific and cultural impact thresholds. While recognising the validity of the issues raised by Godwin (2011), current OEH guidelines necessitate that a cumulative impact assessment be undertaken as part of any Aboriginal cultural heritage assessment in NSW.

9.3.2 Intergenerational Equity - Cumulative Impact Assessment

Two avenues for assessing the cumulative impact of the Project on Aboriginal heritage can be pursued:

1. A comparison, using the results of AHIMS searches, of the identified Aboriginal archaeological resource of the study area with that of the surrounding region, defined here as an arbitrary 20 x 20 km (400 km^2) area roughly centred on the study area; and
2. The use of existing environmental data sources (e.g., digital land use data and topographic maps) to identify the potential open artefact resource of the study region as a whole.

9.3.3 Known Resource

Alongside sites identified within the study area, existing open artefact sites in the study region offer opportunities for future research, conservation and education. Accordingly, it is necessary to quantify the impacts of the proposed development on this joint resource.

As indicated in Section 9.2, a maximum of eleven open artefact sites will be fully impacted by the proposed development. AHIMS data obtained from OEH on 10 January 2018 indicate that these sites represent 21.2% of the valid extant open artefact resource of the study region, with searches of the AHIMS database returning 52 'Valid' open artefact sites for this search region. While acknowledging the limitations of the AHIMS database with respect to the validity of listed site statuses, on the basis of these data, it seems reasonable to conclude that the loss of these sites would constitute a moderate impact to the known open artefact resource of the region. Consideration of the character of these sites, all of which have been assessed as being of low scientific significance, alongside a consideration that the majority of land within this region has not been physically inspected for Aboriginal sites suggests that this impact may not be as significant as it appears.

9.3.4 Potential Resource

AHIMS results only represent a fraction of the likely archaeological resource present within a region, as these results are only representative of land that has been subject to archaeological investigations. Accordingly, an assessment of the *potential* Aboriginal heritage resource of an approximate 20 x 20 km study region centred on the study area is also a useful guide. For the present analysis, land use data (dated 2017) obtained from the Land Assessment Unit at OEH was utilised (Table 34).

As a starting point, it is necessary to quantify the amount of land within the study region that has the *potential* to retain to open artefact sites. A basic assumption here is that grossly disturbed terrain is unlikely to retain such sites whereas non-grossly disturbed terrain does, both in surface and subsurface contexts. Analysis of available digital land use data for the study region is summarised in Table 34. This analysis indicates that grossly modified or disturbed terrain (e.g., urban and industrial areas) accounts for approximately 12.9% of land within the region. Outside of grossly disturbed areas, fully to semi-cleared grazing land is particularly well represented, accounting for approximately 57.6% of land within the region. Cropping is likewise fairly well represented at c.24% and tree and shrub cover at c.0.4%. Tree and shrub cover is comparatively poorly represented at 0.4 as is horticulture land at 0.2%. Areas specifically reserved for conservation meanwhile, account for approximately 0.6% of land within the region.

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Table 34 Land use analysis for study region (20 x 20 km)

Existing Land Use	Km²	%	Archaeological Potential?
Conservation Area	2.5	0.6	Yes
Cropping	95.8	24	Yes
Grazing	229.9	57.5	Yes
Horticulture	1.4	0.4	Yes
Intensive Animal Production	5	1.3	No
Mining & Quarrying	0.6	0.1	No
Power Generation	0.1	0.1	No
River & Drainage System	5.1	1.3	No
Special Category	4.0	1	No
Transport & Other Corridors	10.9	2.7	No
Tree and Shrub Cover	1.7	0.4	Yes
Urban	40.5	10.1	No
Wetland	1.9	0.5	Yes
Total	**399.4**	**100**	

Source: NSW Landuse Data 2017 obtained from OEH.

Viewed from an Aboriginal archaeological perspective, the results of the land use analysis presented in Table 34 suggest that approximately 83.4% of the study region (*c*.333.2 km²) can reasonably be considered to comprise a *potential open artefact resource*. As indicated, land upon which open artefact deposits are unlikely to survive accounts for just over 16.6% of land within the region. This figure increases to 98.1% if cropping and grazing land is included. However, as indicated by the results of numerous Aboriginal archaeological investigations, both within and outside of the study region, cropped and grazed areas can and frequently do retain significant surface and subsurface stone artefact records. It can, therefore, be concluded that around 83.4% of land within the study region has the potential to retain open artefact deposits in surface and subsurface contexts. While acknowledging the fact that the nature and distribution of such deposits will vary markedly in relation to environmental variables such as landform and the availability of potable water, analysis of available land use data does help to quantify the extent of the region's potential Aboriginal open artefact resource. Moreover, it provides a basis from which assess the cumulative impact of the proposed development on this resource.

In order to quantify the impact of the proposed development on the potential open artefact resource of the study region it is necessary to compare the amount of impacted land within the study area that could be considered a potential open artefact resource (i.e., 276 ha) with that available in the search area (*c*.333.2 km²). On this basis, it can be stated that the Project will result in an approximate 0.8% decline in the region's potential open artefact resource (assuming total impact of the proposal site). As such, it can be concluded that the impact of the Project on the potential Aboriginal archaeological resource of the region will be low.

With regards to the existence, outside of the study area, of environmental contexts that have the potential to contain sites comparable to those identified within it, an examination of relevant topographic maps for the study region indicates that many such contexts exist including unmodified sections of the Murrumbidgee River and other unnamed creeklines in the region. On the basis of this evidence, it can be confidently concluded that land outside of the current study area but within the wider region contains a significant, as yet unidentified, open artefact site resource.

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1.1.1 The Precautionary Principle

As indicated in Section 9.3.1, the precautionary principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

In the context of the current assessment, it can be stated that AECOM has adopted a precautionary approach in our assessment of the impacts of the proposed development on the Aboriginal archaeological resource of the study area and that this approach is reflected in our proposed management strategy.

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Figure 24 Impact Assessment

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10.0 Management Recommendations

The following management recommendations are made regarding the identified Aboriginal heritage values of the study area, with recommendations made on the basis of:

- A review of previous archaeological investigations completed within and surrounding the study area;
- the results of the archaeological investigation described in Section 7.0.
- the significance and impact assessments detailed in Section 8.0 and 9.0; and
- consultation with Registered Aboriginal Parties (RAPs).

10.1 Statutory Requirements

As indicated in Section 1.0, this Aboriginal archaeology and cultural heritage impact assessment forms part of an EIS being prepared by AECOM to support Renew Estate's Project Approval under Part 4, Division 4.1 of the EP&A Act.

This AACHIA documents the results of AECOM's assessment and has been compiled with reference to the NSW Office of Environment and Heritage's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011).

10.2 Management Strategy

This assessment has identified Aboriginal heritage constraints across the study area including 20 open artefact sites (i.e., artefact scatters and isolated artefacts), one axe quarry, and one potential Aboriginal scarred tree. The impact assessment undertaken in Section 9.0 has identified that a maximum of eleven open artefact sites alongside areas of identified archaeological sensitivity would be impacted by the Project. The final number of open artefact sites impacted will depend on the final selected transmission line alignment. A management strategy to address the impacts of the Project on the known and potential Aboriginal archaeological resource of the proposal site is provided below.

It is recommended that this strategy be detailed in an Aboriginal Cultural Heritage Management Plan (ACHMP) for the Project, prepared in consultation with RAPs, and to the satisfaction of OEH and DP&I. Subject to Development Consent under Part 4, Division 4.1 of EP&A Act, this ACHMP will guide the management of the known and potential Aboriginal archaeological resource of the proposal site, as well identified cultural values.

The ACHMP should contain procedures for consultation and involvement of RAPs in the management of Aboriginal cultural heritage values within the proposal site. In addition, the ACHMP will include details of proposed mitigation and management strategies of all Aboriginal sites, procedures for the identification and management of previously unrecorded sites, details of an appropriate long term management for any Aboriginal objects salvaged, details of an Aboriginal cultural heritage awareness program for all contractors and personnel associated with construction activities and compliance procedures. The key elements of the ACHMP are detailed below.

10.2.1 Archaeological Salvage Program

An archaeological salvage program should be undertaken for the Project prior to the commencement of any ground disturbance works within the proposal site. The salvage program should incorporate the following components:

1. Surface collection of all impacted open artefact sites. Surface collection is considered an appropriate and effective mitigation option for these sites given their content and level of archaeological significance. Table 35 provides a list of sites to be surface collected. Collected artefacts should be relocated to a section of the proposal site where impacts are not proposed.

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2. A program of archaeological test excavation and potentially open area excavation along the selected transmission line corridor where it occurs within areas of identified high Aboriginal archaeological sensitivity.

The ACHMP for the Project should include a detailed research design for the surface collection and test excavation components of the salvage program.

