# Goschen Rare Earths and Mineral Sands Project Cultural Heritage Impact Assessment

# Report to VHM Ltd

Sponsor: VHM Ltd

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### **EXECUTIVE SUMMARY**

This report provides an assessment of the potential Aboriginal cultural heritage, and historical cultural heritage-related, aspects associated with the construction and operation of the Goschen Rare Earths and Mineral Sands Project (the Project). The report presents an appraisal of the potential impacts of the Goschen Rare Earth and Mineral sands project on Aboriginal and historical heritage within the study area.

VHM Limited (VHM) engaged Eco Logical Australia Pty Ltd (ELA) to undertake an impact assessment of a mineral sands and rare earth elements exploration area in the Loddon Mallee Region near the Rural City of Swan Hill in north-western Victoria. VHM's tenure is located approximately 275 km northwest of Melbourne and 20 km south of Swan Hill. The Project, 35 km south of Swan Hill, is located in the Loddon Mallee Region of Victoria, within the Gannawarra Shire. The Project will involve the mining and processing of heavy mineral sands and rare earths.

On 10 October 2018 the minister for Planning determined that the Project has the potential for a range of significant environmental effects, in particular to... 'native vegetation and associated biodiversity values, surface water and groundwater, existing land uses and Aboriginal cultural heritage values'. The Minister determined that the proponent for the Project must prepare an Environment Effects Statement (EES) to inform the Minister's assessment of the project as per Section 4 (1) of the *Environment Effects Act 1978.* 

This report provides an understanding of the known and previously unregistered Aboriginal and/or historical cultural heritage within the Project study area. The purpose of this report is to present the results of the desktop and field assessments of Aboriginal and historical cultural heritage and define the performance requirements necessary to minimise impacts on Aboriginal and historical cultural heritage during construction, operation and decommission.

#### ABORIGINAL CULTURAL HERITAGE CONTEXT

The site is in the southern Murray Basin at the boundary of the Riverine plain and Mallee Regions of Victoria. The landscape materials are the Loxton Sands deposited as nearshore, shoreline and backshore ridges during a staged marine regression with episodes of stillstand from Late Miocene through Pliocene and into the upper Pleistocene. The deposits are distinctive curvilinear subparallel rides of fine to medium quartz and calcareous sand with abundant shelly fossils. Overlying the sands are clays and silts of Lake Bungunnia formed when the Murray River was defeated by a tectonic dam during the mid-Pleistocene. Several sand bodies of different origin and composition were emplaced across the Victorian Mallee region – Woorineen Formation and Molineaux Sand (formerly Lowan Sand) in the late Pleistocene. The location of the study area is partially located on the Cannie Ridge, a low but prominent north – south ridge uplifted in late Pilocene to early Pleistocene times and capped by ridges of Loxton Sand.

The study area falls within the Murray Mallee bioregion. The Murray Mallee, located in the north-west of the state, is typified by calcareous material in the form of broad undulating sandy plains that are often associated with linear, east-west aligned, low sand dunes with intervening heavier textured swales developed from Cainozoic (aka Cenozoic Era) deposits of alluvial, aeolian and swampy deposits. The vegetation is dominated by East/West-Dune Mallee with some Chenopod Mallee and Shallow-Sand Mallee.

The plains, drainage lines and groundwater discharge landscapes are dispersed with salt lakes and gypsum flats with lunettes developed on the eastern margins of the lakes. The Cainozoic deposits give rise to calcareous earths (Calcarosols), cracking clays (Vertosols), and red sands (Rudosols). The vegetation is dominated by Gypseous Plains Shrubland, Saline Shrubland (Raak), Plains Grassland and Drainage-line Grassy Woodland. The bioregion has few surface waterbodies due to highly permeable soils and climatic conditions. The Murray River forms the northern edge for the bioregion and the

Avoca River roughly defines the eastern edge. The bioregion has few surface waterbodies due to highly permeable soils and climatic conditions. Little remains of the native vegetation that would have covered the study area, with most ground surfaces having been cleared for agricultural purposes in the mid-19<sup>th</sup> century.

While there has been modifications and disturbance of the land due to European farming practices, prior archaeological investigations have indicated that it is unlikely Aboriginal cultural heritage places are present within the study area.

#### HISTORICAL HERITAGE CONTEXT

Swan Hill and the surrounding region were among the earliest settled areas in Victoria. The occupation of the broader region was influenced by environmental conditions that confronted selectors in the region in the later 19<sup>th</sup> century.

Initial European exploration of the study area occurred in the 1830s by Thomas Mitchell; by the late 1840s the area was fully occupied by squatters. The area remained sparsely settled and was grazed initially by sheep, and later by cattle, up until the late 1870s. Occupation of the landscape by pastoralists resulted in the clearance of native vegetation, the sinking of dams and the diversion/alteration of watercourses to provide for livestock. Further vegetation clearance, including grubbing out and burning of tree stumps, construction of water storages and fencing took place during this time, and continued ploughing and rabbit infestation led to widespread erosion. Dust storms were common by the early 1900s. Further settlement of the region was driven by closer settlement acts and the spread of irrigation schemes in the early twentieth century. Due to the regions highly saline ground water, which was too deep to extract and distribute, surface water was heavily relied on. Water has since dropped with the continuing drought, with the communities facing ongoing issues due to the dry conditions exacerbated by hydrology patterns fundamentally altered by 150+ years of white settlement, and the trading of water rights away from the region. The current low water quality in local streams and rivers is evidence of the impacts of historical land and water management practices.

The desktop review of the study area has not identified any historical heritage places or places of archaeological potential within the study area. A single historical site H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall) is located 150 m north of the study area.

### METHODOLOGY

The methods employed in the development of this cultural heritage impact statement included:

Completion of a desktop assessment, including:

- Review of the Victorian Aboriginal Heritage Register (VAHR), the Victoria Heritage Register (VHR) and the Victorian Heritage Inventory (VHI)
- Documentation review (e.g. background literature, geological and environmental conditions)
- Initial consultation with stakeholders (First Peoples State Relations and the Traditional Owners (Wemba Wamba)).

Completion of a standard assessment, including;

- Archaeological survey of the study area, including examination of ground surfaces, mature trees and any rock shelters or cave entrances, and historical structures or features in the study area.
- Field survey including identification of landforms and areas of Aboriginal cultural heritage sensitivity, to inform the site predictive model.
- Observations of developments and disturbance that may have impacted cultural heritage deposits.

#### ASSESSMENT FINDINGS

Aboriginal Cultural Heritage Findings

The desktop assessment conducted within the cultural heritage management plan and subsequent standard assessment (survey), has identified that there is a very low likelihood of subsurface Aboriginal cultural heritage. Geomorphological analysis of the study area has also demonstrated that the most common sediments (Loxton – Parilla sands) often contain a carbonate or limestone horizon at shallow depths below the surface. This layer of carbonate is of age that pre-dates human habitation. As observed during the standard assessment, the entirety of the study area has undergone continuous ploughing activities, including the removal of the lower calcareous layer which has revealed the limestone/ironstone nodules to the surface. This has been demonstrated throughout the study area, it is therefore likely the archaeological deposits have been disrupted and would have been visible on the surface especially in consideration of the excellent visibility. At the conclusion of the assessment, no Aboriginal cultural heritage places were identified, and the study was rated as having a low archaeological potential.

#### Historical Heritage Findings

The desktop assessment and subsequent survey has identified that there is a very low likelihood of historical cultural heritage. The landscape was entirely characterised by a generally flat plains to low sloping ridges within ploughed fields with clayey or sandy soils exposed by ploughing. Multiple instances of ironstone, sandstone, small snail shells, ceramics, glass and slag were identified exposed throughout the paddocks within the ridges and furrows, however, these were not associated with any extant features. Disturbances identified within the study area were generally homogenous (moderate), owing to widespread ploughing, vegetation clearance, rabbit and snake burrows scattered throughout the fields. All of the fields were determined to have been subject to historic and recent ploughing, as well as the excavation of a large a guarry, and localised excavations of dams and artificial drainage channels throughout the study area (which were constructed around 1914 to provide water to the farms). Historic artefacts such as glass, ceramic, metal and/or associated structures were considered in the survey of the study area. No historical artefacts or structures were identified. A single historical site H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall) is located 150 m north of the study area. The VHI site is located within a privately owned paddock and could not be accessed. A review of the ground surface immediately adjacent to the VHI site did not identify any artefacts, or structure. No works or disturbance is proposed within this privately owned paddock where the VHI site is located.

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# Abbreviations

Abbreviation	Description
ACHRIS	Aboriginal Cultural Heritage Research and Information System
APR	Archaeological Potential Rating
AV	Aboriginal Victoria, Department of Premier and Cabinet, Victorian Government
BP	Before Present (years)
CHMP	Cultural Heritage Management Plan
DELWP	Department of Environment, Land, Water and Planning, Victorian Government
DPC	Department of Premier and Cabinet
E	East
ELA	Eco Logical Australia
ENE	East-by-north-east
ESE	East-by-south-east
EVC	Ecological Vegetation Class

Abbreviation	Description
FPSR	First Peoples – State Relations
HA	Heritage Advisor
IA	Investigation Area
km	kilometre
LDAD	Low-density artefact distribution
m	metres
m <sup>2</sup>	square metres
mya	Million years ago
Ν	North
NE	North-east
NNE	North-by-north-east
NNW	North-by-north-west
NOI	Notice of Intention to Prepare a CHMP
NW	North-west
RAP	Registered Aboriginal Party
S	South
SE	South-east
SSE	South by south-east
SSW	South-by-south-west
STP	Shovel test pit
SW	South-west
VAHC	Victorian Aboriginal Heritage Council
VAHR	Victorian Aboriginal Heritage Register
VHI	Victorian Heritage Inventory
VHR	Victorian Heritage Register
Vic	Victoria
W	West
WNW	West-by-north-west
WSW	West-by-south-west
WWAC	Wemba Wamba Aboriginal Corporation
уа	Years ago

# 1. Introduction

# 1.1 Requirement for an EES

The Project was referred to the Minister for Planning to seek advice on the need for an EES under the Environment Effects Act 1978 (Vic) (EE Act).

On 10 October 2018, the Minister for Planning decided that an EES was required on the basis that the Project has the potential for a range of significant environmental effects.

On 19 December 2018 under delegated authority from the Minister for the Environment, the Department of the Environment and Energy (now the Department of Climate Change, Energy, the Environment and Water (DCCEEW) made a decision that the Project is a controlled action under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and would require assessment and a decision about whether approval should be given under the EPBC Act. DCCEEW also confirmed the Victorian Government's advice that the Project will be assessed under a bilateral agreement under the EE Act.

The EES allows stakeholders to understand the likely environmental impacts of the Project and how they are proposed to be managed. The Minister's assessment of the EES will also inform statutory decisions that need to be made on the Project.

The EES was developed in consultation with the community and stakeholders.

# 2. Project description

# 2.1 Project overview

The Goschen Project is approximately 20-25 year rare earth and mineral sands mine and processing facility. VHM has been developing the Project in the context of a rapidly growing global demand for rare earths. One of the world's largest, highest grade zircon, rutile and rare earth mineral deposits is in the Loddon Mallee region of Victoria in Australia. VHM intends to establish the Project to mine these deposits and process to produce and market a range of products to national and international consumers.

The mine footprint has been restricted to avoid intersection with groundwater and significant areas of remnant native vegetation. VHM will implement a staged development approach. Initially developing phase 1 consisting of a mining unit plant (MUP), wet concentrator plant (WCP), rare earth mineral concentrate (REMC) flotation plant and a hydrometallurgical plant (AREM) that will further refine the REMC that is produced at Goschen. The product suite for phase 1 consists of a zircon/titania heavy mineral concentrate (HMC) and mixed rare earth carbonate (MREC).

Phase 2 will commence approximately 2 years post-production and consist of an additional mineral separation plant (MSP) and, subject to prevailing market circumstances at that time, hot acid leach (HAL) and chrome removal circuit, that will produce additional products such as premium zircon, zircon concentrate, HiTi rutile, HiTi leucoxene, LoTi leucoxene, low chromium ilmenite.

Goschen Project is located approximately 4 hours' drive (275 kilometres) northwest of Melbourne and 30 minutes (35 km) south of Swan Hill within Gannawarra Shire (Figure 2-1).



Figure 2-1 – Project Overview

### 2.2 Project development

It is recognised that there are opportunities to avoid and minimise environmental impacts during the many stages of project development. During project inception and early design development stages of the project, decisions on the location of the project, its design and construction techniques have enabled

impacts to be significantly avoided and minimised in accordance with the hierarchy presented in Figure 2-2.



#### Figure 2-2: Mitigation hierarchy

Avoidance and minimisation of social and environmental impacts is central to the Project's decision making and as such, the Project will continue to be refined in response to technical requirements and potential environmental and social impacts identified during the development phase.

This was considered in the preparation of a Project description which is found at Chapter 4: Project description. A description of how avoidance of impact has informed the design in relation to cultural heritage can be found in Section 6.4.

Examples of this include the decision to create vegetation protection zones within the project (mining area), restricting mining operations to daylight hours only to avoid noise related impacts to certain receptors, and restricting mining to depths above the water table to avoid impacts to the groundwater table.

After opportunities to avoid impact were incorporated into the project, minimisation and rehabilitation measures were developed. These are described in the construction and operation impact assessment sections below.

### 2.3 Key project components

The Project site consists of a heavy mineral sand mining and processing operation that will produce several heavy mineral concentrates (HMC) and a range of critical rare earth minerals across two defined mining areas known as Area 1 and Area 3 (Figure 2-3 and Figure 2-4).



Figure 2-3: Area 1 Goschen Project



Figure 2-4: Area 3 Goschen Project

The key components that make up the project are described below.

Mining – Mining will take approximately 20-25 years at 5M tonnes of ore produced per year and will occur only above groundwater (no dewatering) across approximately 1,479 hectares of farmland using conventional open cut mining methods of excavation, load, and haul.

