APPENDIX 12

Sapphire Wind Farm Archaeological and Cultural Heritage Assessment

New South Wales Archaeology Pty Ltd

Proposed Sapphire Wind Farm
Archaeological and Cultural Heritage Assessment

A report to
Wind Prospect CWP Pty Ltd

March 2011

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1. SUMMARY

1.1 Introduction

New South Wales Archaeology Pty Ltd was commissioned by Wind Prospect CWP Pty Ltd in June 2009 to undertake an archaeological and cultural heritage assessment of the proposed Sapphire Wind Farm. The project area is located between the towns of Glen Innes and Inverell in northern NSW.

The proposal would involve the installation and operation of up to 159 wind turbines. The turbines would be placed along a series of ridges on private properties which are currently utilised predominantly for grazing.

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

1.2 Partnership with Aboriginal Communities

This assessment has been conducted in accordance with the consultation process as outlined in the Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants (NSW DEC 2004). The registered stakeholder groups for this project are listed in Section 3. The field survey has been undertaken with the assistance of a number of people from the local community including Liza Duncan, Vicky Duncan, Charmayne Talbot, Jeremy Duncan, Arnold Duncan, Courtney Duncan, and Curtly Duncan.

1.3 Description of Impact

The impacts relating to the construction of the proposed Sapphire Wind Farm will result from the installation of up to 159 wind turbines and associated infrastructure including an on-site underground electrical cable network, an overhead powerline, one or more collector substations comprising cable marshalling, switchgear and transformer, access tracks, crane hardstand areas, site operations facilities, and temporary construction facilities.

The wind farm will have a capacity of 238 – 425 megawatts (MW), depending on the use of one of two current options, these being either 159 1.5 MW turbines or 125 3.4 MW turbines. The output of the wind farm will be connected to the existing 132kV and 330kV transmission lines which traverse the project area.

The proposed works entail ground disturbance and, accordingly, the construction of the wind farm has the potential to cause impacts to any Aboriginal objects or Non-Indigenous items which may be present within the zones of direct impact. Impacts will occur in an area measuring approximately 297 hectares. Impacts will be generally confined to cleared areas currently utilised for grazing and cultivation and, where possible, existing access roads will be used for site access. Electrical connections and communications cabling will be installed adjacent to, or within access roads.

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

1.4 Objectives and Methods

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

The investigation has included a literature review, field survey and analysis of results. Field work was undertaken over an eleven day period in January 2011.

Indigenous

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

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

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

Non-Indigenous

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

The NSW Department of Urban Affairs and Planning and the NSW Heritage Office have produced guidelines for preparing archaeological and heritage assessments as set out in Archaeological Assessment Guidelines 1996 and Heritage Assessments 1996. Where relevant this report has been prepared in accordance with these guidelines and those more recently defined as a result of the 1998 amendments to the NSW Heritage Act 1977.

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

1.5 Heritage Context

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

A search of the New South Wales Department of Environment, Climate Change and Waters' (the NSW DECCW) Aboriginal Heritage Information Management System (AHIMS) has indicated that there are no previously recorded Aboriginal objects located within the proposed impact area (AHIMS #26166: 16th June 2009).

Searches of historical databases have been conducted. There are no previously recorded heritage items on the *Australian Heritage Database*, *State Heritage Inventory* or the *Register of the National Trust* listed as being present within the study area.

1.6 Results and Impact Assessment

The development area has been divided into 21 Survey Units; the total Survey Unit area measures approximately 2,515 hectares. It is estimated that approximately 1,196 hectares of that area was subject to survey inspection. Ground exposures inspected are estimated to have been 7.53 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 1.7 hectares. Effective Survey Coverage is therefore calculated to have been 0.07% of the development envelope and is assessed to be low. The low Effective Survey Coverage achieved is result of the thick ground surface vegetation encountered at the time of the survey and low levels of archaeological visibility within ground exposures.

Indigenous

A total of three Aboriginal object locales, SU14/L1, SU19/L1 and SU21/L1 have been recorded. All three Aboriginal object locales are very low density stone artefact distributions located within Survey Units assessed to be of low archaeological potential and sensitivity; these are assessed to be of low archaeological significance. In addition, five trees have been documented which were considered by the Aboriginal field assistants to be possible scarred trees. A stone arrangement is reported to be situated in reasonably close proximity, although away from, an area of proposed impact near to Survey Unit 6. Attempts were made to relocate this feature, but were unsuccessful due to the presence of thick vegetation covering the ground. However, an approximate area where this arrangement is indicated to be situated was outlined, and it was determined that any proposed impacts should avoid this region.

As noted above, Effective Survey Coverage encountered during the survey was low. It is predicted that additional stone artefacts are highly likely to be present in areas of proposed impacts other than those identified, either on ground surfaces or in subsurface contexts. However, in all Survey Units artefact density is predicted to be either very low or low. Accordingly, all Survey Units are assessed to be of low archaeological sensitivity.

The archaeological significance assessment is based on scientific criteria, and it is noted that the cultural significance (that is - values from an Indigenous perspective) of the local area and the Aboriginal sites it contains, is higher.

The construction of the Sapphire Wind Farm will result in substantial physical impacts to any Aboriginal objects which may be located within direct impact areas - *irrespective of their significance*. That is, any Aboriginal object situated within an area of direct impact will be comprehensively disturbed, and/or destroyed during construction.

As with any development the chances of impacting Aboriginal objects, particularly stone artefacts, is high, given that they are present in a continuum across the landscape, and located on or within ground surfaces. However, with regard to Aboriginal object locales which consist of artefact scatters assessed to be of low significance, the impacts can be viewed as being of correspondingly low archaeological significance. As noted above, the cultural significance of the recorded Aboriginal objects is higher and, accordingly, for the local Aboriginal community, impacts may be considered to be of a higher order of significance. This assessment forms the basis for the formulation of management strategies which aim to mitigate development impact to the archaeological resource.

Non-Indigenous

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

1.7 Mitigation and Management Strategies

Details of the archaeological sensitivity, suitable management strategies and accompanying rationale for each Survey Unit and Indigenous heritage item are outlined in Section 12 of this report.

Indigenous

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

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

Given the nature and density of the artefact locales recorded in the proposal area and the low scientific significance rating they been accorded, unmitigated impacts is considered appropriate; a strategy of impact avoidance is not warranted in respect of these locales. Indeed, with regard to the Aboriginal object locales SU14/L1 and SU19/L1, the location of the proposed impacts falls on reasonably discrete areas which are significantly eroded due to vegetation clearance and subsequent grazing and vehicle disturbance. These activities have initiated on-going stream bank erosion. As a result, much of the artefact bearing soils in these two locales has been, and continues to be washed away, and the archaeological resource represented therein considerably diminished. However, nearby in these landforms the effects of weathering and erosion have been less, so that the soil profile and any artefacts that potentially may be contained therein would be less disturbed and more intact. For this reason it is thought that in relation to SU14/L1 and SU19/L1, maintaining the current alignment of the proposed impacts in these locales, which fall on areas that have already sustained significant prior impacts, would result in a better outcome by conserving adjacent areas that are more intact.

With regard to Aboriginal object locale SU21/L1, it is recommended that avoiding or limiting the extent of impacts to this locale, if feasible, should be given consideration.

Non-Indigenous

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

1.8 Recommendations

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

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

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

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

- The Aboriginal object locales recorded are very low density distributions of stone artefacts. The archaeological significance of these locales is assessed to be low. Accordingly, a management strategy of unmitigated impact is considered to be appropriate.

- While the Aboriginal object locales recorded are very low density distributions of stone artefacts and the archaeological significance of these is assessed to be low, it is nevertheless recommended that limiting the extent of impacts to these locales, if at all feasible, should be given consideration.

- In regard to the recorded trees with scars which have been identified by the Aboriginal field assistants, it is recommended that a strategy of avoidance of impacts be adopted.

- In the area of the proposed internal easement route in Survey Unit 6 that extends across and to the west of Waterloo Road to link with an existing transmission line, impacts should not take place further north than the point 347037e 6712005n GDA in order to avoid inadvertently impacting a potential Aboriginal stone arrangement site.

- It is recommended that additional archaeological assessment is conducted in any areas which are proposed for impacts that have not been surveyed during the current assessment – *that is*, if changes are made to current plans or if additional impact areas are proposed. Significant Aboriginal objects can occur anywhere in the landscape and, accordingly, if present they need to be identified and impact mitigation strategies implemented prior to impacts.

- The proponent should develop a Cultural Heritage Management Protocol, which documents the procedures to be followed for impact avoidance or mitigation. The development of an appropriate Cultural Heritage Management Protocol should be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Environment, Climate Change and Water.

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

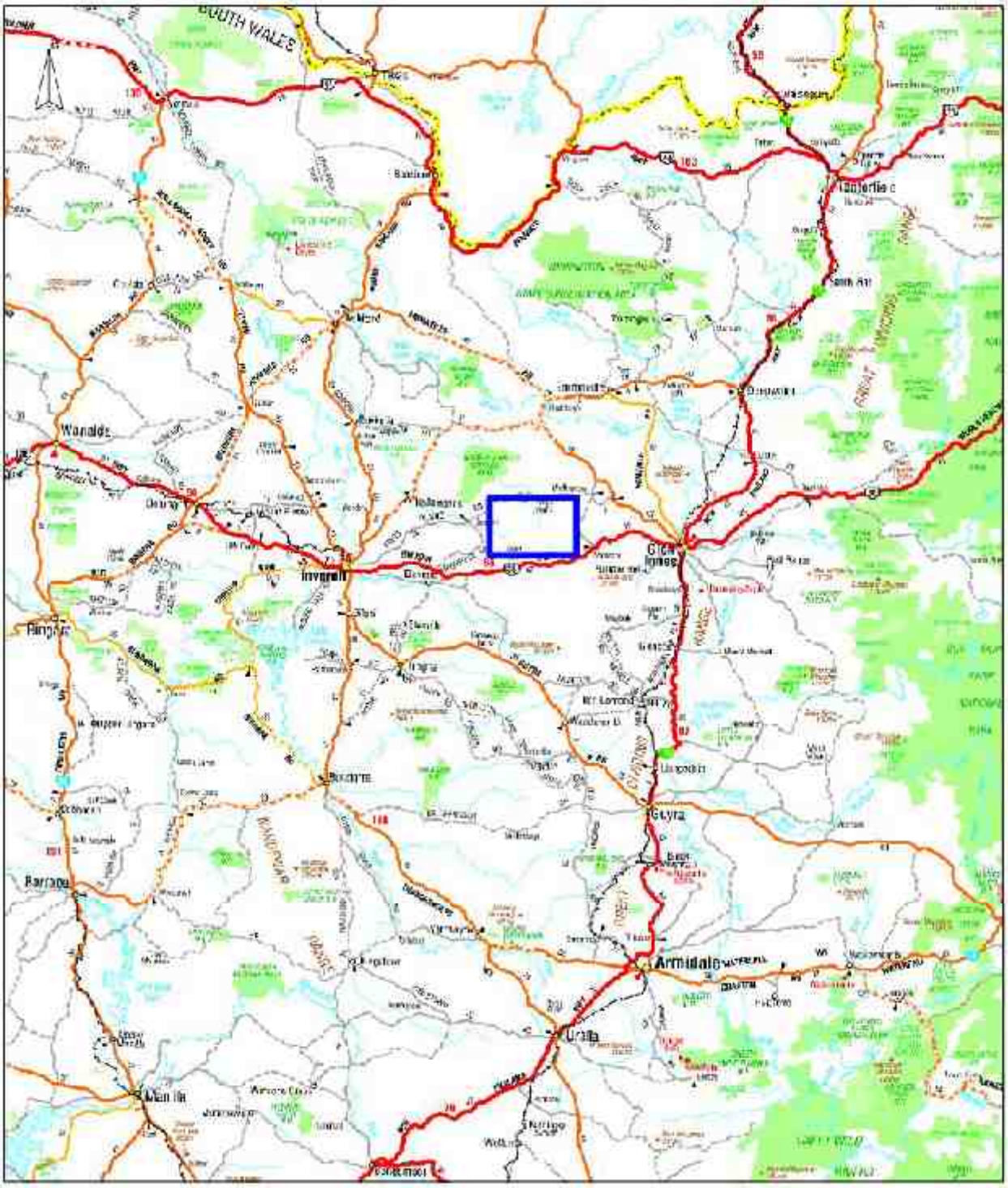

Figure 1. Location of the proposed Sapphire Wind Farm (map provided by proponent).

2. INTRODUCTION

2.1 Introduction

New South Wales Archaeology Pty Ltd was commissioned by Wind Prospect CWP Pty Ltd in June 2009 to undertake an archaeological and heritage assessment of the proposed Sapphire Wind Farm. The project area is located 28 kilometres east of Inverell and 18 kilometres west of Glen Innes, in northern New South Wales (Figure 1).

The proposal would involve the construction and operation of up to 159 wind turbines. The turbines extend over a 10 km area north-south, and 15 km area east-west. The individual turbine positions are located on land with elevations ranging from approximately 750 m to 1,100 m Australian Height Datum (AHD).

The project site is located on rural land situated within the Inverell Shire and Glenn Innes Severn Council areas, and includes twenty two private landowners. The turbines would be placed along a series of ridge landforms which are currently utilised predominantly for grazing.

The development area is defined by a 100 metre buffer around the development footprint as seen in Figure 2 (i.e. 200 metre survey corridor). The study area measures approximately 1,982.13 hectares. The development footprint, defined as the area which will be directly impacted by the construction of the wind farm, is a maximum of 297.08 hectares (for 1.5 MW turbines - 50m x 50m clearance required for each turbine, and a 12 metre easement for roads with varying clearance width for cut and fill areas).

The development footprint of the proposed wind farm includes turbines, access tracks and the associated ancillary structures required for the running of the wind farm. The project description is based on current planning. The site layout may change as a result of issues which might arise in relation to on-going assessments including biodiversity, archaeology and cultural heritage, geology, wind regime, wind turbine availability and transmission connection design issues.

The proposed wind farm is defined as a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979. The Director General, Department of Planning has issued requirements for the preparation of an Environmental Assessment (dated 29th May 2009) in which it is stated that an Indigenous heritage assessment is required to be prepared which addresses the potential impact of the proposal on Aboriginal heritage values (archaeological and cultural).

In accordance with the *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC 2005) this report aims to document:

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

- The cultural and archaeological sensitivity of the landforms subject to proposed impacts (Section 7);
- A review of Non-Indigenous history of the proposal area and the results of relevant heritage database searches (Section 8);
- The field survey results (Section 9);
- An assessment of the impact of the proposal on Aboriginal objects (Section 9);
- The significance assessment(Section 11);
- An assessment of the impact of the proposal on Aboriginal objects (Section 12);
- A description and justification of the proposed management and mitigation strategies (Section 12); and
- A series of recommendations based on the results of the investigation (Sections 12 and 13).

This project has been managed by Julie Dibden. The field work component of this project has been conducted by NSW Archaeology Pty Ltd staff and members of the local Aboriginal community. This report has been written by Julie Dibden and Andrew Pearce.

3. PARTNERSHIP WITH THE ABORIGINAL COMMUNITY

The New South Wales Department of Environment, Climate Change and Water (NSW DECCW) manages Aboriginal cultural heritage in NSW in accordance with the National Parks and Wildlife Act 1974. Part 6 of the Act provides protection for Aboriginal objects and Aboriginal Places. When an activity is likely to impact Aboriginal objects or declared Aboriginal Places approval of the Director-General of the NSW DECCW under s90 or s87 of the NPW Act is usually required. The decision as to whether or not to issue s90 or s87 *or general approval* is based on the supply to the NSW DECCW by a proponent of adequate information in regard to Aboriginal consultation to enable the Director-General to make an informed decision (NSW DEC 2004).

The NSW DECCW requires proponents to undertake consultation with the Aboriginal community "… as an integral part of the impact assessment" process (NSW DEC 2004). While it is recognised that under Part 3A of the Environmental Planning and Assessment Act, National Parks and Wildlife Act 1974 Part 6 approvals are not required, the consultation process as outlined in the 2004 Interim Guidelines for Aboriginal Community Consultation policy document has nevertheless been implemented for this project (NSW DEC 2004).

When administering its approval functions under the NPW Act the NSW DECCW requires applicants to have consulted with the Aboriginal community about the Aboriginal cultural heritage values (cultural significance) of Aboriginal objects and places present in the area subject to development (NSW DEC 2004).

The NSW DECCW requires consultation with the Aboriginal community because it recognises the following:

- That Aboriginal heritage has a cultural and archaeological significance and that both should be the subject of assessment to inform its decision process;
- That Aboriginal people are the primary determinants of the significance of their heritage;
- That Aboriginal community involvement *should occur early* in the assessment process to ensure that their values and concerns can be taken into account and so that their own decision making structures can function;
- That the information arising from consultation allows consideration of Aboriginal community views about significance and impact, and allows for management and mitigation measures to be considered in an informed way (NSW DEC 2004).

The community consultation process aims to improve the assessment by providing the Aboriginal community with an opportunity to:

- Influence the design of the assessment of cultural and scientific significance;
- Provide relevant information about cultural significance values of objects/places;
- Contribute to the development of cultural heritage management recommendations; and
- Provide comment on draft assessment reports (NSW DEC 2004).

The role of the Aboriginal Community is outlined by the NSW DECCW (2004) as follows:

- The Aboriginal community is the primary determinant of the significance of their heritage;
- The Aboriginal community may participate in the process via comment on the assessment methodology and contribution of cultural knowledge; and
- The Aboriginal Community may comment on cultural significance of potential impacts and/or mitigation measures.

In order to fulfil the consultation requirements NSW Archaeology Pty Ltd and the proponent have adopted the following procedure:

1. Notification and Registration of Interests

   NSW Archaeology Pty Ltd and the proponent have actively sought to identify stakeholder groups or people wishing to be consulted about the project and have invited them to register their interest as follows:

   Written notification about the project dated 12th June 2009 has been supplied to the following bodies:

   - Anaiwan Local Aboriginal Land Council;
   - Glen Innes Local Aboriginal Land Council;
   - Native Title Services;
   - NSW DECCW;
   - Inverell Shire Council; and
   - Glen Innes Severn Shire Council.

