Tahmoor South Project: Wirrimbirra Sanctuary

Statement of Heritage Impact

Prepared for Tahmoor Coal Pty Ltd
July 2020

EMM Sydney
Ground floor, 20 Chandos Street
St Leonards NSW 2065

T 02 9493 9500
E info@emmconsulting.com.au

Tahmoor South Project: Wirrimbirra Sanctuary

Statement of Heritage Impact

Report Number

J190483 RP#1

Client

Tahmoor Coal Pty Ltd

Date

31 July 2020

Version

v1 Final

Prepared by

Amelia O'Donnell
Consultant Archaeologist
31 July 2020

Approved by

Pamela Kottaras
National Technical Lead - Historical Heritage
31 July 2020

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

© Reproduction of this report for educational or other non-commercial purposes is authorised without prior written permission from EMM provided the source is fully acknowledged. Reproduction of this report for resale or other commercial purposes is prohibited without EMM's prior written permission.

Executive Summary

This Statement of Heritage Impact (SoHI) has been prepared by EMM Consulting Pty Limited (EMM) to assess the potential impact of the Tahmoor South Project (Project) on Wirrimbirra Sanctuary, a conservation area with State heritage significance. The objectives of the SoHI are to identify historical (non-Aboriginal) heritage values within the Wirrimbirra Sanctuary, assess the potential impacts of the Project on items of historic heritage in the Sanctuary and to formulate management measures for the protection of these historic heritage items.

The study area assessed in this report is the Wirrimbirra Sanctuary, which comprises two areas on either side of the rail line and six lots covering 95 hectares. At 3105 Remembrance Drive, Bargo NSW, in the Wollondilly local government area, the Sanctuary is 3.5 km north of the town of Bargo and 75 km south of Sydney.

The Wirrimbirra Sanctuary is listed on the State Heritage Register (number 01508) and is in the north of the proposed longwall mining footprint of the Project; directly above sections of longwall (LW) 101A, LW102A, LW103A, and LW104A. Overall, it has been assessed that the impacts to the listed heritage sites in the Wirrimbirra Sanctuary are possible to very unlikely.

In addition, relics were identified within the study area. These sites are not heritage listed but have local significance on an individual and collective basis. The probability of subsidence impacts to most of the relics is predicted by MSEC (2020) to be negligible. The 'well' located in Lot 32 may be an exception as it was excavated through shale bedrock.

An ongoing program to monitor the subsidence impacts and environmental consequences of subsidence effects during extraction of the longwalls on known heritage sites within the Wirrimbirra Sanctuary is recommended.

The monitoring program will record the condition of the relevant sites before the mining of LW101A, LW102A, LW103A, and LW104A (baseline survey and baseline check) and the condition of the relevant sites after mining (post mining initial condition and post mining secondary condition check). This SoHI provides the background information for the management plan for the Wirrimbirra Sanctuary (MSEC 2020).

Table of Contents

Executive Summary ES.1

1 Introduction 1

1.1 Background 1

1.2 Purpose of this report 2

1.3 Site description 2

1.4 Study area 2

1.5 Assessment guidelines and requirements 5

1.6 Project description 5

1.7 Assessment objectives 6

1.8 Report assessment methods 6

1.9 Field assessment methods 6

1.10 Authorship 6

1.11 Acknowledgements 6

2 Statutory framework 7

2.1 Legislation 7

2.1.1 Introduction 7

2.1.2 Environment Protection and Biodiversity Conservation Act 1999 7

2.1.3 Environmental Planning and Assessment Act 1979 7

2.1.4 Heritage Act 1977 8

2.2 Identifying listed heritage items 9

3 Existing environment 10

3.1 Overview 10

3.2 Landscape overview 10

3.3 Heritage listings 10

4 Historical summary 12

4.1 Historic themes 12

4.2 Historical context 13

4.2.1 Pre-European Contact 13

4.2.2 1797–1820 The first expeditions into the Bargo Brush 14

4.2.3 A road through Bargo 15

4.2.4 1820–1880 Settling “West” Bargo 15
4.2.5 1880 First occupation of the Wirrimbirra Sanctuary area 16
4.2.6 1917–1962 After the railway 19
4.2.7 1962–Present 19
5 Site evaluation 21
5.1 Background 21
5.2 Land use summary 21
5.3 Previous studies 22
5.4 Predictive model 23
5.5 Significant cultural landscapes 25
5.6 The model 25
5.7 Site assessment methods 26
5.8 Results of site assessment 26
5.8.1 Wirrimbirra Sanctuary (between Remembrance Drive and the railway line) 27
5.8.2 Wirrimbirra Sanctuary Reserve (east of the railway line) 34
5.8.3 Summary 43
6 Assessment of significance 45
6.1 Defining heritage significance 45
6.2 Assessment of Significance 45
6.2.1 Assessment against the criteria –Wirrimbirra Sanctuary SHR 01508 45
6.2.2 Wirrimbirra Sanctuary Statement of Significance 47
7 Heritage impact assessment 48
7.1 Background to assessing impacts 48
7.2 The proposed activity 48
7.2.1 Longwall mining 48
7.3 Potential subsidence impacts to heritage items 49
8 Management measures 52
8.1 Heritage management objectives 52
8.2 General measures 52
8.3 Specific management measures 52
8.4 Conclusion 54
References 56

Appendices

Appendix A Additional photographs A.1

Tables

Table 3.1 Listed heritage items: Wirrimbirra Sanctuary 11

Table 4.1 Historical themes 12

Table 5.1 Observed items previously identified within study area 44

Table 6.1 NSW heritage assessment criteria 45

Table 6.2 Wirrimbirra Sanctuary (from the SHR) 45

Table 6.3 Proposed additions/amendments to Wirrimbirra Sanctuary Assessment of Significance 46

Table 7.1 Maximum predicted total conventional subsidence on heritage strucutres parameters due to the extraction of Longwalls 101A to 108B (MSEC July 2020, Table D.12 50

Table 7.2 Historical sites/items within study area and predicted probability of LW impact. 51

Table 8.1 Mining subsidence management measures for Wirrimbirra Sanctuary. 53

Figures

Figure 1.1 Regional setting 3

Figure 1.2 Study area 4

Figure 5.1 Site assessment 29

Figure 5.2 Wirrimbirra Sanctuary 30

Figure 5.3 Wirrimbirra Sanctuary Reserve 31

Plates

Plate 4.1 *Encampment of drays at Bargo River, on the Goulburn Road*, c.1857 (Source: National Library of Australia, obj-138445149) 16

Plate 4.2 1894 Parish of Bargo map (detail). The location of the study area is outlined in red. (Source: Department of Lands 1894) 17

Plate 5.1 Location of identified heritage features. The location of the study area is outlined in red. (after NSW Office of Environment and Heritage 2013) 23

Plate 5.2 Fire damaged buildings in south of Wirrimbirra Sanctuary. View east. 28

Plate 5.3 Visitor's Centre, south elevation, east. View north. 33

Plate 5.4 Visitor's Centre, south elevation, west. View north. 34

Plate 5.5 Pipe and brick wall fragments in Tea Tree Creek. View east. 36

Plate 5.6 Two-tier mound south east of culvert. View north. 36

Plate 5.7	1992 Wirrimbirra Sanctuary Trail Map. Source: National Trust (NSW).	37
Plate 5.8	Well. View east.	39
Plate 5.9	Square sandstone feature. View south-west.	39
Plate 5.10	Sandstone feature, fireplace. View south.	40
Plate 5.11	Twentieth century artefact deposit. View south-east.	40
Plate 5.12	Australian Glass Manufacturers bottle in artefact deposit.	41
Plate 5.13	Possible well. View east.	42
Plate A.1	Australian Native Dog Conservation Society Dingo Sanctuary building. View south-west.	A.1
Plate A.2	Gardens south of Visitor's Centre. View west.	A.1
Plate A.3	Cottage 1 "Ranger's Cottage". View north-east.	A.2
Plate A.4	Cottage 2. View south.	A.2
Plate A.5	Glasshouse. View south-west.	A.3
Plate A.6	Workshop/store, south elevation. View north-west.	A.3
Plate A.7	Dam and drainage channel. View south-east.	A.4
Plate A.8	"The Mounds" west of the dam. View south-east.	A.4
Plate A.9	Roy Okenden Memorial, an example of the memorials in Wirrimbirra Sanctuary.	A.5
Plate A.10	Culvert 99.338 on Tea Tree Creek under the rail line. View north-west.	A.6
Plate A.11	Mound feature southeast of culvert (most northern in Lot 33). View south-west.	A.6
Plate A.12	Crushed shale feature. View east.	A.7
Plate A.13	Shale pile north of square sandstone feature. View north-east.	A.7
Plate A.14	Track east of square sandstone feature, following the direction of the crushed shale. Vew east.	A.8
Plate A.15	Brick, south of bottle glass deposit. View south-east.	A.8
Plate A.16	Small glass deposit. View east.	A.9
Plate A.17	Large clearing. View east.	A.9
Plate A.18	Mound feature north of clearing. View south.	A.10
Plate A.19	Mound feature north of clearing (north most of mounds in Lot 32). View south-west.	A.10
Plate A.20	Mound in east of Lot 17. View south.	A.11
Plate A.21	*Halls Sarsaparilla* can.	A.11

1 Introduction

1.1 Background

Tahmoor Coal Pty Ltd (Tahmoor Coal) owns and operates the Tahmoor Mine, an existing underground coal mine approximately 80 kilometres (km) south-west of Sydney in the Southern Coalfields of New South Wales (NSW). The mine has been operating since 1979 when product coal was first produced.

Currently, up to three million tonnes (Mt) of run-of-mine (ROM) coal is extracted annually from the mine. Product coal is primarily transported via rail to Port Kembla Coal Terminal, or to Newcastle Port Waratah from time to time, for shipment to both Australian and international markets.

Tahmoor Mine employs close to 400 people.

Mining within the existing Tahmoor North mining area is scheduled for completion by approximately 2022, depending on geological and mining conditions. Unless it can access a new extraction area by this time, the mine will have to start winding up production. Accordingly, Tahmoor Coal is seeking approval for the Tahmoor South Project, being an extension of underground coal mining at Tahmoor Mine, to the south of Tahmoor Coal's existing mining area (the Project).

Given its significance to the State, the Project is deemed to be State significant development (SSD) under the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Under these provisions, the NSW Minister for Planning and Public Spaces, or delegate, is the consent authority for the Project. Approval for the Project is also required from the Commonwealth Minister for the Environment under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Following the receipt of updated Secretary's Environmental Assessment Requirements (SEARs) in June 2018, a comprehensive environmental impact statement (EIS) was prepared by AECOM Australia Pty Limited (AECOM 2018) for the Project. The EIS was publicly exhibited between 23 January and 5 March 2019 by the NSW Department of Planning, Industry and Environment (DPIE). In response, 92 submissions were received from the community and community organisations, and 15 responses were received from government agencies and councils, including the NSW Heritage Council and the National Trust. These responses requested the preparation of a detailed statement of heritage impact (SoHI) for Wirrimbirra Sanctuary; a conservation area with State heritage significance.

On 20 February 2020, a submissions report (AECOM 2020a) was lodged with DPIE which responded to submissions made during exhibition of the EIS. At the same time (ie 20 February 2020) a project amendment report (AECOM 2020b) was lodged with DPIE to document amendments made to the Project in response to the submissions and to reduce potential environmental impacts of the Project.

The amendments documented in the project amendment report included, among other things, changes to the mine plan and the reject emplacement area (REA). The changes to the mine plan included the removal of a longwall in the northern part of the mine (LW109), reconfiguration of the longwall layouts to comprise two series of shorter longwall panels, the reduction of the width of the longwalls, and a reduction in the height of extraction within the longwalls. The changes to the REA included a reduction in the proposed extension area by increasing the height of the REA.

1.2 Purpose of this report

This SoHI has been prepared by EMM Consulting Pty Limited (EMM) to address comments from the NSW Heritage Council and the National Trust on the Project. This report will be used to support a second project amendment report being prepared by EMM on behalf of Tahmoor Coal.

1.3 Site description

The Wirrimbirra Sanctuary is located at located at 3105 Remembrance Drive, Bargo, in the Wollondilly local government area (LGA). The Sanctuary is 3.5 km north of the town of Bargo, approximately 75 km south of Sydney, and covers an area of 95 hectares (ha) (Figure 1.1, Figure 1.2).

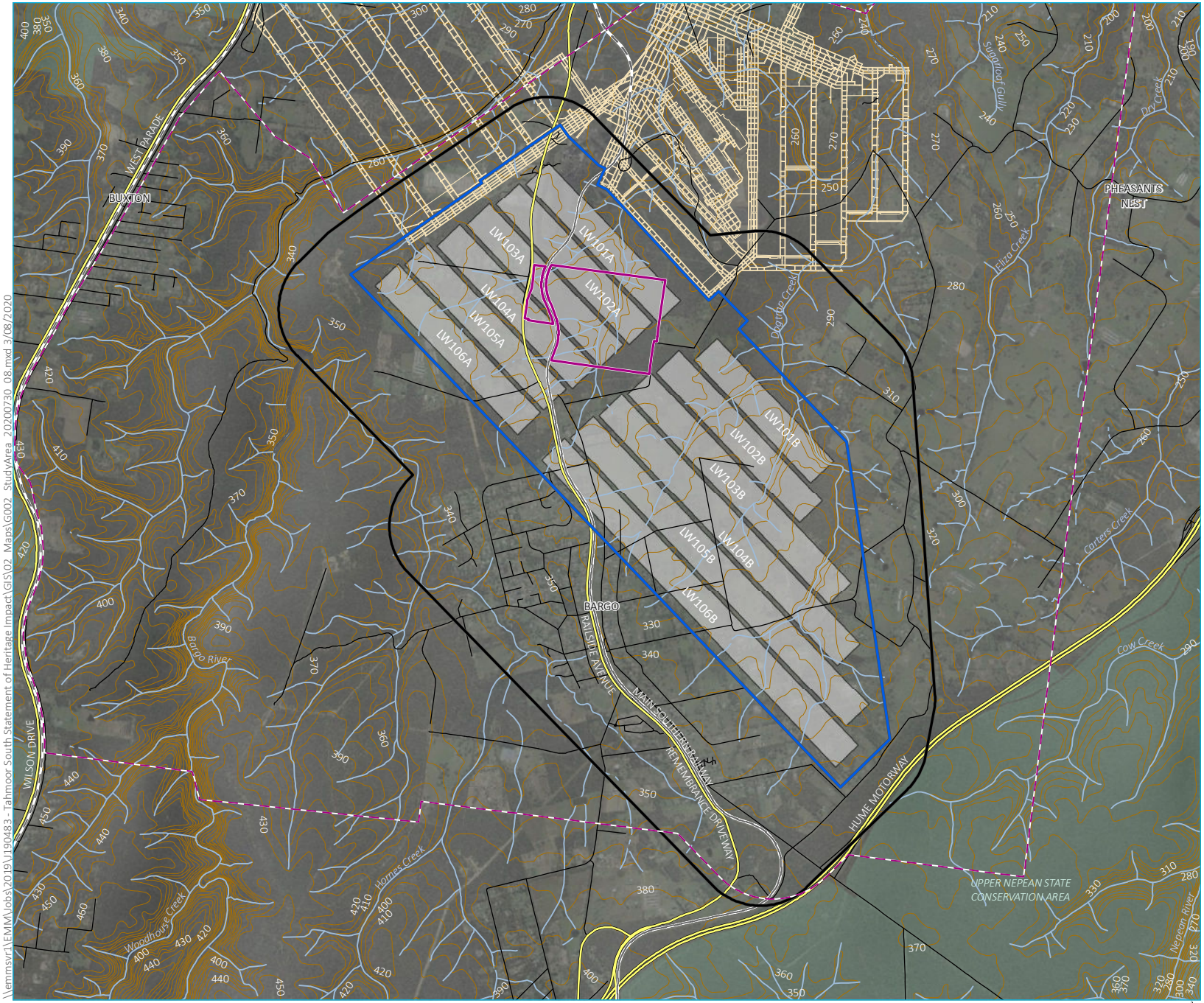
The Wirrimbirra Sanctuary was established in 1963 as a memorial to the biologist and naturalist David Stead through the efforts of his wife, Dr Thistle Stead, conservationist and writer, and their friends. Wirrimbirra is Wildlife Refuge No 163, declared in 1967 under section 68 of the repealed NSW *National Parks and Wildlife Act 1967*. It currently operates as a conservation area and learning centre under the name "Australian Wildlife Sanctuary".

1.4 Study area

The Wirrimbirra Sanctuary encompasses six properties including (from north to south):

- Lot 203, Deposited Plan (DP) 751250, historically the western side of Lot 33;
- Lot 33 (DP 751250) leased Crown Land;
- Lot 132 (DP 130897), historically Lot 32;
- Lot 1 (DP 789005), historically Lot 17;
- Lot 18 (DP 751250), historically this property included Lot 2, Lot 2 is not included in the Sanctuary land; and
- Lot 19 (DP 751250), historically this property included Lot 2, Lot 2 is not included in the Sanctuary land.

Other than Lot 203, all lots are bisected by the Main Southern Railway (Figure 1.1, Figure 1.2)



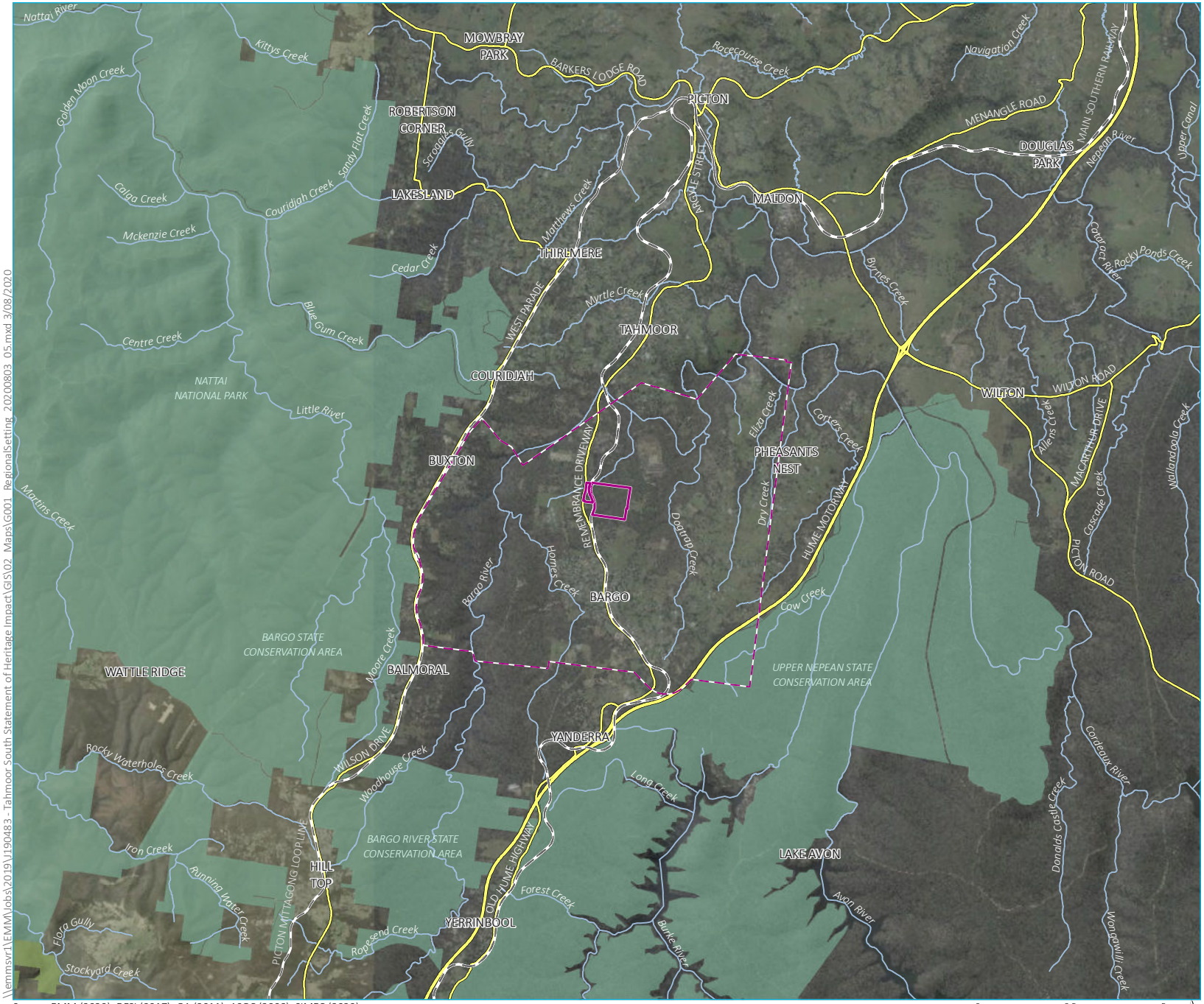
\\emmsvr1\EMM\Jobs\2019\J190483 - Tahmoor South Statement of Heritage Impact\GIS\02 Maps\G002 StudyArea 20200730 08.mxd 3/08/2020

Source: EMM (2020); DFSI (2017); GA (2011); SIMEC (2020)

Study area

Tahmoor Colliery
Tahmoor South Project: Wirrimbirra
Sanctuary Statement of Heritage Impact
Figure 1.2

EMM
creating opportunities





KEY

- Study area
- Project area
- Rail line
- Major road
- Named watercourse
- NPWS reserve
- State forest

\\emmsvr1\EMM\Jobs\2019\J190483 - Tahmoor South Statement of Heritage Impact\GIS\02 Maps\G001 RegionalSetting 20200803 05.mxd 3/08/2020

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006); SIMEC (2020)

0 2.5 5 km

GDA 1994 MGA Zone 56

N

Regional setting

Tahmoor Colliery
Tahmoor South Project: Wirrimbirra Sanctuary Statement of Heritage Impact
Figure 1.1

EMM creating opportunities

1.5 Assessment guidelines and requirements

This historical heritage assessment and SoHI has been prepared in accordance with the relevant government assessment requirements, guidelines and policies. The report and field survey were undertaken using the principles of *The Australian International Council on Monuments and Sites, Charter for Places of Cultural Significance* (also known as the *Burra Charter,* Australia ICOMOS 2013) and the NSW *Heritage Manual* (Heritage Office 1996 with regular additions). Use of these documents satisfies the requirements of the SEARs.