All archaeological salvage works should be undertaken by a combined field team of archaeologists and RAP field representatives. Post-salvage work for the excavation component of the archaeological salvage program should, at minimum, include:

- The analysis and cataloguing of all recovered Aboriginal objects (e.g., stone artefacts, hearth stones) by a suitably qualified person or persons;
- The submission, where deemed appropriate by a qualified archaeologist and/or geomorphologist, of excavated charcoal samples for conventional or Accelerator Mass Spectrometry (AMS) radiocarbon dating;
- The submission, where deemed appropriate by a qualified geomorphologist, of excavated sediment samples for Optically Stimulated Luminescence (OSL) dating;
- The submission, where deemed appropriate by a qualified archaeologist, of a selection of stone artefacts for functional use-wear/residue analysis; and
- The submission, where deemed appropriate by a qualified archaeologist, of a selection of non-artefactual rock samples to a qualified geologist for the purposes of raw material identification.

All Aboriginal objects salvaged as part of the excavation program should be curated in an appropriate manner, as determined through consultation with RAPs, OEH and DP&I during preparation of the ACHMP. Temporary off-site storage of salvaged objects should be allowed for the purposes of analysis and recording.

Aboriginal Site Impact Recording (ASIR) forms for all salvaged sites should be submitted to OEH at the completion of the salvage program.

10.2.2 Conservation of Non-impacted Sites

All Aboriginal sites not impacted by the Project but within the proposal site should be conserved *in-situ.* The potential scarred tree site should be protected via permanent stock-proof fencing and appropriate associated signage. Site fencing is to be erected after consultation with a qualified archaeologist and RAP representatives. All relevant staff and contractors are to be made aware of the nature and locations of all sites as well as Renew Estate's legal obligations with respect to them. Protected sites will need to be identified on all relevant site plans. Details for the care of protected sites should be incorporated into the ACHMP.

10.2.3 Aboriginal Cultural Heritage Awareness Training

An Aboriginal cultural heritage awareness training package should be developed for use throughout the life of the Project. This package should be developed in consultation with RAPs and completed prior to the commencement any ground disturbance works within the proposal site. A register of all persons having completed the training package should be maintained throughout the life of the Project.

Aboriginal cultural awareness training should be mandatory for all staff and contractors whose roles may reasonably bring them into contact with Aboriginal sites and/or involve consultation with local Aboriginal community members. Training should also be offered on a voluntary basis to all other staff and contractors.

Renew Estate should ensure that as part of all standard site inductions, an Aboriginal cultural heritage component is included. At a minimum, this should outline current protocols and responsibilities with respect to the management of Aboriginal cultural heritage within the proposal site, provide an overview of the diagnostic features of potential Aboriginal site types (e.g., scarred trees) and procedures for reporting the identification of Aboriginal archaeological sites.

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10.2.4 Previously Unrecorded Aboriginal Archaeological Evidence

Provisions regarding the appropriate management action(s) for previously unrecorded Aboriginal archaeological evidence identified within the study area throughout the operational life of the Project should be incorporated into the ACHMP. Management action(s) will vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts.

10.2.5 Management of Potential Human Remains

In the event that potential human skeletal remains are identified within the study area at any point during the life of the Project, the following standard procedure (New South Wales Police Force, 2015; NSW Health, 2013) should be followed.

1. All work in the vicinity of the remains should cease immediately;
2. The location should be cordoned off and the NSW Police notified.
3. If the Police suspect the remains are Aboriginal, they will contact the Office of Environment and Heritage and arrange for a forensic anthropologist or archaeological expert to examine the site.

Subsequent management actions will be dependent on the findings of the inspection undertaken under Point 3.

- If the remains are identified as modern and human, the area will become a crime scene under the jurisdiction of the NSW Police;
- If the remains are identified as pre-contact or historic Aboriginal, OEH and all RAPs are to be formally notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided an appropriate management mitigation strategy will be developed in consultation with OEH and RAPs;
- If the remains are identified as historic non-Aboriginal, the site is to be secured and the NSW Heritage Division contacted; and
- If the remains are identified as non-human, work can recommence immediately.

10.2.6 AHIMS Site Cards

AHIMS sites cards will be completed and submitted to OEH for all newly recorded sites within the study area at the completion of the assessment.

In the event that a previously unidentified Aboriginal site is discovered within the study area at any point during the operational life of the Project, an AHIMS site card for that site should be submitted to OEH as promptly as possible. Timing protocols for the submission of AHIMS site cards should be included in the ACHMP for the Project.

10.2.7 Aboriginal Site Database

A comprehensive Aboriginal Site Database for the study area and its immediate environs should be established upon commencement of the Project. Renew Estate would be responsible for the creation and maintenance of this database which will, at a minimum, contain the name, type, size (where applicable), MGA coordinates and status of all Aboriginal sites within and directly adjacent to the study area. The database should be regularly updated throughout the operational life of Project. Printed site lists and maps should be made available to RAPs upon request.

10.3 Summary of Management Mitigation Measures

Table 35 presents a summary of management mitigation measures for identified Aboriginal sites within the study area.

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Table 35 Summary of site management

AHIMS ID	Site name	AHIMS Centroid Coordinates (zone 55)		Site type	Management
		MGAE	MGAN		
56-1-0034	Bomen 538732	638732	6119148	Open artefact site	Conservation
56-1-0043	East Bomen 1	538635	6119129	Axe quarry	Conservation
56-1-0044	East Bomen IF2	538670	6118650	Isolated artefact	Conservation
56-1-0045	East Bomen IF1	539405	6119039	Isolated artefact	Surface collection
56-1-0109	BIF1	540719	6120812	Isolated artefact	Surface collection
56-1-0437	Bomen Solar IS01	540564	6120660	Isolated artefact	Surface collection
56-1-0532	Bomen 539085	539085	6118460	Open artefact site	Surface collection
56-1-0533	Bomen 539070	539070	6118506	Open artefact site	Conservation
56-1-0535	Bomen 539004	539004	6119382	Open artefact site	Conservation
56-1-0536	Bomen 539015	539015	6119445	Open artefact site	Surface collection
56-1-0538	Bomen 539071	539071	6118591	Open artefact site	Conservation
56-1-0537	Bomen 539072	539072	6119150	Open artefact site	Conservation
56-1-0543	Bomen 540568	540568	6120270	Open artefact site	Surface collection
Pending	BSF-IA1-18	540540	6120503	Isolated artefact	Surface collection
Pending	BSF-IA2-18	540296	6120389	Isolated artefact	Surface collection
Pending	BSF-IA3-18	539719	6120405	Isolated artefact	Surface collection
Pending	BSF-IA4-18	539610	6120399	Isolated artefact	Surface collection
Pending	BSF-IA5-18	539038	6119280	Isolated artefact	Conservation
Pending	BSF-IA6-18	538832	6118773	Isolated artefact	Surface collection
Pending	BSF-AS1-18	540261	6120725	Artefact scatter	Surface collection
Pending	BSF-AS2-18	540681	6120545	Artefact scatter	Surface collection
Pending	BSF-ST1-18	540947	6122877	Scarred tree	Conservation

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D R A F T

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Appendix A

Project SEARs

D R A F T

Appendix A Project SEARs

Environmental Assessment Requirements

State Significant Development

Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*

Application Number	SSD 8835
Proposal	Bomen Solar Farm which includes: • the construction and operation of a photovoltaic generation facility with an estimated capacity of 120 MW; • the construction and operation of a 10 megawatt / 44 megawatt-hour energy storage facility; and • associated infrastructure, including a grid connection.
Location	Trahairs Road, Bomen
Applicant	Renew Estate
Date of Issue	21 November 2017
General Requirements	The Environmental Impact Statement (EIS) for the development must comply with the requirements in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* In particular, the EIS must include: • a stand-alone executive summary; • a full description of the development, including: – details of construction, operation and decommissioning; – a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of a separate approvals process); – a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development; • a strategic justification of the development focusing on site selection and the suitability of the proposed site with respect to potential land use conflicts with existing and future surrounding land uses (including other proposed or approved solar farms); • an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: – a description of the existing environment likely to be affected by the development; – an assessment of the likely impacts of all stages of the development, (which is commensurate with the level of impact), including any cumulative impacts, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice; – a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and – a description of the measures that would be implemented to monitor and report on the environmental performance of the development; • a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and • the reasons why the development should be approved having regard to: – relevant matters for consideration under the *Environmental Planning and Assessment Act 1979*, including the objects of the Act and how the principles of ecologically sustainable development have been

	incorporated in the design, construction and ongoing operations of the development; – the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and – feasible alternatives to the development (and its key components), including the consequences of not carrying out the development. While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of this development. In addition to the matters set out in Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*, the development application must be accompanied by a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development (as defined in Clause 3 of the *Environmental Planning and Assessment Regulation 2000*).
Specific Issues	The EIS must address the following specific issues: • **Biodiversity** – including an assessment of the biodiversity values and the likely biodiversity impacts of the development, a detailed description of the proposed regime for minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development. • **Heritage** – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community; • **Land** – including an assessment of the impact of the development on agricultural land and flood prone land, a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing land uses on the site and adjacent land (e.g. operating mines, extractive industries, mineral or petroleum resources, exploration activities, aerial spraying, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land; • **Visual** – including an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners; • **Noise** – including an assessment of the construction noise impacts of the development in accordance with the *Interim Construction Noise Guideline* (ICNG) and operational noise impacts in accordance with the *NSW Noise Policy for Industry* (NPfI), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria; • **Transport** – including an assessment of the site access route, site access point and likely transport impacts (including peak and average traffic generation) of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction, and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required); • **Water** – including: – an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including any

Appendix B

Agency Letters

D R A F T

Appendix B Agency Letters

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
www.aecom.com

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

10 November 2017

Senior Team Leader Planning
Regional Operations, South West
Office of Environment and Heritage
PO Box 1040
Albury NSW 2640

Dear Sir/Madam,

Request for Relevant Aboriginal Stakeholder Information, Bomen, NSW

I am writing to inform you that AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake an Aboriginal cultural heritage assessment for the proposed Bomen Solar Farm located in Bomen, 7 km north of Wagga Wagga, NSW (the Project area, Figure 1).