   Following advice received from NSW DECCW further written notification dated 29th June 2009 has been supplied to the following bodies:

   - Kwiembal Elders Indigenous Group;
   - Ngoorabul Elders; and
   - Aboriginal Reference Group Border Rivers-Gwydir Catchment Management Authority.

   Additional letters were also sent to the two relevant LALC's at different addresses to those sent previously.

   The Registrar of Aboriginal Owners was not notified of the project given that the proposal area is not situated within a National Park which possesses a register of Aboriginal owners.

   Advertisements have been placed in the following papers (16th June 2009):

   - Inverell Times; and
   - Glen Innes Examiner.

The following groups and individuals registered an interest in this project:

- Edgerton-Kwiembal EHCAC:
  Vicky Duncan registered an interest via email on 8 July 2009. The proposed methodology was sent to her as per the DEC guidelines on 20th July 2009. Also on this date an invitation to apply for field work was sent, and Vicky later submitted a formal application to do field work.

- Liza Duncan registered an interest via email on 8 July 2009. The proposed methodology was sent to her on 20 July 2010 with an invitation to apply for field work. Lisa later submitted a formal application to do field work.

- Glen Innes LALC:
  Trevor Potter registered an interest via email on 7 July 2009 and indicated that the LALC wished to take part in the field survey. The proposed methodology and an invitation to apply for field work was forwarded to the LALC.

- Border Rivers CMA:
  Sue Hudson, via an email dated 9 July 2009, sent list of names of people who are member of the BRG ARAG. The proposed methodology and an invitation to apply for field work was sent to her on 20 July 2010. Sue later submitted a formal application to do field work .

- Anaiwan LALC:
  Anaiwan LALC were provided with a methodology and also invitation to apply for field work on 20th July 2009.

No response to the proposed assessment methodology has been received from any of the stakeholders. Draft copies of this report have been made available to all stakeholders who have registered an interest in the project. No response has been received.

4. DESCRIPTION OF IMPACT

A full description of the proposal and its potential impact on the landscape and heritage resource is described below. This information includes a summary of the impact history of the study area. These prior and existing land uses have caused significant changes to geomorphological processes in the area, with an associated effect on the archaeological resource.

The project description is based on the current wind farm design concept (Figure 2).

4.1 Impact Justification

In Australia, wind farms have become viable propositions because of renewable energy policies of the Federal and State Governments requiring electricity retailers to source a certain percentage of electricity from renewable sources. Renewable energy targets have been established in legislation to assist the development of this new industry in Australia, and to reduce greenhouse gas emissions from power generation. By doing so, these renewable targets (and wind farms) would provide a base for cheaper and cleaner power into the future.

In Australia, the cost of wind energy is more than the cost of coal-fired electricity at the wholesale level. In the past, wind farms have become economically viable as a result of the introduction of the Federal Government's Mandatory Renewable Energy Target (MRET). The MRET has required electricity retail companies to purchase a percentage of their power from renewable energy sources.

The Federal Government is committed to the expansion of the renewable energy target to 20 per cent by 2020. This would require in the order of 45,000GWh of new renewable energy generators to be built across Australia by 2020. To deliver on this commitment, the Government is working in cooperation with the states and territories through the Council of Australian Governments (COAG) to implement an expanded national Renewable Energy Target (RET) that will bring the MRET and existing and proposed state and territory targets into a single national RET scheme.

The NSW State Government introduced legislation to parliament in 2007 called the Renewable Energy (NSW) Bill as part of the Government's Greenhouse Policy to encourage additional generation of renewable energy. The NSW renewable target is referred to as NRET and requires 10 per cent of electricity to be sourced from renewable energy by 2010 and 15 per cent by 2020. Once operational, the NSW RET scheme will be absorbed into the National RET scheme.

The Sapphire Wind Farm will offer the following benefits to the environment and local community:

- The project will directly inject funds into the local economy (both during construction and during the operational phase);
- The project will provide an opportunity for regional investment in the local area as the renewable energy sector, and the businesses that supply and service it, grow;
- The wind farm will provide electricity into the NSW grid that would assist in meeting ongoing load growth in NSW;
- The project will reduce greenhouse gas emissions, helping to reduce the impact of climate change; and
- The project will supply renewable energy that would assist NSW electricity retailers fulfil their obligations under the Federal and State renewable energy targets.

4.2 Impact History

The proposed impacts relating to the Sapphire Wind Farm are situated on land which has been farmed for over 160 years. The impact history of the area is therefore related to previous and current

farming activities including grazing and cultivation. Given that the most common Aboriginal objects expected to be present within the proposal area are stone artefacts located in or on ground surfaces, the following review is focused on describing the impact to soils and soil profiles which has resulted from agriculture practices.

The local area has been utilised for stock grazing since the 1830s. The majority of the proposal area is situated on crests and adjoining landforms that, prior to European settlement, would have been predominantly a mosaic of open and heavily treed woodland. The effects of grazing across the proposal area have included significant tree clearance, vegetation loss and subsequent erosion primarily by precipitation, wind, and soil compaction due to stock treadage. In addition to grazing, a significant proportion of the proposal area has been cultivated for pasture improvement and annual fodder production, while other areas have had contour banks installed in an attempt to stem erosion.

Land clearance, grazing and subsequent erosional processes are likely to have resulted in varying levels of prior impacts to Aboriginal objects. Trees hosting evidence of cultural scarring will have been completely destroyed, while Aboriginal objects located in or on the ground will have been disturbed and/or moved, resulting in loss of their original depositional context (both spatially and vertically).

4.3 Proposed Impacts

The proposed Sapphire Wind Farm consists of the installation of wind turbines, an onsite underground electrical cable network, one or more collector substations comprising cable marshalling, switchgear and transformer, access tracks, crane hardstand areas, up to six wind monitoring masts, site operations facilities, internal electrical interconnection lines between each of the turbine clusters and appropriate site signs.

The Sapphire Wind Farm proposal comprises a wind farm with 159 1.5 MW wind turbines, or 125 3.4 MW wind turbines, or equivalent. The varying number of turbines is an outcome of the relative size of the wind turbines being considered for the project. The final configuration and number of turbines is yet to be determined.

Ultimately the choice is largely dependent on the availability of wind turbines to the project. It is important to note that the same area will be utilised irrespective of the final selection, whereas the development footprint would differ slightly with respect to the two layouts (see Figure 2). It is expected that some adjustment of the turbine locations will occur during the planning and assessment phase in response to the findings of various planning studies.

The wind farm layout will be prepared to maximise utilisation of the available wind resource, whilst gaining regulatory and broad community acceptance of the development. The planning and design stages of the wind farm layout have, and will continue to consider any potential environmental impacts on flora communities, fauna habitat, heritage aspects, as well as the location of neighbouring human residences. Some of the impacts from the development footprint will be for the duration of the wind farm operation, and others are temporary impacts during the construction phase.

The proposed Project will have an installed capacity of up to 238 – 425 MW, depending on the model of the turbine selected. A description of the individual components and their related impacts are outlined as follows:

- the installation of up to 159 wind turbines;
- one or more collector substations comprising cable marshalling, switchgear and transformer, site operations facilities and services building;
- underground electrical interconnection lines (33 kilovolt (kV) capacity) and control cables within each of the wind turbine clusters, connecting to the collector substation;

- overhead power line measuring approximately 10 km in length, of either 66, 132 or 330kV capacity, including a 45 m easement;
- access roads to the turbine locations and substation;
- crane hardstand areas for the erection, commissioning, maintenance, recommissioning and decommissioning of the wind turbines;
- temporary construction facilities including site office, parking and materials storage areas;
- appropriate wind farm signage both during the construction and operational phases of the proposed development; and
- mobile concrete batching plant(s) and rock crushing facilities.

Turbines

The turbines used for the project will be three-bladed, semi-variable speed, pitch regulated machines, with rotor diameters between 80 m and 112 m.

Towers

The supporting structure is comprised of a reducing cylindrical steel tower fitted with an internal ladder or lift. The largest turbine under consideration could require a tower height of 100 m with an approximate diameter at the base of 4.5 m and 2.5 m at the top. Typically the tower will be manufactured and transported to site in three or four sections for on-site assembly.

Nacelle

The nacelle is the housing constructed of steel and fibreglass that is mounted on top of the tower and can be 10 m long and 4 m high and 4 m wide. It encloses the gearbox, generator, transformers, motors, brakes, electronic components, wiring and hydraulic and lubricating oil systems. Weather monitoring equipment located on top of the nacelle will provide data on wind speed and direction for the automatic operation of the wind turbine.

Footings

Three types of foundation for the turbines will be considered pending geotechnical investigation of the ground conditions at the site. The footings area measure ca. 15 x 15 m.

Site Access Roads and Crane Hardstand Areas

Site access roads, which could be up to 12 metres wide, would have areas of hardstand (approximately 45m by 45m) adjacent to each wind turbine for use by cranes during construction. The clearing of native vegetation for the construction of access roads and hardstand areas will be avoided where possible. If clearing is found to be unavoidable, this will be appropriately managed and carried out in accordance with the Environmental Management Plan.

Monitoring Masts

Up to six permanent wind monitoring masts up to 100 m high (two per cluster) are proposed to be installed on-site. The purpose of the additional monitoring masts is to provide information for the performance monitoring of the wind turbines. The wind monitoring masts would be of a guyed, narrow lattice or tubular steel design.

Electrical Infrastructure

The electrical works, including those incorporated in the wind turbine structures, will involve:

- up to 159 wind turbine generator transformers;
- the establishment of one or more 100 m by 100 m collector substations and switching substation with 33-to-132kV or 33 kV-to-330kV transformer circuit breakers and isolators;
- approximately 160 km of 33kV underground cables;
- approximately 10 km of 66, 132 or 330kV overhead electrical interconnection cables;
- approximately 170 km of control cables (10 km may be underground or overhead); and
- the establishment of a 30 m by 6 m operation facilities building to house control and communications equipment.

Collector Substations

The collector substations will include two 150 or 200 megavolt ampere (MVA) transformers to step-up the voltage from 33kV or 66kV to 132kV or 330kV (equivalent to the rating of the destination overhead powerline), together with ancillary equipment. It will occupy an area approximately 100 m by 100 m, and will be surrounded by a 2 m high security fence, surmounted by four strands of barbed wire. A buried earth grid will extend one metre beyond the fence on all sides. The ground surface within the substation enclosure will be covered partly with a layer of crushed rock and partly by concrete slabs. As the transformer may contain upwards of 80,000 litres of oil, provision will be made in the design for primary and secondary containment of any oil that may leak or spill from the transformers or associated components. This would involve constructed concrete bunds around each transformer and a spill oil retention basin or oil/water separator outside the substation compound. The one hectare area includes a provision for a 20 m buffer of land surrounding the equipment.

Switching Substation

The switching substation will be located with the western collector substation, adjacent to the 330kV powerline, for direct connection into the grid. The substation arrangement will include an array of busbars, circuit breakers, isolators, various voltage and current transformers, and a static compensator-capacitor as agreed with Transgrid. The switching substation will be located in the same compound as the collector substation, and include the same type of design for construction, fencing, etc.

Overhead and Underground Cables

A combination of overhead and underground cables will be used. The underground cable routes will generally be between the turbines and, where possible, follow the route of the internal access roads. The final route will minimise clearing and avoid potential erosion and heritage sites, and will also depend on the ease of excavation, ground stability and cost. Markers may be placed along the route of the underground cables. Placement of these cables below ground will result in minimal visual impact.

Control cables will interconnect the wind turbine generators and the operation facilities building. Computerised controls within each wind turbine will automatically control start-up, speed of rotation and cut-out at high wind speeds. Recording systems will monitor wind conditions and energy output at each of the turbines. Remote monitoring and control of the wind farm will also be possible. Control cables will consist of optic fibre, twisted pair or multi-core cable and will be located underground within the groups of turbines or above ground. Above ground control cables, if used, would be strung from the poles of the internal 132kV or 330kV overhead lines. The installation of buried earthing conductors and electrodes will also be required in the vicinity of the turbines, the facilities building and the substation.

Operation Facilities Building

A facilities building measuring approximately 30 m by 6 m will be constructed at the same location as the switching substation. The general location has been chosen to minimise the length of overhead lines and underground cables, and also to minimise the visibility of the facilities building and substation. The structure is proposed to be a slab on ground construction with steel frame, metal or brick walls and a sheet steel roof or alternatively a transportable type building constructed on piers.

4.4 Potential Impacts

Table 1 presents the calculated area of the site proposed to be impacted by the project based on the proposed turbine layout. Some of these impacts would be for the duration of the wind farm operation and some are temporary impacts during the construction phase.

Project Component	**Approximate Dimensions**
Turbine footings	15 x 15 m
Collector Substation (Up to two (2))	100 x 100 m
Switching Substation	100 x 100 m
Facilities building	30 x 6 m
Site access: new roads	91 km x 12 m
Underground cabling on-site	160 km x 1m
Internal overhead electrical interconnection / easement #	10 km x 45 m
Temporary construction facilities	
Concrete batch plant (8)	50 x 100 m (ea.)
Rock crushing facility (3)	50 x 60 m (ea.)
Site office (3)	40 x 100 m (ea.)
Construction compound (3)	150 x 200 m (ea.)

Table 1. Individual components of the proposal and their impact area.

The development area is defined by the 100 metre buffer around the development footprint (i.e. 200 metre survey corridor). The study area measures approximately 1,982.13 hectares. The development footprint, defined as the area which will be directly impacted by the construction of the wind farm, is a maximum of 297.08 hectares (for 1.5 MW turbines - 50m x 50m clearance required for each turbine, and a 12 metre easement for roads with varying clearance width for cut and fill areas).

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

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

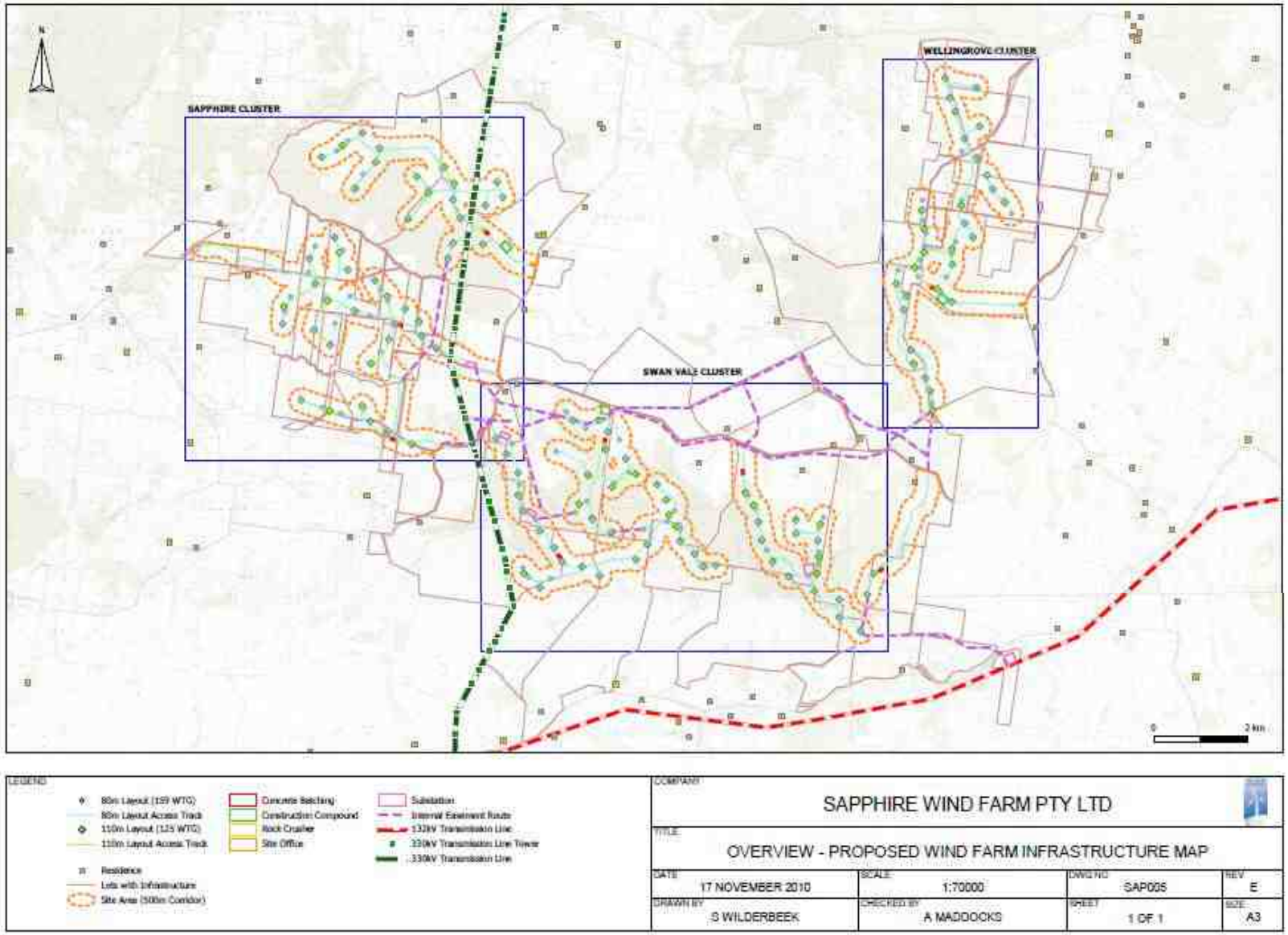

Figure 2. Layout of the proposed Sapphire Wind Farm (map supplied by proponent).

5. STUDY METHODOLOGY

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

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

5.1 Literature Review

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

The following information sources were accessed for this study:

- NSW DECCW Aboriginal Heritage Information Management System.
- Relevant archaeological reports held in the NSW DECCW Cultural Heritage Unit.
- Historical sources and databases.
- Relevant topographic maps.