The *Burra Charter* defines the concept of cultural significance as 'aesthetic, historic, scientific, social or spiritual value for past, present or future generations' (Australia ICOMOS 2013, Article 1.2). It identifies that conservation of an item of cultural significance should be guided by the item's level of significance.

The *Heritage Manual* comprises the following guidance documents:

- *Statements of Heritage Impact Guidelines* (Heritage Office 2006);
- *Investigating Heritage Significance* (Heritage Office 2004);
- *Assessing Heritage* Significance (Heritage Office 2001); and
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch Department of Planning 2009).

These documents have been used to guide this historical heritage assessment and SoHI.

1.6 Project description

The Tahmoor South Project seeks to extend the life of underground mining at Tahmoor Mine for an additional 10 years until approximately 2032. The key components of the project include:

- extraction and processing up to 4 million tonnes per annum (Mtpa) of ROM coal from longwalls situated within the Central Domain;
- continued use of existing mine ventilation shafts and the construction of two additional mine ventilation shafts and associated transmission lines;
- transport of product coal principally via rail to Port Kembla Coal Terminal and occasionally to the Port of Newcastle, using the existing rail load out, rail loop rail infrastructure;
- increase in the height of the reject emplacement area from the approved height of RL 300 m to RL 320 m;
- continued use ancillary infrastructure and services;
- upgrades to existing surface facilities, amenities, equipment and infrastructure to accommodate the extension of mining; and
- mine closure and rehabilitation following the completion of mining.

1.7 Assessment objectives

The objectives of this historical heritage assessment and SoHI for the Wirrimbirra Sanctuary are:

- to investigate the potential for items of historic heritage value, including relics, to exist within the study area;
- to assess the significance of historic heritage items in the study area;
- to assess the potential impacts of the Project on items of historic heritage in the study area; and
- to formulate management measures for the protection of historic heritage items.

1.8 Report assessment methods

The facilities used in research for this historic heritage assessment and SoHI were as follows:

- Land and Property Information (LPI);
- National Library of Australia Trove Online;
- National Trust (NSW); and
- State Library (Mitchell Wing).

In addition to the archival research that was conducted for this report, local knowledge from the National Trust and current lease holders was sought through face to face interviews. The purpose of these interviews and discussions was to ascertain if unrecorded structures or potential relics were present on properties that residents knew of, or if long-term residents remembered the existence of now-demolished structures.

1.9 Field assessment methods

Field survey was undertaken as part of the preparation of this assessment. On 20 January 2020, EMM archaeologists, Pamela Chauvel and Amelia O'Donnell, inspected and recorded structures and areas that may be categorised as 'relics' (refer to Section 2.1.4). Archaeological features were photographed with a scale rod and north arrow in high resolution RAW and JPG format.

Data from the field assessment was captured utilising a Survey123 application developed by EMM for use with ArcGIS (Esri© software) and used to create digital mapping for this report.

1.10 Authorship

This report was prepared by Amelia O'Donnell (EMM) and Pamela Chauvel (EMM) and reviewed by Pamela Kottaras (EMM). The figures were prepared by Nick Simos (EMM).

1.11 Acknowledgements

The investigation was assisted by Zina Ainsworth (Tahmoor Coal), Daryl Kay (MSEC), Brad Wilson (Australian Wildlife Sanctuary - Formerly Wirrimbirra Sanctuary), and Gerry Hayes (National Trust NSW).

2 Statutory framework

2.1 Legislation

2.1.1 Introduction

In NSW heritage items and "relics", that is archaeological sites assessed to be of local or State significance, are protected by two main pieces of legislation: the EP&A Act and the NSW *Heritage Act 1977* (Heritage Act). An additional layer of protection is added, in certain circumstances, by the EPBC Act.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important heritage places, as well as flora, fauna, ecological communities and water resources that have been defined as Matters of National Environmental Significance (MNES) under the EPBC Act. The EPBC Act identifies nine MNES, including world heritage properties and places listed on the National Heritage Register.

The EPBC Act establishes the National Heritage List (NHL) and the Commonwealth Heritage List (CHL). The Register of the National Estate (RNE) was superseded by the NHL and the CHL and is now a static list.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to the (Commonwealth) Department of Agriculture, Water and the Environment (DAWE) for determination as to whether or not it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act for approval.

The Project was referred to the Commonwealth Minister for the Environment in October 2017 based on potential impacts to listed threatened species and communities, and water resources. It was declared to be a controlled action under the EPBC Act on 12 January 2018. Controlling provisions relate to listed threatened species and communities, and water resources only, and not due to potential impacts on world heritage properties or places listed on the National Heritage Register.

2.1.3 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the framework for cultural heritage values, amongst other controls, to be assessed in planning and the development consent process. Environmental impacts are one of the considerations directed by the EP&A Act prior to development; this includes impacts on cultural heritage items and places which includes items of built heritage as well as archaeological sites and deposits (relics).

The EP&A Act requires that local governments prepare planning instruments, such as local environment plans (LEPs) and development control plans (DCPs) to provide guidance on the level of environmental assessment. This includes identification of heritage items, as listed on the heritage schedule of an LEP. Where a project is being assessed as a State significant development (SSD), approval by the relevant council is not required and activity-based approvals are not sought from the consent authorities that administer each act. However, whole of project approval is sought from DPIE and environmental assessment and management is considered as part of the EIS that is prepared for the application for project approval. Wirrimbirra Sanctuary is listed in Schedule 5 of the *Wollondilly Local Environmental Plan 2011* (Wollondilly LEP).

2.1.4 Heritage Act 1977

The Heritage Act is the keystone statutory instrument protecting non-indigenous heritage in NSW. Under the Heritage Act, 'items of environmental heritage' includes 'places, buildings, works, relics, moveable objects and precincts' (Heritage Act Section 4) identified as significant.

Items that have been formally nominated and approved by the Minister for Heritage are on the State Heritage Register (SHR; part 3A) and are managed under the Act. Changes to SRH items is managed through the approvals process defined in the Heritage Act either through an exemption notification or a s60 approval.

Part 6 of the Heritage Act provides protection for 'relics', regardless of their listing status. It applies to all land in NSW that is not included in the SHR. Section 4(1) of the Heritage Act (as amended 2009) defines a 'relic' as follows:

A "relic" means any deposit, artefact, object or material evidence that:

a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and

b) is of State or local heritage significance.

Section 139 (1) of the Heritage Act states that:

> A person must not disturb or excavate any land knowingly or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.

A project that is being assessed under Part 4 or Part 5 (excluding State Significant Infrastructure (SSI) and SSD) would require approval or an endorsed exception or exemption, under the Heritage Act, to 'disturb or excavate any land knowing or having reasonable cause to suspect' that relics exist in that land (Heritage Act s139 [1]).

Approval under the Heritage Act is not applicable for projects assessed as SSI and SSD; however, where unanticipated relics are discovered, notification to the Heritage Council is regulated under Section 146 of the Heritage Act.

Section 146 Notification of discovery of relic:

> A person who is aware or believes that he or she has discovered or located a relic (in any circumstances, and whether or not the person has been issued with a permit) must:
>
> a) within a reasonable time after he or she first becomes aware or believes that he or she has discovered or located that relic, notify the Heritage Council of the location of the relic, unless he or she believes on reasonable grounds that the Heritage Council is aware of the location of the relic, and
>
> b) within the period required by the Heritage Council, furnish the Heritage Council with such information concerning the relic as the Heritage Council may reasonably require.

The Heritage Act identifies the category of 'works', which refers to infrastructure construction, and is viewed as separate to that of archaeological 'relics' under the Heritage Act. 'Works' may be buried, and are therefore archaeological in nature, but exposing a 'work' does not trigger reporting obligations under the Heritage Act unless it is of demonstrable significance.

Other than section 146, the Heritage Act does not apply to this SSD project.

2.2 Identifying listed heritage items

Listing on statutory registers provides a basis under which the item or place is protected, and change is managed through approval processes to the authorities that administer the relevant Acts. Statutory listings provide legal protection for heritage items under the legislation outlined above.

Statutory registers reviewed as a part of this assessment include:

- NHL - the register is made under the EPBC Act;
- CHL - the register is made under the EPBC Act;
- SHR - this register is made under Part 3A of the Heritage Act. Items on the SHR undergo a rigorous assessment process and must reach a high significance threshold to be included. Inclusion on the SHR is directed by the Minister for Heritage;
- section 170 register - this register is made under section 170 of the Heritage Act. It is a register of heritage items that are owned or managed by state government authorities. Items on the section 170 register may also be listed on other registers. Demolition or change to fabric and change of ownership all require notification to the Heritage Council of NSW;
- Schedule 5 of the Wollondilly LEP. The EP&A Act sets the provisions for the making of LEPs. Where an item is included in the heritage schedule, development applications must include an assessment of impacts to the item; and
- State Heritage Inventory (SHI), which was cross-checked with Schedule 5 of the Wollondilly LEP and the section 170 register. The SHI is not a single statutory register, but a central collection of state listed statutory heritage items maintained by the Heritage Division.

Non-statutory listing is an acknowledgment of a site's or place's importance to sections of the community. Listings on such registers do not place legal requirements on development but nevertheless influence the future of such listed items. Non-statutory registers reviewed as a part of this assessment include:

- National Trust of Australia, NSW (NT) - the NT is made up of autonomous state chapters. Each chapter is a community-based and non-government organisation, with a mandate to conserve and promote Australia's natural and cultural heritage. Classification by NT is a strong acknowledgment of heritage significance and while statutory constraints are not applicable, classification offers protection through visibility and community action.
- Register of the National Estate - the RNE is an archived list of heritage items that were protected under the now repealed Commonwealth *Heritage Commission Act 1975*, which was replaced by the EPBC Act. While many items were transferred from the RNE to the NHL or CHL, those that were not remain on the RNE as an indication of their heritage value.

3 Existing environment

3.1 Overview

The study area is comprised of freehold and Crown land. The freehold for Lot 132 (DP 130897) is held by the Wirrimbirra Sanctuary and the National Trust. Lots 203 (DP 751250), 33 (DP 751250), 18 (DP 751250), and 19 (DP 751250) are leased from The Crown (NSW Office of Environment and Heritage 2013). The land is primarily zoned E2 Environmental Conservation under the Wollondilly LEP. The area of the Sanctuary between Remembrance Drive and the railway line, however, is zoned RU2 Rural Landscape.

3.2 Landscape overview

The landscape of the Wirrimbirra Sanctuary comprises a gently undulating plateau incised with gullies with moderately to sharply inclined sides along the water courses. The underlying geology is Hawkesbury sandstone overlaid by Wianamatta shales. Vegetation is typical of the Sydney Basin Bioregion Shale/Sandstone Transition Forest (OEH 2013, p.1). The remnant Bargo Brush of the Wirrimbirra Sanctuary is a mixture of Iron Bark, Scribbly Gum, and Sydney Peppermint forests with an understory of scrub, native grasses, and ferns around the watercourses (OEH 2013).

An account of an interaction with local Aboriginal people in 1836 describes the local landscape:

> we again set forward on our journey: the track lay through an inhospitable territory, called Bargo Brush, which is a thick forest, on a sandstone formation. The timber is chiefly Stringy-bark, of tall and slender growth. A fire had blackened the trunks of the trees, and consumed the scrub; but many of the gay shrubs that ornament these desolate forests, were again springing, and putting forth their lively blossoms. We met several companies of Blacks. Some of the women had considerable quantities of Native Currants, the fruit of Leptomeria acida, that they were carrying in vessels scooped out of the knots of the gum-tree, some of which will hold several quarts.
>
> Backhouse 1843, p.445-446

The main watercourse running through the Wirrimbirra Sanctuary is Wirrimbirra Creek, which flows from south to north along the eastern side of the Wirrimbirra Sanctuary and into Teatree Hollow Creek. Teatree Hollow Creek flows from west to north-east at the northern end of Sanctuary. The portion of Teatree Hollow Creek that passes through the Sanctuary has also historically been known by Caloola Creek. There are five minor watercourses within the Sanctuary property: Broad Valley, East Brook, Callicoma Brook, Wattle Brook, Waratah Brook, and North Waratah Brook. All are tributaries of Wirrimbirra Creek with the exception of North Waratah Brook which is a tributary of Waratah Brook (see Figure 5.1). Part of Wirrimbirra Creek has been dammed between East Brook and Callicoma Brook to form Ockenden Pool. Another pool, known as Big Pool, is located at the convergence of Wattle Brook and Wirrimbirra Creek.

3.3 Heritage listings

The Tahmoor South project area contains listed heritage items that have been assessed to be either of State or local significance, or both. A previous assessment of heritage listed items within the Tahmoor South project area was completed by Niche Environment and Heritage in 2018 (Niche 2018a, pp.35-43). Wirrimbirra Sanctuary is a listed heritage item within the footprint of the Tahmoor South project area that has been assessed to be of State significance and is listed on the SHR (Table 3.1).

Table 3.1 Listed heritage items: Wirrimbirra Sanctuary

Register	Presence	Listing	Legal boundary
NHL	no	N/A	
CHL	no	N/A	
SHR	yes	SHR 01508	Lot 132, DP 130897; Lot 18, DP 751250; Lot 19, DP 751250; Lot 203, DP 751250; Portion 203, DP 751250; Lot1, DP 789005
WLEP	yes	Wollondilly LEP I38	3105 Remembrance Driveway Lot 1, DP 789005; Lot 132, DP 130897; Lots 18, 19, 33 and 203, DP 751250
S170 Register	no	N/A	
NT	yes	National Trust property since 1965	
RNE	yes	3305	

4 Historical summary

4.1 Historic themes

The Australian and NSW heritage systems employ a series of historic themes to guide the understanding of history and historical investigation in the nation and state. As part of any historic heritage assessment, it is important to review the historic themes when undertaking research on an area or place to provide proper context. The state and national themes are complementary to enable the historian to present a unified understanding of how an area fits into Australian history. The historic themes are also an important guide when assessing an item's heritage significance. They provide information on how an item may be historically significant at the local, state or national level.

Finally, historic themes help to develop interpretation and management strategies for items of heritage significance. A full list of these themes can be found on the Heritage Division website. Historic themes in the study area were identified based on the historical background (as described below) and the results of the historical survey (section 5.8). The Australian and NSW historic themes relevant to the study area that have been used in this report are listed in Table 4.1.

Table 4.1 Historical themes

Australian historical themes	NSW historical themes	Local theme
3 Developing local, regional and national economies	Agriculture; commerce; environment; cultural landscape; exploration; and pastoralism	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes, can include aquaculture.
3 Developing local, regional and national economies	Exploration	Activities associated with making places previously unknown to a cultural group known to them.
4 Building settlements, towns and cities	Land tenure	Activities and processes for identifying forms of ownership and occupancy of land and water, both Aboriginal and non-Aboriginal.
6 Educating	Education	Activities associated with teaching and learning by children and adults, formally and informally.
8 Developing Australia's cultural life	Domestic life	Activities associated with creating, maintaining, living in and working around houses and institutions.
9 Marking the phases of life	Persons	Activities of, and associations with, identifiable individuals, families and communal groups.

4.2 Historical context

4.2.1 Pre-European Contact

People have inhabited Australia for at least 50,000 years; however, the time scale for occupation of the Sydney Basin is at least 18,000 years ago (Attenbrow 2010, p3). In 1788, the Aboriginal population of the Sydney region was estimated at between 5,000 and 8,000 people and approximately 1,000 of them lived in the Liverpool/Campbelltown area (Murray & White 1988, in OEH 2016).

The study area is located on Tharawal land. Tharawal land, also referred to as Dharawal in the historic records, encompasses the area south of Botany Bay to north of Shoalhaven River and west to Campbelltown and Camden (Tindale 1974). Information about the socio-cultural structure of Aboriginal society prior to European contact largely comes from ethno-historical accounts made by colonial settlers. These accounts and observations were made after massive disruption due to disease and displacement. As a result, this information in often contentious, particularly in relation to language group boundaries.

At the time of European settlement in the NSW Illawarra region, Dharawal groups had established a regional network linking the highlands west of the Illawarra escarpment and the coastal plain (Stokes 2015). Recent research suggests that the pathways linking Dharawal groups socially and economically continued to be used throughout the first fifty years of European colonisation. Dharawal people came together for ceremonies and exchanged objects such as ground edged hatchets and raw materials (Stokes 2015).

Environmental conditions in this region throughout the Holocene were fertile and relatively stable and ethno-historical evidence suggests that population densities at contact were high (McDonald 2008, p.3). Resources for Aboriginal people in the local area would have included fish and eels from the creeks, and land mammals such as kangaroos, wallabies and possums.

Six months after the arrival of the First Fleet in 1788, cattle escaped from Sydney Cove and travelled to the Menangle-Camden area about 90 km south west of Sydney, an area that became known as the Cowpastures. Dharawal people recorded these animals in a rockshelter now known as Bull Cave (Liston 1888) near Campbelltown.

Aboriginal rock art in the Sydney Basin is found on Hawkesbury sandstone formations. McDonald (2008) argues that the rock art has a distinctive regional style and coincides with the archaeologically most visible period of late Holocene occupation. Most rock art in the region is less than 5,000 years old and was produced up until European contact but ceased soon after. While it is not known how rock art functioned across this region, stylistic behaviours demonstrating social group affiliation and identity was an important cultural marker. Some of these social practices have not survived in the archaeological record such as body making and items of organic material such as bark, but they can be seen in the surviving rock art. Most of the regions large engraving sites are on ridgelines away from economic resource areas (McDonald 2008, p.5).

While bark huts have not survived in the archaeological record, they are frequently mentioned in ethnographic accounts, as is the use of rockshelters,

> (t)hey appear to live chiefly in the caves and hollows of the rocks which nature has supplied them with, the rocks about the shore being mostly shelving and overhanging so as to afford a tolerable retreat (Barrington 1802 in McDonald 2008 p.24).