Processing – Heavy mineral sands and rare earths ore will be separated via an on-site WCP and MSP to generate a Rare Earth Mineral Concentrate (REMC). Refining of the REMC on-site is limited to hydrometallurgical extraction to produce a mixed rare earth carbonate. Tailings from the various mineral processes will be homogenised and placed back into the ore zone earlier mined.

Rehabilitation – The mined areas will be progressively backfilled in a staged manner, with tailings dewatered in-pit to allow overburden and topsoil placement in a profile that reinstates the background soil structure. This will result in the ability for a return to the current agricultural land uses within 3 years.

Power – Electrical power needed for mining and processing will be produced on-site from dual fuel diesel/LNG fired power generators, with a gradual evolution over the life of mine to renewables, hydrogen and/or battery as technologies and commercial viability increase. Heat energy for the on-site gas fired appliances shall be provided from an extension of the distribution network from the main LNG storage and regasification system.

Transport – Final products shall be containerised in 20ft sealed sea containers on site and exported via Melbourne Port using road and/or rail-based land logistics solutions. Ultima will provide intermodal rail solution, to reach the shipping export ports.

Water - Water will be required for construction earthworks, processing, dust suppression and rehabilitation. Up to 4.5 GL a year will be needed for the start-up of the Project. Water will be sourced from Goulburn Murray Water (GMW) from a new pumpstation at Kangaroo Lake via the open water market. A 38km underground pipeline is proposed beneath existing local road easements as shown in Figure 2-5. VHM does not proposed to construct the water supply pipeline in the 'alternative route' section of the alignment.



Figure 2-5: Proposed water supply pipeline route

# 3. Scoping

# 3.1 EES evaluation objectives and scoping requirements

The scoping requirements for the Goschen Rare Earths and Mineral Sands Project Environment Effects Statement ('scoping requirements') by the Minister for Planning, set out the specific environmental matters the project must address in order to satisfy the Victorian assessment and approval requirements.

The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the project in accordance with the *Ministerial guidelines for assessment of environmental effects* under the EE Act.

The following evaluation objective is relevant to the heritage component:

• To avoid or minimise adverse effects on Aboriginal and non-Aboriginal cultural heritage values.

The aspects from the scoping requirements relevant to the evaluation objective are shown in Table 3-1 as well as the location where these items have been addressed in this report.

Aspect Sco	ping requirement	Section addressed
Key issues	Destruction or disturbance of sites or places of     Aboriginal or historical cultural heritage significance	Existing Environment: Section 7.0
Existing environment	<ul> <li>Provide contextual information on past and contemporary activities in the project area and its vicinity by Aboriginal people.</li> <li>Identify and document any Aboriginal cultural heritage sites or areas of sensitivity within the project area in accordance with the requirements for the cultural heritage management plan under the Aboriginal Heritage Act.</li> <li>Identify and document any known and previously unidentified places and sites of historical cultural heritage significance within the project area and its vicinity, including any necessary investigations to supplement past studies having regard for the 'Guidelines for Conducting Historical Archaeological Surveys' (Heritage Council of Victoria, Heritage Victoria, 2008) or updates as relevant.</li> </ul>	Existing Environment: Section 7.0
Assessment of likely effects	Assess the potential effects of the project on identified sites or places of Aboriginal cultural heritage significance.	Construction Impact Assessment: Section 9.0 Operation Impact Assessment: Section 10.0

Table 3-1: Scoping requirements relevant to Cultural Heritage

	<ul> <li>Assess the potential effects of the project on sites and places of historical cultural heritage significance, having regard to the Heritage Victoria's guidelines for investigation Historical archaeological artefacts and sites (2012) or updates.</li> </ul>	Construction Impact Assessment: Section 9.0 Operation Impact Assessment: Section 10.0
Design and mitigation measures	<ul> <li>Describe and evaluate proposed design, operations methods or site protection measures which could avoid or minimise impacts on Aboriginal and historical cultural heritage values.</li> </ul>	Construction Impact Assessment: Section 9.0 Operation Impact Assessment: Section 10.0
Approach to manage performance	<ul> <li>Outline any proposed commitments to mitigate and manage residual effects on sites and places of Aboriginal cultural heritage significance, within the framework of a draft cultural heritage management plan.</li> </ul>	Construction Impact Assessment: Section 9.0 Operation Impact Assessment: Section 10.0 Summary of Mitigation: Section 13
	<ul> <li>Outline any proposed commitments to mitigate and manage residual effects on sites and places of historical heritage significance, including site investigation and recording procedures.</li> </ul>	Construction Impact Assessment: Section 9.0 Operation Impact Assessment: Section 10.0 Summary of Mitigation: Section 13

# 4. Evaluation framework

The assessment will consider legislation, policy and standards relevant to cultural heritage along with specific assessment criteria that have been derived for the purposes of the study.

# 4.1 Legislation, policy, guidelines and standards

The legislation, policy, guidelines and standards relevant to this assessment are summarised in Table 4-1.

Document title	Summary	Relevance to the project
Commonwealth government		
Native Title ACT 1993	To provide recognition and protection of Native Title for Aboriginal and Torres Strait Islanders.	Sections 46 and 49 of the Aboriginal Heritage Act 2006 requires a mandatory CHMP to be prepared if an Environment Effects Statement (EES) is required for the project.
Registers		
National Heritage List	The National Heritage List is administrated by the Australian Government's Department of the Environment and Energy. It lists places of outstanding heritage significance to	Relevance to the project is that it determines whether the project intersects with any listed heritage places

Table 4-1: Legislation, policy, guidelines and standards relevant to the assessment

Document title	Summary	Relevance to the project
	Australia. It includes natural, historic and Aboriginal places that are of outstanding national heritage value to the Australian nation. Places on the list are protected under the EPBC Act, which requires that approval be obtained before any action takes place that could have a significant impact on the national heritage values of a listed place.	of outstanding heritage significance to Australia protected under the EPBC Act.
Victorian Government		
Aboriginal Heritage Act 2006	The Victorian Aboriginal Heritage Act 2006 forms the framework within which Aboriginal heritage assessment is undertaken in Victoria. The Act provides for the protection and management of Victoria's Aboriginal heritage with processes linked to the Victorian planning system.	Sections 46 and 49 of the Aboriginal Heritage ACT 2006 requires a mandatory CHMP to be prepared if an Environment Effects Statement (EES) is required for the project.
Aboriginal Heritage Regulations 2018	The Aboriginal Heritage Regulations 2018 set out the circumstances in which a CHMP is required to be prepared, and the standards for the preparation of a CHMP. The regulations also prescribe standards and set fees and charges for CHMP evaluation.	A mandatory CHMP was required for the proposed activity through the EES. A mandatory CHMP was also required as the 'project' is a high impact activity within an area of sensitivity. Currently, the study area intersects with the following areas of defined sensitivity: • Regulation 39, Lunettes • Regulation 28, Ancient Lake • Regulation 29, Declared Ramsar wetland • Regulation 26, Waterway
Environment Effects Act 1978	To provide recognition and protection of Native Title for Aboriginal and Torres Strait islanders	Sections 46 and 49 of the Aboriginal Heritage Act 2006 requires a mandatory CHMP to be prepared if an Environment Effects Statement (EES) is required for the project.
Heritage Act 2017	The Heritage Act 2017 enables the identification and protection of heritage places and objects that are of significance to the state of Victoria, the protection of known and unknown historical archaeological sites, and establishes the Victorian Heritage Register, the Victorian Heritage Inventory and the Heritage Council of Victoria, the expert statutory body for determining matters relating to historic cultural heritage	Historical heritage of state significance is protected under the Heritage Act 2017. Any historical archaeology identified within the project area is also protected under the Heritage Act 2017.
Traditional Owner Settlement Act 2010	The purposes of the Traditional Owner Settlement Act 2010 are to advance reconciliation and promote good relations between the Victorian Government and Traditional Owners and to recognise Traditional Owner groups based on their traditional and	This document includes recognising Traditional Owner rights and conferring rights on Traditional Owner groups as to access to or ownership or management of certain public land, as well as decision-making rights and other rights

Document title	Summary	Relevance to the project
	cultural associations to certain land in Victoria.	that may be exercised in relation to the use and development of the land or natural resources on the land.
Registers		
Victorian Aboriginal Heritage Register (VAHR)	The VAHR was established under the AH Act 2006 and holds the details of all registered Aboriginal cultural heritage places and objects within Victorian, including their location and description.	The register assists in determining if any places are situated within the study area, and holds information regarding each RAP, their area of responsibility and contact details.
Victorian Heritage inventory (VHI)	The Victorian Heritage Inventory is a list of known historical archaeological sites in Victoria. Places can be included in the Victorian Heritage Inventory and the Victorian Heritage Registers if they have both built heritage and archaeological potential recognised as being of state significance. Works within sites included in the Victorian Heritage Inventory require approval from Heritage Victoria.	The Victorian Heritage Inventory was consulted to determine whether any known historical archaeological sites were situated within the study area.
Victorian Heritage Register (VHR)	The Victorian Heritage Register is a register of known historical archaeological sites in Victoria. Places and objects included in the Victorian Heritage Register are protected under the Heritage Act 2017. Approval is required prior to the commencement of any works at/modifications to places and objects on the Victoria Heritage Register.	The Victorian Heritage Register was consulted to determine whether any known historical archaeological sites were situated within the study area.

### 4.2 Assessment criteria

The assessment criteria relevant to this heritage study are outlined below.

### 4.2.1 Construction criteria

The majority of potential impacts on Aboriginal cultural heritage would occur during the project's construction, and so the impact assessment focused on that phase. There are no identified historical heritage sites within the study area. There is a single site H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall), located 150 m north of Mystic Park Beauchamp Road, the extent of this site cannot be established. No works or disturbance is proposed within this privately owned paddock where the VHI site is located.

The Aboriginal cultural heritage and the historical heritage studies were largely driven by clear statutory controls which essentially afford an equal level of protection for Aboriginal cultural heritage places and historical heritage places of all types.

# 5. Consultation and engagement

Development of the project and preparation of the EES have been informed by consultation with stakeholders and the community. Table 5-1 lists specific community and stakeholder feedback on cultural heritage and how this feedback has been considered by the project in this impact assessment. At the time

of writing, informal verbal statements had been received in relation to the cultural values reflecting the cultural, emotional and spiritual attachments that the Wemba Wamba Aboriginal Nation / Traditional Owners may have to the study area. Wemba Wamba Aboriginal Nation acknowledged that they hold unknown Aboriginal cultural heritage places in extremely high regard and identify these places as evidence of past Aboriginal occupation and use of the area, and identify them as an important source of information about their pre-contact past. Wemba Wamba have said that cultural significance is not only measured by the tangible aspects of cultural heritage places such archaeological sites, but that it also incorporates the unknown intangible heritage that was lost during contact.

Table 5-1: Stakeholder engagement undertaken for cultural heritage

Stakeholder feedback	Consideration in project design or impact assessment
First Peoples State Relations	On 15 April 2021, a project inception meeting was held, which outlined the nature and extent of ground disturbing impacts likely to be associated with the project.
	On 28 July 2021, a post standard assessment was conducted which involved summarising the outcomes of the standard assessment. Confirmation was received via email, that based on the results of the survey, the project activity was unlikely to result in the impact of any significant Aboriginal cultural heritage.
	On 25 February 2022, an update via email was provided to FP-SR (Emma Rae) detailing the study area changes and results of the survey. No reply was received.
Wemba Wamba Aboriginal Corporation	Consultation with WWAC, occurred throughout the life of the project. On 18 April 2021, an informal phone call between the heritage advisors and WWAC to introduce the project and arrange for representatives to participate in the field survey in preparation of the CHMP.
	On 13 September 2021, an update of the CHMP, and invitation for a statement was requested. No reply was received.
	On 28 October 2021, an update of the study area was provided to WWAC, including information of the proposed pipeline and pumping station.
	On 21 March 2022, another request for a statement of significance was send, in which representatives from WWAC confirmed that there were no tangible or intangible values recorded.

Representatives of the Wemba Wamba participated in fieldwork for the CHMP standard assessments from 19-23 April 2021, 10-11 November 2021 and again on 21 July 2022 due to a slight update to the proposed pipeline route. Representatives were informally consulted during fieldwork regarding Aboriginal cultural heritage values that may be associated with the study area.

The outcomes of this consultation are reflected in:

- the agreed standard assessment methodologies implemented during fieldwork
- discussion of the results of the standard assessments

• the cultural heritage management conditions and contingencies presented in the projects' CHMP.

Following the completion of the desktop assessment, a Project Establishment meeting was held for CHMP 17848 on 15 April 2021 between Mike Green (Heritage Advisors, HA), Erica McIntyre and Jen Cookson (Sponsor's representatives), and Emma Rae (Cultural Heritage Manager, Senior Heritage Officer, FP-SR). During the meeting, discussion addressed the level of works occurring within the study area. It was discussed and agreed that the archaeologists and TO representatives would conduct a field survey that would be immediately followed by a post standard assessment meeting to discuss the outcomes of the survey.

During the Standard Assessment, three Wemba Wamba representatives were invited to participate in the field survey between 19 to 23 April 2021. Discussions with the TO representatives during the survey established the potential sensitivity of the study area and the likely impacts on any potentially archaeologically sensitive areas. It was noted that a majority of the study area had been subject to disturbance due prior channeling, quarrying and agricultural activities. On November 10 and 11, 2021 a second standard assessment was held to cover the proposed water supply pipeline and pumping station around Kangaroo Lake. During the survey, the area was inspected via a pedestrian transact, no Aboriginal cultural heritage was identified despite fairly good visibility. On 21 July 2022, a third visit was held to inspect a redesign of the alignment of the pipeline, and additional access tracks, no cultural heritage was identified.