5.2 Field Survey and Methodology

The intended methodology for the field survey entailed surveying all of the proposal area on foot. However, conditions encountered when in the field precluded the entirety of the study area to be surveyed in this manner. Due to the presence in some areas, particularly on crests and locally elevated landforms, of very thick, consistent and uninterrupted expanses of tall thistle growth, foot survey was not physically or effectually viable. Survey of these areas where easement routes or access tracks were proposed was conducted by way of vehicle conveyance, although all areas of proposed turbine placement and other major infrastructure sites were surveyed on foot. The field survey was undertaken by four people on each day. Survey coverage is described in Section 9 of this report.

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

Field survey was designed to assess the archaeological sensitivity of the entire proposal area. The survey methodology entailed walking parallel transects across individual Survey Units with each surveyor situated ca. 20 – 30 m apart. Each Survey Unit was surveyed until the entire area had been systematically inspected. This methodology enabled direct visual inspection of as much of the ground surface of the proposal area as practicable as well as an assessment of all trees within areas of proposed impact.

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

The density and nature of the artefact distribution will vary across the landscape in accordance with a number of behavioural factors which resulted in artefact discard. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to analyse the variability in artefact density and nature across the landscape. Accordingly, in this study, while the artefact is the elementary unit recorded, it is the Survey Unit which is utilised as a framework of recording and analysis (*cf*. Wandsnider and Camilli 1992). The study area has been divided into 21 Survey Units each of which have been defined according to broad landform morphological types.

In order to ensure consistency in data collection field records were noted on two separate forms used for recording Survey Unit data and Aboriginal Object data. The data collected forms the basis for the documentation of survey results outlined in Section 9. The variables recorded are defined below:

Survey Unit Variables

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

Morphological type:
- Crest: - element that stands above all or almost all points in the adjacent terrain – smoothly convex upwards in downslope profile. The margin is at the limit of observed curvature.
- Simple slope: - element adjacent below crest or flat and adjacent above a flat or depression.
- Flat with drainage depression: - association of a level or very gently inclined planar element which is not a crest, with an element that stands below all points in the adjacent terrain.
- Drainage depression: - a landform element, concave upwards, that stands below all points in the adjacent terrain.

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

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

- Rocky - 10-20 % bedrock exposed.
- Very rocky - 20-50% bedrock exposed.

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

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

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

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

Aboriginal Object Recording

The proposal area was found to contain discrete distributions of stone artefacts. For the purposes of defining the artefact distribution in space it has been labelled as a locale (eg. Survey Unit 1/Locale 1). GPS referenced locational information was captured as AGD66 readings and transformed to GDA coordinates.

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

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

- Negligible: insignificant
- Very low: <1 artefact per square metre;
- Low: between 1 and 10 artefacts per square metre;
- Low/moderate: between 11 and 30 artefacts per square metre;
- Moderate: between 31 and 50 artefacts per square metre.

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

5.3 Survey Coverage Variables

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

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

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

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

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

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

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

6. LANDSCAPE CONTEXT

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

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

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

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

6.1 Topography, Geology and Vegetation

The proposed Sapphire Wind Farm is located between Glen Innes and Inverell in northern NSW (Figures 1 and 2). The area falls within the New England Fold Belt and is underlain with volcanic geology of the Late Permian – Middle Triassic periods. Within the study area this manifests as an underlying granite formation capped with basalt (Branagan and Packham 2000). Throughout, basalt comprises the predominant surficial geology, with granite outcropping in only a few areas located mainly in the north-east and western fringes.

The area is a rural landscape and is predominantly utilised for sheep, cattle and goat grazing, as well as cultivation and pasture production.

The layout of the proposal area is roughly 'U' shaped, situated between Polhill Road (previously known as Maids Valley Road) to the east, the Gwyder Highway to the south and Kings Plains Road to the west. The turbines within the proposal area are located over six elevated crest landforms. The supporting infrastructure associated with these turbines, including access tracks, electrical connections, substations, concrete batching areas, rock crushing plants, construction compounds and site offices are located not only on the crests, but also on adjacent landforms comprised of simple slopes, flats and drainage depressions.

The soils located on crests and simple slopes throughout the study area are primarily a brown or reddish-brown duplex silty loam which is found in association with the predominant surficial basalt capping geology. In those areas where the underlying granitic geology is exposed on crests and simple slopes, the soils are a dark grey loam. On flat areas of low local relief, especially those associated with drainage depressions, generally the soils are brownish black light clays.

Given the layout of the windfarm design, with wind generator turbines located on elevated sections upon crests and the associated infrastructure sited in positions which connect these and also link with

nearby existing roads and electrical transmission lines, watercourses present in the study area are lower order (1st and 2nd) ephemeral creeklines arising from minor catchment areas. Major streams in the district which contain more permanent sources of water are located outside the study area, and drain to the north or west. To the east of the study area, Wellingrove Creek flows north into the Severn River. To the west of the study area Frazers Creek flows west and then north, and is also a tributary of the Severn River. South of the study area Swan Brook flows west into the Macintyre River.

Prior to European settlement the study area would have primarily been comprised of a mosaic of both open and thickly treed woodland. However, almost the entire proposal area has subsequently been impacted by agricultural activities. Tree clearance has been extensive throughout, with the vast majority of trees now present being regrowth. Land owner Norman Whitaker (pers. comm. 2011) indicates that the farmland in the district was initially substantially cleared at the beginning of the 1900s, and then again later as part of the employment and settlement on the land of returned soldiers.

Present day vegetation includes stands and isolated examples of grey box (*Eucalyptus moluccana*), apple box, stringy bark (*E. eugeniodes*), native pine and some kurrajong (*Brachychiton populneum*). Ground cover includes both shrubs and native grasses, although at the time of field survey there was an efflorescence of weeds and a wide variety of thistles, including scotch thistle, saffron thistle and St Barnaby's thistle.

Many of the crests originally incorporated large areas of exposed surface rock or rock subsequently exposed on the surface following erosion, and there is evidence throughout, in the form of pushed up rock piles, of mechanical grading to clear the rock. In addition, most flats and gentle side slopes have been ploughed and cultivated, as well as some areas on the crests. Contour banks have also been constructed on numerous slopes within the study area in an attempt to stem erosion. Drainage depressions were generally highly eroded, with some deeply etched, as the result of clearance and subsequent accelerated water runoff, as well as ongoing stock grazing and treadage.

Summary

The proposal area is located on crests and adjoining landforms, that prior to European settlement would have primarily been comprised of a mixture of open and thickly treed woodland possessing low biodiversity values. While potable water would have been seasonally available from the lower order watercourses that emanate from these elevated areas, more reliable water sources were found in the more major surrounding waterways such as Wellingrove Creek, higher up Frazers Creek, Swan Brook, the Severn River and the Macintyre River. At times following rainfall, when water was accessible within the study area, it would have been widely obtainable throughout the broader region. In winter the raised crest would have experienced cold temperatures and strong winds.

In an Aboriginal landuse context the study area is likely to have been utilised by Aboriginal people for a limited range of activities which may have included hunting and gathering and travel through country. Such activities are likely to have resulted in low levels of artefact discard. The nature of stone artefacts discarded can be expected to have been correspondingly limited in terms of artefact diversity and complexity.

Elevated landforms located adjacent to the aforementioned major waterways are likely to have been utilised by Aboriginal people for camping while they occupied the local area. These areas would have provided more sheltered contexts and ready access to drinking water. Artefact discard is likely to have been greater in such areas reflecting more frequent and/or sustained occupation. It is possible that artefact diversity may also be greater in such areas. Such areas are located outside the area of proposed impacts.

7. ARCHAEOLOGICAL CONTEXT - INDIGENOUS

7.1 Social Geography

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

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

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

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

The study area is situated within a region which today is seen as having traditionally been occupied by a number of differing Aboriginal groups. The attribution of the occupation of land by these groups was made by Tindale (1974) based on notions of group affiliation through shared language. The traditional Aboriginal language groups which are understood to have occupied the Inverell/Glen Innes region include the Aniwan (Tingha), the Jukambal (Pindari, Inverell), the Bigambul (Yetman), the Wirrayaraay (Wallangra), the Kwiambal (Ashford), and the Ngarrabal (near Ashford and west of Glen Innes). Of these, the Sapphire Wind Farm study area falls on land which is attributed to have been the traditional terrain of the Ngarrabal (Castlereagh Lachlan Environmental Services 2007).

Botanist and explorer Allan Cunningham was the first European to provide detailed reports of the Inverell/Glen Innes districts following his scientific expedition overland from the Hunter region north to the Darling Downs which he undertook between 20th January and late August 1827 (McBryde 1974). However, he was not the first European to enter these lands, as Cunningham recorded that he came upon cattle and a hut which, extrapolating from his detailed exploration report, was most likely located in the south-east corner of the Stonehenge State Forest, near the present day Gwydir Highway some four kilometres south-east of Warialda (Howard 2009).

When Cunningham made his journey the region was languishing from severe drought and water was scarce. He had minimal contact with the local Aboriginal people, and in his log he exhibited a sweeping lack of knowledge with regard to their culture or conduct. On July 7, 1827 Cunningham recorded *(cited in Lee 1925)*:

> *It is to be wonder'd at, that the Interior of this vast Continent, as far as our Knowledge of it has extended, should be found to be so thinly peopled, when not withstanding its rivers teem with*

> *fish, and its forests abound in Kangaroos & Emus, its few inhabitants are in possession of so few of the Arts of Life, that they neither take the one by hooks, or rarely secure the others, by reason of their fleetness, by spears, but they rather have recourse to the larva of Insects, from which they can at best derive but a miserable support.*

Following Cunningham's expedition European pastoralists were swift to move into the region and take up land. While some accounts portray the early encounters between these farmers and the local Indigenous groups as amicable (Campbell 1978), it is apparent that the arrival Europeans in the district catastrophically impacted the local Aboriginal groups. Not only did the effects of introduced disease take a heavy toll on their population, but the subsequent frontier conflict, of which the Myall Creek Massacre in 1838 is just one example, served to dispossess these peoples of the use of their traditional lands (Elder 1988). However, in the latter half of the nineteenth century when European landowners desperately sought replacement workers for those who had decamped having been swept up in the gold rushes, the labour of local Aboriginal people became an integral part of the pastoral system. In exchange for their labours, Aboriginal people were allowed to reside on 'station camps', and in this way were able to remain on country and, on those stations where it was tolerated, to practice traditional activities (Castlereagh Lachlan Environmental Services 2007).

Despite the severe downturn in population numbers brought about by the impact of introduced diseases, and their dislocation from traditional lands and cycles of activity resulting from the restrictions imposed by European settlement, many Aboriginal people were able to perpetuate traditional knowledge and practices, and through this connection to country.

While the number of archaeological studies conducted within the local area has been limited, numerous studies have been undertaken in the broader New England region, both in an academic and consultancy context. A major contributing reason for this is existence of the University of New England at Armidale, with its faculty of Archaeology and Palaeoanthropology, which has given rise to several such research studies over the years. The following discussion includes archaeological work and its results conducted within the wider area. Consideration of a predictive model of site type and site location within an environmental context relevant to the study area can be made through recourse to these previous studies. From this a contextual and relevant assessment of the archaeological potential of the study area may be formed.

As a focus of her landmark PhD research McBryde (1968; 1974) investigated the Aboriginal prehistory of the New England region. This was the first comprehensive regional archaeological study to be carried out within Australia, entailing not only surface survey but also subsurface excavation. As part of her academic studies McBryde (1968; 1974) excavated rock shelter sites, recorded rock art sites, and identified the metamorphosed basalt quarry source at Gragin Peak from which stone hatchets had been manufactured. At Graman, McBryde (1968) dated the oldest Aboriginal occupation site in the region with a radiocarbon age of 5450 ± 100 years BP. Her subsequent petrographic analysis of stone hatchets from Gragin Peak, Graman and other New England Tableland sites was groundbreaking in its resultant exploration of prehistoric trade routes and exchange networks in Australia (Binns and McBryde 1972; Davidson 1982).

Ensuing from McBryde's initial work, studies in the broader region of northern New South Wales that followed focused primarily on areas to the east of the current study area or in regions towards the southern extent of the New England Tablelands. These studies (e.g. Bowdler 1981; Davidson 1982) sought to address questions which were of currency at the time, dealing predominantly with issues concerning occupation and settlement patterns within northern New South Wales that had taken place during the Holocene.

The most recent archaeological research projects conducted in the region (e.g. Balme and Beck 2002; Martin 1995; Theunissen 1995; Guilfoyle 1997; and Bloxham 1998) focus on areas to the north-west

of the current study area, outside the New England Tablelands and in the Nandewar and Brigalow Belt South bioregions (Castlereagh Lachlan Environmental Services 2007).

Pearson (1981) conducted a comprehensive study in relation to his PhD research which examined the distribution of Aboriginal archaeological sites in the landscape. While the region encompassed in his research, being situated to the south, did not take in the current study area, it nevertheless examined a region which possesses comparable environmental and topographic contexts. Accordingly, it is considered that the results of his work are applicable in relation to the current study and can be used as a corollary for inferred patterns of Aboriginal land usage in the Inverell/Glen Innes districts prior to European occupation in the current study.

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

Between them, in smaller groups of up to 20 people, they exploited the resources of a common territory which had a radius of up to 65 km, but which was generally centred on a particular home base location that possessed a reliable watercourse (Pearson 1981). However, given the generally ephemeral nature of the local catchments and creek lines, the locus of that bands' place of habitation would be closer to a more permanent source of water.

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

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

Hall and Lomax (1996) undertook a study which examined the location and management of stone artefact sites in forested uplands in Eastern Australia. Through the analysis of eight regional scale archaeological studies that employed similar survey methodologies, encompassing a total surveyed distance that extended for 352 linear kilometres, as well as closer examination of the findings of one State Forest survey undertaken in north-eastern New South Wales, Hall and Lomax (1996) were able to draw some conclusions with regard to site location in forested environments. Hall and Lomax (1996) found that:

- While rock shelter occupation and art sites, quarries, axe grinding grooves, scarred trees, stone arrangements, Bora rings, rock engravings and burials may be present in forested areas they are rare site types in this environment;
- Open campsites or activity sites, indicated by the presence of stone artefacts, are more common site types. Stone artefact scatters are present in all forest types and in many, if not most areas, occurring more or less continuously as a low density distribution across the landscape with infrequent high density nodes. One to three artefact occurrences may be expected to be present for each linear kilometre of forest environment, regardless of forest type;
- Larger and generally more diverse stone artefact sites are rare, while small sites of low diversity characterise the stone artefact record of forested environments;
- While in some land systems there was a high correlation between site location and ridgelines, this did not obtain in other land systems. Factors which influenced the presence of sites on ridgelines were the level of constraint of human movement imposed by the terrain, and the relative abundance of stone artefact raw materials in high relief areas relative to areas of low relief.
- The majority of 'sites' have little or no inherent research potential. However, considerable potential exists for examining the human response to forested environments based on an examination of the regional spatial patterning of sites.

7.2 Previously Recorded Sites

A search of the NSW DECCW Aboriginal Heritage Management Information System has been conducted for this project on the 16th June 2009 (AHIMS # 26166). The search area measured 432km² and encompassed eastings 339000 – 363000, and northings 6703000 – 6721000. The Aboriginal objects identified to be listed on the AHIMS register for the area in question are listed below in Table 2.

Site ID	Site Name	Easting	Northing	Context	Recording	Description
11-6-0029	Ashgrove; Swan Pond	351400 (ahims); 351449 (site card)	6704800 (ahims); 6704312 (site card)	Open site	Pearson	Site artefacts (flakes, cores, ground edge axes, grinding slabs); along "several" 100 "yards" of banks of Swan brook
11-6-0052	S30	346644 (ahims); 034660 (site card)	6714657 (ahims); 6714650 (site card)	Open site	Paton	1 Hornfels flake; on a flat; 25m east of a small creek
11-6-0054	S31	347702 (ahims); 034770 (site card)	6709110 (ahims); 6709113 (site card)	Open site	Paton	1 Quartzite flake; on a slightly raised area; 150m west of a small creek
11-6-0062	EL23	345300 (ahims)	6705400 (ahims)	Open site	Paton	10 stone artefacts; raised knoll on a gently undulating hill; site area 10 x 6m
11-6-0063	EL24	345950 (ahims)	6706900 (ahims)	Open site	Paton	6 stone artefacts; raised knoll; site area 12 x 3m

Site ID	Site Name	Easting	Northing	Context	Recording	Description
11-6-0065	EL25	345550 (ahims)	6708990 (ahims)	Open site	Paton	3 artefacts (1 x Quartzite flake/p; 2 x Quartzite flakes); raised knoll above a large ephemeral creek; site area 5 x 3m
11-6-0075 Duplicate recording of 11-6-0054	S31					
12-4-0003	Matheson	361500 (ahims)	6707900 (ahims)	Open site	McBryde	Rock engraving; carved kangaroo tracks on a flat rock near the Gwydir Highway
12-4-0017	Gwydin Scar Tree	354160 (ahims)	6705610 (ahims)	Open site	Moorhouse	Carved tree; canoe/ shield tree; dead tree with scar adjacent to Gwydir Highway

Table 2. Aboriginal objects listed on AHIMS for the site search area.

There are no previously recorded Aboriginal objects in the proposed impact area listed on the AHIMS register. The AHIMS register only includes sites which have been reported to NSW DECCW. Accordingly, this search cannot be considered to be an actual or exhaustive inventory of Aboriginal sites situated within the local area. Generally, sites are only recorded during targeted surveys undertaken in either development or research contexts. It can be expected that sites will be present within the local area but that to date they have not been recorded and/or reported to NSW DECCW.

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

The Inverell Shire Council *State of the Environment Report* (2009/2010) identifies 304 known Aboriginal sites within the shire. Of these, the majority (60.5%) are comprised of stone artefact sites, with art sites (13.5%), grinding grooves (22%), scarred trees (5.26%), and ceremonial/dreaming sites (4.93%) making up the other most frequently recorded site type. In addition, a lesson number of burials, ceremonial rings, conflict sites, areas of potential archaeological deposit (PADs), stone arrangements, stone quarries and one ochre quarry are also listed. It is of interest to note that this inventory of Aboriginal items located within the Inverell Shire is identical to that contained in their 2006 State of the Environment Report (Castlereagh Lachlan Environmental Services 2007), and possibly a reflection of the limited number of Aboriginal Heritage surveys conducted in the area.