The Project will be approximately 250 hectares in size, located on the following lots (Figure 1):

- Lot 11 DP1130519 (part)
- Lot 2 DP590756 (part)
- Lot 174 DP751405 (part)
- Lot 108 DP751405 (part)
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- Lot 3 DP594679 (part) (only potentially required for connection option 2)
- Lot 2 DP1228221 (part) (only potentially required for connection option 2)
- Lot 22 DP1085826 (part) (only potentially required for connection option 2)
- Lot 2 DP594679 (part) (only potentially required for connection option 2)
- Lot 15 DP1108978 (part) (only potentially required for connection option 2).

The Proponent for the Project is Renew Estate Pty Ltd (Level 18, Grosvenor Place, 225 George Street, Sydney NSW 2000). The client Project contact is Lauren Lambert (Lauren@beast.solutions).

The purpose of this letter is to request from you, in accordance with Section 4.1.2 of the Office of Environment and Heritage's (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010), information regarding Aboriginal individuals and/or organisations whom you consider may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects/places in the area of the proposed project, and who may be interested in being consulted.

If you have any questions, please don't hesitate to contact me.

Kind regards,

Geordie Oakes
Archaeologist
Geordie.Oakes@aecom.com

Direct Dial: +61 2 8934 0610
Direct Fax: +61 2 8934 0001

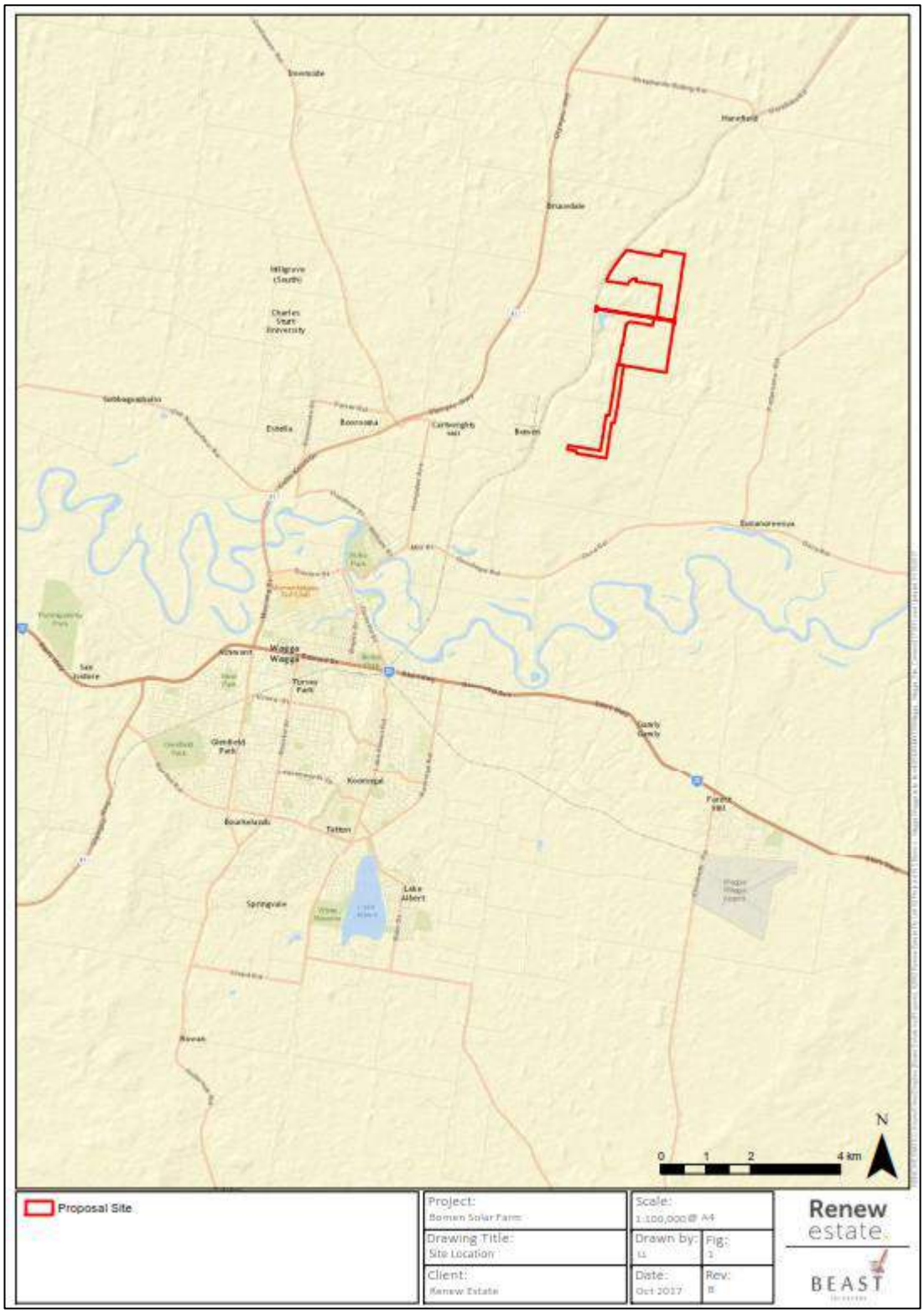

Figure 1: Project area

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
www.aecom.com

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

10 November 2017

Office of the Registrar
PO Box 112
Glebe NSW 2037

Dear Sir/Madam,

Request for Relevant Aboriginal Stakeholder Information, Bomen, NSW

I am writing to inform you that AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake an Aboriginal cultural heritage assessment for the proposed Bomen Solar Farm located in Bomen, 7 km north of Wagga Wagga, NSW (the Project area, Figure 1).

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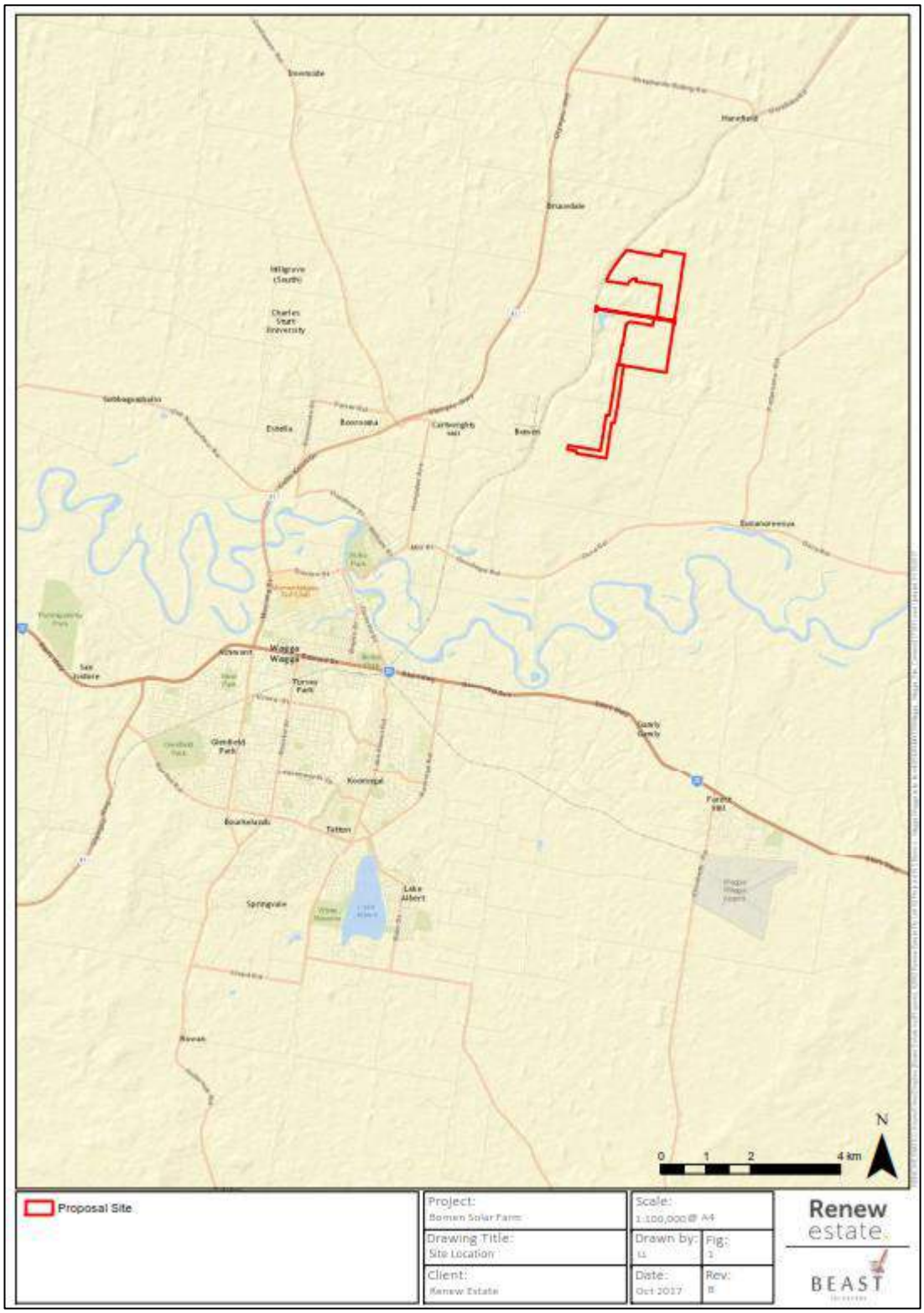