A Post Standard Assessment Meeting was then conducted between Annemarie Reich (ELA, HA), Erica McIntyre and Jen Cookson (Sponsor's representatives), and Emma Rae (Cultural Heritage Manager, Senior Heritage Officer, FP-SR). Discussions surrounded the observable ground disturbance, the observable landforms (n=3) and disturbances noted within the study area. The three landforms identified were: the flat to gently sloping land, a ridge including the surrounding slopes, and a small hill. During the consultation it was discussed that due to the low sensitivity within the study area, that a complex assessment was not required. On 13 September 2021, an update of the CHMP, and invitation for a statement was requested. No reply was received. On 21 March 2022, another request for a statement of significance was send to Daniel Kelly and Robert Nicholls (WWAC), in which WWAC confirmed that there were no tangible or intangible values recorded. WWAC also responded to the management conditions and contingencies with no additional remarks.

# 6. Methodology

### 6.1 Overview of method

This section describes the method that was used to assess the potential impacts of the project. Figure 6-1 shows an overview of the assessment method. A risk-based approach was applied to prioritise the key issues for assessment and inform measures to avoid, minimise and offset potential effects.

The approach used in the assessment has been guided by the evaluation framework that applies to the project comprising the regulatory framework (that is, applicable legislation and policy) as well as the scoping requirements set by the Victorian Minister for Planning.



Figure 6-1: Overview of assessment framework

The environmental assessments were undertaken according to the following steps:

- Establishment of a study area and characterisation of existing environment
- Review of the project description, comprising the key project components (including locations and form), proposed construction and operation activities (in the context of existing environment) and decommissioning activities to determine the location, type, timing, intensity, duration and spatial distribution of potential project interactions with sensitive receptors
- An initial risk-based analysis to evaluate the potential effects of proposed project activities and their likelihood of occurring (considering initial mitigation measures) to determine the relative importance

of environmental impacts associated with the project and therefore prioritise issues for attention in the subsequent assessment of impacts. Initial mitigation measures would include measures that are common industry practice or required to meet legislation.

- An assessment of impacts that examines the severity, extent, and duration of the potential impacts and considers the sensitivity and significance of the affected receptors
- Evaluation of predicted outcomes against benchmarks and criteria such as those described in applicable legislation, policy and standards
- Evaluation of the potential for cumulative impacts (where relevant) caused by impacts of the project in combination with impacts of other existing and proposed projects that may have an overall significant impact on the same environmental asset
- Identification of additional mitigation measures where necessary to address potentially significant
  environmental impacts
- Evaluation and reporting of the residual environmental impacts including magnitude, duration and extent, taking into account the proposed mitigation measures and their likely effectiveness.

Based on the findings of the environmental assessments, an Environmental Management Framework (EMF) has been prepared to monitor and control environmental performance during project implementation. The EMF has specified the committed mitigation measures to avoid, minimise and manage impacts, proposed contingency measures and offset commitments, and describe the roles and responsibilities for implementation throughout project construction, operation and decommissioning.

The specific methods adopted during the key steps are described in the sections below.

### 6.2 Study area

The study area is located between Ultima, Lalbert and Meatian and covers a total area of 1557.79 ha (Figure 6-2 and Figure 6-3). The majority of the study area is situated approximately 35 km south of Swan Hill and is within both the Gannawarra Shire Council and Swan Hill Rural City Council.

It comprises roadway, road reserve and ground surfaces within 14 private properties (large paddocks) along Thompson Road, Bennett Road, Mystic Park-Meatian Road and Pola Road. Residential property and agricultural land are present within the study area. The study area also includes several roadways (Shepherd Road, Jobling Road, Bish Road, Mystic Park – Beauchamp Road, Mystic Park - East Road, Lookout Road, Mystic Park-Meatian Road, Bennett Road, Donald – Swan Hill Road, Lake Boga Ultima Road, and David Street).



Figure 6-2: Location of the study area



Figure 6-3: Photomap of the Study area

### 6.3 Existing environment

A comprehensive assessment was undertaken to understand the existing environment of the study area to inform the environmental impact assessment for the works. This assessment incorporated:

- A desktop assessment of relevant Victorian government online information;
- Searching the Victorian Aboriginal Heritage Register (VAHR) and other archaeological resources (e.g. consultancy reports, academic research) for information relating to the study area.
- Searching the Australian and Victorian historic heritage database list and other and other archaeological resources (e.g. consultancy reports, academic research) for information relating to the study area.
- Consultation with Traditional Owners
- A field survey to inspect areas with ground surface visibility for Aboriginal and non-Aboriginal archaeological sites within the study area.

## 6.4 Avoidance and minimisation

The greatest risk to Aboriginal cultural heritage relates to the potential disturbance of unknown Aboriginal places present within the site. As the primary objective of this assessment is to avoid or minimise adverse effects on Aboriginal and historical cultural heritage places and values, accurately identifying those values is of critical importance. Commencing preparation of a CHMP for the Project has allowed the nature, extent and significance of Aboriginal places within the study area to be accurately determined in accordance with Section 60(1)(b) of the Aboriginal Heritage Act 2006. The final approved CHMP will provide processes by which the discovery of unknown Aboriginal places during the construction phase of the Project can be managed.

### 6.5 Risk assessment

A risk assessment of project activities was performed to prioritise the focus of the impact assessments and development of mitigation measures. The risk pathways link project activities (causes) to their potential effects on the environmental assets, values or uses that are considered in more detail in the impact assessment. Risks were assessed for the construction, operation and decommissioning phases of the Project.

The likelihood and consequence ratings determined during the risk assessment process and the adopted mitigation measures are presented in Section 6.6. The risk assessment has been undertaken in line with the Preparation of Work Plans and Work Plan Variations Guideline for Mining Projects December 2020 (version 1.3).

### 6.6 Impact assessment

A change to baseline conditions (or the no-project case) caused by project activities in any of the project phases (construction, operation or decommissioning) may give rise to impacts.

The impact assessment involved identifying the severity, extent and duration of any impacts, positive or negative, that the project may have on the existing environment.

The significance of the impacts has been assessed in accordance with the evaluation framework, based on applicable legislation, policy and standards and the evaluation objectives and environmental significance guidelines arising from the government terms of reference established to guide the assessments.

This study has assessed the impacts of construction, operation and decommissioning of the project on cultural heritage assets and values to be protected.

In line with the scoping requirements, the focus of the research and subsequent fieldwork for existing conditions has been on identifying and reviewing known Aboriginal and historical cultural heritage values that are 'potentially affected' (scoping requirements, priorities for characterising the existing environment).

The impact assessment phase involved a review of the potential for impacts to Aboriginal and historical; cultural heritage impacts identified during the scoping phase. The likelihood and consequence ratings determined during the risk assessment process and the adopted mitigation measures are presented below. The risk assessment has been undertaken in line with the guidelines outlined in Appendix A of the Preparation of Work Plans and Work Plan Variations Guideline for Mining Projects December 2020 (version 1.3). These guidelines relevant to the risk assessment are included in Appendix A of this report.

### 6.6.1 Pedestrian Field Survey

Fieldwork was undertaken within the study area which consisting of two separate surveys occurring over two days from 19-23 April 2021, 10-11 November 2021 and 21 July 2022. The survey included a walkover of the paddocks, the pipeline route and the pumping station location.

### 6.7 Limitations, uncertainties and assumptions

There are no limitations, uncertainties and assumptions that apply to this assessment.

# 7. Existing environment

### 7.1 Aboriginal Cultural heritage

Desktop assessment of the study area and geographic region

### 7.1.1 Landforms, Geomorphology and geology

Unless otherwise referenced, the following landform, geological and geomorphological descriptions are derived from online resources developed by the Victorian Government, including GeoVic 3 (Department of Economic Development, Jobs, Transport and Resources 2021) and Victorian Resources Online (Agriculture Victoria 2021). The geomorphology and geology of the study area and geographic region are mapped in

Figure 7-1 and Figure 7-2 respectively.

The North-western Dune fields and Plains occur in the Western part of the Murray Basin Plains, submerged by Late Tertiary seas. The undulating landscapes are clearly defined from the western uplands to the south, and from the Riverine plains to the east. The Riverine plains also occur north along the River Murray, and in the south along several ephemeral stream courses which terminate in the central parts. The Victorian North-western Dune fields and Plains is further subdivided into the Calcareous dune fields cover roughly two-thirds of the Mallee on plains with stranded ridges of variable prominence. The east to west dunes are predominate, however, in southern Mallee there are subdued, sub-round hummocky forms.

The study area, along with the majority of the geographic region, is situated within two subunits: 5.1.4 (Hummocky dunes dominant (southeast of Lake Tyrell, north and south of Lake Hindmarsh) and 5.1.5 (Hummocky dunes sub-dominant (southeast of linear dune fields) of the North-western Dune fields and plains (DP) geomorphological unit as defined within Victoria's Geomorphological Framework.

Dominant hummocky dunes (south-east of Lake Tyrell and north and south of Lake Hindmarsh (GMU 5.1.4)) consist of sub round dunes occurring on plains to the south and east of Lake Tyrrell. Geologically, these areas are underlain by weathered Parilla sand, a more porous substrate. The subdued dunes are generally 200 to 500 m across, with surface soil underlain by paleosols which approximately parallel to the land surface, but with a high clay content. Medium- textured calcarosols predominate and gilgaied clays occupy the gentler lower western slopes and intervening plains. The plains on which the dunes occur are generally subdued with weakly-developed northwest - southeast ridges. Low hummocky dunes occupy about one quarter of the unit. Tending to occur in clusters which may be as much as 3 kilometres across.1 Gilgaied clays (vertosols) are the most widespread soils, occupying the broad subdued plains, the elongated plains between stranded ridges and the lower slopes of dunes and ridges.

Sub-dominant hummocky dunes (southeast of linear dune fields: GMU 5.1.5) consist of clusters of subround dunes occurring on broad gilgaied plains just beyond the southern and eastern margins of the Tyrrell Basin. Some areas containing subdued strandline ridges. 2

1 5.1.4 Hummocky dunes dominant (south east of Lake Tyrrell, north and south of Lake Hindmarsh) | VRO | Agriculture Victoria – accessed 25 March 2021.

2 5.1.5 Hummocky dunes sub-dominant (south east of linear dunefields) | VRO | Agriculture Victoria – accessed 25 March 2021.

Most of the surface geology within the study area is comprised of Loxton Sand (NwI), also referred to as Loxton-Parilla Sand.3 The deposit contains well sorted fine to medium grained quartz sandstone occurring in abundant lag horizons containing shelly fossils, pebble beds, rounded ironstone fragments, and some heavy mineral concentrations including rutile, zircon and ilmenite deposited in dissected or remobilised strand lines. The deposits date to the Miocene-Pliocene boundary (7.2 to 3.6 million years ago). Underlying the Loxton-Parilla Sand is the Blanchetown clay, these deposits are characterised as "laminated greenish-grey and red brown clay and silty clay, locally calcareous and gypisferous; minor interbedded quartz sand, ostracod sand; contains calcareous, gypisferous and siliceous nodules". 4 The most common surface features in this area are the east-west aligned linear dunes. These were formed from the reworking of Parilla Sand during periods of extreme aridity (Bowler 1978). The final phase of linear dune activation probably occurred 20, 000 – 15, 000 BP (Bowler 1976; Bowler et al 1976, Bowler 1978).

In 2020, Neville Rosengren prepared a report about the geomorphology and landform history of the Goschen Mineral Sands and Rare Earths Project. The following information presents a summary of this report.

The site is in the southern Murray Basin at the boundary of the Riverine plain and Mallee Regions of Victoria. The landscape materials are the Loxton Sands deposited as nearshore, shoreline and backshore ridges during a staged marine regression with episodes of stillstand from Late Miocene through Pilocene and into the upper Pleistocene. The deposits are distinctive curvilinear subparallel rides of fine to medium quartz and calcareous sand with abundant shelly fossils. Overlying the sands are clays and silts of Lake Bungunnia formed when the Murray River was defeated by a tectonic dam during the mid-Pleistocene. Several sand bodies of different origin and composition were emplaced across the Victorian Mallee region – Woorineen Formation and Molineaux Sand (formerly Lowan Sand) in the late Pleistocene. The location of the study area is partially located on the Cannie Ridge, a low but prominent north – south ridge uplifted in late Pilocene to early Pleistocene times and capped by ridges of Loxton Sand.

The Mallee region is broadly defined by an area where multi-stemmed eucalypts are the primary overstorey vegetation and broadly coincides with varied dunefields of the Victorian and NSW Mallee regions. Thermoluminescence and radiocarbon age measurements on the Lowan Sand and Woorinen Formation suggest that a major phase of aeolian activity in the Mallee Dunefield occurred between 25 and 15 ka ago (Bowler et al 1976, Gardner 1987). The activity possibility reaching a peak between 18 and 16 ka (Wasson 1984), the dunes then stabilizing between 12 and 6 ka (Bowler et al 1976 and Wasson 1984). The Woorinen Formation is the most widespread of the aeolian surface deposits of the Murray Basin and forms the surficial geology of the study area. Its topographically distinctive north and northwest of Swan Hill as chains of discontinuous parallel to sub-parallel west east oriented low dune ridges and swales.

The surface materials of the landscape composed of unconsolidated to variably cemented sediments ranging from silts to gravel but dominantly sand-sized. The materials are able to contain and preserve cultural materials, with potential modifications due to the calcareous content of both fines and sand. The near-surface materials of Cannie Ridge originated as shallow marine and backshore sands deposited well-

4 Australian Stratigraphic Units Database, Geoscience Australia (ga.gov.au)

<sup>3</sup> http://dbforms.ga.gov.au/pls/www/geodx.strat\_units.sch\_full?wher=stratno=10825 - accessed 25 March 2021

prior to any human presence (Loxton Sand). The potential irregular overprint of aeolian fine sand, silt and clay (Woorinen Formation) is also most likely to be beyond human presence i.e. >100,000 years. It is therefore likely that any Loxton Sand surface overlain by Woorinen sediments will be a culturally artefact sterile original surface. Whilst there is potential for cultural heritage material to be preserved on or in the sediment, European occupation and agricultural practices are likely to have triggered local movement of sand and silts/clays by wind action resulting in local deflation and exposure of older surfaces that are artefact sterile. At the same time, deposition may have led to deeper burial of surfaces that do contain cultural heritage, it is unlikely there is a continuous or well- defined artefact rich surface at a consistent depth.