Ethnographic records contain occasional references to local Indigenous people. Barallier (1802, in Mitchell 1938) records passing through the area of Picton and having a hut built for him by Bungin, probably near Matthews Creek,

> The place where I decided to spend the night was on the territory of the mountaineer Bungin. He gave a proof of his friendship and gratefulness for my good treatment by building* a hut for me, and I was very thankful for his kind attention.

> [*The natives do not allow any stranger to inhabit the territories they have appropriated to themselves. They themselves build huts for the strangers they wish to receive as friends.]

At 'Runkard's Island', about 2 miles from Picton, three carved trees were recorded by W.A. Cuneo in 1894 as marking the grave of 'King' Mullingully,

> a leader of great influence in the Burragorang Valley…. [and] a strong opponent of the whites' advent thereto in the early days" (Gullick 1918, p.13).

The glyph on the west tree was carved with diamonds, 4 feet high and situated about two feet from the ground (Gullick 1918, p.52). A local Aboriginal man known as Bundle guided Meehan, Throsby and Hume on their expedition to find an overland route to Jervis Bay in 1818. He appears in the blanket returns for the Stonequarry Police District (Picton) in 1833, 1834 and 1837. Bundle was known as the last Chief of the Cowpastures (Liston 1988, p.59).

Disease and warfare, most notably the massacre at Appin in (1816) depleted Dharawal numbers. In 1845, Matthew McAlister of Picton reported that there were 67 Aboriginal people in his district and numbers were falling (Liston 1988, p.55).

4.2.2 1797–1820 The first expeditions into the Bargo Brush

It was escaped cattle which first drew the colonial officials' attention south of Sydney. Governor Hunter visited south of the Nepean River in 1795 in search of rumored wild cattle in the region, descendants of the domesticated stock that had escaped in 1788 (Higginbotham 1992 Vol 1, p.13). Hunter found a herd of about 60 wild cattle and, with the hope of increasing the herd, the Government prohibited access to the land between present day Camden and Picton. This prohibited land was known as the "Cowpastures".

While convicts hoping to find their freedom or the road to China were likely the first European visitors to the Bargo region, John Wilson was the first named individual to be connected to the area (ADB online *Wilson, John (?-1800)*). Wilson arrived in Australia as a convict on the First Fleet in 1788 (ADB online *Wilson, John (?-1800)*). At the completion of his seven-year sentence Wilson left the colony to live among the Aboriginal groups in the territories around Sydney (ADB online *Wilson, John (?-1800)*). In November of 1797 Wilson met with Governor Hunter and traded information about the discoveries he had made during his travels south for a pardon of his recently imposed status as an outlaw of the Colony (ADB online *Wilson, John (?-1800)*).

John Wilson, along with John Price aged 19, and a man known as "Roe" were members of the first expedition to south of the Cowpastures in 1798 (Jervis 1986, p.5). John Price, also transported to the colony, had been Governor Hunter's servant and "Roe" was possibly another convict. They were all part of a party consisting of another three convicts, as well as guards, provided by Governor Hunter. The group was sent to quash rumours that China, and an escape from the colony, lay to the south (Jervis, 1986, p.4-5). Soon after the expedition began, three of the convicts and their guards made their way back to the settlement at Port Jackson while Wilson, Price and Roe pushed on to the Wingecarribee River (ADB online, *Wilson, John (?-1800)*; Jervis, 1986, p.5). The party pushed south on two different occasions. On January 26, 1798, during the second expedition south, the party led by Wilson and joined by a man called Collins crossed the Bargo River and Price recorded the first descriptions of the koala (cullawine), wombat, Lyre Bird and what would come to be known as the Bargo Brush, "The ground runs very rocky and brushy so that we could scarce pass…" (Discover Collection State Library NSW). Despite the successful expedition, settlement to the south was prevented by the Cowpastures prohibitions.

John Warby led the second expedition to Bargo in 1805 (Niche 2018a). Botanist George Caley (1807) wrote of the expedition in a letter to Joseph Banks noting that his "native", Mowattin, had told him of "a tract of forest land called Barago, the extent of which he thought was great…[and] Since seeing Warby I questioned him about it and he gives the same account" (*Sir Joseph Banks Papers* State Library NSW). Barago, corrupted to Bargo, originally denoted the area stretching from Cataract River to Thirlmere Lakes, only later coming to define the current town

(Brodie 1974). Hamilton Hume and his brother, along with their uncle John Kennedy, passed the Bargo Brush in 1814 and again in 1818 (Brodie 1974).

Governor Macquarie also led an expedition to the region in 1815 in search of pasture, Bargo was noted to have poor soils and insufficient grazing land (Brodie 1974).

Macquarie was still unwilling to allow settlement beyond the Cowpastures even as late as 1819, because he wanted the cattle rounded up (or at least all attempts made) (Higginbotham 1992, v1 p.13). Even so, exceptions were made to a privileged few. Governor Macquarie gave permission for Surveyor General John Oxley to occupy land at "Great Bargo" around 1815 (Jervis 1937, p.252). The land, however, was not fit to supply Oxley's large herd of horned cattle and Oxley moved south to the Wingecarribee River the next year (Jervis 1937, p.252).

Drought, and possibly predation, reduced the cattle numbers enough for Macquarie to lift the Cowpastures prohibitions in 1820 (Higginbotham 1992, v1, p. 14). Governor Macquarie directed Oxley:

> to commence your measurements of Farms in the District of Bargo and onwards…..You are to take special care in marking out Lands for Settlers to make the prescribed Reservations of Lands for the use of government in eligible situations and on the Banks of Rivers and Lakes fit for Towns and Townships
>
> Oxley's Letter Book in Jervis 1937, p.257.

As instructed, Oxley began his survey at Bargo on the 1st of January 1822 (Jervis 1937, p.257). And, Governor Macquarie released forty land grants between Stonequarry Creek and Camden with small land grants released in Bargo (Brodie 1974).

4.2.3 A road through Bargo

In March 1818 Hamilton Hume, Charles Throsby, and Surveyor James Meehan led a successful expedition in search of grazing land in the area between Liverpool and Goulburn (Roads and Maritime Services 2013, p.3-4). Soon after the return of the expedition Governor to Commissary-General Drennan instructed a cart road be constructed "through the country as far as the settlement about to be established there" (in RMS 2013, p.5). Construction of the road through what had become known as the Argyle began in 1819 and was completed in 1821. The route went from Campbelltown to Goulburn, passing through Stonequarry Creek (Picton), Bargo, and Marulan (RMS 2013, p.3-4). The Argyle Road was the primary southern road in NSW and portions of the road, including the Myrtle Creek (near Tahmoor), Bargo and Lupton's Inn (just south of Bargo) sections were incorporated into Major Thomas Mitchell's 1830 South Road survey (later Great Southern Road, later Hume Highway) (RMS 2013, p.5-6). The establishment of an arterial road to the South encouraged a rapid expansion of settlers beyond the colonial centre of NSW.

4.2.4 1820–1880 Settling "West" Bargo

At its settlement Bargo was known as West Bargo, or Cobargo with "Bargo" denoting the area of present-day Wilton. Brian Bagnall claimed to be the first settler in Bargo but he was soon joined by cattle farmers, settlers, and itinerant stockmen over the early 1820s (Brodie 1974, p.7). Initial land grants were generally small, from 30 to 60 acres (c. 74 to 148 ha), and focused around important water sources, such as the larger rivulets running south of the Bargo River, or the Argyle Road (Brodie 1974, p.6-7). A handful of large grants were also claimed including James Vaughn's 100 acres, James Christy Phelps 500 acres, and Prosper De Mestre's 700-acre cattle farm around the Stream Eliza and the Eastern Branch of the Upper Bargo Rivulet (Niche 2018a, p.10; *Sydney Gazette and New South Wales Advertiser*, 12 June 1823, p.3).

The first description of the Bargo settlement comes from a newspaper article published in 1832:

> At length the brush terminates, and, emerging from the gloom, a felicitous combination of objects cheer the opening vista: a few sung cottages, cultivated land, and Lupton's road-side public-house…
>
> *Sydney Gazette and New South Wales Advertiser*, 26 April 1832, p.3.

As a thoroughfare on the Argyle Road numerous travellers passed through the area on their way to and from Sydney. Land around the Bargo settlement was designated for "resting paddocks"– places for travelling settlers and cattle drivers on road south to rest after they tackled the perilous conditions of the road leading to the town (Plate 4.1) (Greenup et al. 1992, p.18; Brodie 1974, p.7). A known resting paddock/camp site was on Teatree (also Ti-Tree) Hollow Creek in the area of the Wirrimbirra Sanctuary (Greenup et al. 1992, p.18). Bushrangers also camped in the Bargo Brush and the Bargo River crossing a notorious hold-up point (Wollondilly Shire Council n.d.).

The population of Bargo remained relatively small throughout the nineteenth century. This lack of settlement was due to the poor quality of soils not being suited to pastoralism, which in turn meant releases of Crown Land ceased (Greenup et al. 1992, p.18; Niche 2018a, p.25). A slight population increase does appear to have occurred in the 1840s as the number of inns in the town increased from one to three and the population (unsuccessfully) petitioned for a church on two occasions (Brodie 1974, p.7-8). This small boom in population and construction was likely influenced by the completion of Mitchell's Southern Road. Although train lines to Picton and Mittagong were constructed in 1863 and 1867 respectively, they bypassed Bargo leading to a decline in Bargo's population and economy (Niche2018a, p.25). Further release of Crown Land, including the Wirrimbirra properties did not occur until the 1880s.

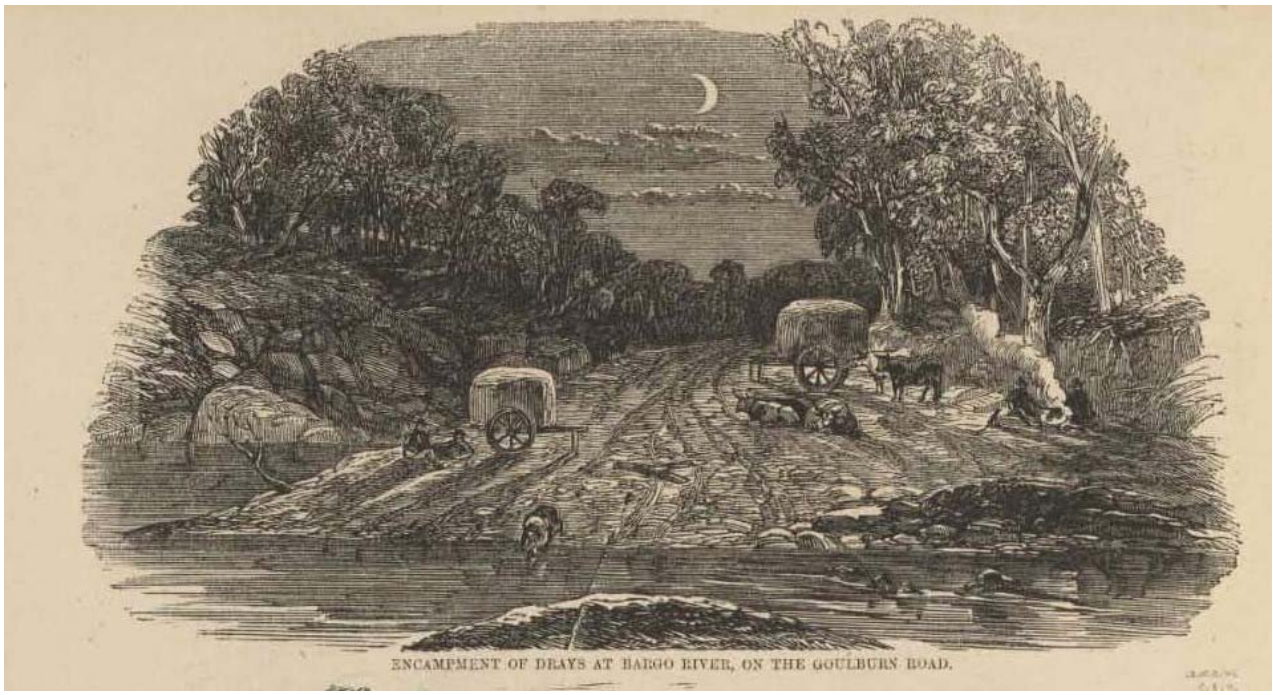


Plate 4.1 ***Encampment of drays at Bargo River, on the Goulburn Road*, c.1857 (Source: National Library of Australia, obj-138445149)**

4.2.5 1880 First occupation of the Wirrimbirra Sanctuary area

Prior to the 1880s the settlement of Bargo congregated around the present town. The Conditional Purchase of Land was introduced in the 1884 Land Act (Niche 2018a, p.25). Conditional Purchase meant land could be purchased and

occupied with a down payment of 20 pounds and continuing annual payments (Greenup et al. 1992, p.19). The increased accessibility of land ownership resulted in the increase of settlement around Bargo. The properties encompassed by the Wirrimbirra Sanctuary were released from the Crown in 1888.

The Wirrimbirra Sanctuary covers five historical lots numbered 33, 32, 17, 18 and 19.[1] The small rectangular lots fronted the Great Southern Road (later the Hume Highway and Remembrance Drive) south of the Ti-Tree Hollow tributaries (Plate 4.2).[2]

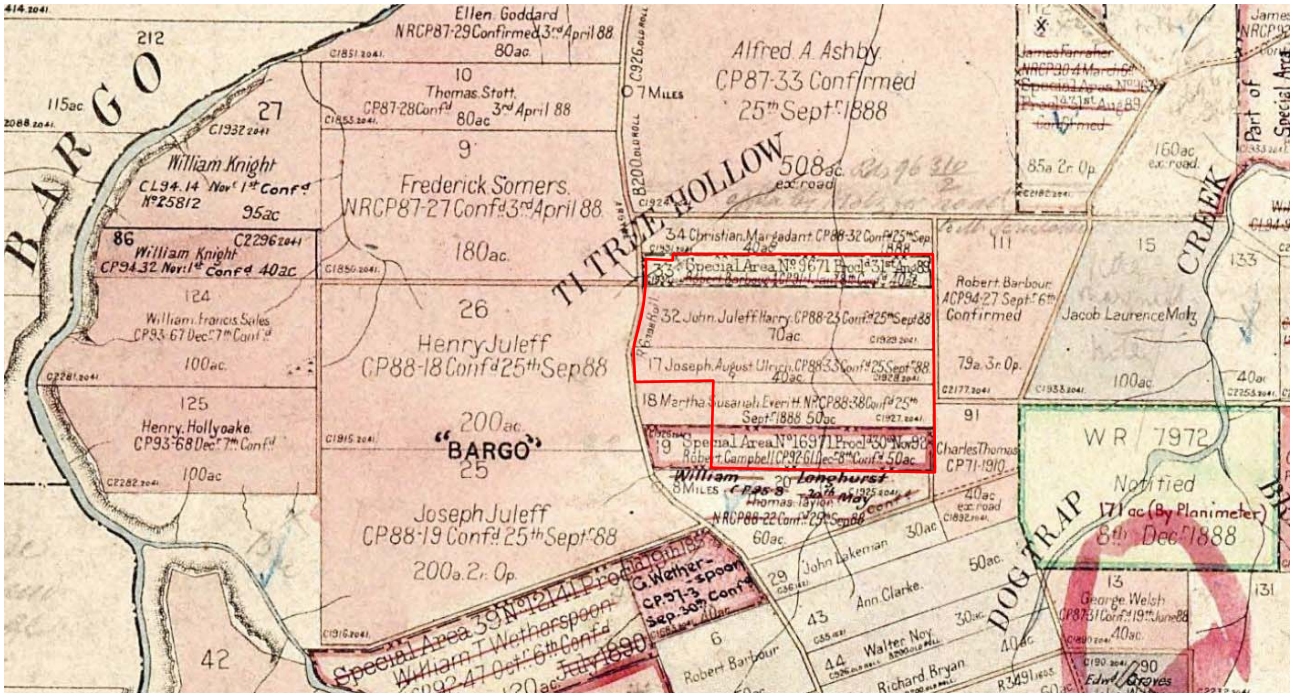


Plate 4.2 **1894 Parish of Bargo map (detail). The location of the study area is outlined in red. (Source: Department of Lands 1894)**

i Lot 33, Portion 203 (DP 751250)

Lot 33 is the most northern of the lots designated as part of the Wirrimbirra Sanctuary and measures approximately 16.2 ha (40 acres). Lot 33 was surveyed on 4 July 1888. The portion was sold as "orchard land" with two creeks running through the portion and stringy bark and gum trees are noted as the primary wood (Niche 2018a, p.26).

The land was granted to Robert Roberts on the 25 September 1888 but was forfeited in July of 1889 (Niche 2018a, p.26). From the 31 October 1889 the portion became "a Special Area No9671 @ 2 pounds per acre for resident" but this status was revoked in 1901. Robert Barbour (grantee of Lot 19) purchased the property as part of his landholdings in 1889 but forfeited the Conditional Purchase in 1897. An individual with the initials C.L. was granted conditional for 10 pounds per acre in 1901 but the land was forfeited in December 1922. The land had been included within the State Coal Mine Reserve in 1917 but had been withdrawn by 1923.

[1] It must be noted both Greenup et al. (1992, p.19) and Niche Environment and Heritage (2018a, p.26) include lot 34 (granted to C. Margadant in 1888) within the boundaries of *Wirrimbirra Sanctuary*. Lot 34 is not part of the *Wirrimbirra* holdings.

[2] See 4.2.3. The Argyle Road alignment through Bargo had been included on Major Mitchell's South Road survey from 1830. The South Road was renamed the Great Southern Road with the *Main Roads Management Act 1858*. The road was known by this name at the time of the land grants.

ii Lot 32/132 (DP 130897)

Lot 32 is south of Lot 33 and covers approximately 28.3 ha (70 acres). Lot 32 was surveyed on 4 July 1888 and noted as suitable "orchard land" with a creek and stringy bark and gum trees (Niche 2018a, p.26).

Lot 32 was granted to John Juleff Harry in May 1888. In 1894 J.J. Harry of Bargo is recorded winning the jar honey category at the Picton show, indicating the property likely functioned as a farm (*Australian Town and Country Journal*, 17 March 1894, p.16). The level of the land clearance, as well as the focus and scale of Harry's farming activity is not known. It is likely subsistence level farming was occurring on the property but the fact that Harry was showing honey may suggest much of his property remained uncleared for production of native plant honey. Harry had left Bargo by 1903 (Ancestery.com a). It is not clear if the property was sold to another occupant. The Lot was renumbered to Lot 132 after 1970.

iii Lot 17/1 (DP 789005)

Lot 17 is south of Lot 32 and covers approximately 16.2 ha (40 acres). Lot 17 was surveyed on 4 July 1888 and noted as suitable "orchard land" (Niche 2018a, p.25).

Lot 17 was granted to Joseph August Ulrich in September 1888. Ulrich died in Sydney in 1900 and the land was forfeited in 1905 (Ancestry.com b). The property was granted to James Short in January 1907 with the Conditional Purchase of 10 pounds per acre (Niche 2018a, p.25). The land was revoked in 1922. Short continued to occupy the property until 1917 and the land was revoked in 1922. Edward Brodie (1974) recollects Mr Short living on the property in 1914 but he does not note how Short made a living. It seems likely the property was used for small-scale farming. Short's house was demolished during the construction of the railway c.1919 (Brodie 1974). Lot 17 was renamed Lot 1 sometime after 1970.

iv Lot 18 (DP 751250)

Lot 18 is south of Lot 17 and measures approximately 20.2 ha (50 acres). The lot was granted to Martha Susanah Everitt in 1888. The land was forfeited prior to and remained Crown Land. In 1938, E.F. Carter is named as the land holder but the land was forfeited to the Crown prior to the property's incorporation into the *Wirrimbirra Sanctuary*.

v Lot 19 (DP 751250)

Lot 19 is the most southern of the lots designated as part of the Wirrimbirra Sanctuary. The Lot covers approximately 20.2 ha (50 acres). Lot 19 was surveyed on 3 July 1888 and noted as suitable "orchard land" with a stream and stringy bark and gum trees (Niche 2018a, p.25).