Figure 2: Project area

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
www.aecom.com

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

10 November 2017

Southern Rivers Catchment Authority
13 Mitchell Street
PO Box 10
Yass NSW 2582

Dear Sir/Madam,

Request for Relevant Aboriginal Stakeholder Information, Bomen, NSW

I am writing to inform you that AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake an Aboriginal cultural heritage assessment for the proposed Bomen Solar Farm located in Bomen, 7 km north of Wagga Wagga, NSW (the Project area, Figure 1).

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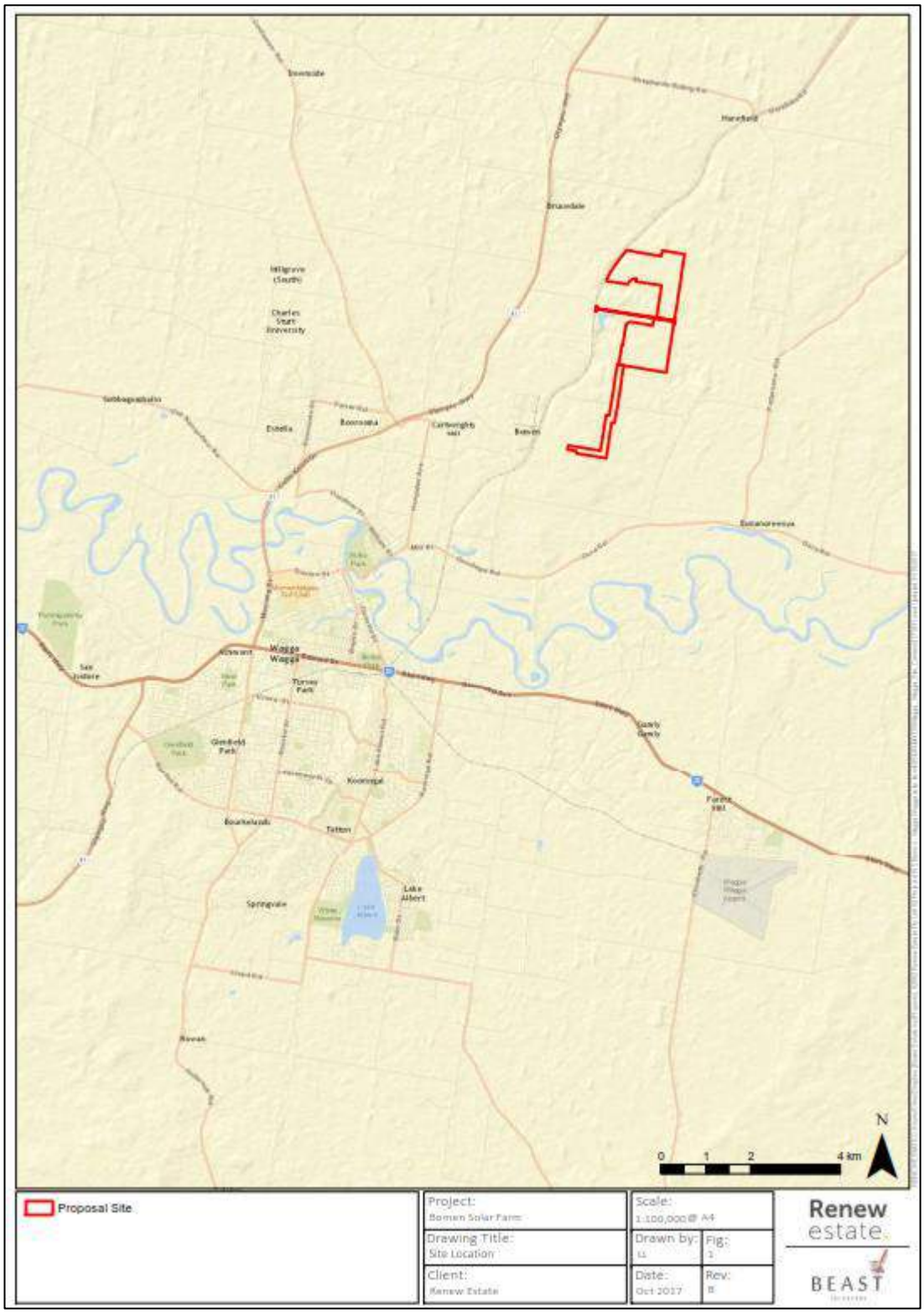

Figure 3: Project area

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www.aecom.com

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ABN 20 093 846 925

10 November 2017

Heritage Advisor
Wagga Wagga City Council
PO Box 20
Wagga Wagga NSW 2650

Dear Sir/Madam,

Request for Relevant Aboriginal Stakeholder Information, Bomen, NSW

I am writing to inform you that AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake an Aboriginal cultural heritage assessment for the proposed Bomen Solar Farm located in Bomen, 7 km north of Wagga Wagga, NSW (the Project area, Figure 1).

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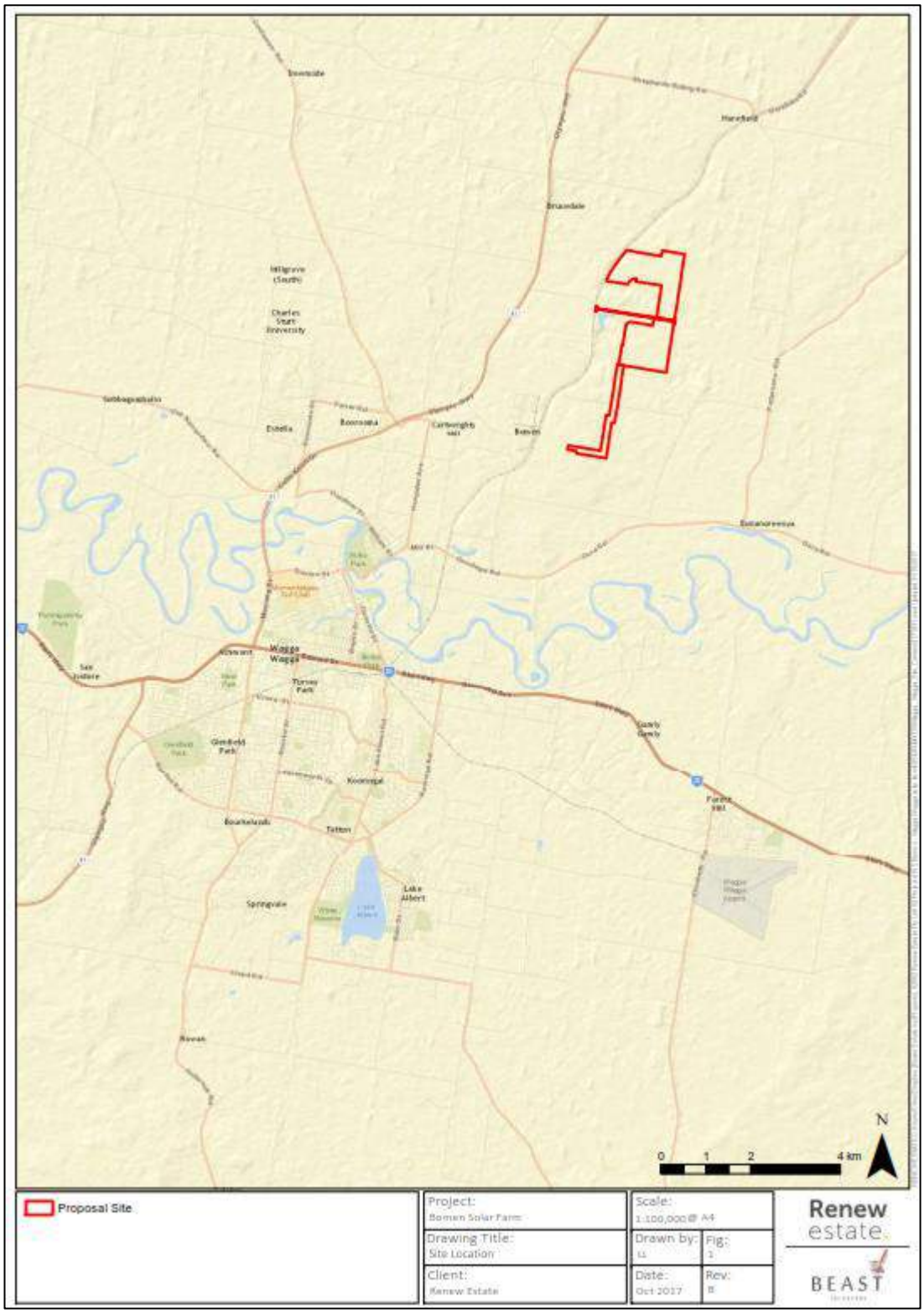

Figure 4: Project area

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
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Australia
www.aecom.com

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

10 November 2017

Wagga Wagga Local Aboriginal Land Council
PO Box 6289
Wagga Wagga NSW 2650

Dear Sir/Madam,

Request for Relevant Aboriginal Stakeholder Information, Bomen, NSW

I am writing to inform you that AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake an Aboriginal cultural heritage assessment for the proposed Bomen Solar Farm located in Bomen, 7 km north of Wagga Wagga, NSW (the Project area, Figure 1).