Figure 7-1: Geomorphology of the study area and geographic region

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Figure 7-2: Geology of the study area and geographic region

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#### 7.1.2 Environment

The study area falls within the Murray Mallee bioregion. The Murray Mallee, located in the north-west of the state, is typified by calcareous material in the form of broad undulating sandy plains that are often associated with linear, east-west aligned, low sand dunes with intervening heavier textured swales developed from Cainozoic (aka Cenozoic Era) deposits of alluvial, aeolian and swampy deposits. The vegetation is dominated by East/West-Dune Mallee with some Chenopod Mallee and Shallow-Sand Mallee.

The plains, drainage lines and groundwater discharge landscapes are dispersed with salt lakes and gypsum flats with lunettes developed on the eastern margins of the lakes. The Cainozoic deposits give rise to calcareous earths (Calcarosols), cracking clays (Vertosols), and red sands (Rudosols). The vegetation is dominated by Gypseous Plains Shrubland, Saline Shrubland (Raak), Plains Grassland and Drainage-line Grassy Woodland. The bioregion has few surface waterbodies due to highly permeable soils and climatic conditions. The Murray River forms the northern edge for the bioregion and the Avoca River roughly defines the eastern edge. The bioregion has few surface waterbodies due to highly permeable soils and climatic conditions.

Annual average rainfall for the Murray Mallee ranges from 360-672 mm per annum. The average annual minimum and maximum temperature range is from 3 to 9 °C and 15 to 21 °C respectively. Descriptions of the likely Ecological Vegetation Classes (EVCs) that would have been dominant in the area prior to 1750 have been derived from modelling developed by DELWP.5 These are presented in Figure 7-3 and include:

#### Murray Mallee

EVC 824 – Woorinen Mallee – Widespread Mallee woodland to 12 m tall, associated with the east-west orientated calcareous dune fields of the Woorinen Formation with a low, open chenopod dominated shrub understorey. A diverse array of sub-shrubs, herbs and grasses are also present. Typically occurs on fine textured red-brown sandy loam and clay loam soils.

EVC 96 – Ridged Plains Mallee – Open, quite grassy Mallee woodland to 10 m tall, typical of the gently undulating "plains" of the Wimmera and Southern Mallee. Soils are somewhat variable but are typically duplex with grey or brown sandy clay loam or clay loam topsoils of aeolian origin.

EVC 826 – Plains Savannah – A structurally diverse vegetation unit which includes 'grassy openings' of a few to many hundreds of hectares, with a variable tree density ranging from a very sparse savanna to woodland. The relative absence of eucalypts is particularly characteristic, with Allocasuarina luehmannii and perhaps Callitris gracilis ssp. murrayensis to 10 m tall being the dominant trees. Widespread on the northern plains.

EVC 103 – Riverine Chenopod Woodland Eucalypt woodland to 15 m tall with a diverse shrubby and grassy understorey occurring on most elevated riverine terraces. Confined to heavy clay soils on higher level terraces within or on the margins of riverine floodplains (or former floodplains), naturally subject to only

#### 5 Bioregions and EVC benchmarks (environment.vic.gov.au) – accessed 06 April 2021

extremely infrequent incidental shallow flooding from major events if at all flooded. Found at Lake Lalbert and Lalbert Creek.

Aboriginal occupation often focused on waterways, and areas adjacent to water sources, including swamps and wetland areas, and these areas would have provided a wide range of food and material resources for Aboriginal people.


Figure 7-3: Pre-1750 ecological vegetation classes in the study area and geographic region

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## 7.1.3 Heritage registers

A search of the Victorian Aboriginal Heritage Register (VAHR) covering the full extent of the study area and the wider geographic region was initially conducted on 06 April 2021, and subsequently updated on the 14 February 2022. The VAHR was searched using the online Aboriginal Cultural Heritage Research and Information System (ACHRIS) maintained by First Peoples – State Relations (FP - SR 2021a).

The desktop assessment did not identify any registered Aboriginal cultural heritage places located within the study area.

The closest registered Aboriginal cultural heritage places to the study area are situated around Kangaroo Lake to the east of the proposed pumping station (VAHR 7526-0530 and VAHR 7523-0571/72). All of the places within the geographic region were identified in proximity to Lalbert Creek, Lake Lalbert and Kangaroo Lake.

The registered Aboriginal cultural heritage places located within the geographic region include:

- 11 (27%) scarred trees
- 2 (4.8%) low density artefact distributions (LDADs
- 9 (22 %) artefact scatters
- 15 (36.5%) earth features (Mounds/Hearths)
- 3 (7.3%) artefact scatters and earth feature (multi- component)
- 1 (2.4%) ancestral remains (burial)

The following key points emerge from a review of the registered Aboriginal cultural heritage places identified within the geographic region:

- The majority of registered places are located in close proximity to water sources including Lake Lalbert and Kangaroo Lake (both of which include a significant number of registered places) and Lalbert Creek.
- Places containing stone artefacts (artefact scatters and LDADs) within the geographic region were all identified on the surface.
- More than half of these sites were discovered during archaeological surveys (and one during a CHMP standard assessment).
- The Aboriginal cultural heritage places containing less than <4 artefacts, consisting of raw materials comprising of silcrete, hornfels, quartz or of an unknown material.
- Scarred trees identified (n=11) within the geographic region were mainly identified surrounding Lake Lalbert and Kangaroo Lake.

## 7.1.4 Historical and Ethnohistorical Accounts of Aboriginal Occupation

In this section the available ethnohistorical and historical information relating to Aboriginal people in the geographic region is briefly reviewed. This information will assist in formulating a model of Aboriginal subsistence and occupation patterns across the region. In conjunction with an analysis of the documented archaeological record of the region, the ethnohistorical information assists in the interpretation of archaeological sites in the wider area, and in predicting the potential location of archaeological site types within the study area.

The majority of information about the sociocultural structure of Aboriginal society before and after European contact is heavily reliant upon early European ethnographic accounts. Such ethnographic sources are subject to several limitations due to the nature of the ethnographic record and the way in which it was compiled. In particular, these sources are coloured by 19th century social attitudes, which held that Aboriginal society was inferior or primitive in relation to European society. With European arrival in 1788, the lifestyle of the local Aboriginal population underwent a period of great disruption and irreversible transformation. Consequently, it should be recognised that any information that exists may be flawed, as this information was recorded by European observers who did not fully understand or appreciate the culture they were witnessing. Moreover, it must also be noted that the Aboriginal culture being observed by Europeans was undergoing significant change due to the impact of white settlement.

Several important European ethnographic sources exist that provide accounts of Aboriginal lifestyles within the general area. These sources provide information about customs, trade, language, diet, medicines and burial practices within the Murray region. One such source is Stone's The Aborigines of Lake Boga, Victoria (Stone 1911), which provides details of a number of facets of Aboriginal life. Major Mitchell's mapping expedition of NSW and Victoria's waterways is another critical resource (Mitchell 1839). Mitchell's observations of Aboriginal life in the 1830s are important because his party interacted with an Indigenous population almost untouched by white settlement. However, while these works document the lives of Aboriginal people in regions surrounding the study area, perhaps the most closely related work is Peter Beveridge's The Aborigines of Victoria and Riverina (Beveridge 1889).

Beveridge was one of the first settlers in the Swan Hill District, having lived on a property fronting the Murray from 1845 to 1868. He named his property 'Tyntynder', a name given to the locality by Wadi Wadi language speakers meaning "song of birds" (Clark & Heydon 2002: 223). Beveridge showed great interest in Aboriginal culture which he observed whilst employing local Aboriginal people on Tyntynder. He learnt their language, details of which he provides in his book, and he recorded facets of Aboriginal use of local resources and tools (Beveridge 1889). Much of the following information comes from Beveridge's writings.

## Social Organisation

The Murray Valley was home to many large Aboriginal communities who lived on the rich resources associated with the Murray River and its tributaries. Tindale (1974) identified the Watiwati (Wadi Wadi) and Wembawemba (Wemba Wamba) language groups as clans occupying the area south and west of Swan Hill.

As shown on Tindale's map, the Wadi Wadi occupied the land north and west of Swan Hill, while the Wemba Wamba occupied the area east and south of Swan Hill (see also Clark 1990: Figures 15 and 16). Tindale (1974) records the location of the Wamba Wemba as occupying the area around the Loddon River from Kerang to the north of Swan Hill (Tindale 1974: 200).

Unlike Europeans, Aboriginal people did not use major rivers as territorial boundaries. While Europeans ultimately divided this region between NSW, Victoria and South Australia, no such divisions existed prior to European settlement. Wemba Wamba country straddled the Murray on both sides, as did Wadi Wadi territory. Tindale places the boundaries of the Wadi Wadi on the Murray River, fifteen miles above the Murrumbidgee junction to Swan Hill, at Piangil extending northward to about Moolpa in NSW. The Wemba Wamba occupied a territory adjacent to the Wadi Wadi and ranged from Swan Hill, Lake Boga and Kerang in the south to the Avoca River near Quambatook, and north east to Booroorban and Moulamein in NSW (Tindale 1974: 200).

At the time of European contact, the Aboriginal population was divided into several layered groupings or units. A 'tribe' or language group occupied a recognised territory, shared a common language and kinship system, participated in ceremonial activities and called itself by a specific name. A tribal group was composed of several clans, that were each responsible for and spiritually linked to a certain area of land. Members of the same clan could not marry one another, so a person's mother and father would come from a different clan.

The basic economic unit of Aboriginal society was the 'band'. 'Band' is the term traditionally applied to the group of people who came together to live or hunt and gather food. In Aboriginal society, the group did not necessarily belong to the same clan but consisted of one or more families from several clans. These groups were made up of anywhere from 10 to 50 people (Mulvaney & Kamminga 1999: 76), and in some cases believed to have consisted of up to 80-150 people in areas surrounding the Murray (Buchan 1983: 2). Larger groupings, composed of different bands or even whole tribes and numbering up to between 400 and 1,000 individuals, came together at times of seasonal resource abundance. In the Murray region, these included eeling seasons in autumn and winter, and large-scale hunting drives, trading and ceremonial exchanges, which principally took place in summer (Lourandos 1976: 180). A local meeting place for groups from this part of the Murray is believed to be on Wemba Wamba land in proximity to the Swan Hill Bridge (Feltdtmann 1973: 9).

As with estimates for the total population of Aboriginal Australia prior to European arrival, there are great variations in numbers given for the Aboriginal population of both Victoria and the Murray Valley. Early estimates of the original Aboriginal population of Victoria range from 5,000 to 15,000. This population was believed to have been divided into 38 tribes of varying sizes averaging about 300 men, women and children (Baxter 1990: 1, Christie 1979: 7).

However, the size of the Aboriginal population within the Murray Valley prior to European arrival is difficult to assess due to the effects of disease that preceded white settlement. It is believed that prior to white settlement, the Murray Valley was the most densely populated region of Australia due to the abundant food resources provided by the river. This idea is supported by archaeological evidence that indicates populations in the valley were semi-sedentary and localised, meaning that they did not move around a great deal and that tribal territories were generally smaller and very vigorously defended (Murray 1999: 6).

The density of population along the Murray is illustrated by early European explorers of the region. Sturt, for example, encountered around 50 Aboriginal people along a 290 km stretch of the upper Murrumbidgee, compared to nearly 1,000 on an equivalent stretch of the Murray (Buchan 1983: 2). The number and size of oven mounds found in the region is also used as an indication for population density. On 8 June 1836, in the vicinity of the Darling-Murray junction, Mitchell recorded the remains of one hundred and thirty-five fires near which about four hundred Aboriginal people were camped (Shire of Swan Hill 1989: 6). Feldtmann estimates an original population figure for the Wemba Wamba at 600 individuals (Feldtmann 1973: 9), and although he does not provide a source for this figure, both ethnographic accounts and archaeological evidence point to high population concentrations along the Murray.

#### Lifestyle, Environment and Resources

The Murray River was central to local Aboriginal lifeways, especially as a source of food. In countryside that was often dry and arid outside the river corridors, the Murray River supported a variety of aquatic and terrestrial life, which in turn sustained large Aboriginal communities. The river created diverse landscapes such as swamps and billabongs, many of which can no longer be seen in the area. Each spring these flooded with the melting of winter snows in the Snowy Mountains.

The subsistence strategies of the Wemba Wamba are difficult to reconstruct in detail from the limited documentary evidence provided by early European explorers and settlers. However, some information is available from these ethnographic accounts. Such records indicate that Aboriginal people led a semisedentary way of life focused on rivers. Their economic way of life involved the exploitation of riverine resources for most of the year, only retreating to more favourable areas during the colder months of June, July and August. Their settlement patterns were likely in tune to the seasonal rhythm of the rivers. This would suggest that during non-flood periods Aboriginal people occupied areas of floodplain. In the Murray region, instances have been recorded of Aboriginal people moving away from the river to exploit seasonally available resources in dry areas, including the Mallee (Hughes 1984: 21).

The material culture of the Aboriginal people of the Murray region was diverse, utilising materials derived from a variety of plants, birds and animals, as well as stone. A short summary of the types of material used by Aboriginal people of the Murray region is provided below.