The Lot was leased under a "Special Lease" to Henry Archer Pollack in July 1888 but was granted to Robert Barbour in September 1888. Barbour's Conditional Purchase was revoked in October 1892. The land was designated a "special area". The land was granted to Robert Campbell in March 1893. Edward Brodie (1974 p.14) recalls Mr Campbell's house was 'a long way off the road where the soil was a little better'. Further, Brodie (1974) notes Campbell kept cattle and dug deep drainage ditches to divert water from his cultivation paddock. In 1974 all that survived of Campbell's house was "a heap of stones in a small clearing" (Brodie 1974 p14). Campbell's grant was forfeited in 1902 and was proclaimed "Within State Coal Mine Reserve" in 1917. W.V. Cheesmen is noted as the property owner in 1938 but the land was likely forfeited to the Crown prior to the Sanctuary accession (Brodie 1974).

All of the original properties comprising the Wirrimbirra Sanctuary were resumed for the construction of a railway line on the 28 January 1915.

4.2.6 1917–1962 After the railway

The course diversion of the Great Southern Railway line had been on the plans since 1907. In 1914, the Legislative Assembly approved changes in the course of the rail-line from Picton to Mittagong with the new line passing through Bargo (Robinson 1998). The railway was constructed from 1917 to 1919 (Robinson 1998). The train line runs east of the highway from Tahmoor to the southern edge of the Ti-Tree Hollow region and cuts through the frontage of all of the lots comprising the Wirrimbirra Sanctuary. Due to the railway line, the frontage of Lot 33 was re-numbered 203. Moreover, the frontages of Lots 18 and 19 were designated as a new property originally numbered 202, but now numbered as Lot 2. Lot 2 is not included in the Wirrimbirra Sanctuary space.

Brodies' (1974) reminiscences suggest that many of the properties around Ti-Tree Hollow were abandoned in the early twentieth century and that many of the homesteads had been destroyed by bushfires. These homesteads may survive as archaeological sites. It is likely the homesteads of the Wirrimbirra Sanctuary were abandoned long before the establishment of the Sanctuary.

4.2.7 1962–Present

In 1962 Sydney accountant Carmen Coleman with educator and conservationist Dr Thistle Y. Stead purchased 66 ha of land north of the town of Bargo (OEH 2000; 2013). The land purchase encompassed Lots 32 and 17 and featured extant Bargo Brush (OEH 2013).

In 1963 the land was donated to the David G. Stead Memorial Wildlife Research Foundation of Australia, formed in the same year, and the Wirrimbirra Sanctuary was established (OEH 2013). The name *Wirrimbirra* was drawn from an indigenous word meaning 'to preserve' and reflects the primary aims of the sanctuary (Wirrimbirra Sanctuary n.d.). David George Stead was a naturalist and driving force in the conservation debate in Australia who helped to establish the Wildlife Preservation Society of Australia in 1909 (ADB online *Stead, David George (1877-1957)*). Stead's wife, Thistle Yolette Stead (nee Harris), a pioneer in conservation education, established Wirrimbirra Sanctuary to perpetuate the work and memory of David Stead through the sharing and dissemination of conservation research and management of the native environment (OEH 2013; Wirrimbirra Sanctuary n.d.; ADB online *Stead, Thistle Yolette (1902–1990)*). A relationship between the Stead Foundation, the Wirrimbirra Sanctuary and The National Trust of Australia was formed in 1963 (OEH 2000).

Rangers residences, office, visitor's accommodation, workshops, greenhouse, and irrigation system were constructed on the Hume Highway frontage of Lot 32 (see Figure 5.2) (*Education: Journal of the N.S.W Public School Teachers* Federation 1967, p.88). The buildings were designed by architect Milo Dunphy of Loder and Dunphy Architects (Design and Art Australian online 2015). Dunphy was an environmental activist with an interest in conservation and his style draws on the intersection of religion, architecture, and the natural environment (Design and Art Australian online 2015). Dunphy's designs were influenced by the environment of the Wirrimbirra Sanctuary and construction was focused on sustainability. Large scale planting was also part of the initial establishment of the Sanctuary for example W.R. Kreech leased 1.1 ha of Lot 17 in 1965 to grow grevilleas and native plants (Niche 2018a, p.27; *Education: Journal of the N.S.W Public School Teachers* Federation 1967, p.88).

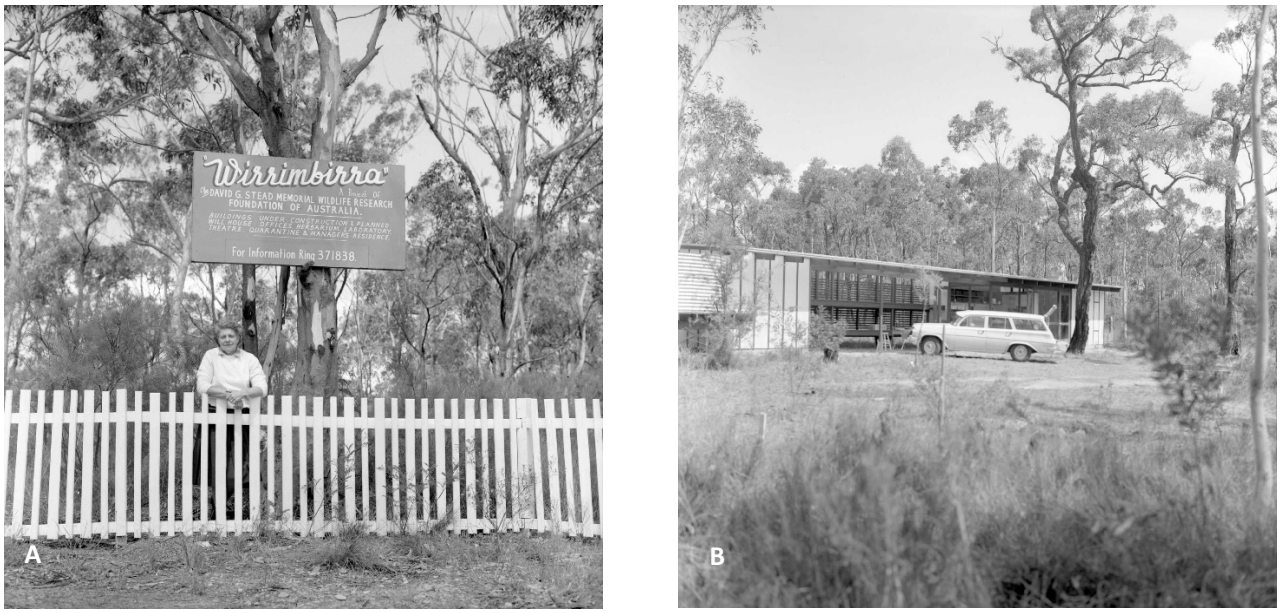


Plate 4.3 **A. Thistle Y. Stead at the entrance to the Wirrimbirra Wildlife Sanctuary, 1964 (Source: Thwaites 1964a); B. Wirrimbirra Sanctuary, 1964 (Source: Thwaites 1964b)**

In 1965 the Wirrimbirra Sanctuary was gifted to The National Trust to ensure the future of the Sanctuary with the caveat that the land was to be leased back to the Stead foundation (OEH 2013). Around the same time the Minister for Mine and Lands recommended a further 68 acres of Crown Land adjoining the property be transferred to the Sanctuary and the National Trust (*Education: Journal of the N.S.W Public School Teachers* Federation 1967, p.88). The Wirrimbirra Sanctuary was officially recognised under Section 23A of the repealed NSW *Fauna Protection Act 1948* as "The David Stead Wildlife Refuge No 163" on 19 April 1967 (OEH 2013). A Field Studies Center was constructed in 1971 and the Sanctuary was extended in 1973 with Crown Land Lots 203, 33, 18, 19 dedicated "For the promotion to the study of conservation of native flora and fauna".

In 1989 the National Trust purchased a small area of land at the southern boundary of the Sanctuary and upgrades were made to the Sanctuary in 2008 and 2019 (OEH 2000; Wirrimbirra Sanctuary n.d). A Conservation Agreement for the Office of Environment and Heritage was drawn up for the Wirrimbirra Sanctuary in 2013 (OEH 2013). The lease of the Wirrimbirra Sanctuary changed hands on October of 2019 and the Stead Foundation is no longer in control of the sanctuary. The new leaseholders, in conjunction with the National Trust, are renaming the sanctuary the *Australian Wildlife Sanctuary*.

A major fire burnt through the sanctuary in December of 2019. The buildings in the south of the Sanctuary were destroyed but the Visitor's Centre and Ranger's cottages were untouched. At present a small area of the sanctuary is dedicated to the Australian Native Dog Conservation Society (OEH 2000).

5 Site evaluation

5.1 Background

The evaluation of sites is developed from an understanding of their historical context and relies on a number of factors including their geographical location, occurrence and the site's condition (refer to assessment of significance Section 6). By undertaking a site evaluation, or analysis, the values of the place can be assessed, and suitable recommendations can be developed with the aim of assuring that significance is not affected.

One part of the evaluation is the historical analysis (section 4.2), the presence and condition of sites and/or features (section 5.8) and a comparison of similar sites.

5.2 Land use summary

The study area has four major phases of land use.

- Pre-1880: Visitation by indigenous groups. No permanent European occupation. Likely some areas used as resting paddocks/camps for itinerant stockmen and travellers.
- 1888 to c.1917: Small-scale farming and pastoralism including cattle grazing, cultivation, and possibly apiculture (beekeeping). Agricultural occupations in the surrounding properties include wood cutting, poultry farming, and viticulture (Brodies 1974).
- 1917: Resumed by the Picton to Mittagong trainline. Demolition of structures in vicinity of trainline.
- 1962 to present: *Wirrimbirra Sanctuary*. From 1965 the Wirrimbirra Sanctuary is managed by the National Trust (NSW) and the David G. Stead Memorial Wild Life Research Foundation. The Field Studies Centre opened in 1971 and from 1972 to the present the entire study area has been a reserve for the research and conservation of native flora and fauna. The following structures were constructed on the site:
    - Visitor's centre (1964);
    - rangers/caretaker's cottage, designed by architect and conservationist Milo Dunphy in 1963 (1965);
    - entrance gates (1965);
    - nursery area (1967);
    - various memorials (1968–1971);
    - second cottage (1970); and
    - pool and nature area (1972).

    In December of 2019 a bush fire destroyed nine buildings in the south of the Sanctuary including five cabins, the education and laboratory buildings, amenities block and a shed (see Figure 5.2).

5.3 Previous studies

Three studies have identified heritage items within the study area. These are:

1. Greenup et al. (1992) *A Conservation and Business Management Plan for Wirrimbirra Sanctuary*, Bargo (Greenup et al. 1992),

2. NSW Office of Environment and Heritage (2013) *Conservation agreement between The Minister Administering the New South Wales National parks and Wildlife Act 1974 and The National Trust of Australia (NSW) for Wirrimbirra Sanctuary*; and

3. Niche Environment and Heritage (2018a) *Tahmoor South Project: Historical Heritage Assessment*.

These studies are summarised below.

i Greenup, Close, Dermody, Lembit and McDougall, 1992

Greenup and associates identified the following cultural items, which they associate with the c. 1880 occupation period, within the study area:

- Portion 33: remains of a sandstone wall in the western area of Wirrimbirra near Caloola (Tea Tree) Creek;

- Portion 32: Ockenden Pool, raised mounds near the main dam, inground well near the rail line, remnants of sandstone foundations of an early building/hut, old fence;

- Portion 18/19: Big Pool; stone foundation of an old hut, aqueduct/diversion channel/drain line (pioneer trench), soil change; and

- Portion 17: well site (informal), stand of Casuarinas and grooves in soil between plant nursery and cabins.

Greenup et al. (1992) identify the historical properties as “portion/s”; however, this terminology is incorrect, and this report employs the more accurate “lot/s”. The portion numbers in Greenup et al. (1992) directly correlate to the Lot numbers. The location of these cultural items was verified during survey and are discussed in Section 5.8.

ii NSW Office of Environment and Heritage (OEH) (2013)

The conservation agreement, which focuses on the natural environment of the study area identifies two heritage items the “well” and “ruins of the old homestead” (OEH 2013, p.21). The GPS location of the well is given, -34.26223805, 150.57549027 (OEH 2013, p.13). The co-ordinates place the well within the bounds of Lot 32 (Plate 5.1).



Plate 5.1 Location of identified heritage features. The location of the study area is outlined in red. (after NSW Office of Environment and Heritage 2013)

iii Niche Environment and Heritage (Niche) (2018a)

The report draws from the results of Greenup et al. (1992). No survey of the study area was undertaken.

5.4 Predictive model

Development of a predictive model is continuous and is based on background research, which includes documentary sources, maps and plans, as well as landholder discussion and future surveys of the study area. Further, the data used to inform predictive models for Aboriginal sites are useful for planning historical survey. Access to water, soil landscapes, geomorphology and land disturbance are characteristics that would have influenced the decisions of Aboriginal people as well as itinerant and permanent white stockmen/farmers.

The presence of multiple water sources, sections of "good" soils for grazing and cultivation, and protection from the elements would have been conducive to either long- or short-term occupation. Moreover, the location of the properties on the major route between Sydney and Goulburn would have been valued by itinerant and permanent occupants alike.

The study area comprises five lots released from The Crown in 1888 (one of the lots has since been subdivided). Occupation prior to the alienation of land may have included Aboriginal people, itinerant stockmen, and traveller camps. Suggested features that may be related to such activity include:

- dwellings;
- posts/post holes;

- middens;
- wells;
- evidence of fireplaces/hearths;
- stumps; and
- trails.

Evidence from this phase of land use should be focused in areas with easy access to water. Moreover, as Lot 33 was Crown Reserve land until the area was leased to the Wirrimbirra Sanctuary in 1972, this lot theoretically holds the highest potential for the survival of the earliest evidence of occupation and land use.

Of the five lots, four were freehold land from 1888 until c 1917. The properties hold the potential for structures relating to fenced pastoral activities and cultivation. The results of previous survey and Edward Brodie's (1974) memoirs indicate structures may survive in remnant or archaeological forms. Evidence of water management, land modifications, stock management, and plantings could also survive. The following features may be present within the study area:

- primary homesteads, potentially multiple phases;
- cottages to house managers or overseers;
- stockmen's huts, particularly around watercourses;
- workshops and sheds;
- stores;
- stone walls and curated stone features;
- cesspits;
- wells or access to drinking water for each dwelling or group of dwellings;
- stables;
- gardens;
- middens or rubbish pits;
- domestic animal skeletal remains;
- trails;
- ploughed cultivation paddocks; and
- stockyards scattered across the properties.

As well as these general features, historical documents suggest specific lots may have unique features relating to the activities of past occupants:

- Lot 32 (now Lot 132 DP 130897): remains of beekeeping such as multiple small foundations, or trees partially stumped to hold beehives; and
- Lot 19 DP 751250: drainage ditches.

The construction of the railway through the study area from 1917 from 1919 is also a significant event that may have left traces on the land. Building the railway attracted many people into Bargo and the construction teams may have made their mark on the land not only through the railway line itself but evidence of the process. There is the potential for that the following survive across the total study area:

- remnant roads;
- construction material stockpiles;
- discarded tools and materials; and
- middens.

Previous reports have identified the presence of relics within all lots:

- Lot 33 DP 751250: sandstone wall;
- Lot 32 (now Lot 132 DP 130897): mounds near main dam, well, sandstone foundations, old fence;
- Lot 18/19 DP 751250: stone foundations, drain trench, soil change; and
- Lot 17 (now Lot 1 DP 789005): well (informal), stand of Casuarinas, grooves in soil (Greenup et al. 1992; OEH 2013).

The reports, documentary sources, and natural features of the study area were drawn upon to refine the predictive model.

5.5 Significant cultural landscapes

5.6 The model

Analysis of the documentary sources with considerations driven by the natural landscape resulted in the following predictions related to the presence and location of possible historical heritage items within the study area:

- Dwellings (huts, cottages, camps), stockyards, and gardens are likely to be found in the vicinity of water; homesteads and huts are likely to be watered by wells. Stockyards and paddocks would, by necessity, need to be close to creeks. The abundance of level ground suggests dwellings are unlikely to be located on sloping areas.
- Dwellings may be located away from the road. It is likely some parts of the structures will be made of stone. Ancillary structures will congregate around the primary structure. Clearings and/or artefact scatters may suggest the location of dwellings. Introduced plant species may indicate the location of dwellings.
- Paddocks for cultivation and grazing are more likely to be away from the road due to better quality soils. Drainage ditches may be associated with paddock systems.

- Remnant fences or walls may occur in all areas across the landscape however, with the exception of property boundaries, their locations cannot be predicted as they are not shown on any of the plans discovered during the investigation for this report.

- Timber structures are less likely to survive in the study area due a history of bushfires in the region. Timber fences or structures may still be evidenced by metal findings.

- Relics related to the construction of the railway may also be present within the study area.

- It is unlikely any permanent structures, beyond the identified wall, will be located in Lot 33 and 203, DP 751250.

5.7 Site assessment methods

Survey is an important aspect to assessing the potential and significance of heritage items and is used to either verify the existence of sites or to discover sites that archival research was not able to identify. Survey methods are adapted to the type and size of project area and the outcomes of archival research. The most common survey method is one that is targeted to areas identified in historical research, and visual information such as remnant buildings and landforms.

The survey strategy for this project was developed using the information gathered in the background research for this report including the historical summary, as well as information gathered from the heritage listing, and previous studies. Field survey was conducted on foot and targeted areas that were predicted to hold tangible evidence of the historical development of the study area, the entirety of which is within the limits of subsidence for Longwalls 101A, 102A, 103A and 104A (Figure 1.2).

Approximately 90% of the study area had been subject to extensive burning from a bushfire that passed through the Bargo region on 19 December 2019. Items affected by the fire were also recorded.

Field Survey was undertaken on 20 January 2020 by Pamela Chauvel (EMM), Amelia O'Donnell (EMM). Brad Wilson (Australian Wildlife Sanctuary), Gerry Hayes (National Trust, NSW), Daryl Kay (MSEC), Zina Ainsworth (Tahmoor Mine) were present during the survey. The purpose of the survey was to:

- record the Wirrimbirra Sanctuary standing structures;

- identify and record structures that were affected by the December fire; and

- identify the potential relics or known relics in the project area.

Standing structures and archaeological features were photographed using a Digital Single Lens Reflex (DSLR) camera - high resolution RAW and JPG format with scale rod and north arrow. In addition, Survey123, an application developed by EMM for use with ArcGIS (Esri© software), was used to create digital map of surveyed structures and relics. It must be noted that heavy rain limited the recording of one site by DSLR photography.

5.8 Results of site assessment

The results of the field survey are presented below and are divided into two sections based on levels of development and the heritage items present – Wirrimbirra Sanctuary (between Remembrance Drive and the railway line), and Wirrimbirra Sanctuary Reserve (east of the railway line) (Figure 5.1).

The Wirrimbirra Sanctuary section is the most developed section of the study area and features mid-twentieth century buildings and landscaping across the majority of the area. The heritage values of the Wirrimbirra Sanctuary

section closely align with the establishment and development of Wirrimbirra as a place for tourism and education. Five standing buildings, burnt structures, and landscape features were recorded.

The Wirrimbirra Sanctuary Reserve section encompasses the conservation area of the sanctuary. The area to the east of the railway line has functioned as a flora and fauna conservation reserve and, as such, has not been developed to the same extent as the Sanctuary section to the west. The heritage values of the Wirrimbirra Sanctuary Reserve generally pre-date the sanctuary phase and are in the form of archaeological sites/items. Items previously identified by Greenup et al. (1992) were confirmed and further sites were identified. Impacts to these items are described in Section 7.