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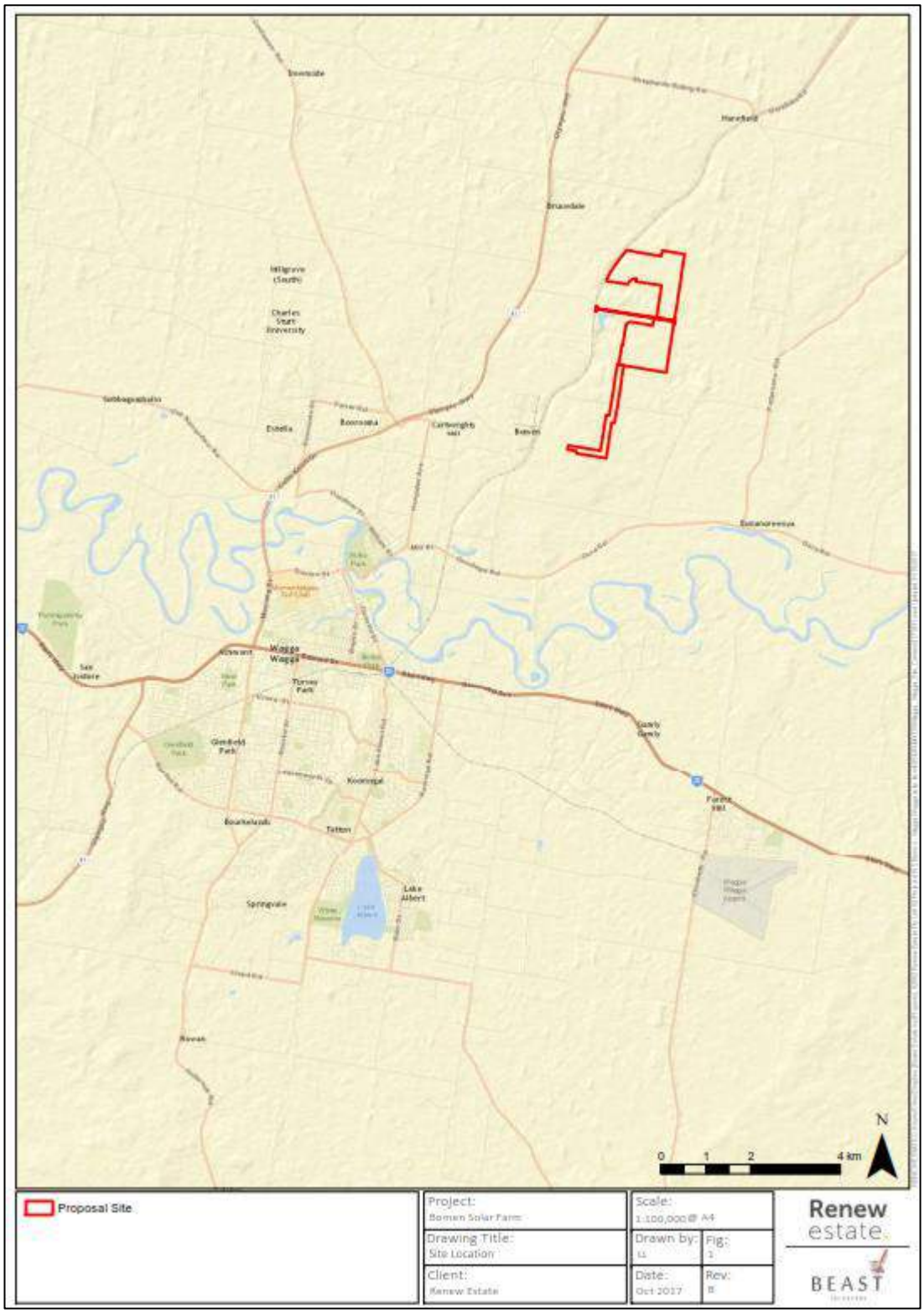

Figure 5: Project area

10 November 2017

Native Title Services Corporation Limited (NTSCorp Ltd)
PO Box 2105
Strawberry Hills NSW 2012

Dear Sir/Madam,

Request for Relevant Aboriginal Stakeholder Information, Bomen, NSW

I am writing to inform you that AECOM Australia Pty Ltd (AECOM) has been commissioned by Renew Estate Pty Ltd to undertake an Aboriginal cultural heritage assessment for the proposed Bomen Solar Farm located in Bomen, 7 km north of Wagga Wagga, NSW (the Project area, Figure 1).

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The Proponent for the Project is Renew Estate Pty Ltd (Level 18, Grosvenor Place, 225 George Street, Sydney NSW 2000). The client Project contact is Lauren Lambert (Lauren@beast.solutions).

The purpose of this letter is to request from you, in accordance with Section 4.1.2 of the Office of Environment and Heritage's (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010), information regarding Aboriginal individuals and/or organisations whom you consider may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects/places in the area of the proposed project, and who may be interested in being consulted.

If you have any questions, please don't hesitate to contact me.

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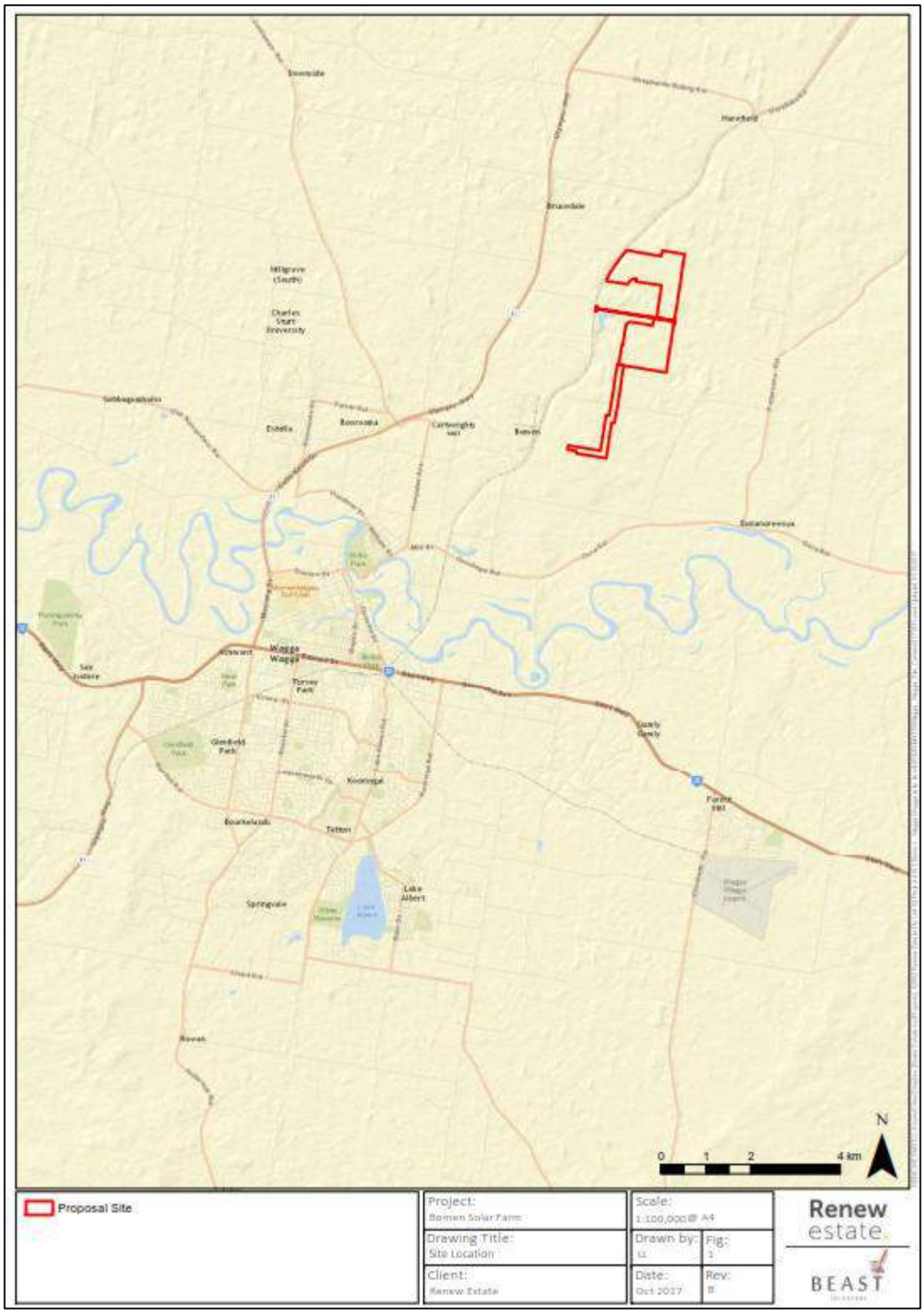

Figure 6: Project area

Appendix C

Agency Responses

D R A F T

Appendix C Agency Responses

OFFICE OF THE REGISTRAR
ABORIGINAL LAND RIGHTS ACT 1983 (NSW)

15 November 2017

Geordie Oakes
AECOM Australia Pty Ltd
Level 21, 420 George Street
SYDNEY NSW 2000

Dear Geordie

Re: Request - Search for Registered Aboriginal Owners

I refer to your letter dated 10 November 2017 regarding an Aboriginal Cultural Heritage Assessment located within the proposed Bomen Solar Farm located 7km north of Wagga Wagga, NSW.