The bark of the River Red Gum (Eucalyptus camaldulensis), a common tree found along the banks of the Murray, was used for a number of purposes, including the construction of canoes. Canoes were an important tool used for fishing, setting nets and crossing flooded creeks. These vessels were often made from a single piece of bark. The process began by marking an outline of a canoe on the chosen tree. Once the outline was complete, a party of men would cut around the marked shape using tomahawks. Small bark wedges were then driven in under the bark to loosen it. The bark was then gently loosened from the tree and carefully lowered to the ground using ropes (Coutts 1981: 9). Many scarred trees found along the banks of the Murray River still bear evidence of this technique of canoe manufacture.

Beveridge (1889: 59-64) noted the use of spears by Aboriginal people along the Murray River, including their varied length and sizes. Wooden fishing spears, about 1.5 m long and often barbed, were used lance-fashion to spear fish from canoes or while swimming. Spears measuring about 2 m, made from the stalks of common reeds with an attached wooden or bone point, were used to hunt small game or

in combat, often in conjunction with a throwing stick or 'spear thrower' to achieve greater accuracy and distance. Long spears made from Mallee gum saplings and thrown by hand at greater distance were used to hunt larger game such as emu and kangaroo (Buchan 1983: 4). Victorian Aboriginal people used decorated hardwood shields in battle to deflect spears. Such shields were essential in close combat to ward off blows (Beveridge 1889: 65-66).

Other equipment used by Murray Valley Aboriginal people included wooden clubs with knobbed ends, often made from red gum wood and used to hunt game or as weapons, and pointed sticks used by women to dig up roots, burrowing animals and grubs. Stone axes that were critical to the construction of canoes and made from local basalts or greenstone traded in from further south were also used for a variety of tasks. Buchan (1983) describes the use of oval shaped bark dishes with curved sides for carrying water or food. 'Bowls' or 'pots' made from animal skins and baskets made from woven reeds or rushes for the transportation of food were also manufactured.

Net bags were used by women and skin bags by men to carry personal belongings (Buchan 1983: 4). Murray Valley Aboriginal people also wove nets for catching fish, crayfish and birdlife. Made of twine from the roots of the bulrush (Typha) or similar fibrous plants, several types of nets were used, including hand, set and drag nets (Coutts 1981: 9). The nets could be strung across creeks or other waterways so that fish became entangled in the mesh, or they could be dragged through shallow waters trapping fish and other aquatic life. Beveridge describes the use of nets up to 90 m in length that were used to trap birds (Beveridge 1889). Water birds were driven into a net strung across a creek between two trees, and when the birds became entangled the net was lowered to retrieve them. Larger game such as kangaroos and emus were often driven in numbers into large nets, where they could be more easily killed. Smaller nets with narrower mesh were used to catch yabbies. Fish were sometimes caught in weirs made of narrowly spaced stakes or stones with turf built across the mouth of a dry river channel, so that the fish were trapped when floodwaters receded (Buchan 1983: 4, Coutts 1981: 7).

Fishing lines were made from cumbungi fibres (Typha muellera), which grew prolifically along the margins of the lagoons and swamps. The root of the plant was lightly cooked, the outer skin removed and then the inner part of the root was chewed until it was soft and pliable. This was then made into hanks with the aid of mussel shell scrapers. Fish hooks were made of bone and baited with fresh water mussel. Beveridge reported that two days' fishing produced 93 fish (Beveridge 1889: 102) (Shire of Swan Hill 1989: 4). Coutts (1981) also notes the use of poison during fishing by some Aboriginal people; large bales of eucalyptus were placed in pools of water, which stunned the fish and made them float to the surface (Coutts 1981: 9).

Aboriginal people of the Murray region used several types of stone tools. Edge ground or wholly ground stone axes were used in woodworking activities such as cutting toe holds in trees or for chopping open a tree to extract a possum. Smaller blades were used to make spear points, to skin and butcher game and to dress skins. Aboriginal people also used freshwater shells to scrape flax and skins (Beveridge 1889: 71). Bivalve shells, pieces of bone, and tough pieces of reed stem were also used to scrape, puncture and cut animal skin so that they could be bound together to make clothing (Buchan 1983: 5).

Two items of clothing were sometimes worn by Aboriginal people in the Murray Valley. These were pubic fringes of animal skin attached by a belt around the waist (worn mostly by women), and cloaks of animal skin worn over shoulders with the fur on the inside. These cloaks were most commonly made of

possum skin (Coutts 1981: 10). Other uses of possum skins were for the treatment of snake bite, and armlets and headbands. Women of some tribes in the region were also known to wear round mats constructed of reeds as cloaks. These mats were tied with twine, allowing babies to be carried in the pouch at the back.

There is some evidence for the construction of temporary wind-breaks used for shelter during the summer months. These were made from boughs or brush arranged on one side against the prevailing wind. In the winter months, more substantial shelters of bark, boughs or grass over a framework of poles were made. These winter huts were large and semi-circular (Buchan 1983: 5).

The Murray region is known for its abundant natural resources including constant water supply and fertile soil, creating ideal conditions for a wide variety of flora and fauna. However, although rich in living resources, the region lacks large quantities of stone suitable for tool making. As most of the region is sedimentary infill, hard rock is extremely rare. Compounding the problem is that rivers in the region, including the Murray, are of such low energy that they do not transport such material. This meant that supplies of stone had to be obtained elsewhere through trade or other methods.

A system of trade or barter is likely to have existed, whereby materials for blades or ochre used for ornamentation of cloaks and bodies were exchanged for materials that were more common to the Murray region. Greenstone (diabase) from Kilmore was exchanged for Murray reeds, which were used as spear shafts. Pituri and red and yellow ochre are thought to have been obtained from as far away as the Queensland border (Beveridge 1889: 165, Coutts 1981: 9, Stone 1911: 459, 46).

Aboriginal people living near Swan Hill had access to a wide variety of both aquatic and terrestrial food resources. Unfortunately, the relative dietary importance of different foods is difficult to assess based on historical accounts. As Hughes notes, although Beveridge (1889) records a great deal of information about the types of foods consumed, there is often a focus on male hunting and fishing activities, with comparatively little attention paid to women's activities (Hughes 1984: 22). However, Kirby (1895:28) does comment on the women using yam sticks to procure yam roots.

Climatic and environmental conditions in the study area and in the Murray Valley generally meant food was particularly plentiful from spring to early autumn; during late autumn and winter, however, food was scarce. Archaeological and ethnographical evidence indicates that Aboriginal people concentrated along the river during the warmer months, consuming fish, shellfish, game (including mammals, reptiles and birds) and some varieties of vegetable. During the winter months, minor shifts away from the river system may have occurred as food supplies dwindled and communities searched further afield for game (Coutts 1981: 3; Hughes 1984: 22).

Various aquatic species probably formed a significant component of the diet. Fish, eel, tortoise, freshwater mussels, crayfish and yabbies were available all year round. The Murray River not only supported large quantities of aquatic life, but also sustained a diverse population of many species of water bird, particularly ducks, which played an important role in the diet of Murray Valley Aboriginal people (Coutts 1981: 9). Water birds were often driven into large nets using a technique that involved herding them by imitating the whistle of a hawk. Bird eggs were collected 'by the thousand' during spring (Beveridge 1889: 86).

The principal source of meat in the diet of local Aboriginal people was kangaroo, wallaby and emu, together with possum, dog and echidna, along with various lizards, snakes, frogs, grubs and ant larvae. It is thought the most commonly hunted land animal was the possum, with snakes, frogs and dogs only eaten when food was scarce in the winter months. Local Aboriginal people also ate tadpoles, yabbies, grubs and Bogong moths. One particular favourite that Beveridge describes in detail was called 'lerg' or 'taarp', an insect secretion that people would go to almost any length to obtain (Beveridge 1889: 142).

Plant foods were plentiful and formed an important part of the diet of Murray Valley Aboriginal people, especially during the winter months. Roots, including yams and water lily tubers, were eaten in great quantity, as were seeds. One of the most important plants was the bulrush (Typha sp.) that grew in great abundance along the margins of rivers in the swampy areas. The roots were collected by women in large quantities, usually in late summer and autumn, when the river levels were lowest (Coutts 1981: 9). Zola and Gott (1990) list several species of edible plant and root found in the Murray River environment including the common reed (Phragmites australis) and water ribbons (Triglochin procera) (Zola and Gott, 1990: 12). Another was the root of the cumbungi that was, according to Beveridge 'a very palatable and nutritious food of which the natives are justly fond' (Beveridge 1889: 17). The gluten from bulrush stems was extracted by chewing, then made into a paste with water and eaten. Other vegetables eaten included sow thistle, dandelion, trefoil, manna and wild fruits (Buchan 1983: 4).

Much of the food consumed by Murray Valley Aboriginal people was cooked using one of three methods – by throwing it on an open fire, boiling it over a fire or cooking it in a pit oven (Buchan 1983: 3). Oven mounds, a common archaeological site type in the region, are described in detail by Beveridge. Aboriginal women were said to have dug a hole about three feet in diameter and eighteen inches deep which was then filled with fire wood. Once the fire wood, mixed with large pieces of clay, had burnt off the ash was removed and the hole was lined with damp grass to protect the food. After the food was placed in the pit it was covered with more grass and clay, and then re-filled with the original soil. When cooking was complete, the covering soil and grass were removed (Beveridge 1889: 34).

#### Post-Contact History

Even before the first settlers arrived at Swan Hill the effects of white settlement were being felt by local Aboriginal people. European diseases, particularly smallpox and influenza, ravaged Aboriginal groups whose immune systems were unable to fight the devastating effects of these introduced viruses. More than likely these diseases spread well in advance of the explorers, making it likely that no European ever saw Aboriginal societies and cultures of the Murray River in all of their diversity and vigour; the first Europeans to arrive in the district were merely seeing the survivors of an epidemic. On his arrival to the district in 1845, Peter Beveridge noted that all the very old men showed 'distinct small pox traces', and estimated that the epidemic had occurred forty or fifty years previously. Owing to high population densities along the Murray, the region was especially susceptible to the devastating impact of these diseases.

Initial contact between Aboriginal people and Europeans in the Murray Valley was the result of European explorer's attempts to map Australia's waterways. The first European explorer in the Riverina was John Oxley in 1817. He followed the Lachlan River downstream south-west of Booligal, but the lack of continuous streams and dense lignum swamps prevented progress further west (Eardley 1999: 21). Oxley was followed by Charles Sturt, who followed the Murrumbidgee downstream to Lake Alexandrina

in South Australia between 1828 and 1831. Sturt was followed by Major Thomas Mitchell in 1836, who reached the junction of the Lachlan and Murrumbidgee. Following the river bank, Mitchell arrived at present-day Swan Hill on 20 June 1836, 'just before sunset'. Mitchell named the place Swan Hill because of 'the number of these birds whose beautiful notes were incessantly heard during the night'. He was most impressed with the 'reedy expanse' which terminated in 'rich grassy flats (Shire of Swan Hill 1989: 7). After Mitchell's expedition in 1836, the pace and intensity of contact increased as the observations made by early explorers filtered back to the Colony and encouraged graziers into the region. The result was the arrival of people overlanding stock to Victoria from NSW.

As graziers arrived on the Victorian side of the Murray in the 1830s a period of escalating conflict and intensified settlement occurred within the region. However, although violence was often the result of early contacts, it was not always the case. Historical commentators all indicate a diversity of responses between the parties, from amicable trade to violence, and in some cases massacre (Murray 1999: 8). For example, Major Mitchell's mapping expedition to trace the Darling River in 1835 came into conflict with local Aboriginal people on several occasions and as a result the mission had to be aborted. Again in 1836, after tracing the Darling to its junction with the Murray, violence resulted between Major Mitchell's party and a group of Aboriginal people believed to have followed them for several hundred kilometres. On this occasion, seven Aboriginal people were killed and four wounded when the expedition's forces attacked the shadowing party. Overlander Joseph Hawdon, one of the first settlers in the region, was also greeted with hostility early in 1838 when he settled on the NSW side of the Murray River (Shire of Swan Hill 1989: 8).

By the 1830s pastoral settlements were being established in the Murray region near Yanco, with grazing runs settled along the Murray and Murrumbidgee as far west as Hay by 1839 (Eardley 1999). Swan Hill itself was not settled until the mid-1840s. Significant contact in this area between Aboriginal people and Europeans is thought to have begun in 1846 when the Kirby and Beveridge brothers took up their Tyntynder run, some 16 km north west of Swan Hill on the Victorian side of the border.

In the 1840s there was great interest in the land west of the Loddon River on the Victorian side of the Murray. By this time most of the eastern Murray River frontage had been taken up by squatters who established large runs of which cattle was the primary pastoral activity (Eardley 1999). After the mid-1840s it had become clear that Aboriginal people and Europeans were in active competition for land. Aboriginal communities began to lose their traditional practices as European presence now made maintaining such practices increasingly difficult. Aboriginal people began to lose their land despite attempts to resist the overwhelming wave of European settlement. Eventually, Aboriginal people from the Murray region were left with few options beyond finding a means of keeping their customs alive on their own lands. In many cases this resulted in local Aboriginal people working for the white settlers that now occupied their lands or camping elsewhere on the lands of friendly settlers (Barwick 1971: 289; Murray 1999: 8).

The loss of traditional lands had a great impact upon Aboriginal society in the Murray region. White settlers could not comprehend Aboriginal land management practices, or the spiritual relationship Aboriginal people had with the land. Europeans only saw small bands of Aboriginal people moving around unsettled, uncultivated, unimproved, but rich countryside. As their lands were swallowed by European settlers, Aboriginal people forced from their lands came into conflict with not only Europeans,

but groups from other tribal areas. Serious conflicts between rival groups increased in frequency and men were speared, shot and maimed, and 'pay back' killing intensified (Coutts 1981: 107).

During the 1850s white settlement continued in the district, with the European population expanding rapidly with a corresponding decrease in the Aboriginal population. This was a trend that continued throughout the remainder of the century. A government Gazette of 1865 noted that there were now 550 Europeans in the Swan Hill district, 150 of them in Swan Hill (Gardner 1986: 2). By this time the Aboriginal population of the entire state of Victoria had been reduced to less than 2,000 (Barwick 1971: 289).