The Glenn Innes Severn LGA (2010) Aboriginal Heritage Study lists 70 Aboriginal sites in its LGA. Of these, again the majority (62.8%) are comprised of stone artefact sites (51.4% being artefact scatters and 11.4% being isolated finds), with scarred trees (12.9%), and stone arrangements (5.7%), making up the other most frequently recorded site type. In addition there are two recordings each of natural mythological (ritual) stone arrangements, Bora/ceremonial sites and burials; with one recording each of a natural mythological (ritual) site, a natural mythological (ritual) open camp site, and axe grinding grooves - stone arrangement, and axe grinding grooves, a waterholes/well, and a rock engraving site.

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

7.3 Archaeology – The Local Area

Three studies have been conducted in reasonable proximity to the proposed Sapphire Wind Farm study area. McCardle Cultural Heritage Pty Ltd (2007) conducted an archaeological assessment in relation to a proposed wind farm west of Glen Innes. The location of this wind farm is ca. five kilometres to the south-east of the proposed Sapphire Wind Farm study area and situated over comparable landforms of similar relief. In conditions of moderate (24.92%) effective survey coverage, along a survey corridor that encompassed ridges, crests, slopes, flats and creeks and extended ca. 8.5 kilometres, McCardle (2007) recorded one isolated stone artefact. McCardle (2007) attributed the scarcity of Aboriginal objects to the distance of that study area from sources of permanent water. McCardle (2007) indicates that despite the prevalence of exploitable stone materials within that study area as well as the presence of numerous 1st and 2nd order streams, sites would be expected to be found in close proximity to reliable water sources.

Castlereagh Lachlan Environmental Services (2007) undertook a survey in relation to the proposed replacement of the Swan Brook Bridge, located ca. 3 km south of the study area. Over an area of 13.5 ha located immediately adjacent to Swan Brook, in conditions which afforded a high 2.05 ha of effective survey coverage, no Aboriginal objects were located and no areas of potential archaeological deposit identified. These findings were attributed to both high levels of disturbance in certain areas adjacent to the existing highway, as well as high water flow velocities across the Swan Brook floodplain which are indicated to have removed by scouring any potential stone artefacts that may have originally been deposited there.

Robert Paton Archaeological Studies Pty Ltd (1998) undertook a survey in relation to TransGrid's proposed Queensland Interconnection Transmission Line Protect. The proposed transmission line route extended from the Armidale area, north to the vicinity of Texas in Queensland, a distance of some 215 kilometres. Paton (1998) subdivided the route into four 'Zones' in accordance with the broad general environmental characteristics of each sector and the assessed associated differences with regard to site distribution patterning for each 'Zone'. These differences in patterning were derived from predictive modelling. A section of the now extant transmission line route, which falls within Paton's (1998) 'Zone 2', traverses part of the subject study area towards the west.

'Zone 2' measures ca. 40 kilometres in length and was typified by Paton (1989) as being comprised of moderately undulating terrain with more pronounced ephemeral waterways and set at less elevation than 'Zone 1'. Paton predicted that 'Zone 2' would have an archaeological sensitivity rating of medium. During the subsequent sample survey of 'Zone 2', which varied in width from 1 – 3 kilometres and focused on areas of high archaeological visibility and likely site locations, five sites and five isolated finds were located. In all, the length of the surveyed area in 'Zone 2' was 35 kilometres, so that the frequency of sites located was 1 per 3.5 per linear kilometre. Paton (1989) concluded that the survey results indicated that as predicted, there was a moderate distribution of sites in 'Zone 2', and that this was a clear demonstration of the value of the predictive model despite its limitations in finding certain site types such as mythological sites. However, given the width of the surveyed area, the survey sampling methodology, and the findings of artefact locales spaced at slightly less than one every three linear kilometres, this distribution of artefacts could be considered to be reasonably sparse.

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

7.4 Predictive Model of Site Type and Location

Stone Artefacts

As indicated by the listing of site type totals for both the Inverell and Glen Innes Severn Shire Councils (The Inverell Shire Council 2009/2010; Glen Innes Severn Shire Council 2010), stone artefact sites are the most common site type found within the region, totalling in excess of 60% of known Aboriginal sites.

Stone artefacts are found either on the ground surface and/or in subsurface contexts. Stone artefacts will be widely distributed across the landscape in a virtual continuum, with significant variations in density in relation to different environmental factors (Pearson 1981; Hall and Lomax 1996). Artefact density and site complexity is expected to be greater near reliable water and the confluence of a number of different resource zones (Pearson 1981). The detection of artefacts during a surface survey depends on whether or not the potential archaeological bearing soil profile is visible.

Given the environmental context of the proposed Sapphire Wind Farm, which encompasses areas of low biodiversity with several lower order watercourses originating from minor catchment areas, but no relatively reliable higher order streams, stone artefacts are predicted to be present in very low to low densities across the study area. This prediction is supported by the results of McCardle's (2007) survey in relation to the proposed Glen Innes Wind Farm, located ca. five kilometres to the southeast of the subject study area. McCardle (2007) recorded one stone artefact in conditions of moderate (24.92%) effective survey coverage in terrain comprised of comparable landforms of similar relief, including numerous 1st and 2nd order streams.

Grinding Grooves

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

Burials sites

Burial sites have been recorded within the wider region. This site type is rarely located during field survey and given the topography, nature of the soils and geology, the potential for burials to be present in the proposal area is considered to be negligible.

Rock Shelter Sites

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

Scarred and Carved Trees

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

Bark removal by European people through the entire historic period and by natural processes such as fire blistering and branch fall make the identification of scarring from a causal point of view very difficult. Accordingly, given the propensity for trees to bear scarring from natural causes their positive identification is impossible unless culturally specific variables such as stone hatchet cut

marks or incised designs are evident and rigorous criteria in regard to tree species/age/size and it specific characteristics in regard to regrowth is adopted.

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

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

Stone Quarry and Procurement Sites

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

The bedrock geology which underlies the study area is predominantly basaltic. Basalt stone was used by Aboriginal people for the manufacture of certain tool types, including hatchet heads and grinding implements. Basalt grinding implements were generally made from broad flattish coarse-grained stone, while hatchet heads were fashioned from either pebbles or large flakes struck from rock outcrops. The best basaltic raw materials for hatchet manufacture, selected for their suitability for use in cutting, scraping, pounding and chopping, occur in relatively few places and were extracted from specific quarry locations (Mulvaney & Kamminga 1999). Given that most basalt is of a quality poorly suited for tool manufacture, a stone quarry is unlikely to be recorded during the current study, although it is possible.

Ceremonial Grounds

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

8. ARCHAEOLOGICAL AND HERITAGE CONTEXT – NON-INDIGENOUS

8.1 Alienation of Lands Within the Colony of New South Wales

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

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

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

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

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

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

By 1850 settlement had spread throughout New South Wales and Victoria (Shaw 1970:45) and at that time 3,000 squatters had the use of over 70 million acres of Crown Land (Jeans 1966:212). It

was during this period that political support increased for small rural landholders. Support came from a number of groups, including:

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

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

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

8.2 Regional History

Exploration and Pioneers

John Oxley passed through the southern extremities of the New England area in 1818 and camped at the site of Walcha (HO & DUAP 1996), however it was another decade before exploration of the region really began. By the late 1820s the Hunter Valley was effectively fully settled by Europeans and there was pressure to open up new land for pastoralism (RES 1986) and accordingly, colonial exploration of the New England area was prompted as the result of pastoralists seeking new lands. The first written accounts of the area come from the diaries of Allan Cunningham, who passed through the area in 1827. Cunningham had set out with an exploration party from Peter Macintyre's property near Scone in search of an overland route to Moreton Bay. On the way north Cunningham's party passed through the site of Barraba, approximately 80km to the south-west of Inverell, then on their return they followed the Dumaresq River and came within about 40km of the site of Inverell. During this return journey they also came across a large shed that was clearly of European construction with a thatched roof but no walls. So while Cunningham provided the first written accounts of the region it would appear that European exploration and settlement in the district had already begun prior to 1827 (Wiedemann 1996).

Non Indigenous settlement began in earnest in the 1830s as squatters moved into the area. H. C. Sempill is thought to have established the first squatting run in 1832 (RES 1986). Following the reports from Cunningham of the rich soils to the north, Peter Macintyre also sent one of his overseers, Alexander Campbell, out to claim land in the northern district in 1835 (Wiedemann 1996). Other Hunter Valley pastoralists such as the Dumaresqs, Cory, Dangar, Collins and Hewitt families also made their way north (RES 1986). Squatting licences were made available in 1836 at a price of £10 per station, however, since the district was administered from the distant Macleay River there were not many who actually took them up. This changed in 1839 when the New England pastoral

district was formed, and a new commissioner of crown lands set up in Armidale where there was soon a court house, commissioner's home, police barracks and lockup. At this stage in the settlement the main concerns for the government were to define the pastoral runs and issue licences. A subsidiary concern was finding a suitable transport route to the coast that would provide an alternative to the current overland route to Maitland. A convict built road was established from Walcha to Port Macquarie, however this proved to be short lived as erosion on the steep sections soon made it impassable. Various other routes were also established with the link between Tenterfield and Grafton proving the most successful. By 1839 there were some 46 stations in the region; this had increased to 178 by 1852, at which time there were an estimated one million sheep being grazed in the district. Essentially all of the grassy land on the rich basalt soils through the centre had been taken up by this time, leaving only the wooded country around the eastern and western falls, which was better suited to cattle (HO & DUAP 1996).

Towns and Settlements

During the initial arrival of the squatters there was a group who set out from Sydney on an expedition to find new land in 1838. This particular expedition was of note because the guides used were the original "Beardies" - ex-convict shepherds John Duval and Chandler, who guided many of the early settlers to the area. Other members of the 1838 expedition included representatives of Archibald Boyd, Windeyer and Oswold Bloxsome, who each drew lots and then chose land for their stations before sending people in to settle the area. Settlers then came from Sydney on bullock wagons bringing sheep and cattle with them (BGIWC 1988). Many of these early settlers in the area around Glen Innes and Inverell were Scots, which is why so many of the place names have Scottish origins (HO & DUAP 1996).

In 1846 Armidale had a population of 76, at which time it already had a post office, various inns, a steam flour mill and a church, in addition to the judicial buildings associated with the seat of the commissioner of crown lands. The town plan was gazetted in 1849, and by the early 1850s the population was in excess of 500. The Catholic and Anglican churches were replaced with cathedrals in the 1850s, a hospital was built in 1853, and a newspaper published from 1856. The population of Armidale was 4,200 in 1861, and the town saw major growth over the rest of the nineteenth century. Following the arrival of the railway in 1883 the town also enjoyed the luxury of gas lit streets (HO & DUAP 1996).

Settlement at Tenterfield begun at a similar time to Armidale, with George Inn and a store built in the 1840s, and a town surveyed in 1851. The population of Tenterfield continued to grow following gold discoveries in nearby Timbarra and Drake. While growth at Tenterfield was somewhat slower during the second half of the nineteenth century than that experienced at Armidale and Glen Innes, it was also lucky enough to be joined into the rail network in 1886.

Wellingrove, which is situated just to the northeast of the study area, was the original location chosen for the court of petty sessions, however following land sales in 1854, when Glen Innes proved a more popular locale, settlement at Wellingrove declined in preference to the emerging centre at Glen Innes. Glen Innes enjoyed good growth in the second half of the nineteenth century, as it benefited from the effects of increased trade from the new tin fields. In the 1870s the town was incorporated, a road was built to Grafton and a hospital established. The railway then arrived in 1884, which also saw competition between Glen Innes and Guyra for local trade.

Inverell started off as Green Swamp, the location of Colin Ross' store situated at the intersection of fairly major north-south and east-west travel routes. It was settled slightly later than the other towns though, with the town surveyed in 1858 and the courthouse and lock up built by 1861. In 1891 there were 576 dwellings in Inverell, of which 476 were wood, 60 brick, 10 iron and 39 canvas (RES 1986; HO & DUAP 1996).

Essentially, the towns of the New England district developed at centres associated with farming, dairying, mining and the railways. However, it was pastoralism and mining that had the biggest impacts on the establishment and growth of settlements. The pastoral towns have generally continued as settlement centres to the present day, while the mining towns have largely been

abandoned. Common industries in the towns themselves included tanneries, saddleries, mills, soap and candle makers, brickmaking, foundries, wheelwrights, coach builders and tailors. The landscapes of New England country towns were largely established between 1861 and 1914, and are thus a product of Victorian and Federation architectural styles (RES 1986; BGIWC 1988; HO & DUAP 1996).

Most of the towns in the region were built of timber, although brick also saw increasing popularity with time; in particular there is a characteristic local 'blue' brick (HO & DUAP 1996). As a rule however, brick making was not common, although quarries are known to have been located at King's Plain (1908-1912), and Wallangra Station (1876) (RES 1986). Slab houses were generally very common, particularly prior to the 1920s, although bark huts were also still common well into the twentieth century (Wiedemann 1998). The slab houses often had a bark roofed kitchen located adjacent and joined to the main building by a landing. Chimneys were normally constructed of stone, brick, slabs, kerosene tins or iron (BGIWC 1988). Unfortunately, few of the original homesteads are still extant (HO & DUAP 1996).

Mining

Gold discoveries in the north took off quite quickly following the success of finds at Ophir and the declaration by Reverend W. B. Clarke that the area was auriferous. There was a rush in 1851 at Rocky River, near Uralla, with 3,400 miners attracted to the area. By 1855 companies and bands had established deep lead mines and there were 5,000 on the field. More substantial gold deposits were then discovered in the headwaters of the Gwydir and the town of Barraba on the western fall was declared in 1852. Barraba continued to grow as a result of various successful gold mining ventures in the area and it eventually became a railhead and the centre of a wheat growing district. Another town that enjoyed growth due to gold discoveries was that of Bingara, where the All Nations Gold Mine operated from 1880 to 1948 (HO & DUAP 1996).

While gold continued to be mined from the 1850s onwards and enjoyed small revivals at various locations throughout the nineteenth century, the mining of tin was an important new development in the 1870s following discovery of alluvial tin on the western fall. Tin was eventually found to be quite widespread, and Glen Innes in particular benefited from the development of tin mining (HO & DUAP 1996). The Chinese played an important role in mining throughout the district; they were instrumental in the mining of both gold and tin. (HO & DUAP 1996; Wiedemann 1996).

In terms of mining, the area is renowned not only for tin and gold, but also for sapphires (BGIWC 1988). The mining of various gems including sapphires, emeralds and diamonds saw an increase in significance when the Boer War (1889-1902) interrupted South African trade (RES 1986). Sapphires were also mined during the 1920s but the markets at the time did not favour the local industry as high quality stones were produced in areas such as Kashmir and Cambodia. As a rule, sapphires are rare in Australia; the only commercial fields are at Inverell, Glen Innes and near Anakie in Queensland. The stones occur in alluvial deposits in basalt country, and are usually of relatively low quality. However, Horse Gully, a tributary of Frazer's Creek, is reputedly one of the richest sapphire bearing areas in the world (Wiedemann 1998).

As an industry, sapphire mining saw a revival in the second half of the twentieth century. This was brought about by the employment of new and more profitable extraction techniques using earth moving machinery, and by changes in fashion that increased demand for this gemstone. The high quality gems were sold to markets in Europe, while the poorer quality stones were sold into the Asian market, with many stones seeing their way into the workshops of Bangkok. The local boom in the sapphire mining industry took place in the 1960s and 1970s with buyers from Thailand coming into Inverell each month to buy up the gems. Indeed, the majority of local sapphires were eventually cut in Thailand (Wiedemann 1998). Today the gemstone trade continues to be important for local tourism (RES 1986).

Pastoralism and Agriculture

Initially the land around Inverell and Glen Innes was not fenced and natural features such as valleys and watersheds were used as boundaries, with trees also marked to signify ownership (BGIWC 1988).

The nature of land ownership and property boundaries changed quite radically however with the introduction of the Robertson Land Acts.

Around this time the side effect of the success associated with gold mining was also felt through an increased demand for pastoral produce. By 1861 there were 4,000 acres in cultivation and nearly every town had its own steam flour mill. New England was a pastoral district up until 1874 when it was divided up into counties. In this region the effect of the Robertson Land Acts was somewhat different to that experienced elsewhere in New South Wales. In the New England district the run-holders tended not to have the financial power of squatters in other areas, and as a result there were more inroads made by the new selectors and most of the large early stations had shrunk by half their size by the 1880s (HO & DUAP 1996).

Most of the Robertson Land Acts selections were between 50 and 100 acres in size, with settlement focused on the basalt soils in the west, as well as the central tablelands. The new selectors also used dummying techniques to build up grazing runs of up to 4,000 acres with sheep often being run at one head per acre. Ringbarking and fencing, which had been introduced in 1851 at Rockvale Station, increased in use and shepherding decreased. By 1880 the majority of the district was fenced (HO & DUAP 1996).

Cultivation of various crops was undertaken in areas where land could be cleared and wheat proved particularly successful. However, when the arrival of the railway to Armidale in 1883 allowed cheap transport of better quality milling wheat from South Australia, the central and eastern plateau began to be used for growing maize, oats and potatoes instead. Subsidiary industries included orchards at Armidale and Glen Innes and dairying, the latter largely proving unsuccessful in comparison to the butter industry from the coastal regions (HO & DUAP 1996).

Essentially the Robertson Land Acts enabled the establishment of a new class of small-scale graziers as well as the development of crop and orchard cultivation and to a lesser extent dairying (HO & DUAP 1996). Subdivision and soldier settlement also brought about closer settlement patterns in the early twentieth century (RES 1986). The growth in agriculture saw a peak of population in 1911. Evidence of the dense settlement that once existed can be found in aerial photos and by abandoned homesteads, plantations and graves (HO & DUAP 1996).