I have searched the Register of Aboriginal Owners and the project area described does not have Registered Aboriginal Owners pursuant to Division 3 of the Aboriginal Land Rights Act 1983 (ALRA).

I suggest that you contact the Wagga Wagga Local Aboriginal Land Council on 02 6921 4095. They may be able to assist you in identifying other Aboriginal stakeholders for this project.

Yours sincerely

Jodie Rikiti
Administration Officer
Office of the Registrar, ALRA

Address: Level 3, 2 – 10 Wentworth Street, PARRAMATTA NSW 2150
Post: P.O Box 5068, PARRAMATTA NSW 2124
Phone: 02 8633 1266

Office of Environment & Heritage

Your reference:
Our reference: DOC17/560532
Contact: Peter Ewin
Ph: (02) 6022 0606

Mr Geordie Oakes
Archaeologist
AECOM Australia Pty Ltd
PO Box Q410
QVB Post Office NSW 1230

Dear Mr Oakes

Re: Registration of Aboriginal Interests – Bomen Solar Farm, Aboriginal Cultural Heritage Assessment, Wagga Wagga Local Government Area

I refer to your letter dated 10 November 2017 to the Office of Environment and Heritage (OEH) regarding the above matter. Attached is a list of known Aboriginal parties for the Wagga Wagga Local Government Area that OEH considers likely to have an interest in the proposed development.

Please note this is not necessarily an exhaustive list of all interested Aboriginal parties and receipt of this list does not remove the requirement for a proponent or consultant to advertise in local print media and contact other bodies seeking interested Aboriginal parties, in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (April 2010). The list includes all Local Aboriginal Land Councils (LALC) that occur within the local government area. While it is likely that Wagga Wagga LALC are the appropriate LALC for this proposal, it is the proponent's responsibility to identify which of these organisations is appropriate and should be included within the consultation process as identified in the consultation requirements.

Please note that the contact details in the list provided by OEH may be out of date as it relies on Aboriginal parties advising OEH when their details require changing. If individuals or companies undertaking consultation are aware that any groups contact details are out of date, or letters are returned unopened, please contact either the relevant stakeholder group (if you know their more current details) and/or OEH.

Should you require any further information or advice please contact me on 6022 0606 or via email peter.ewin@environment.nsw.gov.au.

Yours sincerely

P.E 14/11/17

PETER EWIN
Senior Team Leader Planning
South West Branch
Regional Operations
Office of Environment and Heritage

Enclosure: Attachment 1 – Registered Interests Wagga Wagga Local Government Area

PO Box 1040 Albury NSW 2640
Second Floor, Government Offices
512 Dean Street Albury NSW 2640
Tel: (02) 6022 0624 Fax: (02) 6022 0610
ABN 30 841 387 271
www.environment.nsw.gov.au

ATTACHMENT 1 – Registered Interests Wagga Local Government Area

Organisation/ Individual Name	Address	Contact Details
Wagga Wagga Local Aboriginal Land Council	159 Docker Street PO Box 6289 WAGGA WAGGA NSW 2650	Phone: 02 6921 4095 Fax: 02 6921 7625 Email: waggawaggalalc@bigpond.com
Brungle/Tumut Local Aboriginal Land Council	95 Capper St PO Box 684 TUMUT NSW 2720	Phone:02 6947 4518 Fax: 02 6947 4501 Email: btlalc@bigpond.net.au
Narrandera Local Aboriginal Land Council	172 East Street PO Box 544 NARRANDERA NSW 2700	Phone: 02 6959 1823 Fax: 02 6959 2811 Email: nlalc14@bigpond.com
Wagga Wagga Aboriginal Elders Group Inc.	Isobel Reid P.O. Box 2238 WAGGA WAGGA NSW 2650	
Waagan Waagan Project Group	Robert Hampton 16 Otama Street WAGGA WAGGA NSW 2650	Phone: 0428 660 680
Yalmambirra	120 Talgarno Gap Road BETHANGA VIC 3691	Email: yalmambirra@outlook.com
Bundyi Aboriginal Cultural Knowledge	Mark Saddler P.O. Box 8005 KOORINGAL NSW 2650	Phone: 0412 693 030 Email: marksad@live.com.au

City of Wagga Wagga

Civic Centre
Cnr Baylis & Morrow Sts
PO Box 20
Wagga Wagga NSW 2650

abn 56 044 159 537
p 1300 292 442
f 02 6926 9199
e council@wagga.nsw.gov.au
w www.wagga.nsw.gov.au

Geordie Oakes
AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410

08/01/2018

Dear Mr Oakes,

RE - Request for Relevant Aboriginal Stakeholder Information, Bomen, NSW

Thank you for your enquiry regarding Aboriginal stakeholders for the above mentioned project.

Bomen is home to a number of recognised Aboriginal significant sites gazetted through the NSW Office of Environment and Heritage and as such, holds cultural importance too many local Aboriginal people within the Wagga Wagga community.

For privacy reasons, I am unable to release personal information to outside parties, however, within my role at Council I am able to assist with distribution of materials through an extensive email network of local Aboriginal community members and services. Upon receiving the documents, I am happy to send your correspondence to these networks. If you wish to forward me any further documents in relation to this matter, please email them to Pengelly.ashleigh@wagga.nsw.gov.au.

Additionally, I would recommend advertising in the local newspaper, The Daily Advertiser as well as the national Indigenous newspaper, The Koori Mail, to ensure the project has the potential to reach as many interested parties as possible.

I would also highly recommend discussing this project with Wagga Wagga Local Aboriginal Land Council CEO, Lorraine Lyons. Lorraine can be contacted on 6921 4095. I would also recommend contacting Aboriginal stakeholders at Riverina Local Land Services.

Yours Sincerely

Ashleigh Pengelly
Aboriginal Youth and Community Development Officer
Wagga Wagga City Council

ntscorp

14 November 2017 ref: OE&H : 14-11-2017/1

Geordie Oakes
Level 21/420 George St
Sydney NSW 2000

Dear Sir or Madam,

Aboriginal Cultural Heritage Assessment

Proposed Bomen Solar Farm, Bomen NSW

I refer to your letter of 10 November 2017 regarding the above matter.

We acknowledge that section 4.1.2 of the Office of Environment & Heritage's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* require you to contact us in order to compile a list of Aboriginal people who may have an interest in the proposed project area and hold knowledge relevant to determining the cultural significance of Aboriginal objects and/or places.

However, we advise that NTSCORP's privacy guidelines restrict us from providing proponents with contact details of traditional owners who may have such an interest or hold such knowledge.

Please be advised that, in response to your notification, we will forward your correspondence to any individuals, groups and organisations whom NTSCORP is aware assert traditional interests within or hold cultural knowledge about the relevant area. Recipients of our correspondence will be invited to register their interest in the project directly with you ASAP.

Please be aware that NTSCORP cannot make a guarantee or undertaking that the recipients of our correspondence represent the entirety of traditional owners for the relevant area.

Yours faithfully,

Anupam Singh
Research Officer – Strategic Development
NTSCORP Limited

Level 1, 44-70 Rosehill St Redfern NSW 2016 Australia
t + 61 2 9310 3188
PO Box 2105 Strawberry Hills NSW 2012 Australia
f + 61 2 9310 4177
abn: 71 098 971 209
w www.ntscorp.com.au

Appendix D

Newspaper Advertisement – Bungendore Weekly

D R A F T

Appendix D Newspaper Advertisement – Bungendore Weekly

Bomen Solar Farm
adjacent to Byrnes Road, Bomen, NSW

Lot 11 DP1130519 (part), Lot 2 DP590756 (part), Lot 174 DP751405 (part), Lot 108 DP751405 (part), Lot 110 DP751405, Lot 109 DP751405, Lot 3 DP594679 (part), Lot 2 DP1228221, Lot 22 DP1085826 (part), Lot 2 DP594679 (part), Lot 15 DP1108978 (part)

Renew Estate Pty Ltd (proponent)

(Lauren Lambert, Level 18, Grosvenor Place, 225 George Street, Sydney NSW 2000)

AECOM on behalf of Renew Estate Pty Ltd is seeking to identify Aboriginal persons or organisations who wish to be consulted in relation to an Aboriginal Heritage Assessment for a proposed solar farm in Bomen, NSW.