## **Government Policy**

The breakdown of traditional Aboriginal society was hastened by short-sighted and ineffective government policy that, in an attempt to protect Aboriginal people, only caused greater harm. In London, as a result of a strong campaign for social reform by evangelicals of the Church of England and nonconformist humanitarians, an 1837 Parliamentary Select Committee reported that genocide was occurring in the Antipodes. From July 1835 to 19 May 1837, a Select Committee of inquiry into the condition of the Aboriginal people heard evidence in London. Appalled at reports of widespread violence, Secretary of State Lord Glenelg ordered the establishment of a protectorate in the Port Phillip District. In 1837, he appointed George Robinson as Chief Protector (Penney 1997: 4).

Under the Port Phillip Protectorate, which lasted from 1839 to 1849, four depots were set up in the Loddon Valley, the Western District, the Goulburn Valley, and near Melbourne for Aboriginal people to settle (Barwick 1971: 289, Penney 1997: 5). The notion behind the depots was to establish places from which rations could be distributed to Aboriginal people who, as a result of being forced away from their traditional lands, no longer had access to traditional food supplies. However, this endeavour largely failed due to insufficient funds and a desire by Aboriginal people to stay close to their own lands.

As a result of a government enquiry and recognition of the failure of the Protectorate Board to provide sufficient support, a Board of Protection of Aboriginals was established in June 1860. The Board appointed a number of sympathetic settlers as Honorary Correspondents (or 'Local Guardians'), who were designated to distribute food and supplies whenever possible.

Penney (1997: 47, 49) has noted that the procedures for the appointment of Honorary Correspondents do not appear to have ever been encoded by the Board. Her observations are that correspondents were clearly important members of their community, prominent pastoralists, magistrates, medical practitioners, or police officers. Many of these men, or at least their stations, were in regular contact with local Aboriginal people.

Penney (1997: 71) also noted that Aboriginal people in Victoria were used to clustering around those pastoral stations and towns where supplies were more freely available to them. They were also using the depots as centres for social gatherings to maintain their social networks (Penney 1997: 87). In many cases, the local guardians also offered employment to the Aboriginal people under their care. Stores were distributed on a weekly, or twice weekly basis.

Several local Honorary Correspondents were appointed at Swan Hill between the years 1860 and 1923, at which time the Board ceased to operate in Swan Hill. These were Police Magistrate Crawford Pascoe

(1861-62); Dr Benjamin Gummow (1862, 1866-1874); Seutenious Officer (1863-1874) and Peter Beveridge (1863-1868). Two depots were operated from pastoral stations – Tyntynder Station and Boort Station. From 1874, Board supplies are believed to have been distributed from the Swan Hill Police Station, under the control of Local Guardians Sergeant L. Fawcett (1874-80), Senior Constable David S. Clark (1880), and Sergeant Edward Tronson (1880-1904?) (Long and Clark, 1999: 45). The Swan Hill depot was considered the centre of the mid- Murray region and was originally responsible for the Murray region downstream as far as Mildura and occasionally to the South Australian border (ibid 50).

In response to requests from many Aboriginal people who wanted land of their own, the Board sought large reserves of land suitable for supervised Aboriginal stations. For many reasons, not the least being the anticipated cost of salaries, it was thought best to encourage missionary endeavour rather than establish secular government stations (Barwick 1971: 289). Churches of varying persuasions had been operating in Victoria since the 1830s in an attempt to alleviate the suffering of Aboriginal people. Now, with the support of the Board, several new missions were established throughout Victoria. In many cases these missions failed to have any lasting effect due to inadequate support and financial difficulties.

The sites chosen for missions were often selected for later reserves or depots as Aboriginal people clustered at known or preferred locations. The closest mission to Swan Hill was the Lake Boga Moravian Mission, but this mission suffered due to opposition from neighbouring squatters. After its closure, the local Aboriginal people did not need to move far away and began receiving their supplies at Swan Hill (Penney 1997: 9).

In addition to government stations and missions, at the advice of John Green, who in 1861 was appointed to superintend the welfare of Aboriginal people in the colony, reserves were set aside for Aboriginal people who would not leave their home territories. In his 1872 report to the board he remarks:

"I would also recommend the board to form two stations (reserves) as soon as possible on the Murray; one somewhere between Echuca and Wodonga; the other below Swan Hill, and to send all supplies to these stations." (Victorian Aboriginals Protection Board 1872: 9, in Atkinson and Berryman 1983).

By this time, few Aboriginal people remained in the Swan Hill district due to the influence of government policy and squatters. A report by the Board for 1863 provides the figure of 171 Aboriginal people in the Swan Hill/Piangil area (Barwick 1971: 292). Instead of time with family on traditional lands, life for Aboriginal people was now more likely to be filled with itinerant labour, time on a mission at a place like Cummeragunja, service in the armed forces or removal from family to be raised as a non-Aboriginal person. Those who were not removed were reduced to begging around towns and pastoral stations, and either became heavily dependent on government depots for supplies or camped on the properties of friendly settlers. By 1884 there were, according to the Board of Protection of Aboriginals, just 844 Aboriginal people left in the colony of Victoria. Of those, 250 were living on reserves, most along the lower Murray River downstream from Swan Hill (Shire of Swan Hill 1989: 26). By 1887, about 45% of the Aboriginal population on the Murray was settled on pastoral stations. Numbers declined rapidly in the late 1880s due to diseases such as venereal disease, tuberculosis and influenza, and some eighty years after first European contact, the last official recorded 'full blood', Queen Agnes Edwards, died in 1928 (Gardner 1986: 2).

The situation in NSW followed a similar pattern to that of Victoria. A Protector of Aboriginals, appointed in 1881, recommended that reserves be set aside throughout the state to which Aboriginal people should be encouraged to move. A Board of Protection was then established in 1883. At that time, there was an estimated 9,000 Aboriginal people in NSW. As was the case in Victoria, the Board attempted to centralise Aboriginal people onto missions and reserves and implemented a policy of removing Aboriginal children from their families. In 1889 a reserve was established just north of Barmah, making it the closest to Swan Hill on the NSW side of the Murray River. The mission, called Cummeragunja (meaning 'my home') was extended to its final size of 2,695 inhabitants after the 1900s (Barwick 1971: 50).

#### 7.1.5 Land Use History

Initial European exploration of the study area occurred in the 1830s by Thomas Mitchell; by the late 1840s the area was fully occupied by squatters. The area remained sparsely settled and was grazed initially by sheep, and later by cattle, up until the late 1870s. Occupation of the landscape by pastoralists resulted in the clearance of native vegetation, the sinking of dams and the diversion/alteration of watercourses to provide for livestock (Ballinger 2008: 11).

Land selection acts of the late 1800s and high rainfall in the early 1870s brought selectors into the region. Selectors generally farmed small acreages of wheat or oats and ran a few head of pigs, poultry and cattle. However, dry years in the late 1870s which lead to failed crops and loss of livestock, coupled with rabbit infestations, forced many selectors off the land (Ballinger 2008: 13-15). Later land acts such as the Mallee Pastoral Leases Act in the 1880s saw land sold in larger allotments and wheat become the dominant crop. Further vegetation clearance, including grubbing out and burning of tree stumps, construction of water storages and fencing took place during this time, and continued ploughing and rabbit infestation led to widespread erosion. Dust storms were common by the early 1900s (Ballinger 2008: 16-18). Further settlement of the region was driven by closer settlement acts and the spread of irrigation schemes in the early twentieth century (Ballinger 2008: 18-32). Due to the region's highly saline groundwater which was too deep to extract and distribute, surface water was heavily relied on (Wimmera CMA 2008). The original Wimmera-Mallee Domestic and stock channel system was a complex network of open earthen channels that were very inefficient, with losses through seepage and evaporation approaching 90% with water being redirected from the Murray into the region (DELWP 2019). The channel system was run once a year to fill domestic and stock dams on farms. In 2006, the construction of the Northern Mallee Pipeline Project began, and was completed in 2010, with the open channels replaced by pipelines (DELWP 2019).

Agriculture continues to be the main economic driver in the region6. Water supplied though enhanced irrigation is derived from the Murray River and Goulburn River systems via a network of constructed channels. Wheat, barley and canola are the most popular crops and are grown primarily in the western Mallee, from Lake Meran through to Quambatook and Lalbert. Broadacre cropping is highly mechanised with large air seeders, tractors and harvesters allowing farmers to cover large areas of land. Many of the cereal farms in the Mallee are up to 12,000 acres or larger.

<sup>6</sup> http://www.gannawarra.vic.gov.au/Business-and-Events/Business-Development/Agriculture - accessed 25 March 2021

## 7.1.6 Previous Studies Relevant to the project area

A series of local studies have been reviewed to assist with understanding the level of previous archaeological investigation of the study area and to characterise the likely archaeological and cultural heritage values. The reports that have been reviewed are listed in Table 7-1.

Table 7-1: Previous Studies Relevant to the project area

Report Title
Waitchie-Ultima- Lalbert Road-Lalbert Survey Project: Telecom Optical Fibre Cable Route (Northern Victoria): A Field Assessment of The Potential Impact on Cultural Heritage Sites (Russell, L, 1995)
An Archaeological Survey of The Cannie Ridge Area Pipelines (Patterson 2003, 2004)
Kangaroo Lake Floodway, Kerang (Edmonds, 2006)
Murray Valley Highway, Improvement Works (Wilson and Sonego, 2019) (Amendments by Johnson and Rooney (2019) and Brooke (2020)

Waitchie-Ultima- Lalbert Road-Lalbert Survey Project: Telecom Optical Fibre Cable Route (Northern Victoria): A Field Assessment of The Potential Impact On Cultural Heritage Sites (Russell, L, 1995)

Russell (1995) prepared a heritage assessment for a proposed for the Telecom Optical Fibre Route (Northern Victoria) and provided a field assessment of the potential impact on Cultural heritage sites. The survey area traverses areas within the current study area along the Donald Swan Hill Road. The report includes information regarding risks to cultural heritages sites and historical places. The survey identified a single landform, a floodplain and the surrounding channels, with the visibility showing at 60-75%. The road between Lalbert and Lalbert Road were identified as being extensively disturbed with the top 30 cm removed. At the channel crossing, the ground surface had been extensively disturbed ensuring excellent visibility. During the survey, no cultural heritage or historical places were identified. Management conditions of the area identified that as the subsurface deposits could not be seen and therefore contingencies were included should any cultural heritage be identified during works.

An Archaeological Survey of The Cannie Ridge Area Pipelines (Patterson 2003, 2004)

An archaeological survey was prepared for the Cannie Ridge Pipelines project, the aim of which was to undertake an investigation of the cultural heritage values on or near the proposed Cannie Ridge pipelines routes. The investigation comprised a desktop study and a field survey along the actual pipeline routes. The study also assessed historical archaeological features within the study area. The desktop assessment identified that there are no previously recorded Aboriginal archaeological sites along the proposed pipelines routes in the Cannie Ridge area, the closest of which fall into two areas; to the west of the study area near Lalbert and to the northeast near Lake Boga. The study area contained a number of environments and landforms that are sensitive to Aboriginal archaeology such as Back Creek and ridges adjacent to low lying swamps. A survey was conducted over two days to assess for cultural heritage and historic sites, due to the large area, a sample survey was proposed, with random areas were chosen by walking 200 m every 10km on foot. Additionally, archaeologically sensitive landforms such as creek crossings were surveyed on foot. Almost 100% of the pipelines were driven in car, with inaccessible areas (such as mature crops in paddocks) not surveyed. A total of 24 areas were surveyed

including random and sensitive archaeological landforms, with only 4.3 km or 1.39% of the pipeline routes were surveyed.

### Cultural heritage fieldwork

The survey identified no Aboriginal archaeological sites recorded along the proposed pipeline routes, this being possibly due to the fact that the pipeline routes were a small and narrow part of the overall area and may have only been subject to transitory use between the resource rich areas of the Murray River and Kerang Lakes to the east.

Management conditions within the 2003 report identified areas of potential sensitivity for Aboriginal archaeological material in surface or subsurface contexts, including creek crossings such as Back Creek. The report acknowledged that the sites were not investigated, and that should they be impacted, they would need to be investigated prior to disturbance to investigate the potential for subsurface archaeological deposits.

In 2004, a test excavation was commissioned within three of the areas identified above: Area A, a large sand dune overlooking a depression/ old dry lake; Area B, Gillies Road crossing of Back Creek; and Lavey Road crossing of Back Creek. Area A contained a sand dune situated north of a former lake. During periods of high lake levels, sandy dunes are created along the lake margins; as the lake levels fell, the clay-rich lake floors are exposed, providing the source of material for windblown sediments. According to Ross (1983, p.63), lunettes in the Mallee were mainly deposited in two phases: an early sandy phase when lake levels were high form 40, 000BP to 26, 000 and a later clay phase deposited during an arid phase between 26 000 and 14 000 BP. These periods of lunette formation were often contemporaneous with Aboriginal use of the lake margins, with the rapid formation of dune sediments contributing to the preservation of archaeological material, including burials. Beneath the sand dunes, approximately 400 - 500 mm in depth of white beach sand, overlying this is the red brown mallee sand dune (see Profiles of test trenches (Terra Culture, 2004)). Back Creek contains a floodplain landform and is marked by grey brown clayey soils and dominated by black box woodland, the local geology within the floodplain is alluvium. No Aboriginal Cultural heritage was identified.