5.8.1 Wirrimbirra Sanctuary (between Remembrance Drive and the railway line)

Development within Wirrimbirra Sanctuary has been focused in the portions purchased by Carmen Coleman and Thistle Stead in 1962. Structures and landscaping associated with the sanctuary are in lots 32 (132) and 17 (1) and are located between Remembrance Driveway and the railway line, in the west of the study area. The sanctuary is accessed by a gate on Remembrance Driveway. A dirt driveway leads to education buildings and cabins in the south of the property and the primary sanctuary structures, including the Visitor's Centre, are to the north (Figure 5.2). Animal enclosures and the Australian Native Dog Conservation Society sit between the cabins and primary buildings east and west of the drive. A large dam is located north of the primary building precinct and treated pine-lined paths are present in the north of the section. All areas were subject to the 2019/2020 bushfire damage except the primary building precinct and animal enclosures.

i Entrance

Greenup et al. (1992, p.9) notes that ornate iron gates with a plaque reading "given to Mrs Thistle Stead as a mark of esteem. Teachers College Sydney, July 1962" were erected at the entrance of Wirrimbirra Sanctuary in 1965. The gates are no longer present and have not been at the entrance for at least 20 years, the location of the gates is unknown (Brad Wilson *pers comm* 20 Jan 2020). The current entrance gate is a simple low steel pipe gate.

ii South Structures/landscape

The south portion of the Wirrimbirra Sanctuary section was heavily affected by the December 2019 fire. Fires are recorded passing through the Sanctuary in 1968 and 1977, however, they caused minimal structural damage (Greenup et al. 1992, p.10). Nine structures were destroyed by the fire including five cabins, the education and laboratory buildings, amenities block and a shed (BRE_580_pa01-05) (Figure 5.2). A number of the structures were designed by Milo Dunphy (AM). Survey of the buildings occurred from outside an established safety buffer zone. From what could be seen, the destroyed buildings were constructed similarly to the remaining standing buildings- wooden frame, clad with asbestos sheeting, and corrugated iron roof; some of the buildings were raised on brick piers (Plate 5.2). Wirrimbirra Sanctuary records had been stored in one of the cabins and were lost during the fire.

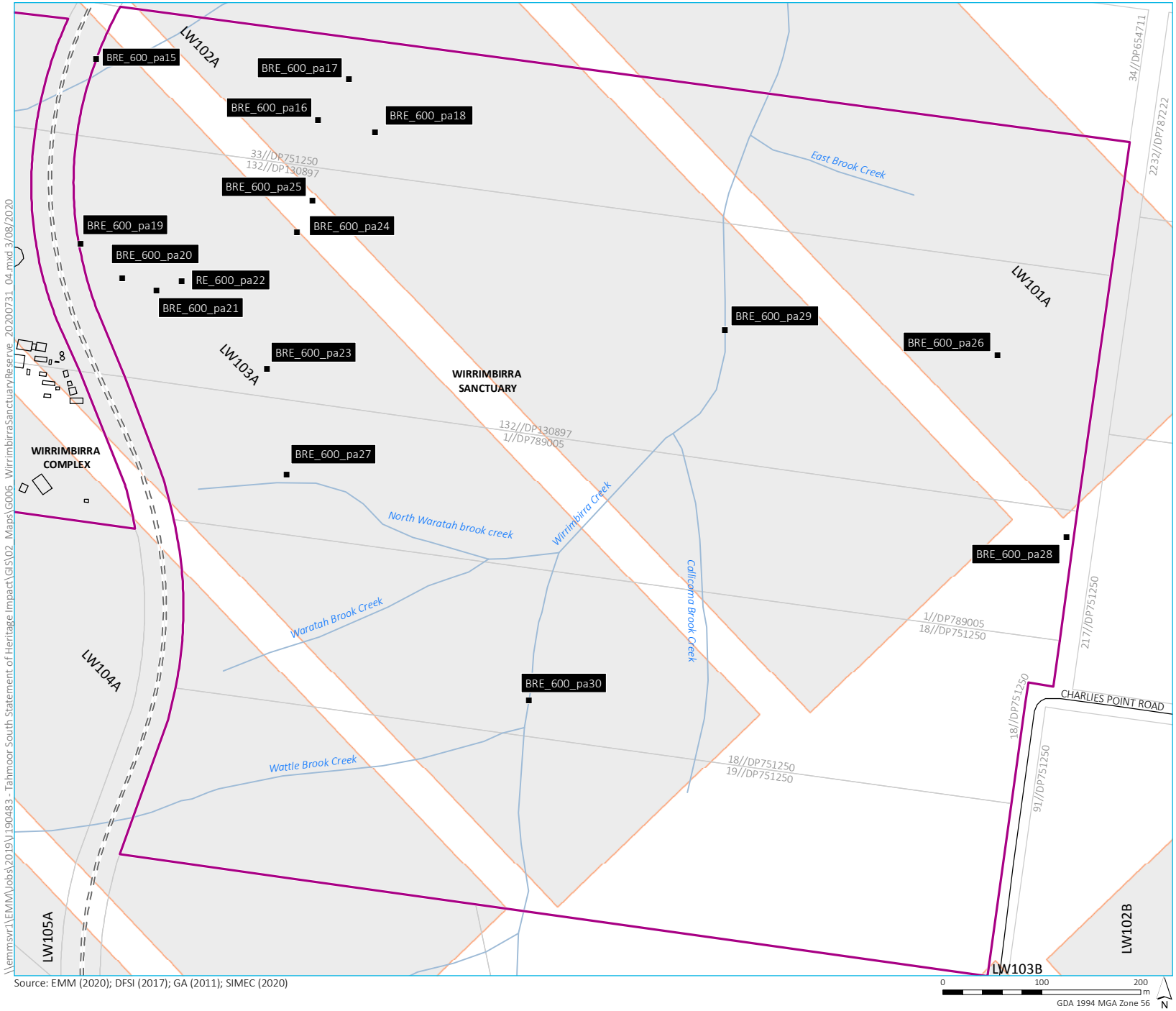
The area around the southern buildings is landscaped with sandstone-lined dirt paths. The Alan Strom memorial pond is west of the buildings (BRE_580_pa16). The doughnut shaped pond is lined with concrete and bordered by rough cut sandstone. With the exception of mature trees, plantings in the southern area of the section were destroyed.



Plate 5.2 Fire damaged buildings in south of Wirrimbirra Sanctuary (BRE_580_pa01-05). View east.

iii Animal pens

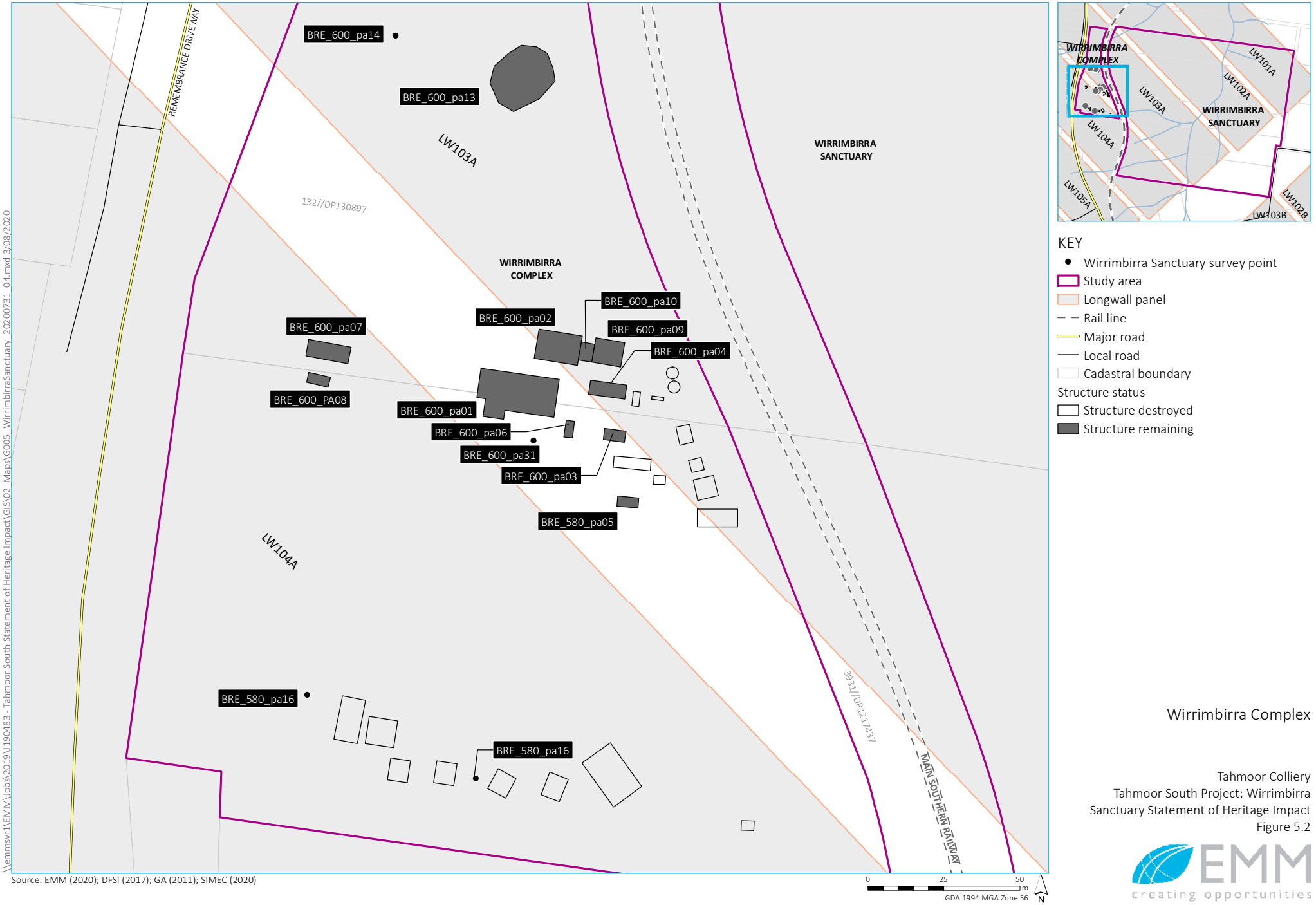
Animal pens are located north of the destroyed structures (see above). There are two groups of pens located to the east and west of the driveway (BRE_600_pa07-08). The pens are constructed of steel poles and chain link fence about 3 metres (m) in height. The Australian Native Dog Conservation Society Dingo Sanctuary enclosure is located in the eastern group of pens (Plate A.1). A small fibro building with corrugated iron roof pergola is located on the north-east fence line. The animal pens were not affected by fire.



Wirrimbirra Sanctuary

Tahmoor Colliery
Tahmoor South Project: Wirrimbirra Sanctuary Statement of Heritage Impact
Figure 5.3

EMM
creating opportunities



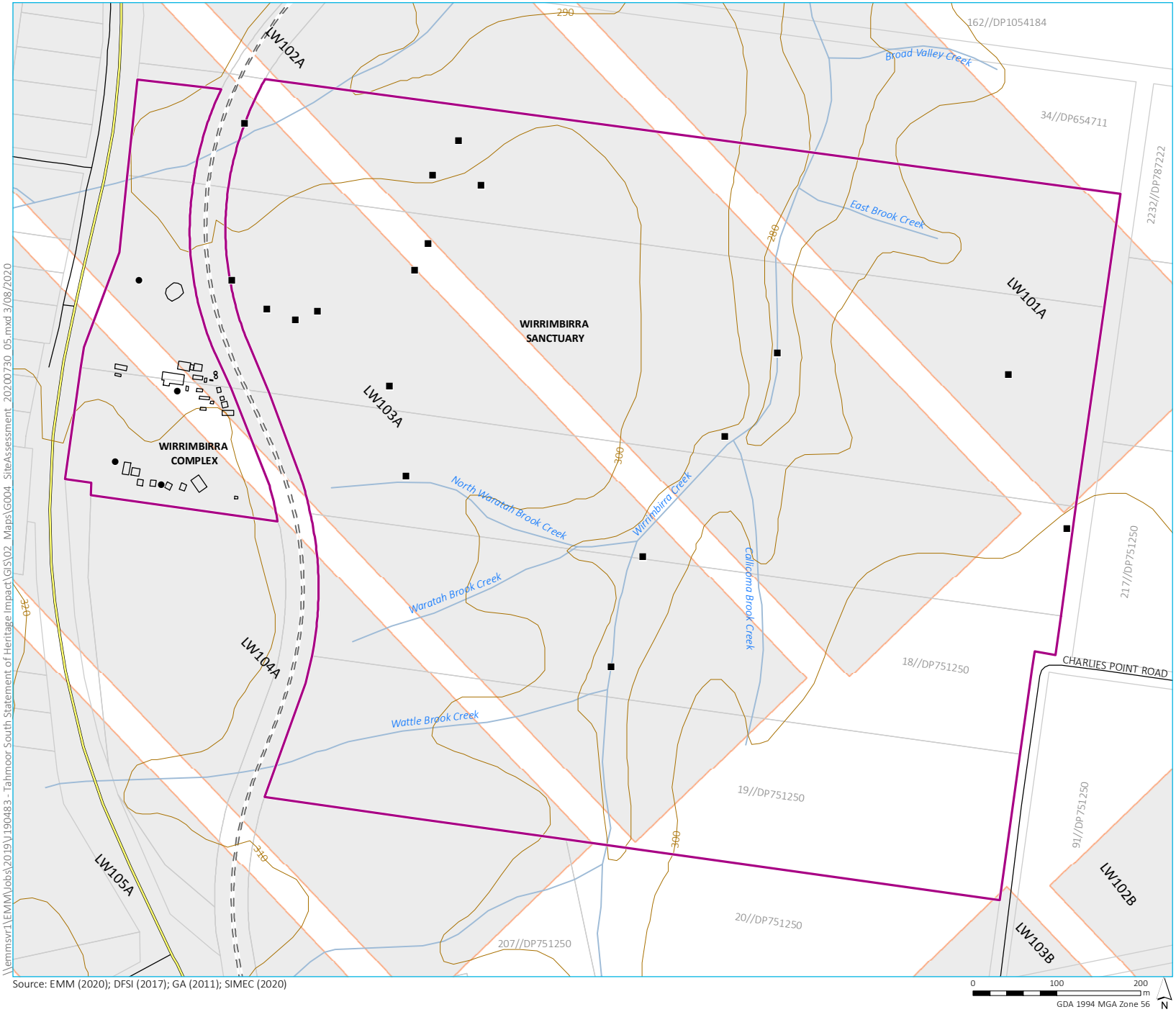
Source: EMM (2020); DFSI (2017); GA (2011); SIMEC (2020)

\\emmsvr1\EMM\Jobs\2019\J190483 - Tahmoor South Statement of Heritage Impact\GIS\02_Maps\G005_WirrimbirraSanctuary_20200731_04.mxd 3/08/2020

Wirrimbirra Complex

Tahmoor Colliery
Tahmoor South Project: Wirrimbirra Sanctuary Statement of Heritage Impact
Figure 5.2

EMM
creating opportunities



Site assessment

Tahmoor Colliery
Tahmoor South Project: Wirrimbirra Sanctuary Statement of Heritage Impact
Figure 5.1

EMM
creating opportunities

iv Primary Precinct

The primary precinct is north of the Dingo Sanctuary enclosure and contains the Visitor's Centre, Ranger's cottages, and ancillary buildings. This area was minimally affected by the fire.

a Visitor's Centre

The Visitor's Centre (BRE_600_pa01) was designed by Milo Dunphy and constructed in 1964 (Greenup et al. 1992, p.9). The building is wood frame structure clad with asbestos sheeting and timber set on a concrete slab foundation (Plate 5.3, Plate 5.4). It has large timber-frame windows and corrugated iron roof. The structure is painted green, and the trim is painted mission brown. The main room of the Visitor's Centre has a double storey height ceiling and the upper storey is surrounded by timber-framed windows on all sides creating an atrium effect. The interior floors of the Visitor's Centre are terracotta-toned tile. The building is partially wrapped by a verandah along the south elevation, which becomes a large pergola/seating area west of the main room. A toilet block is in the west of the structure. The different levels of roof indicate that additions have been made to the 1964 construction over time.

The Visitor's Centre is surrounded by a crushed gravel driveway and paths on all sides. Landscaped gardens are present along the southern and eastern elevations of the building, where visitors enter from the upper terrace of the driveway (Plate A.2). The gardens are surrounded by sandstone drystone retaining walls, a small pond is present in the southwest of the beds. The gardens had been cleared and replanted prior to the fire.

b Cottages

Two cottages are present north of the Visitor's Centre. Cottage one (BRE_600_pa02), the "Ranger's Cottage", built in 1965 (Greenup et al. 1992, p.9), is directly north of the Visitor's Centre. The building is a timber-frame structure clad with asbestos sheeting and timber, set on a concrete slab foundation (Plate A.3). The roof is steeply pitched and clad in corrugated iron with a verandah along the west elevation/frontage. A stone chimney is present on the northern side. A feature of large timber-framed windows is present on the west elevation, the majority of the cottage windows are small.

Cottage two (BRE_600_pa09), constructed in 1970, is north-east of the Visitor's Centre, and directly east of cottage one (Plate A.4) (Greenup et al. 1992, p.10). The building is a timber-framed structure, clad with asbestos sheeting and timber set on a concrete slab foundation. The structure is T-shaped with verandahs along the north and south; the roof is low hipped, corrugated iron. The structure has large timber-framed windows along the north and south elevations. Cottage two is connected to cottage one via a roofed car port.

c Ancillary structures

A glasshouse (BRE_600_pa06) is present east of the Visitor's Centre (Plate A.5). Its construction date is unknown but may have been part of the 1967 nursery (Greenup et al. 1992, p.10). The lower half of the glasshouse is constructed of rendered brick on a concrete foundation. The upper walls and gable roof are steel-framed glass panels.

A workshop/store (BRE_600_pa04) is present northeast of the Visitor's Centre (Plate A.6). The building is wood frame structure clad with asbestos sheeting and timber set on a concrete slab foundation. The roof is corrugated iron and is missing in parts, for example there are beams for a verandah on the south elevation, but it is not roofed.

A small nursery area (BRE_600_pa03) was constructed east of the glasshouse in 1967 (Greenup et al. 1992, p.10). The nursery was comprised of timber-framed shade houses and small sheds. The nursery structures were destroyed by the fire.

v Dam and surrounds

A large earthen dam (BRE_600_pa13) is north of the main precinct. An overflow channel constructed of rough-cut sandstone blocks in concrete is set into the north-west section of the dam wall (Plate A.7).

Greenup et al. (1992, p.15) identified "The Mounds" (BRE_600_pa14) as a possible cultural feature in the vicinity of the dam. The earthen mounds are west of the dam and rise approximately 1 m from the surrounding ground level (Plate A.8). The function of the mounds is unclear. Moreover, research has not shed light on when they were constructed. The proximity of the mounds to the dam and walking tracks suggests they may be a deposit of overburden from the construction of the dam or landscaping.

vi Landscape

The Wirrimbirra Sanctuary section features landscaped gardens and paths. Thistle Stead created a large number of themed native gardens and memorial gardens were also established in this area (Gerry Hayes *pers comm* 20 January 2020; Greenup et al. 1992, p.14). The upkeep of the gardens, however, became too overwhelming and so they were not maintained (Gerry Hayes *pers comm* 20 January 2020). It is likely remnants of the gardens were damaged by fire. Small metal signs identifying flora species planted in the gardens have been collected from around the property by the National Trust and current lease holders, a sample of the signs are on display in the Visitor's Centre.

A number of memorials were also located throughout the gardens. The majority of the memorials were stone with metal signage plaques (Plate A.9). The location of many of the memorials is no longer known, and a number may have been destroyed by the fire.



Plate 5.3 Visitor's Centre, south elevation, east. View north.



Plate 5.4 Visitor's Centre, south elevation, west. View north.

5.8.2 Wirrimbirra Sanctuary Reserve (east of the railway line)

The Wirrimbirra Sanctuary Reserve area lies to the east of the trainline (Figure 5.3). The Reserve has been subject to little intervention since the establishment of the Wirrimbirra Sanctuary and zoned as an environmental conservation area. The Reserve can be accessed with permission across the train line or, as was the case for this survey, via a dirt road off Charles Point road, which runs behind sanctuary.

The December 2019 bushfire cleared the forest understory; only mature trees and the skeletons of substantial shrubs remained. The ground was covered with a layer of ash and scattered leaf litter. Visibility of the ground surface was clear, however, features that relied on changes in the density of flora, such as trails, and soil difference were not easily discernible.

The survey group entered the reserve from the north-eastern corner of Lot 18 and moved west to Wirrimbirra Creek. The Creek was surveyed north to Okenden Pool and then south to Big Pool. From Big Pool the group moved northwest towards known relics, then north to the culvert on Tea Tree Creek before travelling south/southeast back towards the entry point.