This assessment will form part of an Environmental Impact Statement (EIS) being prepared to support a development application for Development Consent under Part 4, Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Interested Aboriginal persons or stakeholders are requested to register their interest in writing to:

Geordie Oakes
c/- AECOM Australia Pty Ltd
PO Box Q410, QVB Post Office,
Sydney, NSW 1230
Ph: +61 2 8934 0610
Fax: +61 2 8934 0001
Email: Geordie.Oakes@aecom.com

Expressions of interest should include current

DRAFT

Appendix E

OEH & LALC RAP Notification

D R A F T

Appendix E OEH & LALC RAP Notification

AECOM Imagine it. Delivered.

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
www.aecom.com

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

12 February 2017

Senior Team Leader Planning
Regional Operations, South West
Office of Environment and Heritage
PO Box 1040
Albury NSW 2640

To Whom it May Concern,

Notification of Registered Aboriginal Parties (RAPs) for the Bomen Solar Farm development located Bomen, Wagga Wagga, NSW

In accordance with Section 4.1.6 of OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, please find enclosed for your records a list of the Aboriginal organisations and individuals who have registered an interest in being consulted for an Aboriginal Cultural Heritage Assessment being undertaken by AECOM Australia Pty Ltd (AECOM) for the proposed Bomen Solar Farm, located in Bomen, Wagga Wagga, NSW.

As was stated in the letters of invitation issued to Aboriginal organisations and individuals requesting registrations of interest, the official registration period for this project closed on 29 December 2017. A copy of the invitation is attached to this letter as well as the newspaper advertisement stakeholder request.

A total of three registrations of interest have been received regarding consultation for this project (Table 1). Please note that in accordance with Section 4.1.5 of the Consultation Requirements, AECOM provides the opportunity for Registered Aboriginal Parties (RAPs) to withhold their details from being forwarded on to the Local Aboriginal Land Council and/or OEH, and respects the wishes of RAPs to withhold their details at their discretion. No RAPs requested that their details be withheld in regard to this project.

Table 1 List of Registered Aboriginal Parties

Organisation	Date of registration	Method	Contact Person
Bundyi Aboriginal Cultural Knowledge	14/11/2017	Email	Mark Saddler
Eddie Whyman	26/11/2017	Email	Eddie Whyman
Yalmambira	11/12/2017	Email	Yalmambira

Yours faithfully,

Geordie Oakes
Archaeologist
geordie.oakes@aecom.com

Direct Dial: +64 2 89340610
Direct Fax: +64 2 89340001

AECOM Imagine it. Delivered.

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
www.aecom.com

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

12 February 2018

Wagga Wagga Local Aboriginal Land Council
PO Box 6289
Wagga Wagga NSW 2650

To Whom it May Concern,

Notification of Registered Aboriginal Parties (RAPs) for the Bomen Solar Farm development located Bomen, Wagga Wagga, NSW

In accordance with Section 4.1.6 of OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, please find enclosed for your records a list of the Aboriginal organisations and individuals who have registered an interest in being consulted for an Aboriginal Cultural Heritage Assessment being undertaken by AECOM Australia Pty Ltd (AECOM) for the proposed Bomen Solar Farm, located in Bomen, Wagga Wagga, NSW.

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Yalmambira	11/12/2017	Email	Yalmambira

Yours faithfully,

Geordie Oakes
Archaeologist
geordie.oakes@aecom.com

Direct Dial: +64 2 89340610
Direct Fax: +64 2 89340001

DRAFT

Appendix F

Draft Assessment Methodology

D R A F T

Appendix F Draft Assessment Methodology

AECOM Imagine it. Delivered.

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
www.aecom.com

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

1 December 2017

«Organisation»
«First_Name» «Last_Name»
«Address_1»
«Address_2»

Dear Stakeholder,

RE: Notification of Project Proposal, Registration of Interest and Proposed Project Methodology - Aboriginal Archaeological and Cultural Heritage Impact Assessment for a proposed solar farm located in Bomen, NSW

1.0 Registration of Interest

AECOM Australia Pty Ltd (AECOM) was commissioned by Renew Estate Pty Ltd to prepare an Aboriginal Archaeological and Cultural Heritage Impact Assessment (AACHIA) for a proposed solar farm located in Bomen, NSW ('the Project area', Figure 1). The Project will be approximately 250 hectares in size, located on the following lots, east of Bomen:

- Lot 11 DP1130519 (part)
- Lot 2 DP590756 (part)
- Lot 174 DP751405 (part)
- Lot 108 DP751405 (part)
- Lot 110 DP751405
- Lot 109 DP751405
- Lot 3 DP594679 (part) (only potentially required for connection option 2)
- Lot 2 DP1228221 (part) (only potentially required for connection option 2)
- Lot 22 DP1085826 (part) (only potentially required for connection option 2)
- Lot 2 DP594679 (part) (only potentially required for connection option 2)
- Lot 15 DP1108978 (part) (only potentially required for connection option 2).

I am writing to you as it has been identified that you may have an interest in registering for consultation in relation to this assessment. Please also find enclosed a copy of AECOM's draft assessment methodology. Should you wish to register your interest or would like to make comment on the proposed methodology, it would be greatly appreciated if you could please provide written and/or verbal confirmation/comments within 28 days of the date shown on this letter. My contact details are provided at the end of this letter.

In addition to providing our draft methodology, I would also like to take this opportunity to request from you any initial comments regarding the cultural values of the Project area.

Please be advised that if you register an interest for consultation, your details will be forwarded to the Office of Environment and Heritage (OEH) and Wagga Wagga Local Aboriginal Land Council, unless you specify that you do not want your details released.

2.0 Notification of Project Proposal

Renew Estate Pty Ltd is proposing to construct a solar farm within the Project area. AECOM has been engaged to complete an AACHIA that will be form part of an Environmental Impact Statement (EIS) for the project.

SAMPLE

3.0 Proponent Contact Details

Name: Renew Estate Pty Ltd

ABN: 21 617 855 311

Address: Level 18, Grosvenor Place, 225 George Street, Sydney NSW 2000

Contact: Lauren Lambert (lauren@beast.solutions)

4.0 Project Archaeological Background

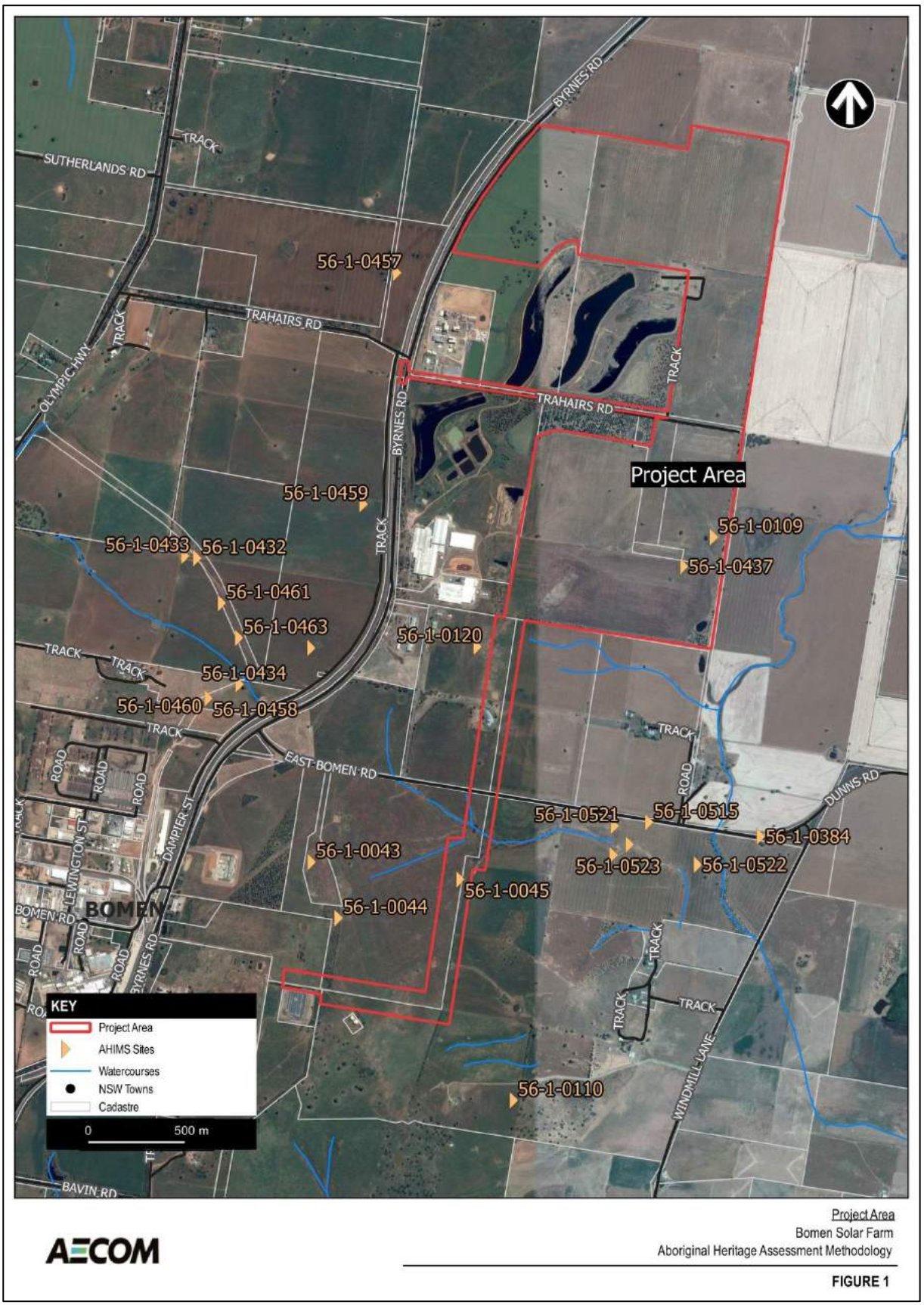
Aboriginal Heritage Information Management System (AHIMS) Search