Figure 7-4: Profiles of test trenches (Terra Culture, 2004)

Kangaroo Lake Floodway, Kerang (Edmonds, 2006)

Edmonds (2006) conducted an indigenous Heritage Assessment on the southern side of the Murray Valley Highway, approximately 40 km northwest of Kerang on behalf of the Goulburn-Murray Water (G-MW). G-MW propose investigate using Kangaroo lake as a possible on-line winter storage on the Murray system which needs to accommodate potential flood flows to the Avoca River. A standard assessment was conducted to survey the entire corridor of the proposed development area for ground surface exposure. Generally, vegetation cover was moderate to low across the study area, with moderate exposure. At the conclusion of the standard assessment, no Aboriginal cultural heritage was identified. The study area was identified as being moderately to heavily disturbed through existing channel construction and agricultural modification of the landscape. Only 100 m of the proposed development (the margin of Kangaroo Lake) was predicted to be archaeologically sensitive, during the survey, the area was severely modified through removal of vegetation and grading.

Murray Valley Highway, Improvement Works (Wilson and Sonego, 2019) (Amendments by Johnson and Rooney (2019) and Brooke (2020)

The study area comprises a 14 km length of road reserve along the Murray Valley Highway situated between Bael Bael, Lake Boga and Copeland Road and Mystic Park adjacent to Kangaroo Lake. A desktop assessment identified that the study area was located within 200 m of water sources (Lake Boga and Kangaroo Lake), and within 500 m of Lake Tutchewop. Disturbances were noted within the study area through the construction of the Murray Valley Highway, as well as irrigation infrastructures, including

irrigation channels and levees. A standard assessment was undertaken during the CHMP and both amendments. A single Aboriginal cultural heritage place was identified, a single burnt mound/ hearth (Tutchewop Wildlife Reserve 1, VAHR 7626-0898), however, as no works were associated with that area, testing was recommended. During the amendments, the surveys identified no Aboriginal cultural heritage, with an average ground surface visibility and survey coverage of 80%. Due to the lack of potential for Aboriginal cultural no complex testing was recommended.

A complex assessment was undertaken during the original version of the CHMP, with a single area of former wetland to the southwest of Lake Tutchewop. A single 1x1 m test pit, and 33 mechanical test trenches were excavated. The test pit identified a loose brown silt containing occasional roots and carbonate nodules, overlaying a compact clay containing frequent carbonate nodules. The maximum depth of the trench was 120 mm. It was concluded that it was unlikely additional Aboriginal places would be present within the study area.

## 7.1.7 Regional Studies

Previous archaeological regional studies assist in characterising the general pattern of archaeological site distribution across a broad regional environment. The reports that have been reviewed are listed in Table 7-2.

#### Table 7-2: Previous studies in the regional context

Report Title
Aboriginal Prehistory in Northwestern Victoria (Coutts, 1977-1978)
An Archaeological Survey of The Tyrrell and Lalbert System (Edmonds Et Al. 1997)
Northern Mallee Pipeline Project Desktop Archaeological Study (Marshall, Schell and Walsh, 1996)
Cokam Bushland Reserve Works, CHMP (Stradwick and Johnson, 2018)
Quail Lakes Min5291, Tresco West 3584

## Aboriginal Prehistory in Northwestern Victoria (Coutts, 1977-1978)

The 1977-1978 Activities Report of the Victoria Archaeological Survey (VAS) indicated that two archaeological sites (VAHR 7526-0002 and 7526-0003) were recorded at Lake Lalbert in 1977 during field surveys carried out as part of the annual VAS Summer School. No further information regarding the Lake Lalbert survey or these two registered places was provided in the report.

Northern Mallee Pipeline Project Desktop Archaeological Study (Marshall, Schell and Walsh, 1996)

This report was prepared for the proposed Northern Mallee Pipeline extending from Swan Hill towards Sea Lake near Lake Tyrell. The survey conducted included an intensive survey of parts of the route: east of the Murray Valley Highway and Lalbert Creek. Marshall et al, reflect on work conducted by Bell, Ross and Silcox (1981) whom recorded 35 sites and 75 isolated finds, including stone artefacts and hearths around the margins of two lakes, and where Lalbert Creek drains into the Lake. Additionally, work conducted by Ross (1985, 1986) recorded more than 100 sites in the Mallee, with observations that sites were no more than 500 m from either a temporary or permanent source of water. Marshall et al, (1996, p.7), commented on the potential for archaeological site to remain, with scarred trees likely to have

been destroyed by tree removal, and that European farming activity having widely distributed sites. The Mallee Plains was designated a low potential for sites to remain, with an exception along watercourses, and water margins (such as Lake Lalbert and Lalbert Creek).

# An Archaeological Survey of The Tyrrell and Lalbert System (Edmonds Et Al. 1997)

This report focuses on the Tyrrell and Lalbert drainage catchment within a semi-arid, low lying flat land, and specifically on Lake Lalbert, a shallow swampy lake which occasionally dries out and receives water via Lalbert Creek. Systematic archaeological research was undertaken consisting of surveys of the plains between the Murray River and Lake Lalbert. Scarred trees were the most commonly occurring site types examined with their distribution limited to the immediate floodplains of Lalbert Creek. The occurrence of cultural material was considered a reflection of the presence of high ground adjacent to water sources. Freshwater is considered scarce within the region, with the distribution of sites indicating a pattern of both present and past water usage demonstrated by the occurrence of sites of potential Pleistocene age adjacent to currently dry or saltwater bodies.

## Cokam Bushlan Reserve Works, CHMP (Stradwick and Johnson, 2018)

Stradwick and Johnson (2018) conducted a mandatory CHMP for walking track and roadway. The desktop assessment identified that the study area was situated within the Shepparton Formation which is a widespread fluvial and lacustrine sediments. Despite a low probability of Aboriginal Cultural Heritage remaining, a standard assessment was undertaken in two stages. The entirety of the study area was surveyed with excellent visibility, the survey identified no sensitive landforms. A complex assessment comprised of two test pits (1x1m) and fourteen (STPs), no Aboriginal cultural heritage was identified. The soil profile of the two test pits consisted of redeposited natural soils, which were the result of the dumping of spoil during the construction of the dams. Whilst the STPs contained natural soils with shallow silty clays terminating on impenetrable clays at relatively shallow depths. The complex program further confirmed that there were no sensitive landforms within the study area.

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Lambert and Lambert (2020) conducted a mandatory CHMP for the extraction of gypsum to depths of 2-3 m. The study area was located within the LGA of Swan Hill. A desktop assessment included a geographic region that targeted the geomorphic units (5.1.4 and 4.1.3). This CHMP was conducted approximately 14km NE of the current study area (CHMP 17848).

The desktop assessment identified that it was reasonably possible that Aboriginal cultural heritage could be present in the study area, and that the area was likely to have been used intermittingly by Wemba Wemba as their primary occupation generally occurred around the perennial freshwater lakes of the region. A standard assessment was then conducted within the study area, which identified good ground surface visibility within a saline depression landform (80-100%). The study area identified an old lakebed with no trees. A single silcrete artefact (VAHR 7626-0900-1) was identified on the surface. No other sensitive locations were identified within the study area, and no additional artefacts were identified within proximity to the already identified place. The entirety of the works was to occur within the lakebed of Quail Lake and within the proposed mining lease and therefore no complex assessment was required.

## Summary

By comparing the results of the background research and the archaeological investigations previously undertaken within the geographic region, the following conclusions can be drawn regarding the likely nature of Aboriginal archaeological material within the study area:

- No archaeological sites have previously been identified within the study area.
- The study area is located on the Parilla sands geological unit within North Western Dunefields and Plains and overlies two geomorphological units (5.1.4: Hummocky dunes dominant and 5.1.5: Hummocky dunes sub-dominant). The study area is therefore located on linear dunes.
- The Parilla Sands is quartz sandstone: well sorted, fine to medium grained; well bedded, abundant lag horizons containing shelly fossils, pebble beds, rounded ironstone fragments; some heavy mineral concentrations; dissected or remobilised strand lines.
- A total of 41 registered Aboriginal cultural heritage places are located within the geographic region, which is defined as a radius buffered on the study area spanning 6 km capturing creeks and rivers.
- A review of these Aboriginal places indicates specific clustering around Lake Lalbert and Kangaroo Lake. Registered Aboriginal places have also been identified on the plains, floodplains and depressions, although these tend to be low density scatters or isolated artefacts.
- Artefact scatters within the geographic region mostly comprise sparse surface stone artefacts identified in ploughed paddocks on plain landforms. Artefact scatters, scarred trees and earth features also exist along the margins of nearby watercourses and waterbodies (Lalbert Creek, Kangaroo Lake and Lake Lalbert).
- There has been a limited number of archaeological investigations within the geographic region.
- The study area is located on a landscape that was historically utilised for stock grazing and for agricultural practices.

It is unlikely that scarred trees remain within the study area, as it is unlikely any mature trees remain due to prior clearance of the study area for agricultural activities.

The results of the desktop assessment indicate that low-density artefact scatters or isolated artefacts and earth features are the most common place type across the geographic region. There is a low to moderate potential for stone artefacts to be present within the study area.

# 7.1.8 Aboriginal Archaeological Survey

An Aboriginal archaeological ground survey of the study area was conducted in line with the requirements of a CHMP standard assessment, pursuant to regulation 63 of the Aboriginal Heritage Regulations 2018 (Vic) (the Regulations) and in accordance with proper archaeological practice as outlined in Burke, Morrison and Smith (2017: 93-94). The aims of the archaeological survey were to:

• Inspect areas with ground surface visibility for Aboriginal archaeological sites within the study area.

• Undertake a general assessment of the overall archaeological potential of the study area.

# 7.1.8.1 Obstacles Encountered in Completing the Survey

Ground surface visibility was fair to good overall, however, there were sections of felled crops or stalks which limited the ground surface visibility. Whilst the entirety of the study area was accessible, due to the size of the paddock's only limited surveying was able to be conducted.

# 7.1.8.2 Method of Assessment

The survey was undertaken over eight days (19-23 April 2021, 10-11 November 2021 and 21 July 2022) by a team comprising between four to six participants. Pedestrian spacing varied from 2 to 30 m, with good survey coverage across the study area given its size. The study area was split into groups of two or three traversing the study area. Areas with trees were targeted, with a pedestrian inspection also conducted along the access and pipeline route (including the proposed pumping station location).

# 7.1.8.3 Archaeological Potential Rating

As a component of the archaeological ground survey, each investigation area (IA) within the study area was assessed in terms of its overall archaeological sensitivity and evidence for disturbance.

The archaeological sensitivity rating reflects the likely cultural heritage values of the study area. An initial archaeological sensitivity rating for each IA was assigned based on the outcomes of the desktop assessment. If necessary, upon completion of the standard assessment, the sensitivity rating was adjusted as a result of observations made during the ground survey. Within the geographic region, stone artefact sites are likely to occur within along the margins of watercourses such as Lalbert Creek, Kangaroo Lake and Lake Lalbert.

Archaeological sensitivity ratings were based on a variety of factors including elevation, distance to water, land use history, Traditional Owner viewpoints, the presence or absence of previously identified cultural heritage and the presence or absence of newly identified cultural heritage.

Archaeological sensitivity ratings were based on a range detailed below:

- a) Low sensitivity: associated with areas of the landform that has experienced heavy modern modifications and is at the furthest distance from waterways/water sources or other sensitive landforms and displays little to no evidence of Aboriginal Cultural Heritage.
- b) Moderate Sensitivity is associated with a partially modified landform and with moderate evidence of Aboriginal cultural heritage.
- c) High sensitivity is associated with landforms closest to waterways or other sensitive landforms, that demonstrate little to no modification, and increased concentrations of in situ Aboriginal cultural heritage.

These investigation areas are also assigned intermediary archaeological sensitivity ratings of low-moderate or moderate-high.

Each investigation area was also assigned a disturbance rating based on the level of disturbed observed. Disturbance ratings were based on taphonomic processes factors such as the extent of accidental and deliberate human activity (ploughing, construction, removal) to the activities of animals (grazing,

trampling, burrowing, digging), insects (nesting, burrowing, eating) and plants (tree roots, vegetation, overgrowth) (Burke, Morrison and Smith 2017:107). The disturbance rating reflects the compounded impact of past and present land uses.

A disturbance rating for each IA was assigned based on the findings of the desktop assessment and the outcomes of the ground survey. The disturbance rating included factors such as the extent of landscape modification and disturbance of subsoil deposits by various activities.

Archaeological disturbance ratings were based on a range detailed below:

- a) Low Disturbance is associated with minor surface impacts such as reserve area with no visible or listed subsurface utilities or prior farming practices.
- b) Moderate Disturbance is associated with moderate surface impacts including unsealed roads, drainage minimal subsurface utility infrastructure and minor landscape modification (ploughing, animal burrowing and grazing)
- c) High Disturbance is associated with highly disturbed landscapes including existing roads and modified road reserves and rail corridors, numerous subsurface utilities, mining and quarrying activities, including dam construction.

Investigation Areas are also assigned moderate-high or low-moderate level of ground disturbance where ratings cannot be clearly distinguished.

A rating scheme (Table 7-3) was used to assign both an archaeological sensitivity rating and a disturbance rating to each IA. The archaeological sensitivity and disturbance rating values are then multiplied together to determine an overall Archaeological Potential Rating (APR) for each IA as outlined in Table 7-3. The results of the standard assessment are presented in Figure 7-3.

Archaeological Sensitivity		Disturbance		Archaeological Potential	
1	Low	1	High	1-4	Low
2	Low-moderate	2	Moderate-high	5-7	Low-moderate
3	Moderate	3	Moderate	8-17	Moderate
4	Moderate-high	4	Low-moderate	13-17	Moderate-high
5	High	5	Low	17-25	High

Table 7-3: Archaeological sensitivity and disturbance rating scheme

## 7.1.8.4 *Survey Results*

The study area was assessed as ten separate investigation areas (IAs) (Table 7-4 to Table 7-13), based on the presence of three identified landforms:

- Flat to gently sloping land (IA-1, IA-4, IA-6, IA-8 and IA-10)
- A floodplain (IA-11)
- Cannie Ridge, comprising a narrow crest (IA-3 and IA-7) and short adjoining slopes (IA-2 and IA-9)
- A small rise (IA-5)



Figure 7-5: Map of the Standard assessment results of each Investigation Area.