The survey identified 14 items/sites. Items were observed in Lots 33, 1, and 18 with the majority identified in Lot 132. Inclement weather meant Lots 18 and 19 were subject to minimal survey. The survey results of Greenup et al. (1992) are presented by lot boundary and this report will follow the same layout for continuity. A discussion will follow to reintegrate the results at a landscape level.

i Lot 33

Lot 33 is the most northern of the surveyed lots. Four items/sites were found within the lot (Figure 5.3). Greenup et al. (1992, p.34) identified remains of a stone wall in this lot.

A concrete culvert (99.338) with brick wing walls diverts Tea Tree/Caloola Creek under the trainline in the northwest area of Lot 33 (Plate A.10). Large fragments of mortared brick wall and a section of reinforced concrete pipe, about 2 m in diameter were found in the creek bed 5 m to 10 m east of the culvert (BRE_600_pa15) ((Plate 5.5). The pipe and brickwork are similar to those used in the construction of the culvert. Cuts in the creek bed indicate the culvert was originally a larger structure and it seems likely the pipes and brickwork in the creek were damaged, removed from the culvert and left in situ. A large steel beam was observed on the north bank of the creek in this area and may also relate railway line repairs/construction. Deposits of twentieth and twenty-first century rubbish, such as soda and alcohol bottles and cans, were present along banks of Tea Tree creek and are likely the result of natural processes.

A two-tier mound was identified southeast of the culvert upslope from the Creek valley (BRE_600_pa16) (Plate 5.6). The lower tier of the mound was ovoid in shape, constructed of natural silty clay and measured about 2 m (east/west) by 70 centimetres (cm) (north/south) by 15 cm (height). The upper tier was constructed of a silty clay embedded with chips of shale ranging in size from palm-sized to 20 x 20 cm. The upper tier measured approximately 80 cm (east/west) by 60 cm (north/south) by 50 cm (height). The upper portion had been subject to erosion. The mounds will be discussed further in section 5.8.2 viii.

Another two-tier mound was recorded southeast of the culvert (north-east of above, BRE_600_pa17) (Plate A.11). The lower tier of the mound was ovoid in shape, constructed of natural silty clay and measured about 70 cm (east/west) by 2 cm (north/south) by 10 cm (height). The upper tier was constructed of a silty clay embedded with yellow pebbles. The upper tier measured approximately 30 cm (east/west) by 60 cm (north/south) by 30 cm (height). The upper and lower tiers had been subject to erosion.

An area of compact, crushed shale gravel was found southeast of the mounds (BRE_600_pa18) (Plate A.12). The gravel ranges in size from 1 by 1 cm to 10 by 10 cm and appears to have been deposited in a rectilinear shape measuring approximately 2.5 m (north/south) by 2 m (east/west). The shape of the deposit suggests purposeful placement, possibly for a floor, path or levelling fill for a structure that no longer survives.

The “remains of a sandstone wall in the western area of Wirrimbirra near Caloola Creek” recorded by Greenup et al. (1992, p.34) was not located during the survey. A 1992 map marks the location of “The Wall” (Plate 5.7). The area was rich in exposed natural sandstone, but no wall-like feature was detected.



Plate 5.5 Pipe and brick wall fragments in Tea Tree Creek (BRE_600_pa15). View east.



Plate 5.6 Two-tier mound south east of culvert (BRE_600_pa16). View north.

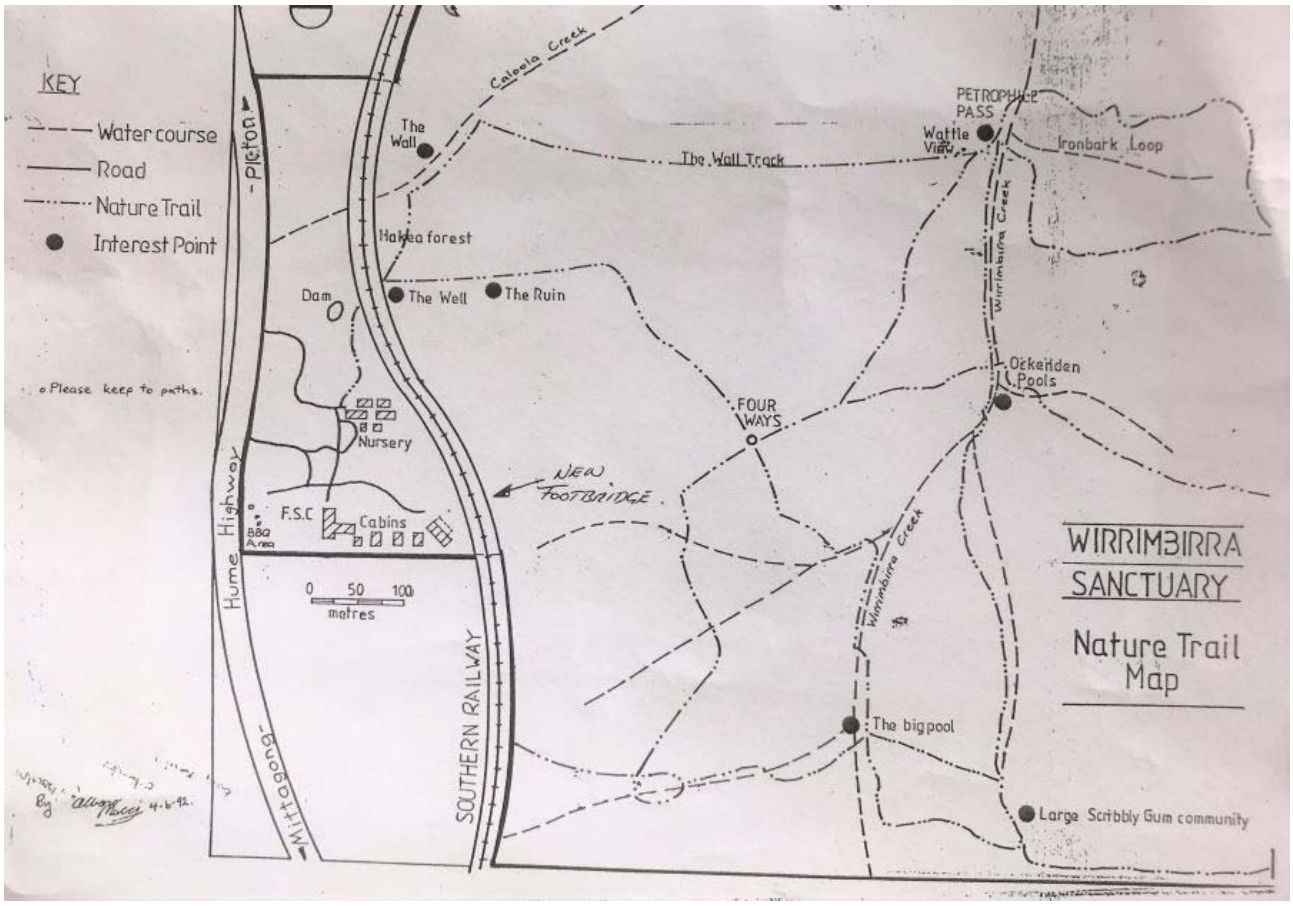


Plate 5.7 1992 Wirrimbirra Sanctuary Trail Map. Source: National Trust (NSW).

ii Lot 32 (132)

Eight items/sites were recorded within Lot 32 (currently Lot 132) (Figure 5.3). Greenup et al. (1992, p.34) identified a well, remains of a stonework hut, and fence within Lot 32.

A large earthen “well” (BRE_600_pa19) is located in the west of the Lot on the edge of the train line , excavated directly into the ground through the shale bedrock (Plate 5.8). Measuring approximately 4 m (north/south) by 3 m (east/west) with depth estimated to be over 2 m. The feature was recorded (and photographed) as a well by Greenup et al. (1992) and OEH (2013) and is a known item within the Sanctuary. The feature is currently fenced by star pickets and chicken wire. Mounding of earth was visible around the circumference and the presence of shale within the matrix suggests that this is the overburden from excavation of the feature. A large metal Wirrimbirra Sanctuary sign is located on the eastern border of the feature. It is likely that the feature fills via groundwater and/or rain but the lack of lining within the feature suggests it is unlikely to have functioned as a well. It is more likely a waterhole for stock or a form of water storage from the construction or early period of the railway.

A square sandstone feature (BRE_600_pa20) was recorded west of the well (Plate 5.9). The feature was constructed with an outer “skin” of rough sandstone blocks bonded with a yellow-tone silty clay and was filled with gravel and silty clay. It measured 1.5 m by 1.5 m and survives to two-courses (40 cm). A number of large pieces of sandstone were present around the feature. A 1 m x 1 m deposit of chipped shale was directly north of the feature (Plate A.13). A trackway lined with crushed shale was observed approximately 2 m west of the feature running from the feature in a southwest direction to the train line (Plate A.14). The feature is substantial but the use of un-cut sandstone blocks and silty clay as bonding, as opposed to a lime mortar suggests that the construction materials were drawn from the surrounding environment. The sandstone feature is a known item within the Sanctuary,

however, the naming/identification of the item is inconsistent– “The ruin” (Plate 5.7), “remains of stonework hut” (Greenup et al. 1992, p.34), “European relic-ruins of building” (Greenup et al. 1992, p.51), “ruins of the old homestead” (OEH 2013, p.21) have all been used. The function of the sandstone feature is not clear. It is possible the sandstone feature and the associated shale features may represent the remains of a post-1888 homestead. The proximity to the railway, however, means an association to the 1917/1919 construction of the rail line cannot be discounted. The condition of the sandstone is as depicted in Greenup et al. 1992 (p.51).

Another group of sandstone blocks, interpreted as a fireplace, was recorded approximately 20 m west of the square sandstone feature (BRE_600_pa21) (Plate 5.10). This second group of sandstone blocks forms a rectilinear shape and is constructed of sandstone cobbles (about 15 cm x 15 cm in size), and sandstock bricks bonded with a sandy mineral lime mortar. The feature measures 1.5 m (east/west) x 1 m (north/south) and survived to three courses with a maximum height of 40 cm at the west. Large, flat, dressed sandstone blocks were observed in the ground on the northern edge of the feature. The dressed stone was identified as an interior hearthstone, indicating that it is the remains of a fireplace. The surrounding area was clear of large trees suggesting the presence of a building in the area. The building attached to the fireplace may have been constructed of wood, bark, or canvas and the installation of the hearthstone in the natural clayey silt suggests no permanent floor covering was installed. Such structures were typically constructed in rural areas during the first phases of settlement. The fireplace may be from the homestead of John Juleff Harry, who owned the property from 1888 to c.1903. This feature is a known item within the Sanctuary but lack of description in previous reports means it is unknown if it has been recorded prior to this survey. The fireplace survives in poor condition but was not damaged by the fire.

A small artefact deposit was located approximately 30 m north east of the fireplace (BRE_600_pa22) (Plate A.16). The deposit was marked by a circular depression in the ground and the presence of bottle glass spread over an area approximately 80 cm in diameter. The bottle glass was stained with ash, but all fragments were green in colour. Although the depth of the deposit is unknown, the uniformity of glass suggests, for the surface at least, a single deposition event. The presence of a mamelon, a large round protrusion found on the base of bottles, suggests an early twentieth century date for the artefacts, and, perhaps, a connection to the construction of the railway (Society for Historical Archaeology online). A single fragment of sandstock brick with an oval frog/manufacturing scar was found 10 m south of the deposit, it is possible this may have come from the fireplace or an unknown construction in the vicinity (Plate A.15).

A large cleared area (BRE_600_pa23) approximately 10 m (east/west) by 20 m (north/south) was observed south-east of the sandstone features, near the border of Lot 17 (Plate A.17). Without the presence of undergrowth, it is unclear if this was a part of the Wirrimbirra Sanctuary walking track system or if the area was cleared as part of the establishment of a homestead prior to the Sanctuary period.

Two mounds were located north of the clearing in Lot 132 close to the boundary with Lot 33. The first mound (BRE_600_pa24) featured a lower tier ovoid in shape, constructed of natural silty clay and measuring about 2.5 m (east/west) by 1 m (north/south) by 20 cm (height) (Plate A.18). The upper tier was constructed of a silty clay embedded with palm-sized chips of shale. The upper tier measured approximately 1.5 m (east/west) by 30 cm (north/south) by 20 cm (height). The upper portion had been subject to erosion, especially in the middle.

The second mound was north of the first (BRE_600_pa25, Plate A.19). The lower tier of the mound was ovoid in shape, constructed of natural silty clay and measured about 2 m (east/west) by 1 m (north/south) by 10 cm (height). The upper tier was constructed of a silty clay embedded with a pebbly gravel. The upper tier measured approximately 30 cm (east/west) by 30 cm (north/south) by 30 cm (height). The upper portion had been subject to heavy erosion, the original extent is not known.

A large historical artefact deposit was discovered in Lot 32, east of Wirrimbirra Creek and southeast of East Brook (BRE_600_pa26, Plate 5.11). The deposit was spread over a 4 m by 3 m area (north /south). Metal, glass, and ceramic were observed on the surface of the deposit. Many of the objects were recognisable and included car headlights, two clothes iron bases, mattress springs, a bicycle wheel rim, corrugated iron, asbestos sheeting, ceramic teawares, glass condiment, cordial and medicine bottles, and a ceramic rabbit. An Australian Glass

Manufacturers mark was visible on the base of one of the bottles indicating a date of manufacture between 1934 and 1948 (Burke and Smith 2004) (Plate 5.12). The mark and the types of artefacts suggest the deposit was created in the middle of the twentieth century. The deposit appears to be in situ. The presence of this deposit is a unique find as the history of Lot 32, and the Wirrimbirra Sanctuary properties in general, does not suggest occupation beyond the construction of the railway.



Plate 5.8 **Well feature (BRE_600_pa19). View east.**



Plate 5.9 **Square sandstone feature (BRE_600_pa20). View south-west.**

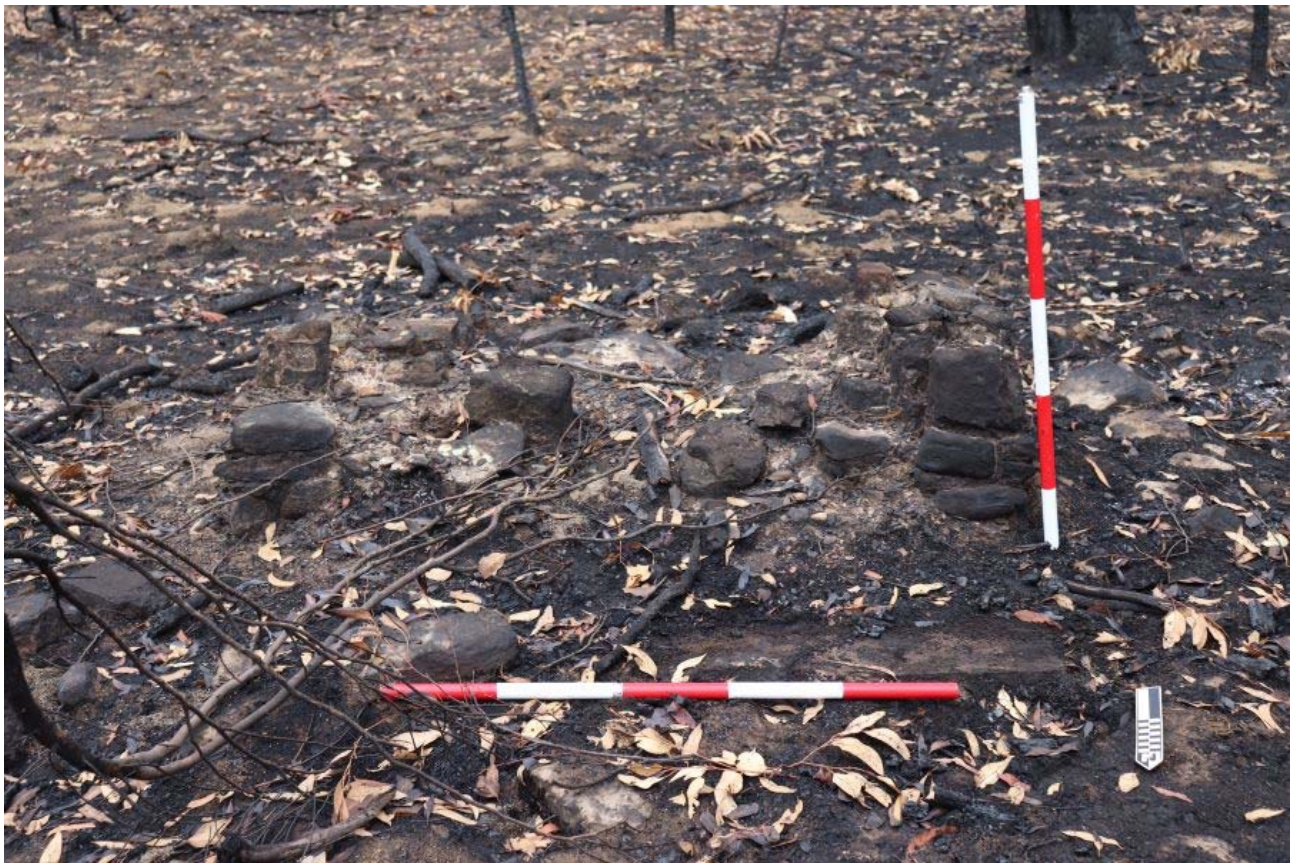


Plate 5.10 **Sandstone feature, fireplace (BRE_600_pa21). View south.**



Plate 5.11 **Twentieth century artefact deposit (BRE_600_pa26). View south-east.**



Plate 5.12 Australian Glass Manufacturers bottle in artefact deposit.

iii Lot 17 (1)

Lot 17 (now Lot 1) is the most southern of the surveyed lots with recorded items (Figure 5.3). Greenup et al. (1992, p.34) identified a well in the Lot 17 section of the Reserve.

A large, somewhat circular pit was identified in the west Lot 17, north of North Waratah Brook (BRE_600_pa27). The pit measured 2 m (north/south) by 2.5 m (east/west) and was approximately 60 cm deep (Plate 5.13). The southern wall of the pit featured straight cut sides suggesting it was excavated and not caused by tree fall. It is likely this pit is the "well site" identified by Greenup et al. (1992, p.34). The feature may have functioned as a small dam/ water hole for stock. The presence of an active wombat burrow in the base, however, indicates why the feature has not held water recently.

A two-tier mound was recorded in the north-east corner of the lot, near the border of Lot 32 (BRE_600_pa28, Plate A.20). The lower tier of the mound was ovoid in shape, constructed of natural silty clay and measured c.1.5 m (east/west) by 70 cm (north/south) by 15 cm (height). The upper tier was constructed of a silty clay embedded with palm-sized sherds of shale. The upper tier measured approximately 1 m (east/west) by 30 cm (north/south) by 30 cm (height). The upper portion had been subject to erosion.



Plate 5.13 Pit feature, possible "well" (BRE_600_pa27). View east.

iv Lot 18

Lot 18 is south of Lot 17. Greenup et al. (1992, p.34) observed stone foundations, a drain line, changes in the soil, and a dray track in Lots 18 and 19.

No items/sites observed during this survey.

v Lot 19

Lot 19 is the southern-most Lot of the Wirrimbirra Sanctuary. Greenup et al. (1992, p.34) observed stone foundations, a drain line, changes in the soil, and a dray track in Lots 18 and 19.

No items/sites observed during this survey.

vi Wirrimbirra Creek and Tea Tree Creek

The length of Wirrimbirra Creek was surveyed between Okenden Pool (TTH-P03, TTH-P04) and Big Pool (TTH-P02). Steel pipes were found protruding from the ground at both pools. These pipes acted as uprights for benches installed for education purposes by the Wirrimbirra Sanctuary. Soft drink bottles and cans were also observed around the pools. A *Halls Sarsparilla* can dating to the 1970s was found on the east bank of Wirrimbirra Creek in the vicinity of Okenden Pool (Plate A.21) (canmuseum.com 2013). The can likely came from a visitor to the Sanctuary.

vii The mound features

Five two-tier mounds were recorded within Lots 33, 32 and 17 (BRE_600_pa16, 17, 25, 25, 28). These features had not been observed by the previous surveys, probably due to undergrowth obscuring visibility until the recent fires. The mounds were constructed by similar methods and are of a similar size. Two categories of mounds were

observed, those with shale inclusions and those with pebble inclusions. The inclusion of shale or pebbles within the feature does not relate to lot boundaries.