A search of the AHIMS database was undertaken on 30 November 2017 for a 10 x 10 km area centred on the Project area. A total of 29 Aboriginal archaeological sites were identified within the search area comprising 20 open artefact sites (i.e., artefact scatters and isolated artefacts), six scarred trees, and three stone quarries. Consideration of the location of previously recorded sites indicates three are located in the Project area including open artefact sites – 'BIF1' (AHIMS#56-1-0109), 'East Bomen IF1' (AHIMS#56-1-0045) and 'Bomen Solar IS01' (56-1-0437)(Figure 1). All three sites comprise isolated artefacts. Site details are provided in the table below.

Table 1 AHIMS sites within the Project area

AHIMS Site ID	Site name	AHIMS Centroid Coordinates (MGA 55)		Site type	Current AHIMS status	Reference
56-1-0109	BIF1	540719	6120812	Isolated artefact	Valid	Kelleher Nightingale Consulting Pty Ltd (2008)
56-1-0045	East Bomen IF1	539405	6119039	Isolated artefact	Valid	Navin Officer Heritage Consultants Pty Ltd (1998)
56-1-0439	Bomen Solar IS01	540564	6120660	Isolated artefact	Valid	ngh Environmental, (2016)

SAMPLE



AECOM

Project Area
Bomen Solar Farm
Aboriginal Heritage Assessment Methodology

FIGURE 1

Figure 1: Project area

5.0 Draft Methodology

In accordance with the Office of Environment and Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a), AECOM is providing for your review a draft assessment methodology for the Project, and allowing 28 days from the date of this letter for comment.

AECOM proposes the following assessment methodology:

A. Desktop assessment;

B. Archaeological survey of the Project area with Registered Aboriginal Parties (RAPs);

C. Consultation with RAPs in order to identify the Aboriginal cultural heritage values of the Project area; and

D. Preparation of an AACHIA for the Project area detailing the results of the above. Appropriate management/mitigation measures for the identified Aboriginal heritage values of the Project area will be provided in these reports.

A. Desktop Assessment

The desktop assessment will comprise:

- A search of OEH's AHIMS database prior to archaeological survey;
- A review of the landscape context of the Project area;
- A review of relevant archaeological and ethnohistoric information for the Project area; and
- Preparation of a predictive model for Aboriginal archaeological site type and distribution within the Project area.

B. Archaeological Survey

A targeted archaeological survey of the Project area, focussing on sensitive landforms (i.e., creeklines), will be undertaken over two days by a combined field team of two AECOM archaeologists and an appropriate number of RAP representatives. Previously identified AHIMS sites will be located and re-recorded. Any new sites identified during survey will be recorded to the standard required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b). For each site located, individual artefact locations will be captured by differential GPS with associated technological attributes entered into the same device. Photographic records of each site will also be taken.

D. Consultation with RAPs

RAP representatives are in the best position to provide information on the Aboriginal social/cultural heritage values of a given area. During the assessment process, AECOM archaeologists will consult with RAPs regarding the cultural heritage values of the Project area. This will include:

- A request (with this draft methodology) for any initial comments regarding the Aboriginal cultural heritage values of the Project area;
- The provision of this project information package, including draft assessment methodology to all RAPs for comment prior to fieldwork;
- RAP participation in field survey;
- Discussion of cultural heritage values with RAPs during field survey; and
- Provision of draft AACHIA to all RAPs for comment prior to finalisation.

6.0 Contact Details

To register your interest in this project and/or should you have any queries/comments regarding the proposed methodology or cultural heritage values of the Project area, please contact Geordie Oakes by any of the below contact details.

Phone: 02 8934 0610

SAMPLE

Fax: 02 8934 0001

Email: Geordie.Oakes@aecom.com

Post: Geordie Oakes
AECOM Australia Pty Ltd
PO Box Q410
QVB PO, Sydney NSW 1230

The comment period for the draft methodology will close 28 days from the date of this letter.

Yours faithfully,

Geordie Oakes
Archaeologist
geordie.oakes@aecom.com
Direct Dial: +64 2 89340610
Direct Fax: +64 2 89340001

SAMPLE

D R A F T

Appendix H

RAP Submission on Draft Report

[waiting on comments from RAPS]

D R A F T

Appendix H RAP Submissions on Draft Report

DRAFT

Appendix I

Test Pit Details

[Waiting on data]

D R A F T

Appendix I Test Pit Details

DRAFT

Appendix J

Artefact Data

D R A F T

Appendix J Artefact Data

Rec.No.	Phase	Test pit	Depth	Tech. Type	Raw Mat.	Quartz type	Cortex	Colour	Weight (g)	MLD (mm)	Flk. lngth (mm)	Flk. wdth (mm)	Flk. thk (mm)	Plat. Type	Overhang	Plat. wdth (mm)	Plat. thk (mm)	Dorsal Cortex	DFSO	Termination
1	1	13	0-10	Proximal flake	FGS	NA	Yes	Black	1.38	15.6				Multiple	None	8.7	4.5			
2	1	13	0-10	Proximal flake	Quartz	Milky	No	White	4.57	22.5				Multiple	None	12.7	5.4			
3	1	13	0-10	Proximal flake	Quartz	Milky	No	White	0.53	11.5				Single	None	6.8	2.7			
5	1	13	0-10	Flake shatter	Quartz	Milky	No	White	0.09	7.3										
7	2	3B	10-20	Multidirectional core	Quartz	Milky	No	White	7.97	31.4										
8	2	3B	10-20	Angular shatter	Quartz	Milky	No	White	1.17	21										
9	2	3B	10-20	Angular shatter	Quartz	Milky	No	White	0.43	9.7										
10	2	3B	10-20	Flake shatter	Quartz	Milky	No	White	0.2	8.3										
11	1	9	0-10	Flake shatter	Quartz	Milky	No	White	0.15	9.7										
12	1	9	0-10	Flake shatter	Quartz	Milky	No	White	0.18	10										
13	1	3	10-20	Flake shatter	FGS	NA	No	Black	0.58	16.6										
14	1	3	10-20	Angular shatter	Quartz	Milky	No	White	0.16	9.8										
15	1	3	10-20	Angular shatter	Quartz	Milky	No	White	0.23	8.9										
16	1	11	0-10	Flake shatter	Quartz	Milky	No	White	0.74	16.1										
17	1	11	0-10	Flake shatter	Quartz	Milky	No	White	0.46	12.3										
18	1	11	0-10	Angular shatter	Quartz	Milky	No	White	1.15	12.8										
19	1	11	0-10	Angular shatter	Quartz	Milky	No	White	0.18	7.5										

20	1	11	0-10	Angular shatter	Quartz	Milky	No	Grey-white	0.13	7.8										
21	1	7	20-30	Flake shatter	Quartz	Milky	No	White	0.97	19.3										
22	1	7	20-30	Proximal flake	Quartz	Milky	No	White	0.45	12.6				Single	None	8.98	2.4			
23	1	7	20-30	Proximal flake	Quartz	Milky	No	White	0.48	12.4				Single	None	5.7	2.9			
24	1	19	0-10	Complete flake	Quartz	Milky	No	White	3.6	29.1	29.1	18.8	6.6	Single	None	15.3	5.6	None	Irregular	Feather
25	1	1	10-20	Complete flake	Quartz	Milky	No	White	0.47	16.4	16.4	10.2	2.8	Single	None	6.4	1.8	Yes	Unidirectional	Feather
26	1	1	10-20	Proximal flake	Quartz	Milky	No	White	0.27	12.2				Multiple	None	5.8	2.5			
27	2	3D	0-10	Proximal flake	Quartz	Milky	No	White	0.83	11.6				Single	None	10.7	5.9			
28	2	3D	0-10	Angular shatter	Quartz	Milky	No	Grey-white	0.22	10.4										
29	2	3B	0-10	Angular shatter	Quartz	Milky	No	White	0.16	7.5										
30	1	5	0-10	Angular shatter	Quartz	Crystal	No	Clear	0.29	8.3										
31	1	7	0-10	Flake shatter	Quartz	Milky	No	White	0.25	10										