Overgrazing and the rabbit plague in the late nineteenth century combined to see New England change from breeding country to wool production, although that has since changed somewhat thanks to the introduction of new pasture and better control of rabbit numbers. Other aspects of the agricultural industry have also changed, with wheat cultivation shifting further west and orchards declining in importance. Potatoes and maize both continue to be important however. The pattern of settlement has also changed with many of the smaller towns and villages declining in size or being abandoned while the main centres such as Armidale have enjoyed substantial growth (HO & DUAP 1996).

Railways and Roads

Early on in the settlement of the district bullock and horse teams were used for transport. The first roads in the district were fairly basic tracks with maintenance carried out by pick and shovel (BGIWC 1988).

The two biggest changes to transport in the local area were the arrival of the railway and the introduction of automobiles. Inverell competed with Armidale for the railway that was planned in the late 1800s, and although the agricultural land around Armidale was arguably not as rich as that of Inverell, the wealthy sheep breeders in that area lobbied heavily for the railway and eventually won. Inverell did not join the railway until 1901, by which time the role of Armidale as the major regional centre was well established. Prior to the turn of the century much of the local trade from Inverell went via bullocks to Glen Innes and then on to Grafton (Wiedemann 1996).

Since the turn of the twentieth century the Glen Innes to Inverell and Glen Innes to Grafton bus services have continued to be important for transporting both passengers and produce. These services began as a Cobb and Co. horse drawn service and were later replaced by motorised transport around 1914 (BGIWC 1988).

Sapphire Wind Farm Study Area

The Sapphire Wind Farm project area straddles various County, Parish and Land District Boundaries. The majority of the northern portion corresponds to the Parish of Buckley in County Arrawatta, Land District of Inverell, while the western margins cross over into the Parish of Swamp Oak and the eastern section overlaps with the Parishes of Wellingrove and Waterloo in the County of Gough in the Land District of Glen Innes. The southern section is also in the County of Gough and corresponds with the Parish of Ross.

Based on the information available on the early parish maps it would appear that there were a number of key families that were major players in land selection and settlement within the study area. In particular, the Vivers family is well represented across the Parish of Buckley and the Parish of Swamp Oak, while the McAllisters and Blankenbergs selected and purchased land in the northeast in the Parish of Wellingrove. Much of the study area coincides with land that formed part of the larger Vivers' estate of Kings Plains.

8.3 Previously Recorded Sites

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

Australian Heritage Database

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

The database includes places in:

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

and places under consideration for any one of these lists. A search of this database (25th June 2009) revealed that there are no heritage items within the Sapphire Wind Farm proposal area listed on the Australian Heritage Database (AHD). There is however one item listed within the Inverell Local Government Area that is situated just to the north of the proposal area (ca. 5km from the nearest turbine sites). Details of this item are provided below (Table 3).

LGA	Item	Address	Listing
INVERELL	Kings Plains Private Cemetery	Nullamanna-Wellingrove Rd Kings Plains	(Indicative Place) Register of the National Estate

Table 3. Summary of previously identified heritage items on the AHD located in or near the proposal area.

State Heritage Inventory

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

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

A search of this database (25th June 2009) revealed that there are no items within the Sapphire Wind Farm proposal area that are currently listed on the State Heritage Inventory (SHI). There are however two previously identified items that are located nearby (within ca. 3-5km or the nearest turbine sites); details of these items are provided below in Table 4.

LGA	Item Name	Suburb	Significance
INVERELL	Kings Plains Castle	Kings Plains	LGOV
GLEN INNES SEVERN	Presbyterian Church	Wellingrove	LGOV

Table 4. Summary of previously identified heritage items on the SHI located in or near the proposal area.

The Kings Plains Castle was identified in the Inverell Heritage Study (RES 1986); it is listed in Volume 2 of that document as item RUR005. The abovementioned Kings Plains Private Cemetery, which is listed on the Register of the National Estate, is a component of the larger site complex at Kings Plains Castle.

The NSW Heritage Act (1977)

The purpose of the NSW Heritage Act 1977 is to ensure that the heritage of New South Wales is adequately identified and conserved. In practice the Act has focused on items and places of Non Indigenous heritage to avoid overlap with the NSW National Parks & Wildlife Act, 1974, which has primary responsibilities for nature conservation and the protection of Aboriginal objects and places in NSW. In recent years, however, the Heritage Council has targeted these other areas, working with relevant state agencies such as NPWS to identify gaps in the protection of Aboriginal and natural heritage places (for example the Cyprus Hellene Club was protected under the Heritage Act as a place of historic significance to Aboriginal people amongst other values).

Section 4 of the Act considers a heritage item to include *any place, building, work, relic, movable object, which may be of historic, scientific, cultural, social, archaeological, natural or aesthetic value.*

The Heritage Amendment Act 1998 came into effect in April 1999. This Act instigated changes to the NSW heritage system which were the result of a substantial review begun in 1992. A central feature of the amendments was the clarification and strengthening of shared responsibility for heritage management between local government authorities responsible for items of local significance, and the NSW Heritage Council. The Council retained its consent powers for alterations to heritage items of state significance.

The Heritage Act is concerned with all aspects of conservation ranging from the most basic protection against damage and demolition, to restoration and enhancement. It recognises two levels of heritage significance, State significance and Local significance across a broad range of values.

Generally this Act provides protection to items that have been identified, assessed and listed on various registers including State government section 170 registers, local government LEPs and the State Heritage Register. The Interim Heritage Order provisions allow the minister or his delegates (local government may have delegated authority) to provide emergency protection to threatened places that have not been previously identified. The only 'blanket' protection provisions in the Act relate to the protection of archaeological deposits and relics greater than 50 years old.

The Heritage Council of NSW

The role of the Heritage Council is to provide the Minister with advice on a broad range of matters relating to the conservation of the heritage of NSW. It also has a role in promoting heritage conservation through research, seminars and publications. The membership of the Heritage Council is designed to reflect a broad range of interests and areas of expertise.

Interim Heritage Orders

Under the provisions of Part 3 of the Act, the Minister can make an interim heritage order (IHO). A recommendation with respect to an order can come from the Heritage Council, either based on a request for the Minister, or the Council's own considerations. The Minister can also authorise Local Councils to make IHOs within their area. An interim conservation order may remain in force for up to 12 months, until such time as it is revoked or the item is listed on the State Heritage Register. A heritage order may control activities such as demolition of structures, damage to relics, places or land, development and alteration of buildings, works or relics.

The State Heritage Register

Changes to the Heritage Act in the 1998 amendments established the State Heritage Register which includes all places previously protected by permanent conservation orders (PCOs) and items identified as being of state significance in heritage and conservation registers prepared by State Government instrumentalities. Sites or places which are found to have a state level of heritage significance should be formally identified to the Heritage Council and considered for inclusion on the State Heritage Register.

National Trust of Australia (NSW) Register

The National Trust of Australia (NSW) is a non-government Community Organisation which promotes the conservation of both the built and natural heritage (for example, buildings, bushland, cemeteries, scenic landscapes, rare and endangered flora and fauna, and steam engines may all have heritage value). The Trust has approximately 30,000 members in New South Wales.

Following its survey and assessment of the natural and cultural environment, the Trust maintains a Register of landscapes, townscapes, buildings, industrial sites, cemeteries and other items or places which the Trust determines to have heritage significance and are worthy of conservation. Currently there are some 11,000 items listed on the Trust's Register. They are said to be 'Classified'.

The Trust's Register is intended to perform an advisory and educational role. The listing in the Register has no legal force. However, it is widely recognised as an authoritative statement of the heritage significance of a place. The Trust does not have any control over the development or demolition of the Classified Places or Items in its Register.

While the National Trust Register does not provide any statutory obligations for protection of a site as such, the acknowledgment of a place being listed on the Register as a significant site lends weight to its heritage value. Also, the fact that the actual data for sites may be minimal does not diminish the significance of a place. In fact, many sites were listed with only basic data added, especially in the early developmental stages of the Register.

The Trust, over the last few years has been upgrading the information for places listed, with criteria for assessment for listing based on the Australian Heritage Commission Criteria of assessment for entry to the Register of the National Estate.

A search of the National Trust of Australia (NSW) Register (25th June 2009) revealed that while there are various items listed within both Inverell and Glen Innes Severn LGAs there are no heritage items currently listed in the Sapphire Wind Farm proposal area. The Kings Plains Private Cemetery, which is situated just to the northwest of the study area, is however listed on the Register Index for the Inverell LGA (Table 5). This item is also listed on the Register of the National Estate.

LGA	Locality	Address	Item Name
INVERELL	Wellingrove	Kings Plain Property 30 km west of Glen Innes, past Wellingrove	Kings Plains Private Cemetery

Table 5. Summary of previously identified heritage items on the National Trust Register located near the proposal area.

8.3 Historical Themes

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

The table (Table 6) below provides a summary of themes that are applicable to the Sapphire Wind Farm project area.

Australian Theme	NSW Theme	Local Theme
Peopling Australia	Aboriginal cultures and interactions with other cultures	Day-to-day life
		Mythological and ceremonial
		Natural resources
		Contact period
	Ethnic influences	Chinese
Developing local, regional and national economies	Agriculture	Fencing
		Sheds
		Pasture
		Water provision
		Farmsteads
		Shearing
		Machinery
	Commerce	Banking
		Trade routes
		Shops
		Inns
	Communication	Postal services
		Telephone and telegraph services
		Newspapers
		Transport networks
	Environment – cultural landscape	Tree plantings
		Picnic areas
		Fishing spots
	Events	Floods
	Exploration	Camp sites
		Exploration routes
		Water sources
	Industry	Mills
		Shearing sheds
		Workshops
		Transport networks
		Mines
		Quarries
		Lime kilns
		Miners' camps
		Processing plants
	Mining	Prospecting
		Mine claims
		Extraction of ores
		Processing plants
		Transport of supplies and ore
		Mining settlements
		Mining equipment/machinery
		Mining landscapes
		Aboriginal stone procurement
	Pastoralism	Pastoral homesteads
		Sheds and yards
		Travelling stock reserves
		Fencing and boundaries
		Pastoral workers' camps
		Water sources
	Technology	Communication networks
	Transport	Railways
		Early roads
		Private tracks
		Coaches and teamsters
		Bridges
Building settlements, towns and cities	Towns, suburbs and villages	Town plan
		Neighbourhoods
	Land tenure	Fencing and other boundary markers
	Utilities	Water distribution

Australian Theme	NSW Theme	Local Theme
		Garbage disposal
		Sewage/septic systems
		Provision of electricity
		Bridges
		Culverts
	Accommodation	Inns and hostels
		Domestic residences
		Temporary encampments
		Homesteads
		Humpies
Developing Australia's cultural life	Domestic life	Domestic artefact scatters
		Residences
		Food preparation
		Gardens
		Domesticated animals
	Leisure	Show grounds
		Picnic/camping areas
		Racecourse
		Scenic lookouts
		Town halls
		Tourism
	Religion	Churches
	Social institutions	Public hall
		Social groups/associations
	Sport	Sports grounds
		Sports teams
Marking the phases of life	Birth and death	Graves
	Persons	Individual monuments
		Significant individuals/families
		Place names

Table 6. National, state and local historical themes that are applicable to the study area and surrounds.

8.4 Predictive Statements

While the table above lists a wide variety of themes that are important contextually to the history and heritage of the study area, not all of these themes are of direct relevance to this project. A previous study of local heritage within the Inverell LGA (RES 1986) identified the following themes as being the most significant to patterns of local history:

- Pre-European
- Exploration
- Squatter
- Settlers/Pastoral
- Mining
- Village/Town
- Cereal cropping

These themes have been adapted somewhat for the Sapphire study area; the following broad thematic categories encompass all of the major themes relevant to the history and heritage in and around the Sapphire Wind Farm proposal area:

- Agriculture/Pastoralism
- Mining
- Domestic life
- Transport/Communications

Agriculture/Pastoralism

The land in and around the study area has been used by Europeans for agricultural purposes for over 160 years. Sheep grazing has been the primary industry during that period, however cattle grazing, dairying, orchards and wheat growing have also contributed to the local economy. Initially the area in which the Sapphire Wind Farm is proposed would have corresponded to portions of a variety of squatter runs, however, as a result of the introduction of the Robertson Land Acts, the land has been subdivided into a series of small portions. Nevertheless, selection tactics employed by some families, most notably the Vivers on the Kings Plains, did enable the establishment of substantial and expansive grazing runs.

There is a high potential for additional items associated with this theme to be present in the study area. Potential heritage item types are likely to include homesteads (see below), sheds, yards, fences, plough-lands, dams, gardens, roads and tree plantings. These items may be present as extant/standing features or ephemeral remnants. Such items may have archaeological research potential and historical/social significance. The location of such features is difficult to predict, although it might be expected that the potential will increase in and around existing homestead complexes, and along property boundaries and drainage lines.

Mining

While gold and then tin were the first minerals to be mined in the broader Glen Innes/Inverell region, it was the mining of sapphires that grew to dominate the industry locally. These sapphires usually occurred in Quaternary and Tertiary alluvial deposits, in both existing and palaeo-alluvial channel systems. The first commercial mining of sapphires in the district was undertaken by C. L. Smith on Frazers Creek near Inverell in 1919, where alluvial stream deposits were worked by hand using relatively simple equipment. Following suit, a number of other small-scale mining enterprises soon started up, establishing themselves throughout the Glen Innes and Inverell region. However, these endeavours were short lived, continuing for just 10 years before failing with the onset of the Great Depression. Sapphire mining saw a resumption in the district in the 1960s and 1970s, when it was made viable and profitable through the introduction of new extraction techniques using earth moving equipment combined with a boom in demand from Asian markets.

There is a moderate potential for items associated with this theme to be present in the study area. Potential heritage item types are likely to include impacted areas of ground bearing marks arising from extraction works, dam structures associated with the sapphire processing, mullock heaps, standing or ruined structures, and machinery items including material used for piping or pumping. These items may be present as extant/standing features or ephemeral remnants. As indicated, sapphire mining in the region was conducted by way of alluvial extraction so that it is predicted that any material remnants associated with this mining would usually be located in close association with drainage lines.

Domestic life

Homesteads are one of the key testaments to the success of the agricultural industry. They were as a rule single story affairs with various outbuildings and outstations. As with most of the buildings in the New England district homesteads were usually built of wood. While very few of the original houses are still standing (HO&DUAP 1996), the potential for sites associated with this theme is high. There is a high potential for more ephemeral sites such as shepherd huts or other types of camps to be located throughout the study area.

Elements associated with domestic life that might be present within the Sapphire Wind Farm study area include: standing structures, ruins, gardens and tree plantings, fences, toilet pits, and rubbish disposal areas. These sorts of items are generally likely to occur on relatively level ground, either on hill crests or locally elevated ground adjacent to water sources. All such items may have archaeological research potential and historical/social significance.

Transport/Communications

The study area is between Inverell and Glen Innes and is bordered in the south by the Gwydir Highway, which links these two towns, and continues east to Grafton. The main routes within the

study area are Waterloo Road, which extends east to west through the southern half and the Eastern and Western Feeder Roads, which join Waterloo Road with Kings Plains in the north. There is a moderate to high potential for sections of older road alignments to occur adjacent these existing roads. In addition, there are various old access roads shown on various maps that appear to correspond to road reserves established during the nineteenth century when the land was sold off under the Robertson Land Acts. Some of these roads are probably no longer in use however they may still be evidenced by fence lines and/or subtle earthworks.

Other potential heritage items associated with this theme may include old cars, drays and carts, internal farm access roads, creek crossings, culverts and old telegraph and electricity poles. Generally speaking the location of such items is difficult to predict. The alignments of old communication and transport routes should however be evidenced as linear features linking elements of farm complexes together and with neighbouring settlements and transport networks. These sorts of items similarly have potential to be of heritage significance.

Summary

There is the potential that potential heritage items might be present within the study area. The themes that such items are most likely associated with are agriculture/pastoralism, mining, domestic life and transport/communications. Items may be present as extant/standing structures or ephemeral sites and ruins. The location of such items is difficult to predict, although the potential generally increases on level ground adjacent to existing homesteads, good water supplies and existing or former road alignments.

It should be noted that while there is the potential for such items to occur, this does not necessarily indicate that any items that may be present will be of a significance to warrant heritage listing.

9. SURVEY RESULTS

9.1 Survey Coverage

The development area has been divided into 21 Survey Units. These Survey Units are described in Table 7; their location is shown in Figures 3 - 5. The environmental context of each Survey Unit is discussed in the following section.

At the time of the field survey almost the entirety of the study area was very densely covered with grasses, weeds and pasture due to what local landowners described as the most consistent season of rainfall for some 20 years. Accordingly, ground surface visibility throughout was greatly restricted.
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Survey Unit 1 (SU1) is located in the north-east of the study area. This landform is a broad amorphous undulating crest that runs north/south, with an elevation between ca. 950 and ca. 1050 m AHD. The underlying geology is predominantly basalt, which is present in outcrops and surface cobbles, and which grades to granitic at its northern extent. The landform generally falls away sharply at its flanks, particularly to the east, and forms a watershed between Wellingrove Creek, ca. three km to the east, and Kings Plains Creek, ca. six km to the north-west. The turbines within this survey unit are located on elevated areas upon the crest and the associated infrastructure, including roads and electrical connections link these along areas of higher elevation. The entirety of the survey unit is used for grazing and/or pasture production, and has undergone erosion from wind and water. Previous impacts include clearance, fencing, surface rock removal, and ploughing and cultivation. The current vegetation is stands of predominantly regrowth eucalypts, grasses and a variety of weeds and thistles (Plates 1 and 2).

Plate 1. Survey Unit 1, looking north to wind turbine generator impact area.

Plate 2. Survey Unit 1, construction compound impact area, looking south.

Survey Unit 2 (SU2) and Survey Unit 5 (SU5) are simple slopes that extend east from Survey Unit 1. They are gently inclined with an easterly aspect and are comprised of basalt geology which outcrops intermittently. Three turbine sites and associated electrical services are proposed for SU2, while an access track to Polhill Road and site office located adjacent to that road are proposed for SU5 (Plate 3). The current landuse of these Survey Units is grazing. In both, there is evidence of moderate erosion, and prior impacts include clearance, fencing and mechanical removal of surface rock.