It is likely the mounds are the result of natural processes. Soil mounds are one of the five main types of nests constructed by termites in Australia, as such, these mound features may be the remains pre-fire abandoned or failed termite nests (Australian Museum online 2019). Active termite mounds were observed during the survey (Plate A.20). Other types of mounds are likely to be overburden, resulting from excavations for dams and other activities on the site.

A cultural interpretation of the mounds was not discounted as pebble/shale rubble in a matrix of natural silty clay was used in the construction of the square sandstone feature. Moreover, the upper portions of the mound features were solid as opposed to termite mounds where the centre is hollow, and the outer portions are marked by numerous tunnels. If the mounds are the result of human activity, it is possible they may be the remains of temporary camps or another type of construction on the properties after the land was resumed by the railway and the lot boundaries were not regulated.

Further research would be necessary to determine if the features are natural or cultural items.

5.8.3 Summary

The survey recorded a total of 14 items/sites within the Sanctuary Reserve, eleven of which had not been identified in previous surveys. Three of the thirteen features identified by Greenup et al. (1992) were confirmed (Table 5.1). The large number of sites that remained unconfirmed were the result of poor descriptions and lack of maps within Greenup et al. (1992) and subsequent reports (OEH 2013; Niche 2018). Thunderstorms on the day also affected the results of the survey. It is likely further historical items are present within the study area.

The compact shale surface in Lot 33 possibly indicates a pre-sanctuary structure in the Lot, however, this feature may be related to the construction of walking trails through the Reserve during the Sanctuary period. Evidence for the construction and repair relating to the train line was present around Tea Tree Creek near the railway culvert.

The fireplace (BRE_600_pa21) and “well” (BRE_600_pa19) in Lot 32 illustrate that a dwelling and possible homestead was present in the property boundaries. The fireplace structure was set back approximately 300 m (east) from the Great Southern Road, confirming Edward Brodie’s (1974) accounts that the soil was of a higher quality away from the road. It is possible the fireplace relates to John Juleff Harry’s occupation of the lot. The sandstone square feature (BRE_600_pa20) also points to activity on the lot. It is possible that the feature is a different phase of the homestead as a connection to the railway cannot be discounted at this time. The considerable artefact deposit (BRE_600_pa26) dating to the twentieth century east of Wirrimbirra Creek within Lot 32 is of an unknown origin and may benefit from future research.

The large pit feature in Lot 17 may relate to Mr Shorts homestead (BRE_600_pa27).

The mound features found across Lots 33, 32, and 17 are of an unknown origin. Further research may assist in determining if the features are natural or cultural items.

Table 5.1 Observed items previously identified within study area

Lot	Item (Author and date)	Observed	Comment (EMM 2020)
33	Remains of a sandstone wall in the western area of Wirrimbirra near Caloola Creek	no	The location of the item is unclear. A 1992 Wirrimbirra Sanctuary trail map puts "The "wall" east of trainline. No wall or remnants were found in the marked area.
32	Well (Greenup et al.; OEH 2013)	yes	BRE_600_pa19. Dry at the time of recording. No fire damage. More likely to be the negative impression of a tank related to railway construction and/or operations, than a structured well.
	Remains of stonework for a hut (Greenup et al.; OEH 2013 "ruins of the old homestead")	yes	BRE_600_pa20. No fire damage.
	Old fence (Greenup et al.)	no	May have been destroyed by fire.
18/19	Stone foundation of an old hut (Greenup et al.)	no	Not re-located.
	Drain line (pioneer trench) (Greenup et al.)	no	Not observed. Likely obscured by ash cover. Possibly a drainage ditch on Robert Campbell's property and part of the land improvements.
	Soil change (Greenup et al.)	no	Likely obscured by ash cover.
	Old dray track between railway and Waratah Trail near Wattle Creek (Greenup et al.)	no	Clearing of undergrowth by fire made identification of trackways (including modern walking tracks) difficult as there little visible differentiation in the ground surface.
17	Well site (Greenup et al.)	yes	BRE_600_pa27. Dry at the time of recording. No fire damage. More likely to be a soak rather than a structured well.
	Stand of Casuarinas and grooves in soil between plant nursery and cabins (Greenup et al.)	no	Impacted by fire. Area was an asbestos hazard.

6 Assessment of significance

6.1 Defining heritage significance

In NSW the assessment of heritage significance is based on the Burra Charter (Australia ICOMOS 1999) and further expanded upon in the Heritage Manual's Assessing Heritage Significance (Heritage Office 2001). It lists seven criteria to identify and assess heritage values that apply when considering if an item is of state or local heritage significance as set out in Table 6.1.

Table 6.1 NSW heritage assessment criteria

Criterion	Explanation
a)	*An item is important in the course or pattern of NSW's (or the local area's) cultural or natural history (Historical Significance).*
b)	*An item has strong or special association with the life or works of a person, or group of persons of importance in NSW's (or the local area's) cultural or natural history (Associative Significance).*
c)	*An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area) (Aesthetic Significance).*
d)	*An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons (Social Significance).*
e)	*An item has the potential to yield information that will contribute to an understanding of NSW's (or the local area's) cultural or natural history (Research Significance).*
f)	*An item possesses uncommon, rare or endangered aspects of NSW's (or the local area's) cultural or natural history (Rarity).*
g)	*An item is important in demonstrating the principle characteristics of a class of NSW's (or the local area's) cultural or natural places or environments (Representativeness).*

The following section presents the statement of significance for the Wirrimbirra Sanctuary and suggested additions to the current listings.

6.2 Assessment of Significance

6.2.1 Assessment against the criteria –Wirrimbirra Sanctuary SHR 01508

Table 6.2 Wirrimbirra Sanctuary (from the SHR)

Criterion	Assessment
a) Historical	Significant for its role in the development of the conservation movement in NSW, and for its association with key persons who pioneered the conservation debate, the evolution of the conservation movement in Australia and environmental education in NSW. Also associated with pioneering expeditions which led to the settlement of the Southern Highlands Region and the first written report of the koala and lyrebird in Australia (Greenup, Conservation Plan for Wirrimbirra Sanctuary 1992).
b) Associative	Not listed against this criterion at this time.

Table 6.2 Wirrimbirra Sanctuary (from the SHR)

Criterion	Assessment
c) Aesthetic	The Sanctuary forms part of a link between the large natural areas of the Metropolitan and Warragamba Catchments and the Greater Blue Mountains and is therefore significant as a corridor for wildlife, particularly as areas immediately to the South of the Sanctuary have been cleared. As a remnant of the Bargo Bush, it contains a rich and diverse flora and fauna habitat including a number of rare or threatened species. It contains extensive plantings of native plants, including rare and endangered flora. (L Greenup – Conservation Plan for Wirrimbirra Sanctuary 1992).
d) Social	It is of social significance for its promotion, education and an example to the community with respect to practical protection of Australia's flora and fauna, and research into management and preservation of indigenous wildlife. Education of young people in the endless facets of the natural and man-made environment. (Introduction to Wirrimbirra Sanctuary, 1991).
e) Research	Wirrimbirra is a leaning centre for the education of students in environmental matters through an 'outdoor' classroom, designed to represent a variety of plant communities ranging from aquatic plants to tree tops and their related communities. This specialised classroom, together with nature trails, natural Bargo Brush and a nursery, provide valuable lessons for students. The Centre is recognised as a leading institution in environmental education. (Greenup, Conservation and Business Plan for Wirrimbirra 1992).
f) Rarity	The importance of Wirrimbirra as a centre for environmental education was recognised by the visit in 1992 of specialists from the OECD as part of an international research project on policy and practice in environmental education. Wirrimbirra holds an enviable reputation in promoting the environment.
g) Representativeness	Not listed against this criterion at this time.

The Wirrimbirra Sanctuary SHR listing (01508) was updated on 30 June 2000, however, the assessment against the significance criteria does not appear to have been revised at that time. A number of potential additions/amendments to the current listing have been identified in the preparation of this report and are presented in Table 6.3.

Table 6.3 Proposed additions/amendments to Wirrimbirra Sanctuary Assessment of Significance

Criterion	Assessment
A) Historical	As per the SHR listing
b) Associative	The Wirrimbirra Sanctuary has strong associations to key figures in Australia's conservation movement. The Sanctuary was established by Thistle Stead in memory of her husband, conservationist David Stead. Thistle Stead was an educator, biologist and wildlife preservationist who advocated to educate and raise awareness of Australian flora and fauna within the general community. The Wirrimbirra Sanctuary represents the physical manifestation of Stead's conservation education philosophies. The major buildings within Wirrimbirra Sanctuary were designed by architect Milo Dunphy who established the Total Environment Centre and was instrumental in the resurgence of the Australian Conservation Foundation, which campaigned for conservation of the natural environment. Level of significance: State
c) Aesthetic	As per the existing SHR listing with additional assessment (below) Buildings within the Wirrimbirra Sanctuary, including the Visitor's Centre and Ranger's Cottages, demonstrate architectural innovation as early examples of sustainable architecture. The Visitor's Centre was designed by architect firm Loder and Dunphy and not only exhibits distinctive attributes in form but also represents the culmination of Milo Dunphy's design and conservation philosophies. The Sanctuary also contains vestiges of the Bargo Brush – a landscape that is now largely gone but was an integral part of access issues to Argyle. Level of significance: State

Table 6.3 Proposed additions/amendments to Wirrimbirra Sanctuary Assessment of Significance

Criterion	Assessment
e) Research	As per the existing SHR listing with additional assessment (below) Archaeological evidence present within the conservation area of the Wirrimbirra Sanctuary has the potential to yield information relating to colonial expansion, the development of regional economies, and cultural life in NSW over the nineteenth and twentieth centuries. Evidence of structures, sub-surface features, and artefact deposits were noted and recorded during field surveys in 1992 and 2020. Moreover, archaeological evidence relating to education at the Sanctuary also survives in the project area. An understanding of the day to day lives of small property holders in NSW is not readily available from other sources. Evidence of the historical period, in the form of sandstone structures, has the potential to yield archaeological information about settler life in remote locations. Level of significance: Local
f) Rarity	As per the existing SHR listing with additional assessment (below) Archaeological features relating to the early historical use of the place, such as the locations where sandstone wall ruins survive, may hold information related to early colonial expansion and daily life in the region.
g) Representativeness	The Wirrimbirra Sanctuary is an outstanding place as it is one of the few forested areas remaining on the flat plateau of the Bargo area and contains remnant Bargo Brush. The Wirrimbirra Sanctuary is a physical representation of the philosophies developed in the early years of Australia's conservation movement. Level of significance: State

6.2.2 Wirrimbirra Sanctuary Statement of Significance

The Wirrimbirra Sanctuary is a State significant site, important for its role in the development of the conservation movement in NSW; its association with key persons who pioneered the conservation debate; as a natural area with a rich and diverse flora and fauna, including rare and endangered species; as a recreation and social area; as a historic site containing relics and cultural items, as well as being associated with the pioneering expeditions to the Southern Highlands; as an area containing extensive plantings of native plants including rare and endangered species, and as an area which encouraged investigations into the growing and propagation of native plants (Tait 1997 in SHR 01508).

The Wirrimbirra Sanctuary was founded in 1963 by Dr Thistle Y. Stead and the David G. Stead Memorial Wild Life Research Foundation of Australia as a memorial to David G. Stead (Wirrimbirra Sanctuary n.d.). Thistle Stead contributed to the Australian conservation movement through the promotion of conservation through education (Webb 2012). David Stead was a naturalists and key figure in the Australian conservation movement (Walsh 1990).

The Sanctuary contains a surviving remnant of Bargo Brush, a natural environment which features heavily in narrative of Australian exploration, history and mythology (Wirrimbirra Sanctuary n.d.). Archaeological remnants within the Sanctuary Reserve represent a short-lived attempt to tame the brush during the latter nineteenth and early twentieth centuries and contribute to the history of the Bargo Brush. Moreover, the Sanctuary is a protected area for native flora and fauna and a place for research, education, and tourism (Wirrimbirra Sanctuary n.d.). The Wirrimbirra Sanctuary was gifted to the National Trust in 1965 and the Sanctuary is listed on the NSW State Heritage Register (01508) as a significant natural area connected to Australia's conservation movement and historic events.

7 Heritage impact assessment

7.1 Background to assessing impacts

The assessment of the impact of a project to the heritage significance of a place or an item is to understand change; if it is beneficial to the place or item; and how changes can be managed to best retain significance. The historical landscape in Australia, be it rural or urban, is by social agreement, a significant aspect of our identity. That agreement is codified in legislation, the intent of which is to encourage the conservation of cultural heritage by incorporating it into development where feasible. In many situations avoiding impacts is impossible, but the aim is to reduce those impacts by either project re-design or managing the loss of information through methods that reduce and/or record significance before it is removed.

The framework around assessing significance and therefore suitable levels of impact is to understand how the place or item came to be, how important it was (and may be still) in the development of the local area or the state (the colony at the time) and providing guidance on its management. This is what this report aims to do.

7.2 The proposed activity

7.2.1 Longwall mining

Longwall mining is a method of underground coal mining that involves the extraction of large rectangular panels of coal by progressively shaving slices of coal from the longwall face under the protection of hydraulic roof supports. As coal is excavated, the weight of the overlying ground originally supported by the coal becomes supported only by the remaining pillars or walls. This causes the mine void walls to compress and the overlying rock to crack and tilt into the void.

Tahmoor Mine extracts coal using the longwall mining method. This method will continue to be employed in Tahmoor South Coal, where coal will be extracted in a series of longwall panels approximately 400 metres beneath the surface. Subsidence at the ground surface occurs as underlying strata collapse into the void, which is called the goaf. The ground at the surface subsides vertically and moves horizontally towards the centre of the mined goaf area. Maximum subsidence typically occurs near the centre of each panel, reducing gradually towards and beyond the edges of the longwall panels. Vertical subsidence, by itself, typically does not result in impacts on surface features. Impacts typically occur due to differential subsidence movements. The changes in subsidence result in a change in the natural slopes of the ground surface, which is referred to as tilt, and bending of the ground surface, which is referred to as curvature. Horizontal mining-induced movements also vary across the ground surface. The changes in horizontal movements are referred to as strain. Tensile strains occur where the ground stretches, which can result in surface cracking. Compressive strains occur where the ground shortens, which is less visible on the ground surface but can result in buckling of the ground surface.

These changes occur gradually as longwall mining progresses, which is why regular monitoring is an important aspect of managing heritage items above longwalls. Analysis of strains in survey bays during the mining of previous longwalls in the Southern Coalfield is based on measurements taken from previous longwalls at Tahmoor, Appin Area and West Cliff Collieries. Above goaf, the 95% confidence levels for maximum total strains at these sites were 0.9 mm/m tensile and 1.6 mm compressive. The strains for the proposed longwalls are predicted to be 20 % to 40 % greater than those previously observed at these collieries and, therefore, it is expected that 95 % of the strains measured above goaf would be less than 1.3 mm/m tensile and 2.2 mm/m compressive. The 99 % confidence levels for the maximum total strains that the individual survey bays *above goaf* at these mines were 1.4 mm/m tensile and 3.1 mm/m compressive. It is therefore expected that 99 % of the strains measured *above goaf* for the proposed longwalls would be less than 2.0 mm/m tensile and 4.3 mm/m compressive.

Above solid coal, the predictions of strain at 95% confidence levels at the abovementioned collieries was 0.6 mm tensile and 0.5 mm compressive. The strains for the proposed longwalls are predicted to be 20 % to 40 % greater than those previously observed at these collieries and, therefore, it is expected that 95 % of the strains measured *above solid coal* would be less than 1.0 mm/m tensile and compressive. At 99% confidence, would be less than 1.5 mm/m tensile and 1.5 mm/m compressive (for a more detailed analysis of strains associated with the subject longwalls, refer to MSEC 2020).

The prediction of impacts to heritage sites is determined first by adequate surveys to determine the existence and significance of heritage sites within the study area. The design and configuration of buildings and the materials of which they are built will determine the effects which mining subsidence will have upon them. In addition, the levels of impact due to curvature and strain will vary considerably throughout the longwall area (EIS 1998, p.85-6). Structures which are most susceptible to subsidence-induced damage are those with more rigid foundations or built directly on bedrock. It is possible that the culverts or tunnels discussed in this report could be built directly on bedrock.

7.3 Potential subsidence impacts to heritage items

The Wirrimbirra Sanctuary is a listed heritage item within the project area. Wirrimbirra Sanctuary is listed on the NSW SHR (01508) and RNE (3305). At present, the Sanctuary is owned by the National Trust (NSW) and is being maintained as the Australian Wildlife Sanctuary. The Sanctuary property is above sections of LW101A, LW102A, LW103A and LW104A of the proposed mine extension.

The Wirrimbirra Sanctuary is located in a region that was historically known as the 'Bargo Brush' and retains some of that historical landscape. The surviving area Bargo Brush is significant as a representative and aesthetic element of the historical landscape that was inhospitable to new settler life.

The western section of the Wirrimbirra Sanctuary, between Remembrance Driveway and the Southern trainline contains six buildings, animal pens, structured paths, pond and dam (Figure 5.2). The Visitor's centre, cottages, workshop, and glasshouse have been constructed with concrete foundations. While concrete is inflexible and may experience cracking as a result of subsidence, the buildings have been constructed with timber frames. Therefore, the structures above the foundations are flexible and should experience minimal impacts from the proposed levels subsidence. The Alan Strom pond is constructed of concrete, but the shallow depth of the pond means it is unlikely to be affected by the predicted subsidence. It is not known if the supports for the animal pen fences are set into the bedrock, if this is the case, the fences may be destabilised by subsidence. Surface features, such as paths, and the dam are very unlikely to experience impacts from the predicted subsidence.

The probabilistic assessment (Table D.03 MSEC 2020) determined that impacts arising from the mining method will be very minor to nil. This method of assessment is based on the observation of impacts to three other longwall locations – Tahmoor, Appin Area and West Cliff Colliery.

The predicted mining induced conventional subsidence movements for LW101A to LW106B have been published in MSEC report No. MSEC1123. Table 7.1 presents the maximum predicted total subsidence movements after the extraction of the longwalls within a 20 m radius of the Wirrimbirra Sanctuary structures.

The landscape will experience mine subsidence movement, but the orders of magnitude will be such that changes will not be visually perceptible and will therefore not have a detrimental effect on its significance.