Plate 3. Survey Unit 5, proposed access track impact area, looking west.

Survey Unit 3 (SU3) is a flat with drainage depression (Plate 4). It is very gently inclined to the west and has exposed outcrops of granitic geology to the east, which shifts to alluvial basaltic soils over the majority of the flat. The drainage depression is a narrow and ephemeral 1st order stream, arising from a catchment area of ca. two km² above this Survey Unit. SU3 is highly disturbed having been extensively cleared and repeatedly ploughed and cultivated, and at the time of field survey the ground showed high levels of pugging from stock treadage. The proposed impact to this survey unit is an easement route.

Plate 4. Survey Unit 3, looking south.

Survey Unit 4 (SU4) is a gently inclined simple slope with a north-easterly aspect which falls on either side of Waterloo Road (Plate 5). The underlying geology is basalt, and prior impacts are extensive clearance, road construction, fencing, and recurrent ploughing and cultivation. The proposed impacts to this survey unit are an easement route and access track.

Plate 5. Survey Unit 4, looking south, showing a cultivated field sown to oats.

Survey Unit 6 (SU6) is located to the south-west of the study area. The landform is a broad generally amorphous undulating crest that runs east/west, with an elevation between ca. 885 and ca. 970 m AHD. The underlying geology is basalt, with the Survey Unit being rocky, with outcrops and surface cobbles. The landform generally falls away steeply at its western extent but slopes reasonably gently at the eastern end. The entirety of the survey unit is used for grazing and/or pasture production. Some areas have been significantly impacted by the construction of contour banks, while other prior impacts include clearance, fencing, surface rock removal, and ploughing and cultivation. The current vegetation is sparse isolated stands of predominantly regrowth eucalypts, grasses and a variety of weeds and thistles (Plate 6). At the time of field survey the thistle growth at the western extent of the Survey Unit was extremely thick and up to ca. 1.5 metres in height, which prevented foot survey. The proposed impacts for this survey unit are an easement route, turbines, access track, concrete batching plant and substations.

Plate 6. Survey Unit 6, looking west from near Waterloo Road.

Survey Unit 7 (SU7) is a flat with drainage depression (Plate 7). It is very gently inclined to the north and has basalt soils. The drainage depression is broad and deeply etched, but an ephemeral 2nd order steam, arising from a catchment area of ca. 2.1 km² above this Survey Unit. SU7 is generally highly disturbed having been extensively cleared, ploughed and cultivated. At the time of field survey much of the area was sown to lucerne. The proposed impacts to this survey unit are an easement route, access track and accompanying electrical services.

Plate 7. Survey Unit 7, looking south.

Survey Unit 8 (SU8) is a flat with drainage depression (Plate 8). It is very gently inclined to the north with basalt soils. The drainage depression is a narrow and an ephemeral 2nd order stream, arising from a catchment area of ca. five km² above this Survey Unit. SU8 is moderately disturbed having been extensively cleared, ploughed and cultivated. The proposed impact to this Survey Unit is an easement route.

Plate 8. Survey Unit 8, looking east.

Survey Unit 9 (SU9) is a minor crest of basalt geology with surface cobbles. The entirety of the Survey Unit is used for grazing and/or pasture production. Prior impacts include clearance, fencing, an unformed vehicle track, ploughing, and cultivation. The current vegetation is sparse, isolated stands of predominantly regrowth eucalypts, grasses, a variety of weeds and thistles, and pasture (Plate 9). The proposed impact for this survey unit is an easement route.

Plate 9. Survey Unit 9, looking north-east along the easement route to Survey Unit 10.

Survey Unit 10 (SU10) is a flat with drainage depression. It is very gently inclined with open aspect and basalt soils. The drainage depression is a 2nd order stream, arising from a catchment area of ca. 19 km² above this Survey Unit, and flows north into Kings Plains Creek ca. 5.5 km away. The proposed impact to this survey unit is an easement route, and at the point where the proposed route crosses the drainage depression the stream bank is highly eroded and enlarged following the clearance of the original trees that would have existed in this area, as well as the subsequent impacts of farming practices (Plate 10). Elsewhere the associated flat is highly disturbed having been extensively cleared, ploughed and cultivated. The current vegetation is sparse isolated regrowth eucalypts, grasses, a variety of weeds and thistles.

Plate 10. Survey Unit 10, looking north-east, showing the eroded stream banks of the drainage depression.

Survey Unit 11 (SU11) is located centrally to the south of the study area. The landform is an undulating crest, with elevations ranging between ca. 970 and ca. 1030 m AHD. The higher section is located along the southern extent, and the landform drops off sharply from here to the south, while to the north the reduction in elevation is more gradual. The underlying geology is basalt, and at higher elevations the Survey Unit is very rocky with some outcrops and an abundance of surface cobbles. The landform forms a watershed which to the south drains into Swan Brook. The upper tributary of Kings Plains Creek originates from water runoff from this landform which flows to the north. The entirety of the survey unit is used for grazing and has undergone erosion from wind and water. Previous impacts include clearance, fencing, surface rock removal, ploughing and cultivation, and areas of contour banking. The current vegetation is stands of predominantly regrowth eucalypts, grasses, clover, and a variety of weeds and thistles (Plates 11 and 12). The proposed impacts for this survey unit are easement routes, turbines, access track, concrete batching plants, rock crusher, a construction compound, substations and a site office.

Plate 11. An area of Survey Unit 11 to the south, looking west to a wind turbine generator impact area.

Plate 12. An area of Survey Unit 11 to its north, looking west to wind turbine generator impact area.

Survey Unit 12 (SU12) is a drainage depression (Plate 13). It is very gently inclined to the north-west and is underlain with basalt geology. The drainage depression is an ephemeral 1st order steam with a catchment area of ca. 2.1 km² above this Survey Unit. The stream channel has been widened and scoured through heavy erosion initiated by tree clearance and the impacts of stock treadage, which have exacerbated stream bank attrition. The proposed impact to this survey unit is an easement route.

Plate 13. Survey Unit 12, looking north.

Survey Unit 13 (SU13) is a flat with drainage depression (Plate 14). It is very gently inclined to the north and comprised of alluvial basalt soils. The drainage depression is an ephemeral 2nd order steam with a catchment area of ca. 6.5 km² above this Survey Unit. This Survey Unit has undergone extreme prior impacts. As indicated by property manager Dale Brown (pers. comm. 2011) the entire area has experienced alluvial mining which ceased 15 years ago, leaving both the flat and drainage depression within SU13 thoroughly disturbed. The proposed impact to this survey unit is an easement route.

Plate 14. Survey Unit 13, looking north-east.

Survey Unit 14 (SU14) is located to the south-east of the study area. The landform is a broad undulating crest with elevations ranging between ca. 980 and ca. 1156 m AHD. The south-eastern section of the Survey Unit has the highest elevations and from here the landform drops off sharply to the south and east, but generally grades more gently to the north. The underlying geology is basalt, and especially at higher elevations the Survey Unit is often rocky with some outcrops and many areas where surface cobbles are present. Similarly to Survey Unit 11, the landform forms a watershed, which to the south drains into Swan Brook. The entirety of the Survey Unit is used for grazing and has undergone erosion from wind and water. Previous impacts include clearance, fencing, surface rock removal, ploughing and cultivation, and areas of contour bank construction. The current vegetation is stands of predominantly regrowth eucalypts, grasses, clover, and a variety of weeds and thistles (Plates 15 and 16). The proposed impacts for this Survey Unit are an easement route, turbines, access track, concrete batching plants, and a substation.

Plate 15. Survey Unit 14, looking north-east to wind turbine generator impact area.

Plate 16. Survey Unit 14, looking west to wind turbine generator impact area.

Survey Unit 15 (SU15) is a gently inclined simple slope with a southerly aspect located on the southern side of the Gwyder Highway (Plate 17). The underlying geology is basalt, and prior impacts include clearance, fencing, and grazing. The current vegetation is stands of predominantly regrowth eucalypts, grasses, and a variety of weeds and thistles. The proposed impacts to this Survey Unit are an easement route and substation.

Plate 17. Survey Unit 15, looking south.

Survey Unit 16 (SU16) is a gently inclined simple slope with south-westerly aspect located adjacent to Eastern Feeder Road (Plate 18). The underlying geology is basalt, and prior impacts include clearance, fencing, grazing, ploughing and cultivation. The current vegetation is sparse isolated regrowth eucalypts, grasses, and a variety of weeds and thistles. The proposed impacts to this survey unit are an easement route.

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Plate 18. Survey Unit 16, looking north-west.

Survey Unit 17 (SU17) is a drainage depression. It is very gently inclined to the west and overlies basalt geology. The drainage depression is an ephemeral 1st order steam with a catchment area of ca.

1.5 km² above this Survey Unit. This is a minor stream channel which has been widened and scoured through erosion initiated by tree clearance and the subsequent impacts of stock treadage (Plate 19). The proposed impacts to this survey unit are an easement route.

Plate 19. Survey Unit 17, looking north-east.

Survey Units 18 and 21 are crests in a rolling hill system, intersected by the drainage depression Survey Unit 20. Survey Unit 18 (SU18) is located to the north-west of the study area (Plates 20 and 21). The landform is a broad undulating crest with elevations ranging between ca. 900 and ca. 960 m AHD. The underlying geology is basalt with few rocky outcrops, however, surface cobbles are present in quantities from very slightly rocky to rocky on some crests. The entirety of the Survey Unit is used for grazing and has undergone erosion from wind and water. Previous impacts include clearance, fencing, surface rock removal, ploughing and cultivation, the instalment of troughs and connecting subsurface waterlines, as well as areas of contour bank construction. The current vegetation is stands of predominantly regrowth eucalypts, grasses, and a variety of weeds and thistles. The proposed impacts for this Survey Unit are an easement route, turbines, access track, concrete batching plant, rock crusher, construction compound and a site office.

Plate 20. Survey Unit 18, looking west to a wind turbine generator impact area.

Plate 21. Survey Unit 18, looking south-east to wind turbine generator impact area.

Survey Units 19 (SU19) is a drainage depression within the rolling hill system of crests that comprises Survey Unit 18 (Plate 22). It is very gently inclined to the south and is underlain with basalt geology. The drainage depression is an ephemeral 1st order steam with a catchment area of ca. 0.75 km^2 above this Survey Unit. The stream channel has been widened and scoured through heavy erosion initiated by tree clearance, the impacts of stock treadage, vehicle traffic, and enhanced water runoff due to depleted vegetation on the adjoining crest landform. These activities have served to

destabilise the stream bank and initiate ongoing erosion. The proposed impact to this survey unit is an access track.

Plate 22. Survey Unit 19, looking east.

Survey Unit 20 (SU20) is a drainage depression within the rolling hill system of crests that bisects Survey Units 18 and 21. It is very gently inclined to the west and is underlain with basalt geology. The drainage depression forms the headwater of Frasers Creek, but in the Survey Unit it is an ephemeral 1st order steam with a catchment area of ca. 2.3 km^2 above this Survey Unit. The stream channel has been scoured and widened through heavy erosion initiated by tree clearance, the impacts of stock treadage, and enhanced water runoff due to depleted vegetation on the adjoining crest landforms (Plate 23). These activities have destabilised the stream bank and initiated ongoing erosion. The proposed impact to this survey unit is an easement route.

Plate 23. Survey Unit 20, looking south-east.

Survey Unit 21 is located in the west of the study area. The landform is a broad undulating crest with elevations ranging between ca. 820 and ca. 990 m AHD. The underlying geology is basalt to the

east, but granite begins to appear on crests centrally and then more frequently moving west. There are few rocky outcrops, however, surface cobbles are present in quantities from very slightly rocky to rocky on some crests. The entirety of the Survey Unit is used for grazing and has undergone erosion from wind and water. Previous impacts include clearance, fencing, surface rock removal, ploughing and cultivation, as well as areas of contour bank construction. The current vegetation is stands of predominantly regrowth eucalypts, grasses, and a variety of weeds and thistles (Plates 24 and 25). The proposed impacts for this survey unit are easement routes, turbines, access track, a concrete batching plant and a substation.

Plate 24. Survey Unit 21, looking west.

Plate 25. Survey Unit 21, looking north to wind turbine generator impact area.

SU	Proposed Impacts	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
SU1	Turbines, access track, electrical, rock crusher, concrete batching plant, construction compound	Crest; broad and undulating	Low biodiversity; scattered trees; 2.25 km from reliable water in Wellingrove Ck	Gently to moderately inclined	Open	Mostly basalt, with granite section at the northern end	Mainly very slightly rocky, with rocky areas	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU2	Turbines, access track and electrical	Simple slope	Low biodiversity; scattered trees; 1.8 km from reliable water in Wellingrove Ck	Gently inclined	E	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU3	Easement route	Flat with drainage depression	Low biodiversity; scattered trees and pasture; 1st order stream with minor catchment area	Very gently inclined	W	Mostly basalt, with granite section at the eastern end	Slightly rocky	Negligible	Silty loam	Yes	Eroded or aggraded	Precipitation	High	Very low /Low
SU4	Easement route and access track	Simple slope	Low biodiversity; 2.4 km from reliable water in Wellingrove Ck	Gently inclined	NE	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU5	Access track and site office	Simple slope	Low biodiversity; 0.5 km from reliable water in Wellingrove Ck	Gently inclined	E	Basalt	Slightly rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU6	Turbines, access track, electrical, concrete batching plants, substations	Crest; broad and gently undulating	Low biodiversity; 1.6 km from reliable water in Horse Gully	Very gently to gently inclined	Open	Basalt	Slightly rocky to rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU7	Access track, electrical and easement	Flat with drainage depression	Low biodiversity; scattered trees and pasture; 2nd order	Very gently inclined	W	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low

SU	Proposed Impacts	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
	route		stream with minor catchment area											
SU8	Easement route	Flat with drainage depression	Low biodiversity; scattered trees and pasture; 2nd order stream with minor catchment area	Very gently inclined	N	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Eroded or aggraded	Precipitation	Moderate	Very low
SU9	Easement route	Crest; minor	Low biodiversity; scattered trees; 3.6 km from reliable water in Kings Plains Creek	Very gently inclined	Open	Basalt	Rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU10	Easement route	Flat with drainage depression	Low biodiversity; scattered trees and pasture; 2nd order stream with minor catchment area	Very gently inclined	Open	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Highly eroded or aggraded	Precipitation	High	Very low /Low
SU11	Turbines, access track, electrical, easement route, rock crusher, concrete batching plants, construction compound, site office	Crest; broad and undulating	Low biodiversity; scattered trees; 3 km from reliable water in Kings Plains Creek	Very gently inclined to moderately inclined	Open	Basalt	Slightly rocky to very rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU12	Easement route	Drainage depression	Low biodiversity; scattered trees and pasture; 1st order stream with minor catchment area	Very gently inclined	NW	Basalt	Slightly rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU13	Easement route	Flat with drainage depression	Low biodiversity; scattered trees and pasture; 2nd order stream with minor catchment area	Very gently inclined	Open	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Highly eroded and mined	Precipitation	High	Very low
SU14	Turbines,	Crest; broad	Low biodiversity;	Very	Open	Basalt	Very	Negligible	Silty	Yes	Eroded	Precipitation,	Moderate	Very low

SU	Proposed Impacts	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
	access track, electrical, easement route, concrete batching plants, substations	and undulating	scattered trees; 4 km from reliable water in Kings Plains Creek	gently inclined to moderately inclined			slightly rocky to very rocky		loam			wind		
SU15	Easement route and substation	Simple slope	Low biodiversity; scattered trees; 2.75km from reliable water in White Rock Creek	Very gently inclined	S	Basalt	Slightly rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU16	Easement route	Simple slope	Low biodiversity; scattered trees; 5 km from reliable water in Kings Plains Creek	Very gently inclined	SW	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU17	Easement route	Drainage depression	Low biodiversity; sparse trees and pasture; 1st order stream with minor catchment area	Very gently inclined	W	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Highly eroded	Precipitation	Moderate	Very low
SU18	Turbines, access track, electrical, easement route, concrete batching plant, rock crusher, construction compound, site office	Crest; broad and undulating	Low biodiversity; grassland; 1 km from reliable water in Kings Plains Creek	Very gently inclined to moderately inclined	Open	Basalt	Very slightly rocky to rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low
SU19	Access track, electrical	Drainage depression	Low biodiversity; scattered trees and pasture; 1st order stream with minor catchment area	Very gently inclined	S	Basalt	Very slightly rocky	Negligible	Silty loam	Yes	Highly eroded	Precipitation	High	Very low

SU	Proposed Impacts	Landform	Environmental context	Slope	Aspect	Geology	Abundance Rock	Quartz Background	Soil	Deposit Potential	Geomoph -ology	Agents	Disturbance Levels	Predicted Artefact Density
SU20	Easement route	Drainage depression	Low biodiversity; scattered trees; 1st order stream with minor catchment area	gently inclined	W	Basalt	Rocky	Negligible	Silty loam	Yes	Eroded	Precipitation	Moderate	Very low /Low
SU21	Turbines, access track, electrical, easement route, concrete batching plant	Crest; broad and undulating	Low biodiversity; grassland; 1 km from reliable water in Horse Gully Creek.	Very gently inclined to moderately inclined	Open	Mostly basalt, with granite areas towards the western end	Very slightly rocky to rocky	Negligible	Silty loam	Yes	Eroded	Precipitation, wind	Moderate	Very low

Table 7. Survey Unit descriptions.

Survey Coverage

The intended methodology for the field survey entailed surveying all of the proposal area on foot. However, conditions encountered when in the field precluded the entirety of the study area to be surveyed in this manner. Due to the presence in some areas, particularly on crests and locally elevated landforms, of very thick, consistent and uninterrupted expanses of tall thistle growth, foot survey was not physically or effectually viable (Plates 26 and 27). While a total of ca. 80.4% of the proposal area was surveyed on foot, the remainder was conducted by way of vehicle conveyance. Survey by way of vehicle was only conducted in some sections where access tracks and easement routes were proposed and where ground surface visibility was manifestly zero. In this process all proposed turbine sites and areas of plant and office construction were inspected on foot, all trees of sufficient age were examined for the presence of scarring, and all landforms assessed in relation to their environmental characteristics and associated archaeological potential and sensitivity.

Plate 26. Survey Unit 6, looking west over a field of St Barnaby's and saffron thistle ca. 1.4 m high.

Plate 27. Survey Unit 21, looking south-west in a field of saffron thistle.

The development area surveyed during this assessment measured approximately 2,515 hectares in area (Table 8). It is estimated that approximately 1,196 hectares of that area was subject to foot survey inspection. Ground exposures inspected are estimated to have been 7.53 hectares in area. Of that ground exposure area archaeological visibility (the potential artefact bearing soil profile) is estimated to have been 1.7 hectares. Effective Survey Coverage is therefore calculated to have been very low at 0.07% of the survey area.

SU	SU Area	Surveyed on foot %	Area Inspected %	Area Inspected sq m	Ground Exposure %	Ground Exposure sq m	Visibility %	Net Effective Exposure sq m	Effective Survey Coverage %
SU1	3365400	100	60	2019240	1	20192	15	3029	0.09
SU2	97200	100	60	58320	1	583	20	117	0.12
SU3	552000	25	60	82800	0	0	0	0	0
SU4	566800	60	60	204048	0	0	0	0	0
SU5	281800	100	60	169080	0.5	845	15	127	0.05
SU6	2236400	90	60	1207656	0.5	6038	15	906	0.04
SU7	122200	100	70	85540	0.5	428	10	43	0.04
SU8	205200	100	60	123120	1	1231	20	246	0.12
SU9	225200	100	60	135120	1	1351	10	135	0.06
SU10	1320000	60	60	554400	1	5544	30	1663	0.13
SU11	4709000	90	60	2542860	0.5	12714	30	3814	0.08
SU12	10600	100	90	9540	15	1431	40	572	5.4
SU13	164200	10	60	9852	0	0	0	0	0
SU14	3182600	80	60	1527648	0.5	7638	20	1528	0.05
SU15	67600	50	40	13520	0	0	0	0	0
SU16	195400	45	40	35172	0	0	0	0	0
SU17	13200	100	90	11880	0	0	0	0	0
SU18	2929000	85	50	1244825	0.5	6224	25	1556	0.05
SU19	9200	100	90	8280	20	1656	60	994	10.80
SU20	23800	100	75	17850	0	0	0	0	0
SU21	4881200	65	60	1903668	0.5	9518	30	2856	0.06
Total	**25158000**	**80.4%**		**11964419**		**75395**		**17585**	**0.07%**
	2,515 ha			**1,196 ha**		**7.53 ha**		**1.7 ha**	

Table 8. Survey Coverage Data.

9.2 Survey Results - Indigenous

A total of three Aboriginal object locales have been recorded in the survey area. These are described below and tabulated in Table 9; their location is shown in Figures 3 - 5. Stone artefacts were found in two environmental contexts. Two artefact locales were recorded in association with watercourses, and an isolated find was located on an undulating crest.

Effective Survey Coverage encountered during the survey was very low due to the presence of thick ground cover in the form of grasses, weeds, thistles, and in some areas cultivated crops. As a result there was a low incidence of ground exposure. Accordingly, the ability to record Aboriginal objects during the survey was correspondingly low. The survey results are attributed at least in part to the low Effective Survey Coverage.

Survey Unit 14/Locale 1 grid reference: Hand GPS (GDA): 354450e 6708898n

This recording consists of three stone artefacts situated on the edge of an ephemeral 1st order watercourse located within Survey Unit 14 (Plates 28 and 29). This watercourse originates from a minor catchment that above the Survey Unit is ca. 0.7 km² in area. The locale has a very gentle gradient and a westerly aspect. Soils are a dark brown silty loam. The locale is highly eroded due to vegetation clearance, farming activity and vehicle traffic across the watercourse depression, and the artefacts are located in the actively eroding area. While originally this watercourse would have been a shallow depression, ongoing stream bank erosion has resulted in a broader and deeper landscape feature.

Ground exposure was present on either side of the watercourse, however, artefacts were only located on the southern side. The total area of exposure measures approximately 210 metres square, with ground surface visibility being 60% and archaeological visibility 80%. Artefact density is very low, calculated to be 1 per 33.6 m².

The artefacts recorded are described as follows:

- Grey fine grain volcanic proximal flake portion measuring 30 x 26 x 7 mm.
- Grey fine grain volcanic medial flake portion measuring 20 x 15 x 5 mm.
- Grey fine grain volcanic medial flake portion measuring 27 x 11 x 3 mm.

Given the similar nature and quality of material that the three artefacts are made from, there is a likelihood that they all originated from a single knapping event. All three artefacts exhibited damage that had probably been caused by vehicle traffic. It is likely that additional artefacts are present within this locale, however, it is predicted that any additional artefacts will be present in very low numbers and density.

This artefact recording is situated within the development envelope and may therefore be subject to impacts relating to the wind farm proposal. Impacts proposed for the broader area are a turbine, access track and associated electrical works.

Plate 28. Survey Unit 14/Locale 1, looking east.

Plate 29. Survey Unit 14/Locale 1, looking west.

Survey Unit 19/Locale 1 grid reference: Hand GPS (GDA): 345445e 6717748n

This recording consists of two stone artefacts situated on the edge of an ephemeral 1st order watercourse located within Survey Unit 19 (Plate 30). This watercourse originates from a minor catchment that above the Survey Unit is ca. 0.75 km² in area. The locale has a very gentle gradient with a southerly aspect. Soils are a brown silty loam. The stream channel at this locale has been widened and scoured through heavy erosion initiated by tree clearance, the impacts of stock treadage, and enhanced water runoff due to depleted vegetation on the adjoining crest landform. These activities have served to destabilise the stream bank and given rise to ongoing erosion. While originally this watercourse would have been a relatively shallow depression, heavy stream bank erosion has resulted in a broad and deeply etched landscape feature. Both artefacts were located in a secondary context, having eroded out of the soil profile.

Ground exposure was present on either side of the watercourse, however, artefacts were only located on the eastern side. The total area of exposure on the eastern side of the drainage depression measures approximately ca. 2400 metres square, with ground surface visibility being 40% and archaeological visibility 80%. Artefact density is extremely low, calculated to be 1 per 384 m².

The artefacts recorded are described as follows:

- Brown silcrete flake, 20% terrestrial cortex, measuring 37 x 38 x 16 mm.
- Grey fine grain volcanic flake measuring 32 x 27 x 7 mm.

It is likely that additional artefacts are present within this locale, however, it is predicted that any additional artefacts will be present in very low numbers and density.

This artefact recording is situated within the development envelope and may therefore be subject to impacts relating to the wind farm proposal. Impacts proposed for the broader area are an access track with associated electrical works.

Plate 30. Survey Unit 19/Locale 1, looking east, with locale situated on the far side of the drainage depression.

Survey Unit 21/Locale 1 grid reference: Hand GPS (GDA): 342970e 6714240n

This recording consists of one isolated stone artefact situated on a gentle slope with south-westerly aspect on the edge of a crest within Survey Unit 21 (Plate 31). Soils are a dark brown silty loam. The locale is eroded from sheet wash and wind and there is a moderate distribution of basalt cobbles across its surface.

Ground exposure present is in the form of scattered areas of bare earth on the gentle slope caused by stock treadage. The total area of exposure measures approximately 90 metres square, with ground surface visibility being 5% and archaeological visibility 30%. Artefact density is very low, calculated to be 1 per 1.35 m^2.

The artefact recorded is described as follows:

- Grey chert core, lenticular in shape, with 1 rotation and 10 negative flake scars, measuring 43 x 36 x 16 mm.

It is likely that additional artefacts are present within this Survey Unit, however, it is predicted that any additional artefacts will be present in very low numbers and density.

This artefact recording is situated within the development envelope and may therefore be subject to impacts relating to the wind farm proposal. Impacts proposed for the broader area are a turbine, access track and associated electrical works.

Plate 31. Survey Unit 21/Locale 1, looking south.

In addition to the Aboriginal object locales recorded during the field survey, five trees, each of which had exposed heartwood (scars), were recorded by the Aboriginal field assistants. It is conventionally understood that today Aboriginal scarred trees are a rare site type, and that Aboriginal scarring will only exist on trees older than 70 years, assuming that bark removal activities occurred before ca. 1950, and that the trees were a minimum of 10-15 years old at the time (Long 2005). However, Liza Duncan (pers. comm. 2011) indicates that in the local area Indigenous people continued traditional practices including bark removal into the 1970s and that accordingly, within the study area, scarring on trees that are currently aged ca. 50 years or older may be of Aboriginal origin.

There is also the possibility however, that the causes of the scarring on these trees is the result of natural processes. The trees are described below:

SU11/Tree 1 grid reference: Hand GPS (GDA): 349553e 6710187n

This tree is a grey box (*Eucalyptus moluccana*) located in a sparse scattering of trees in Survey Unit 11 (Plate 32). The tree possesses three main trunks as well as a very low set branch growing out at an angle. It has a section of elongated scarring on the inside portion (eastern side) of one of the three trunks that is reasonably symmetrical in shape. The condition of the deadwood is reasonably good, showing no sign of deterioration associated with significant age. Regrowth of the callus tissue now partially covers the fringes of the original scarred area. The scar measures 210 cm in length and 33 cm in width at its widest point in its centre. The base of the scar is located 143 cm above the ground. At 1.5 metres above the ground the major trunk has a circumference of 180 cm. This tree is located near to an area in which an access track and associated circuit is proposed. It is recommended that these be designed to avoid impacts to the tree.

Plate 32. SU11/Tree 1, looking west.

SU11/Tree 2 grid reference: Hand GPS (GDA): 349679e 6710130n

This tree is a grey box (*E. moluccana*) located in a stand of trees in Survey Unit 11 (Plate 33). The tree has a section of elongated scarring on the western side of its trunk that is reasonably symmetrical in shape. The condition of the deadwood is very good, showing no sign of deterioration associated with significant age. Regrowth callus tissue is thick and partially covers the outer edges of the original scarring. The exposed scarring measures 90 cm in length and 16 cm in width at its widest point in its centre. The base of the scar is located 70 cm above the ground. At 1.5 metres above the ground the major trunk has a circumference of 170 cm. This tree is located outside areas of impact. It is recommended that the tree be avoided.

Plate 33. SU11/Tree 2, looking east.

SU14/Tree 1 grid reference: Hand GPS (GDA): 353967e 6709646n

This tree is one of several that have been cleared on an elevated section of Survey Unit 14. It is believed to be a grey box (*E. moluccana*) (Plate 34). The tree has been felled and shows signs of having been cut up into sections with a chain saw above the upper extent of the scar. The scarring measures 70 cm in length and 41 cm in width at its widest point towards the roots. The base of the scar was originally at ground level. This tree is located near to an area in which an access track and associated circuit is proposed. It is recommended that these be designed to avoid further impacts to the tree.

Plate 34. SU14/Tree 1, looking north-east with Liza Duncan holding ranging pole.

SU14/Tree 2

This tree is an isolated grey box (*E. moluccana*) located on an elevated section of Survey Unit 14 (Plate 35). The tree has a section of elongated scarring on the north-eastern side of its trunk that is reasonably symmetrical in shape. The condition of the deadwood is very good, showing no sign of deterioration associated with significant age. Regrowth callus tissue is c 3 cm thick and partially covers the outer edges of the original scarring. The exposed scarring measures 152 cm in length and 31 cm in width at its widest point towards the base. The base of the scar extends to the ground. At 1.5 metres above the ground the trunk has a circumference of 307 cm.

Liza Duncan indicates that the bark from trees where the scarring extends all the way to the ground was used in relation to traditional burials in 'hard country', that being rocky areas or areas where the ground was too difficult to dig, thus making subsurface interment not viable.

Imprecise locational information was recorded during the survey. The location of the tree will need to be precisely identified. It is recommended that the tree be avoided.

Plate 35. SU14/Tree 2, looking south-west with Liza Duncan in photo.

SU19/Tree 1 grid reference: Hand GPS (GDA):344221e 6717816n

This tree is a grey box (*E. moluccana*) located in a stand of trees in Survey Unit 19 (Plate 36). The tree has a section of elongated scarring on the south-eastern side of its trunk that is reasonably symmetrical in shape. The condition of the deadwood is reasonably good, showing no sign of deterioration associated with significant age. Regrowth callus tissue is thick at the edges of the scarring. The scar measures 135 cm in length and 44 cm in width at its widest point towards its top. The base of the scar extends all the way to the ground. At 1.5 metres above the ground the major trunk has a circumference of 240 cm. This tree is located near to an area in which a turbine, access track and associated circuit is proposed. It is recommended that the tree be avoid if feasible.

Plate 36. SU19/Tree 1, looking north-west.

Eliza Duncan (pers. comm. 2011) also indicates that she is aware of a stone arrangement which is situated in reasonably close proximity, although away from, an area of proposed impact near to Survey Unit 6. Attempts were made to relocate this feature, but were unsuccessful due to the presence of thick vegetation covering the ground. However, an approximate area where this arrangement is indicated to be situated was outlined, and it was determined that any proposed impacts should avoid this region. The proposed impact nearest to, but south of this site, is an internal easement route which crosses Waterloo Road and extends west to link with the existing transmission line. In order not to inadvertently impact this site works should not take place further north in this landform from the location 347037e 6712005n GDA.

In addition Eliza Duncan (pers. comm. 2011) indicated the possible presence of a Bora ring site in an area south of, but reasonably near to the abovementioned area. The site was inspected (346872e 6711413n GDA) but no remnants of a Bora ring was located. The area has a cattle feed station positioned next to it, and it is believed that stock trampling has completely removed any physical signs of the site. Eliza Duncan indicated that given that there are no remnants of the site left, there was no reason to avoid impacts in this area.

9.3 Indigenous Heritage - Discussion and Impact Assessment

It is predicted that stone artefacts representing past Aboriginal occupation are likely to be distributed across the majority, if not all, the Survey Units defined within the proposal area. However, given the environmental context of the proposal area, a former woodland zone with limited resources encompassing predominantly crests and elevated terrain with lower order ephemeral watercourses emanating from it, it is expected that these artefacts will be present in low to very low densities only.

The crests and slopes within the proposed impact areas are landforms which are generally amorphous and undifferentiated in character. Watercourses are drawn from minor catchments and are ephemeral. Most of the watercourses in the study area are associated with broad flats, so that they do not have elevated landforms suitable for campsites adjoining them. The remainder derive from very minor catchments, the largest being 2.3 km^2, and would not have been reliable sources of water. In addition, the biodiversity represented by this environment is assessed to have been comparatively low. Given the absence of a reliable fresh water source in the proposal area, and the limited resources that would have been present, it is predicted that the area was not likely to have been subject to sustained Aboriginal habitation. Aboriginal habitation sites are expected to be situated in locations elsewhere, which were closer to permanent watercourses and in areas where there was a confluence of resources represented.

During the field survey no landforms (or areas within landforms) were identified as likely to have been environmental focal points that Aboriginal people would have habitually occupied and hence which would result in high density concentrations of artefacts. Accordingly, Aboriginal use of this landscape is predicted to have been of low intensity, and restricted to a limited range of activities; - movement through country, hunting and gathering forays conducted away from base camps, and so forth. Such short term events are unlikely to result in the formation of large, high density or complex archaeological sites. It is predicted instead that such land usage would result in low to very low levels of artefactual discard, which is patchy and low density in distribution. This pattern is generally consistent with the predictive model of site type and location applicable to the area.

Accordingly, it is concluded that the proposed impacts to the archaeological resource can be considered to be of low archaeological significance. It is also relevant to take into consideration that impacts will be discrete in nature and will occupy a relatively small foot print within the properties on which they are to be located. The archaeological resource in the broader development envelope (those areas which lie outside actual proposed impacts) will not sustain any impacts as a result of the proposal.

SU	Locale	Easting	Northing	Area	Exposure	Context	Exposure	Visibility	Artefact Number	Predicted Density	Integrity	Subsurface potential at site	Subsurface potential away from site	Impacts
SU14	L1	354450	6708898	10 x 1	Eroded area both sides of minor watercourse: area: 10 x 1m plus 20 x 10 m	On south side of minor watercourse on crest; aspect: W; very gentle gradient	60	80	3	Very low	Highly disturbed: eroding	Yes	Yes	Access track, turbine and electrical cabling
SU19	L1	345445	6717748	10 x 5	Eroded area at edge of a drainage depression: area: 80 x 30 m	On eastern side of a drainage depression; aspect: open; very gentle gradient	40	80	2	Very low	Highly disturbed: eroding	Yes	Yes	Access track, and electrical cabling
SU21	L1	342970	6714240	1 x 1	Bare earth patch: area: 30 x 30 m	On side of crest; aspect: SW; very gentle gradient	5	30	1	Very low	Moderately disturbed	Yes	Yes	Access track, turbine and electrical cabling

Table 9. Summary of Aboriginal object recordings in the survey area.