Table 7.1 Maximum predicted total conventional subsidence on heritage structures parameters due to the extraction of Longwalls 101A to 106B (MSEC July 2020, Table D.12

Structure (MSEC ID)	Description	Maximum predicted total subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km-1)	Maximum predicted total sagging curvature (km-1)
BRE_580_pa01	Cabins 4 and 5 - destroyed by bushfire	1,200	3.5	0.05	0.04
BRE_580_pa02	Cabin 3 – destroyed by bushfire	1,250	3.5	0.05	0.04
BRE_580_pa03	Laboratory – destroyed by bushfire	1,300	3.5	0.06	0.15
BRE_580_pa04	Schoolhouse / hall – destroyed by bushfire	1,300	3.5	0.06	0.19
BRE_580_pa05	Nursery structure	1,000	3.0	0.05	0.03
BRE_580_pa06	Amenities – destroyed by bushfire	1,300	3.5	0.06	0.15
BRE_580_pa07	Cabin 1 – destroyed by bushfire	1,300	3.5	0.06	0.10
BRE_580_pa08	Cabin 2 – destroyed by bushfire	1,250	3.5	0.05	0.06
BRE_580_pa09	Garden shed – destroyed by bushfire	1,100	3.5	0.05	0.04
BRE_580_pa10	Dingo shed – damaged by bushfire	950	2.0	0.07	0.03
BRE_580_pa11	Shade house – destroyed by bushfire	900	2.0	0.07	0.03
BRE_580_pa12	Shade house – damaged by bushfire	900	2.0	0.07	0.03
BRE_580_pa13	Shade house – destroyed by bushfire	900	1.5	0.07	0.03
BRE_580_pa14	Shed	950	2.0	0.06	0.03
BRE_580_pa15	Shade house	950	2.5	0.06	0.03
BRE_600_pa01	Visitor centre	1,000	3.0	0.06	0.03
BRE_600_pa02	Cottage 1	950	3.0	0.07	0.03
BRE_600_pa03	Shade house	900	3.0	0.07	0.03
BRE_600_pa04	Workshop	900	2.0	0.07	0.03
BRE_600_pa06	Glass house	950	2.5	0.05	0.03
BRE_600_pa07	Enclosure 1	1,100	3.5	0.05	0.04
BRE_600_pa08	Enclosure 2	1,100	3.5	0.05	0.04
BRE_600_pa09	Cottage 2	900	1.5	0.07	0.03
BRE_600_pa10	Awning	900	2.0	0.07	0.03
BRE_600_pa11	Aviary – destroyed by bushfire	900	1.5	0.07	0.03
BRE_600_pa12	Aviary – destroyed by bushfire	900	1.5	0.07	0.02
BRE_600_t05	Water tank – destroyed by bushfire	900	1.5	0.07	0.02
BRE_600_t06	Water tank – destroyed by bushfire	900	2.0	0.07	0.02

Fourteen items/possible relics have been recorded within the conservation area, east of the rail line (Figure 5.3). The large “well” in Lot 32 had previously been described as a shallow structure; however, it was observed to be at least 3 m in depth and cut through the shale bedrock (Niche 2018a). Although dry during the survey, the well has been photographed containing water in both Greenup et al. (1992) and OEH (2013). Cracking in the bedrock may cause cracks within the structure of the well and affect the ability for the feature to fill. The “well”, and other

possible water holes within the Sanctuary, may also be affected by impacts to ground water levels. Although a historical feature, the well is an important role as a water source for fauna within the reserve. However, the subsidence prediction for this feature is that adverse impacts to the wells are unlikely (MSEC 2020, p.178)

On the basis of the MSEC subsidence predictions it is considered that the likelihood of adverse impacts on the remaining archaeological sites within the study area is very unlikely.

MSEC provided predicted mining induced conventional subsidence movements for relics within the Sanctuary Reserve, with the effects predicted generally to be low.

A summary of the predicted impacts of subsidence on historical heritage sites across the Wirrimbirra Sanctuary is provided in Table 7.2.

Table 7.2 Historical sites/items within study area and predicted probability of LW impact.

Item (MSEC ID)	Site name	Site type	Significance	Location in relation to LWs	Predicted probability of impact
BRE_600_pa01-12 (see above)	Wirrimbirra Sanctuary- primary precinct	Complex of built structures	State	Directly above LW 103A and 104A.	Possible
BRE_600_pa13	Wirrimbirra Sanctuary- dam	Built structure	State - contributory	Directly above LW 103A.	Unlikely
BRE_600_pa14	Wirrimbirra Sanctuary- mounds near Dam	Overburden	None	Directly above LW 103A.	Unlikely
BRE_580_pa16	Wirrimbirra Sanctuary- Alan Strom pond	Built structure	State- contributory	Directly above LW 104A.	Possible
BRE_600_pa07-08	Wirrimbirra Sanctuary - animal Pens	Built structure	State- contributory	Directly above LW 104A.	Unlikely - dependant on depth
BRE_600_pa31	Wirrimbirra Sanctuary- landscaping	Landscape	State	Directly above LW 103A and 104A.	Very unlikely
BRE_600_pa16, 17, 25, 25, 28	Mound features	Overburden	None	Directly above LW 101A to 104A.	Very unlikely
BRE_600_pa18	Lot 33- compact shale	Unknown	State	Directly above LW 102A.	Very unlikely
BRE_600_pa19	Lot 32/132 - “well”	Built structure	State	Directly above LW 103A.	Very unlikely
BRE_600_pa20-21	Lot 32/132 - sandstone features	Archaeological remains	State	Directly above LW 103A.	Very unlikely
BRE_600_pa22, 26	Lot 32/132- artefact deposits	Relics	State	Directly above LW 102A and 103A.	Very unlikely
BRE_600_pa27	Lot 17- pit feature	Built structure	State	Directly above LW 103A.	Unlikely

8 Management measures

8.1 Heritage management objectives

The overriding objective in managing heritage significance is the avoidance of impacts. Avoidance removes the need for mitigation or amelioration and is in keeping with the philosophy of the *Burra Charter 2013* (Australia ICOMOS 2013).

In all cases where significant heritage values may be affected by a project, it is prudent to take a precautionary approach. Longwall mining can result in subsidence related impacts and while these can be predicted, there is a residual degree of risk for items within the subsidence contour.

The *Burra Charter* (Australia ICOMOS 2013) advocates a cautious approach whereby as much as necessary is done to care for the item and make it useable, but otherwise change it as little as possible so that its cultural significance is retained. With these principles in mind, the following management measures are proposed.

An overarching strategy to protect the significance of heritage items during longwall mining at Tahmoor Mine has been followed to date and will continue as needed through active monitoring. This will continue to be applied during the mining of LW101A to LW104A for heritage items or potential heritage items within the study area. That is, the items will be assessed prior to the commencement of underground mining and reinforcement measures taken where necessary. The items will be monitored throughout the extraction of LW101A to LW104A.

8.2 General measures

An ongoing program will be implemented to monitor the impacts and consequences of subsidence effects during the extraction of longwalls below the Wirrimbirra Sanctuary. The monitoring program will record the condition of the relevant sites before mining (baseline recording and baseline check) and the condition of the relevant sites after mining (post mining initial condition and post mining secondary condition check).

The proposed program has been informed by Tahmoor Coal's experience with managing subsidence impacts to buildings of similar construction in subsidence areas.

Specific management measures for the items within the Wirrimbirra Sanctuary are discussed below.

8.3 Specific management measures

Subsidence impacts within the Wirrimbirra Sanctuary is predicted to be variable, as such, items should have specific management measures. A management plan including a Trigger Action Response Plan (TARP) for the Wirrimbirra Sanctuary should be implemented prior to longwall extraction.

The Visitor's Centre, cottages, and ancillary structures of the main precinct of the Wirrimbirra Sanctuary may experience subsidence impacts. The buildings will be monitored throughout the project so any impacts can be managed through early detection and the implementation of appropriate mitigation measures implemented.

Based on the predicted subsidence, negligible subsidence impacts for the historical heritage items within the Wirrimbirra Sanctuary are expected.

Although MSEC have considered predicted mining induced conventional subsidence movements for relics and other significant features within the Sanctuary Reserve to be negligible, it is suggested that, due to its depth and interactions with the bedrock, the large well (BRE_600_pa19) in Lot 132 be monitored in future surveys recording the impacts of subsidence on the groundwater within the Wirrimbirra Sanctuary.

Where relics are noted with subsidence-related changes, archaeological excavation should be considered.

The specific management measures for the items within the Wirrimbirra Sanctuary are presented in Table 8.1.

Table 8.1 Mining subsidence management measures for Wirrimbirra Sanctuary.

Item (MSEC ID)	Item	Subsidence performance measures	Probability of subsidence impact	Management measures
BRE_580_pa01-15	South complex of structures (destroyed by fire)	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	No management measures due to previous damage.
BRE_580_pa16	Alan Strom pond	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Unlikely.	Monitor structure at completion of extraction of LW 103A and 104A.
BRE_600_pa07-08	Animal Pens	Negligible subsidence impacts or environmental consequences	Unlikely.	Monitor structure at completion of extraction of LW 103A and 104A.
BRE_600_pa01	Visitor's Centre	Low possibility of subsidence impacts or environmental consequences Negligible loss of heritage value	Possible impacts to concrete foundations. Unlikely impacts to overall structure.	Monitor throughout longwall extraction.
BRE_600_pa02, BRE_600_pa09	Cottages	Low possibility of subsidence impacts or environmental consequences Negligible loss of heritage value	Possible impacts to concrete foundations. Unlikely impacts to overall structure.	Monitor throughout longwall extraction.
BRE_600_pa03-06, BRE_600_pa10-12	Ancillary structures	Low possibility of subsidence impacts or environmental consequences Negligible loss of heritage value	Possible impacts to concrete foundations. Unlikely impacts to overall structure.	Monitor throughout longwall extraction.
BRE_600_pa13	Dam and surrounds	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	Monitor structure at completion of extraction of LW 103A and 104A.
BRE_600_pa31	Landscaping	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	Monitor at completion of extraction of LW 103A and 104A.

Table 8.1 Mining subsidence management measures for Wirrimbirra Sanctuary.

Item (MSEC ID)	Item	Subsidence performance measures	Probability of subsidence impact	Management measures
BRE_600_pa16, 17, 25, 25, 28	Mound features	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	No management required
BRE_600_pa18	Lot 33- compact shale	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	Monitor at completion of extraction of LW 101A to 104A.
BRE_600_pa19	Lot 132- “Well”	Low possibility of subsidence impacts or environmental consequences Negligible loss of heritage value	Possible impacts to ability to fill.	Monitor at completion of extraction of LW 103A.
BRE_600_pa20-21	Lot 132- Sandstone features	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	Monitor at completion of extraction of LW 101A to 104A. Archaeological excavation if substantial movement is noted.
BRE_600_pa22, 26	Lot 132- artefact deposits	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	Monitor at completion of extraction of LW 101A to 104A. Archaeological excavation if substantial movement is noted.
BRE_600_pa27	Lot 17- pit feature	Negligible subsidence impacts or environmental consequences Negligible loss of heritage value	Very unlikely.	Monitor at completion of extraction of LW 101A to 104A.

8.4 Conclusion

The results of the assessment of impacts against identified heritage items (including relics, standing structures and landscape features) is that the range of probability is ‘possible’ to ‘very unlikely’. The assessment of impacts in this report is based on the experience of subsidence impacts at Tahmoor and the adjacent mines of Appin Area and West Cliff collieries.

Provided that the management measures described in this report are included and qualified in the project management plan, impacts to heritage items should be able to be managed without loss of value.

References

Ancestry.com (a) *Australia, Electoral Roles, 1903-1980* [database online] (1903-1904, entry 1573, Redfern, NSW), Ancestry.com Operations Inc, accessed 4 September 2019.

Ancestry.com (b) *Australia, Death Index, 1787-1985* [database online] (1900, NSW), Ancestry.com Operations, Inc. accessed 4 September 2019.

Attenbrow, V. 2010, *Sydney's Aboriginal Past: Investigating the Archaeological and Historical Records*, University of New South Wales Press.

Australian Dictionary of Biography (ADB), accessed 4 September 2019, *Stead, David George (1877-1957)*, http://adb.anu.edu.au/biography/stead-david-george-8634/text15087

- *Stead, Thistle Yolette (1902–1990)*, http://adb.anu.edu.au/biography/stead-thistle-yolette-15520/text26732
- *Wilson, John (?-1800),* http://adb.anu.edu.au/biography/wilson-john-2803/text4001

Australian Museum 2019, *Termites*, accessed 12 February 2020, https://australianmuseum.net.au/learn/animals/insects/termites/

Australian Town and Country Journal, 17 March 1894, Picton (By our special reporter), p.16.

Backhouse, James 1843, *Narrative of a Visit to the Australian Colonies London*, Adams and Co, Hamilton.

Brodie E. 1974, *'The history of Bargo' 1797-ca. 1930 Written by Edward Brodie, 1974*. Unpublished Manuscript.

Burke, H. & Smith, C. 2004. *The Archaeologist's Field* Handbook, Allen and Unwin, Crows Nest.

Canmuseum.com 2013, HALL'S-Sarsaparilla-370mL-Australia, accessed 30 January 2020, http://www.canmuseum.com/Detail.aspx?CanID=48866

DEC 2005, *A History of the Aboriginal People of the Illawarra 1770 to 1970* New South Wales Department of Environment and Conservation, Hurstville.

Department of Lands, 1894, *Parish of Bargo, County of Camden, Land Districts of Picton and Mossvale, Eastern Division N.S.W.*, *Second compilation, Sixth edition*, scale not given, Department of Lands Sydney, Sydney.

Design and Art Australian online 2015, *Milo Dunphy b.1921*, accessed 31 January 2020, https://www.daao.org.au/bio/milo-dunphy/biography/

Discover Collection State library online 2013, *John Price's Account* http://www2.sl.nsw.gov.au/archive/discover_collections/history_nation/exploration/early/interior/price.html

Education: Journal of the N.S.W Public School Teachers Federation 1967, Wirrimbirra Sanctuary at Bargo, Vol.4, No. 10, p.88.

Encampment of drays at Bargo River, on the Goulburn Road [engraving], 1857, accessed 5 September 2019 from https://nla.gov.au:443/tarkine/nla.obj-138445149

Greenup l., Close E., Dermody J., Lembit R. and McDougall R. 1992, *A Conservation and Business Management Plan for Wirrinbirra Sanctuary, Bargo*, report prepared for the David G. Stead Memorial Wild Life Research Foundation of Australia.

Gullick W. 1918 'Taphoglyphs (Inhumation, "Carved Trees," or Grave-Indicators' *in The Dendroglyphs or Carved Trees of NSW,* accessed 16 September 2019, https://downloads.newcastle.edu.au/library/cultural%20collections/pdf/etheridge2.pdf

Higginbotham E. 1992, *The Historical Archaeology of Rural Settlement in the South Western Districts* PhD thesis in 3 volumes, University of Sydney Rare Books Library.

Jervis, J. 1937, *The Wingecarribee and Southern Highlands District. Its Discovery and Settlement. Journal of the Royal Australian Historical Society,* Vol 23, pp. 247-291.

1986, *A history of the Berrima district, 1798-1973,* Library of Australian History in association with Wingecarribee Shire Council.

Liston, C. 1988 *The Dharawal and Gandangara in Colonial Campbelltown, New South Wales, 1788-1830,* Campbelltown City Council.

McDonald, J. 2008, Social Context', in Dreamtime Superhighway: Sydney Basin Rock Art and Prehistoric Information Exchange, ANU Press.

Mitchell, E. 1938 'Barrallier's Blue Mountains Explorations, 1802', *Journal and Proceedings*, Royal Australian Historical Society, vol 24, part 4, pp. 291-313.

Murray, R. & White, K. *1988 Dharug and Dungaree: The History of Penrith and St Marys to 1860*, Hargreen Publishing Company in conjunction with the Council of the City of Penrith.

Niche Environment and Heritage 2018a, *Tahmoor South Project: Historical Heritage Assessment,* Report prepared for Tahmoor Coal Pty Ltd.

Niche Environment and Heritage 2018b, *Tahmoor South Project: Aboriginal Cultural Heritage Assessment*, Report prepared for Tahmoor Coal Pty Ltd.

NSW Office of Environment and Heritage 2000, "Wirrimbirra Sanctuary", in *State Heritage Register*, Heritage Branch, NSW Office of Environment and Heritage, Sydney.

NSW Office of Environment and Heritage 2013, *Conservation agreement between The Minister Administering The New South Wales National Parks and Wildlife Act (1974) and The National Trust of Australia (NSW) for Wirrimbirra Sanctuary*, New South Wales Office of Environment and Heritage, Sydney.

NPWS n.d. *Bargo State Conservation Area*, NSW National Parks and Wildlife Service, accessed 3 September 2019, https://www.nationalparks.nsw.gov.au/visit-a-park/parks/bargo-state-conservation-area/learn-more#61A8EE367AC648A69940A8C336891156

Robinson, J.F. 1998, *Reflections from a bush town: Pioneer Families of Bargo, NSW,* Bargo, N.S.W.

Roads and Maritime Services (RMS) 2013*, The Old Hume Highway: History Begins with a Road: Routes, Towns, and Turnoffs off the Old Hume Highway,* Roads and Maritime Service NSW, Milsons Point.

Sir Joseph Banks papers, Letter received by Banks from George Caley, 27 September 1807, 18.068, State Library of NSW, accessed 5 September 2019, https://www.sl.nsw.gov.au/banks/section-05/series-18/18-068-letter-received-by-banks-from-george

Society for Historical Archaeology online, *Bottle Glossary*, accessed 06 February 2020, https://sha.org/bottle/glossary.htm

Stokes, K. 2015 *Stones, Sources and Social Networks: Tracing Movement and Exchange Across Dharawal Country, Southeastern Australia*, Honours thesis, Department of Archaeology, University of Sydney.

Sydney Gazette and New South Wales Advertiser,

- 12 June 1823, Notice, p.3.
- 26 April 1832, Notes of a pedestrian tour from Bathurst, via Argyle, No. III Bong Bong to Camden, p.3.

Tait 1997 *Wirrimbirra – The Next Generation*

Thwaites, J. 1964a, Thistle Y. Stead at entrance to Wirrimbirra Wildlife Sanctuary - Tea Tree Hollow near Bargo NSW NS3195/1/3080 [photograph], accessed 5 September 2019, https://librariestas.ent.sirsidynix.net.au/client/en_AU/tas/search/detailnonmodal/ent:$002f$002fARCHIVES_DIGITISED$002f0$002fARCHIVES_DIG_DIX:NS3195-1-3080/one

Thwaites, J. 1964b, Wirrimbirra Gardens and Sanctuary - Tea Tree Hollow, near Bargo - NSW. NS3195/1/3078 [photograph], accessed 5 September 2019, https://librariestas.ent.sirsidynix.net.au/client/en_AU/tas/search/detailnonmodal/ent:$002f$002fARCHIVES_DIGITISED$002f0$002fARCHIVES_DIG_DIX:NS3195-1-3078/one

Wirrimbirra Sanctuary n.d., *Wirrimbirra Sanctuary*, accessed 2 September 2019, http://www.wirrimbirra.com.au/

Woolondilly Shire Council n.d., *Towns of Wollondilly*, accessed 2 September 2019, https://www.wollondilly.nsw.gov.au/lifestyle/tourism/towns-of-wollondilly/

Appendix A

Additional photographs

A.1 Wirrimbirra Sanctuary (between Remembrance Drive and the railway line)



Plate A.1 **Australian Native Dog Conservation Society Dingo Sanctuary building (BRE_600_pa07). View south-west.**



Plate A.2 **Gardens south of Visitor's Centre (BRE_600_pa31). View west.**



Plate A.3 Cottage 1 “Ranger’s Cottage” (BRE_600_pa02). View north-east.



Plate A.4 Cottage 2 (BRE_600_pa09). View south.



Plate A.5 **Glasshouse (BRE_600_pa06). View south-west.**



Plate A.6 **Workshop/store, south elevation (BRE_600_pa04). View north-west.**



Plate A.7 Dam and drainage channel (BRE_600_pa13). View south-east.



Plate A.8 "The Mounds" west of the dam (BRE_600_pa14). View south-east.



Plate A.9 Roy Okenden Memorial, an example of the memorials in Wirrimbirra Sanctuary.

A.2 Wirrimbirra Sanctuary Reserve (east of the trainline)

A.2.1 Lot 33



Plate A.10 Culvert 99.338 on Tea Tree Creek under the rail line. View north-west.



Plate A.11 Mound feature southeast of culvert (most northern in Lot 33) (BRE_600_pa17). View south-west.



Plate A.12 Crushed shale feature (BRE_600_pa18). View east.

A.2.2 Lot 32



Plate A.13 Shale pile north of square sandstone feature (BRE_600_pa20). View north-east.



Plate A.14 **Track east of square sandstone feature, following the direction of the crushed shale (BRE_600_pa20). View east.**



Plate A.15 **Brick, south of bottle glass deposit. View south-east.**



Plate A.16 **Small glass deposit (BRE_600_pa22). View east.**



Plate A.17 **Large clearing (BRE_600_pa23). View east.**



Plate A.18 **Mound feature north of clearing (BRE_600_pa24). View south.**



Plate A.19 **Mound feature north of clearing (north most of mounds in Lot 32) (BRE_600_pa25). View south-west.**

A.2.3 Lot 17



Plate A.20 Mound in east of Lot 17/1 (BRE_600_pa27). View south.

A.2.4 Wirrimbirra Creek



Plate A.21 *Halls Sarsaparilla* can.