9.4 Survey Results – Non-Indigenous

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

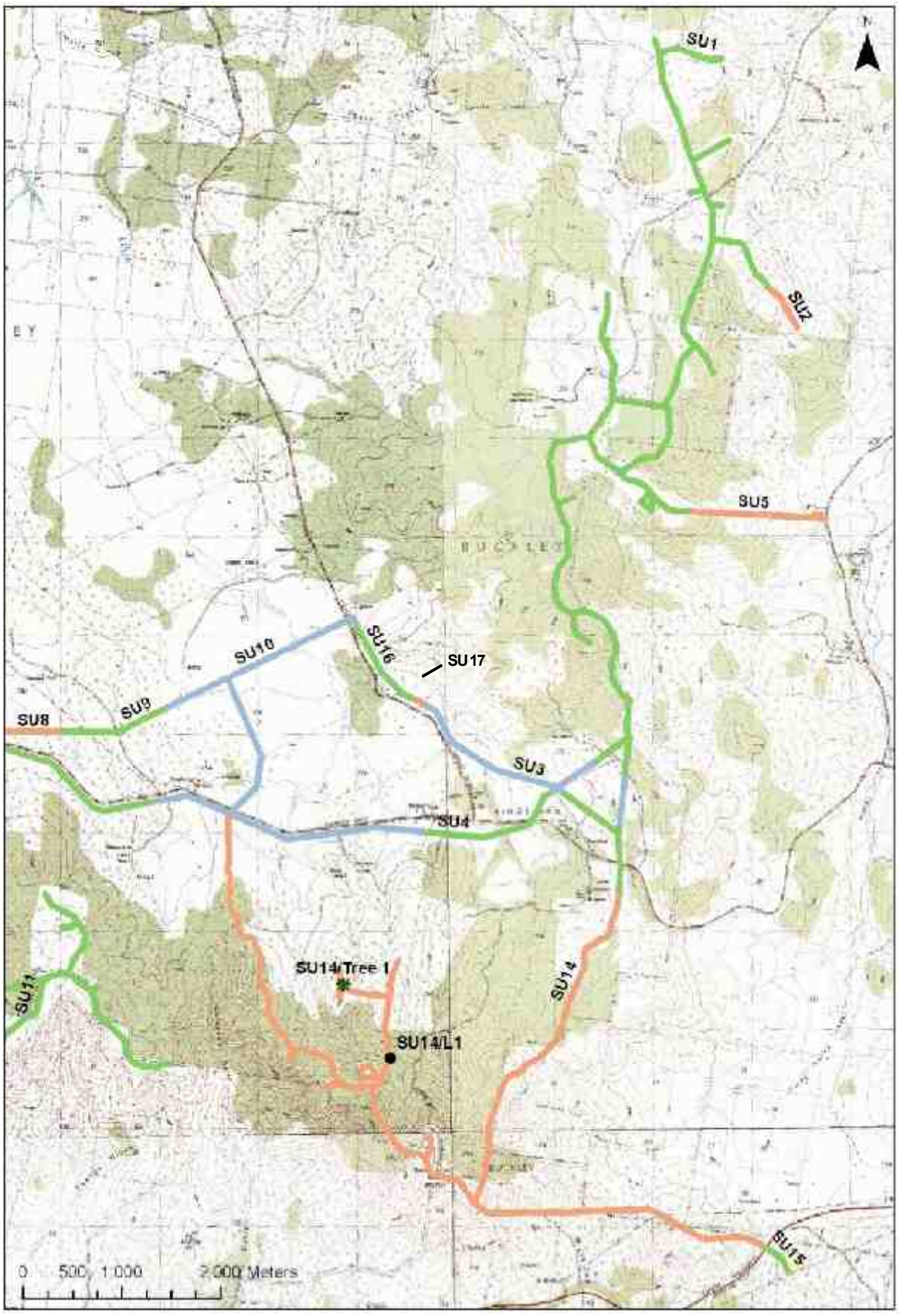

Figure 3. Location of Survey Units and Aboriginal object recordings in eastern section of the proposal area (Note that Survey Units measured 200 metres in width and accordingly their graphic display in this series of maps indicates the centre line).

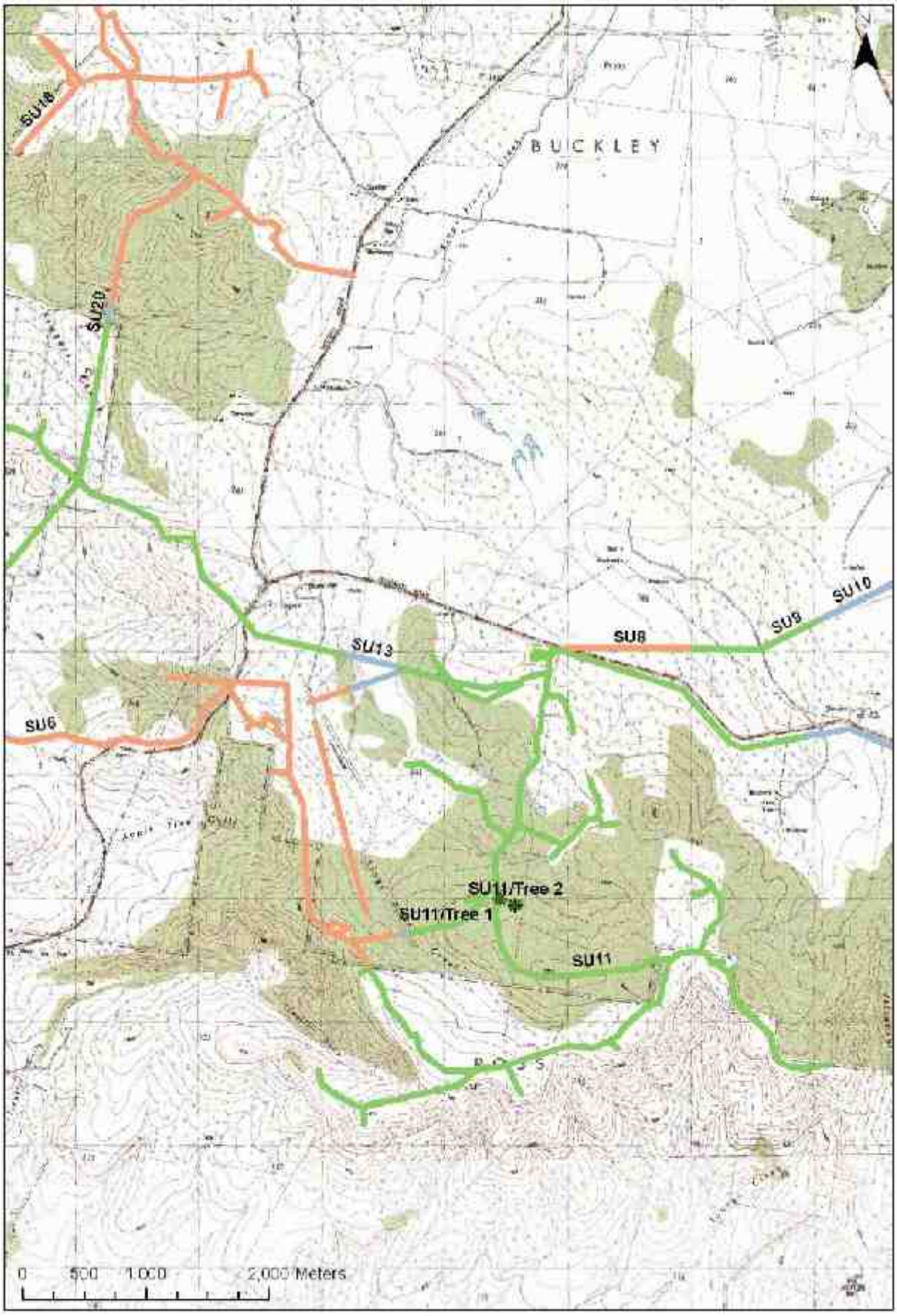

Figure 4. Location of Survey Units and Aboriginal object recordings in southern section of the proposal area.

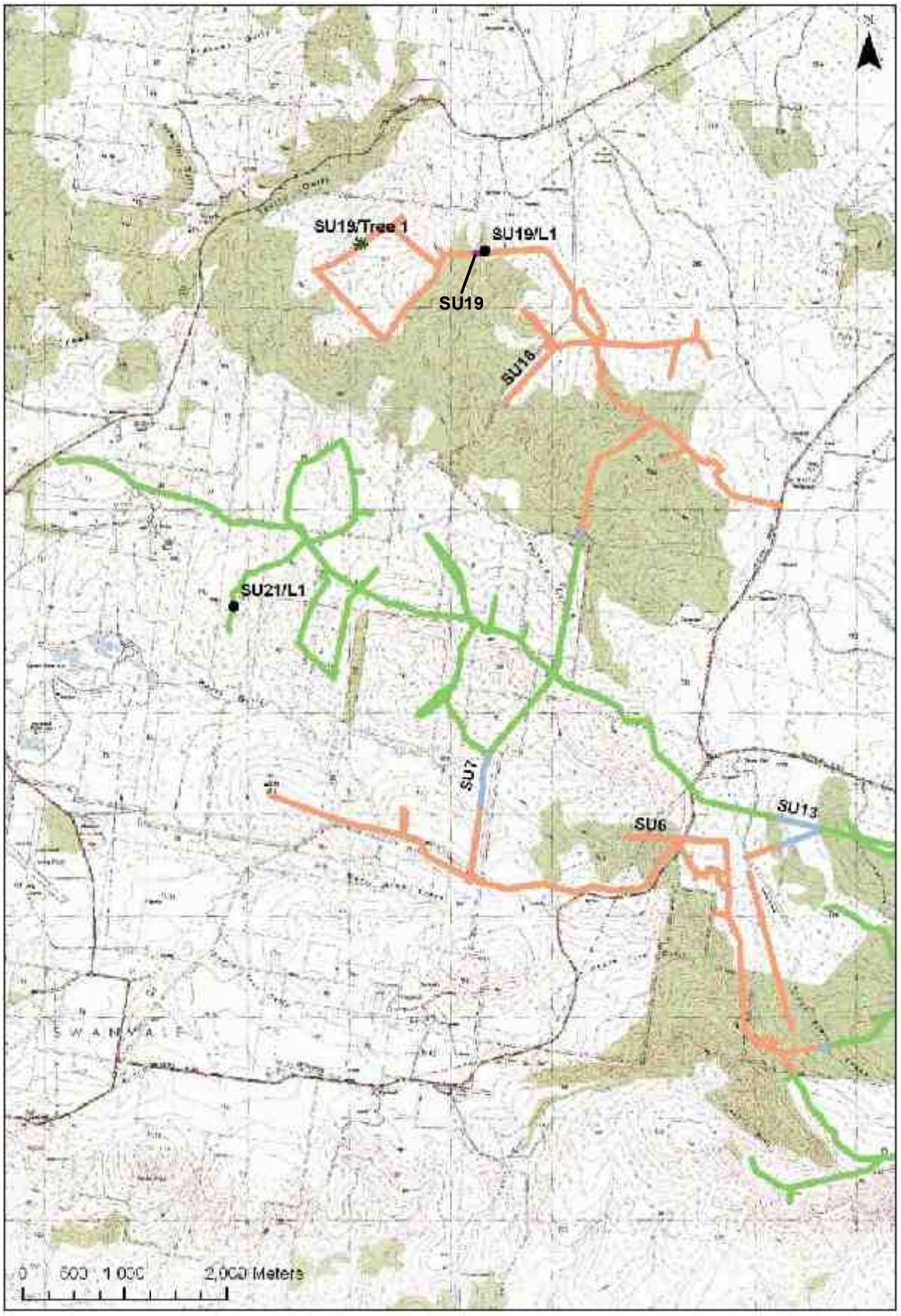

Figure 5. Location of Survey Units and Aboriginal object recordings in western section of the proposal area.

10. STATUTORY CONTEXT

The Environmental Planning and Assessment Act 1979

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

Part 3A of the Environmental Planning and Assessment Act 1979

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

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

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

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

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

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

11. SIGNIFICANCE ASSESSMENT

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

11.1 Significance Assessment Criteria - Indigenous

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

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

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

Aboriginal cultural significance

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

Archaeological value

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

Representativeness

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

Educational value

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

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

11.2 Significance Value of the Aboriginal Objects in the Study Area

The scientific significance of the recorded Aboriginal artefact locales in the project area are listed below in Table 10:

SU	Locale	Artefact Number	Predicted Density	Integrity	Subsurface potential at site	Subsurface potential away from site	Significance	Criteria
14	1	3	Very low	Highly disturbed: eroding	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted very low/low artefact density in majority of Survey Unit
19	1	2	Very low	Highly disturbed: eroding	Yes, to the east of the area of severe erosion.	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted very low artefact density in majority of Survey Unit
21	1	1	Very low	Moderately disturbed	Yes	Yes	Low local scientific significance	Common Aboriginal object and site type Low educational value Low aesthetic value Low research potential: predicted very low artefact density in majority of Survey Unit

Table 10. Archaeological significance assessment of recorded Aboriginal object locales.

12. MITIGATION AND MANAGEMENT STRATEGIES

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

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

12.1 Management and Mitigation Strategies - Indigenous

Further Investigation

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

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

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

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

Conservation

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

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

In the case at hand, avoidance of impacts (or minimisation of impacts) in regard to artefacts locales is not considered to be warranted. Indeed, with regard to the Aboriginal object locales SU14/L1 and

SU19/L1, the location of the proposed impacts falls on reasonably discrete areas which are significantly eroded and depleted due to vegetation clearance and subsequent grazing and vehicle disturbance. These activities have initiated ongoing stream bank erosion. As a result, much of the artefact bearing soils in these two locales has been, and continues, to be washed away and the archaeological resource represented therein considerably diminished. However, nearby in these landforms the effects of weathering and erosion have been less, so that the soil profile and any artefacts that potentially may be contained therein would be less disturbed and more intact. For this reason it is thought that in relation to SU14/L1 and SU19/L1 maintaining the current alignment of the proposed impacts and through these locales, which fall on areas that have already sustained significant prior impacts, a better outcome would be achieved as this would conserve adjacent areas that are more intact.

With regard to Aboriginal object locale SU21/L1, it is recommended that avoiding or limiting the extent of impacts to this locale, if feasible, should be given consideration.

Mitigated Impacts

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

For many Aboriginal object locales and/or discrete areas within wider Survey Units avoidance of impacts is unlikely to be feasible. Furthermore it is probable, that if a program of site avoidance was actively implemented, it is likely that other Aboriginal objects (perhaps undetected and in a subsurface context) would, instead be impacted.

It is assessed that the archaeological resource in the proposal area does not surpass significance thresholds which would preclude impacts. However, as noted above in regard to Aboriginal object locale SU21/L1, avoiding or limiting the extent of impacts to this locale, if feasible, should be given consideration.

Unmitigated Impacts

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

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

Proposed management and mitigation strategies

The table below summarises the management and mitigation strategies considered to be relevant to proposal area. Management and mitigation strategies are addressed in relation to all Survey Units recorded during the study (noting that not all Survey Units contain Aboriginal object locales) and where relevant individual locales located within each Survey Unit. The recommended management strategy listed for each Survey Unit (as highlighted in table) and Aboriginal object locale is selected from the various management options as discussed above. Finally the rationale behind each

recommendation is outlined, taking into consideration the nature of the Aboriginal object and its archaeological significance rating.

SU	Locale	Artefact density (predicted and as per analysis of ESC)	Impacts	Significance	Recommended management strategy	Rationale
SU1	-	Very low	Turbines, access track, electrical, rock crusher, concrete batching plant, construction compound	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU2	-	Very low	Turbines, access track and electrical	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU3	-	Very low /Low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low/ low density artefact distribution.
SU4	-	Very low	Easement route and access track	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU5	-	Very low	Access track and site office	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU6	-	Very low	Turbines, access track, electrical, concrete batching plants, substations	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU7	-	Very low	Access track, electrical and easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU8	-	Very low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU9	-	Very low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU10	-	Very low /Low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low/ low density artefact distribution.
SU11	-	Very low	Turbines, access track, electrical, easement route, rock crusher, concrete batching plants, construction compound, site office	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU12	-	Very low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU13	-	Very low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.

SU	Locale	Artefact density (predicted and as per analysis of ESC)	Impacts	Significance	Recommended management strategy	Rationale
SU14	-	Very low	Turbines, access track, electrical, easement route, concrete batching plants, substations	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU14	L1	Very low	Access track, turbine and electrical cabling	Low local scientific significance	No constraints to impacts in SU **Unmitigated impacts**	Very low density artefact distribution. Archaeological significance assessed to be low.
SU15	-	Very low	Easement route and substation	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU16	-	Very low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU17	-	Very low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU18	-	Very low	Turbines, access track, electrical, easement route, concrete batching plant, rock crusher, construction compound, site office	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU19	-	Very low	Access track, electrical	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU19	L1	Very low	Access track, and electrical cabling	Low local scientific significance	No constraints to impacts in SU **Unmitigated impacts**	Very low density artefact distribution. Archaeological significance assessed to be low.
SU20	-	Very low/Low	Easement route	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low/ low density artefact distribution.
SU21	-	Very low	Turbines, access track, electrical, easement route, concrete batching plant	n/a	No constraints to impacts in SU **Unmitigated impacts**	Predicted very low density artefact distribution.
SU21	L1	Very low	Access track, turbine and electrical cabling	Low local scientific significance	**Conservation of SU21/L1 Avoid impacts to SU21/L1 if feasible**	Very low density artefact distribution. Archaeological significance assessed to be low.

Table 11. Recommended management strategies relating to Survey Units and Aboriginal object locales in the proposal area.

13. RECOMMENDATIONS

The following recommendations are made on the basis of:

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

The results of the investigation as documented in this report.

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

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

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

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

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

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

5. The Aboriginal object locales recorded are very low density distributions of stone artefacts. The archaeological significance of these locales is assessed to be low; accordingly a management strategy of unmitigated impact is considered to be appropriate.

6. While the Aboriginal stone artefacts locales recorded are very low density distributions of stone artefacts and the archaeological significance of these locales is assessed to be low, it is nevertheless recommended that avoidance of impacts, or limiting the extent of impacts to these locales, if at all feasible, should be given consideration.

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

8. In the area of the proposed internal easement route in Survey Unit 6 that extends across and to the west of Waterloo Road to link with an existing transmission line, impacts should not take place further north than the point 347037e 6712005n GDA in order to avoid inadvertently impacting a potential Aboriginal stone arrangement site.

9. It is recommended that additional archaeological assessment is conducted in any areas which are proposed for impacts that have not been surveyed during the current assessment – *that is*, if changes are made to current plans or if additional impact areas are proposed. Significant Aboriginal objects can occur anywhere in the landscape and accordingly if present they need to be identified and impact mitigation strategies implemented prior to impacts.

10. The proponent should develop a Cultural Heritage Management Protocol, which documents the procedures to be followed for impact avoidance or mitigation. The development of an appropriate Cultural Heritage Management Protocol should be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Environment, Climate Change and Water.

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

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