#### IA-1: Mid slope

Investigation Area 1 is located along the southern boundary of Thompson Road within a large agricultural field on a gently inclined landform (towards the south), although the northern boundary is a flatter / level open depression and inclines towards the south. Ground surface visibility (GSV) was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposure were identified underneath and around tree roots, along the fence line and property boundaries (Plate 1).

- IA-1 was assessed as being of low archaeological sensitivity (1) due to the landform comprising a gently inclined slope (towards the south) with no nearby resources (such as natural watercourses), and also due to the absence of cultural heritage within an area of good to excellent visibility.
- IA-1 was assessed as having undergone a moderate level of ground disturbance (3) through the impact of farming practices such as land clearance, ongoing ploughing, and the construction of a dam and a pumping station (to the east). Multiple snake burrows were also identified throughout the paddock, and continuous land clearance activities for dams (Plate 2).

No Aboriginal cultural was identified. IA-1 was assessed as having low archaeological potential (3).

Investigation Area	IA-1, (73.04 ha; or 730, 462.85 sqm)
Survey Method	Pedestrian
Sampling Strategy	Systematic
No. of Participants	6
Transect Width	120 m
Transect Spacing	30 m
Visibility	
Exposures	Areas of grass dieback, between the furrows, fence lines and trees
% Average ground surface visibility	80
Environment	
Setting	Inland
Land System/Elevation	Lowland
Locality Landform	Flat, Level
Slope	Very gently inclined (>0.50-1.50)
Water	Artificial channels, Lalbert Creek (10 km west)
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing), gravel road construction.
Previous/Current Land Use	Farmland.
Vegetation	
Vegetation Condition	Agricultural
Vegetation Type	Introduced grassland
Aboriginal Place Identified?	No

Table 7-4: Summary description of IA-1

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Investigation Area	IA-1, (73.04 ha; or 730, 462.85 sqm)
Sensitivity Ratings	1: Low
Disturbance Ratings	3: Moderate
Archaeological Potential Rating	3: Low



Plate 1: Example of GSV looking north



Plate 2: Land clearance for a dam, good to excellent GSV.

## IA-2: Upper slope

Investigation Area 2 is situated on the eastern boundary of Shepherd Road on the upper slope of a ridge, within a large agricultural field. Ground surface visibility (GSV) was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposure were identified underneath and around tree roots, along the fence line and property boundaries.

- IA-2 was assessed as being of low archaeological sensitivity (1), this landform is part of the slope of a stranded ridge. However, there are no nearby resources (ie. watercourses or water sources), and due to the slope, this area was unlikely to have been utilised.
- IA-2 was identified as having undergone a moderate level of ground disturbance (3) through the impact of farming practices such as land clearance and ongoing ploughing (Plate 3 and Plate 4). Multiple snake burrows were also identified throughout the paddock.

No Aboriginal cultural was identified. IA-2 was assessed as having low archaeological potential (3).

Investigation Area	IA-2 (52.73 ha; or 527, 338.60 sqm)
Survey Method	Pedestrian
Sampling Strategy	Systematic
No. of Participants	6
Transect Width	120 m
Transect Spacing	30 m
Visibility	
Exposures	Areas of grass dieback, between the furrows, fence lines and trees
% Average ground surface visibility	80
Environment	
Setting	Inland
Land System/Elevation	Lowland
Locality Landform	Flat, Level
Slope	Gently inclined (>1.6°-5.5°)
Water	Artificial channels, Lalbert Creek (10 km west)
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)
Previous/Current Land Use	Farmland.
Vegetation	
Vegetation Condition	Agricultural

Table 7-5: Summary description of IA-2

Investigation Area	IA-2 (52.73 ha; or 527, 338.60 sqm)
Vegetation Type	Introduced grassland
Aboriginal Place Identified?	No
Sensitivity Ratings	1: Low
Disturbance Ratings	3: Moderate
Archaeological Potential Rating	3: Low



Plate 3: Facing East, looking towards the upper slope



Plate 4: Facing north, fair to good GSV

IA-3: Ridge

Investigation Area 3 is situated on the western boundary of Shepherd Road, within a large agricultural field on a ridge landform. GSV was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposure were identified underneath and around tree roots, along the fence line and property boundaries.

- IA-3 was assessed as being of low to moderate archaeological sensitivity due to the landform (stranded ridge) (2). However, there are no nearby resources (ie. watercourses or water sources), and due to the slope, this area was unlikely to have been frequently utilised.
- This IA was identified as having undergone a moderate level of ground disturbance (3) through the impact of farming practices such as land clearance, drainage and ongoing ploughing (Plate 5 and Plate 6). Multiple snake burrows were also identified throughout the paddock.

No Aboriginal cultural was identified. IA-3 was rated as low-moderate archaeological potential (6). Despite a low-moderate archaeological potential rating, during the survey the ground surface was exposed and revealed the underlying geology. It's unlikely that Aboriginal Cultural Heritage will be present within the Investigation Area.

Investigation Area	IA-3 (241.09 ha; or 2,410,925.17 sqm)
Survey Method	Pedestrian
Sampling Strategy	Systematic

Table 7-6: Summary description of IA-3

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Investigation Area	IA-3 (241.09 ha; or 2,410,925.17 sqm)
No. of Participants	6
Transect Width	120 m
Transect Spacing	30 m
Visibility	
Exposures	Areas of grass dieback, between the furrows, fence lines and trees
% Average ground surface visibility	75
Environment	
Setting	Inland
Land System/Elevation	Lowland
Locality Landform	Flat, Level
Slope	Very gently inclined (>0.5°-1.5°)
Water	Artificial channels, Lalbert Creek (10 km west)
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)
Previous/Current Land Use	Farmland.
Vegetation	
Vegetation Condition	Agricultural
Vegetation Type	Introduced grassland
Aboriginal Place Identified?	No
Sensitivity Ratings	2: Low - moderate
Disturbance Ratings	3: Moderate
Archaeological Potential Rating	6: Low - moderate



Plate 5: View west along the fence line with drainage works constructed



Plate 6: View north, example of the general visibility between the furrows and ridges

#### IA-4: Plain

Investigation Area 4 is located along the eastern boundary of Bush Road within a large agricultural field on a flat/level landform. Ground surface visibility (GSV) was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposures were identified underneath and around tree roots, along the fence line and property boundaries (Plate 7 and Plate 8).

- IA-4 was assessed as being of low archaeological sensitivity (1) due to the landform comprising flat/level plain with no nearby resources (such as natural watercourses), and also due to the absence of cultural heritage within an area of good to excellent visibility. As a result, IA-4 was assessed as having low archaeological potential (3).
  - IA-4 was assessed as having undergone a moderate level of ground disturbance (1) through the impact of farming practices such as land clearance and ongoing ploughing. Multiple snake burrows were also identified throughout the paddock.

No Aboriginal cultural was identified. IA-4 was assessed as having low archaeological potential (3).

Investigation Area	IA-4 (82.82 ha; or 828 213.54 sqm)
Survey Method	Pedestrian
Sampling Strategy	Systematic
No. of Participants	6
Transect Width	120 m
Transect Spacing	30 m
Visibility	
Exposures	Areas of grass dieback, between the furrows, fence lines and trees
% Effective survey coverage	77
Environment	
Setting	Inland
Land System/Elevation	Lowland
Locality Landform	Flat, Level
Slope	Level/ Flat Ground (<0.5°)
Water	Artificial channels, Lalbert Creek (10 km west)
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)
Previous/Current Land Use	Farmland.
Vegetation	
Vegetation Condition	Agricultural
Vegetation Type	Introduced grassland

Table 7-7: Summary description of IA-4

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Investigation Area	IA-4 (82.82 ha; or 828 213.54 sqm)
Aboriginal Place Identified?	No
Sensitivity Ratings	1: Low
Disturbance Ratings	3: Moderate
Archaeological Potential Rating	3: Low



Plate 7: view of the ploughed field with dried stalks, facing northwest



Plate 8: Example of an area with excellent ground surface visibility

#### IA-5: Small rise

Investigation Area 5 is a small rise within a large agricultural field. Ground surface visibility was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposures were identified underneath and around tree roots, along the fence line and property boundaries. Multiple snake burrows were also identified throughout the paddock.

- IA-5 was assessed as being of low to moderate archaeological sensitivity (2), this landform was
  prescribed a slightly higher sensitivity than those landforms surrounding it due to it being a slightly
  raised hillcrest. However, due to a lack of cultural heritage identified within good to excellent
  visibility and with no nearby resources (such as natural watercourses), this IA was rated as low to
  moderate.
- IA-5 was identified as having undergone a moderate level of ground disturbance (3). This IA was identified as having undergone a moderate level of ground disturbance (3) through the impact of farming practices such as land clearance, drainage and ongoing ploughing (Plate 9).

As a result, IA-5 was assessed as having low to moderate archaeological potential (6).

Investigation Area	IA-5 (30.83 ha; or 308,289.15 sqm)
Survey Method	Pedestrian
Sampling Strategy	Systematic
No. of Participants	6
Transect Width	120 m
Transect Spacing	30 m
Visibility	
Exposures	Areas of grass dieback, between the furrows, fence lines and trees
% Average ground surface visibility	75
Environment	
Setting	Inland
Land System/Elevation	Lowland
Locality Landform	Flat, Level
Slope	Very gently inclined (>0.5°-1.5°)
Water	Artificial channels, Lalbert Creek (10 km west)
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)
Previous/Current Land Use	Farmland.
Vegetation	
Vegetation Condition	Agricultural

Table 7-8: Summary description of IA-5

Investigation Area	IA-5 (30.83 ha; or 308,289.15 sqm)
Vegetation Type	Introduced grassland
Aboriginal Place Identified?	No
Sensitivity Ratings	2: Low to Moderate
Disturbance Ratings	3: Moderate
Archaeological Potential Rating	6: Low to Moderate



Plate 9: Facing east towards the hill crest

#### IA-6: Plain

Investigation Area 6 is located along the eastern boundary of Shepherd Road within a large agricultural field on a flat to gently inclined landform. Ground surface visibility was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposures were identified underneath and around tree roots, along the fence line and property boundaries (Plate 10 and Plate 11).

- IA-6 was assessed as being of low archaeological sensitivity (1) due to the landform comprising flat to gently inclined plain with no nearby resources (such as natural watercourses), and also due to the absence of cultural heritage within an area of good to excellent visibility.
- IA-6 was assessed as having undergone a moderate level of ground disturbance (3) through the impact of farming practices such as land clearance and ongoing ploughing. Multiple snake burrows were also identified throughout the paddock, which increased visibility surrounding the area.

As a result, IA-6 was assessed as having low archaeological potential (3).

Investigation Area	IA-6 (237.35 ha; or 2,373,523.00 sqm)
Survey Method	Pedestrian
Sampling Strategy	Systematic
No. of Participants	6
Transect Width	90 m
Transect Spacing	30 m
Visibility	
Exposures	Areas of grass dieback, between the furrows, fence lines and trees
% Average ground surface visibility	77
Environment	
Setting	Inland
Land System/Elevation	Lowland
Locality Landform	Flat, Level
Slope	Very gently inclined (>0.5°-1.5°)
Water	Artificial channels, Lalbert Creek (10 km west)
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)
Previous/Current Land Use	Farmland.
Vegetation	
Vegetation Condition	Agricultural

Table 7-9: Summary description of IA-6

Investigation Area	IA-6 (237.35 ha; or 2,373,523.00 sqm)
Vegetation Type	Introduced grassland
Aboriginal Place Identified?	No
Sensitivity Ratings	1: Low
Disturbance Ratings	3: Moderate
Archaeological Potential Rating	3: Low



Plate 10: View of the ploughed field and ground surface visibility within IA-6, facing west



Plate 11: View of the ploughed field and ground surface visibility within IA-6, facing south
### IA-7: Ridge

Investigation Area 7 encompasses a ridge landform (Cannie Ridge) within a large agricultural field. Ground surface visibility (GSV) was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposure were identified underneath and around tree roots, along the fence line and property boundaries. Multiple snake and rabbit burrows were also identified throughout the paddock. A large quarry was also identified within the centre of the field which provided excellent visibility.

- IA-7 was assessed as being of low to moderate archaeological sensitivity (2) due to it being a stranded ridge. However, no cultural heritage was identified within an area of excellent visibility, with no nearby resources (such as natural watercourses).
- This IA was identified as having undergone a moderate to high level of ground disturbance (2) through the impact of farming practices such as land clearance, drainage, dam excavations, quarrying activities and ongoing ploughing (Plate 12 to Plate 15).
- No Aboriginal cultural was identified. IA-3 was rated as low archaeological potential (4).

Investigation Area	IA-7 (355.46 ha; or 3, 554, 632.87 sqm)		
Survey Method	Pedestrian		
Sampling Strategy	Systematic		
No. of Participants	6		
Transect Width	120 m		
Transect Spacing	30 m		
Visibility			
Exposures	Areas of grass dieback, between the furrows, fence lines and trees		
% Average ground surface visibility	75		
Environment			
Setting	Inland		
Land System/Elevation	Lowland		
Locality Landform	Flat, Level		
Slope	Very gently inclined (>0.5°-1.5°)		
Water	Artificial channels, Lalbert Creek (10 km west)		
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)		
Previous/Current Land Use	Farmland.		
Vegetation			

Table 7-10: Summary description of IA-7

Investigation Area	IA-7 (355.46 ha; or 3, 554, 632.87 sqm)	
Vegetation Condition	Agricultural	
Vegetation Type	Introduced grassland	
Aboriginal Place Identified?	No	
Sensitivity Ratings	2: Low - moderate	
Disturbance Ratings	2: Moderate- high	
Archaeological Potential Rating	4: Low	



Plate 12: Stockpiled soil (with Rabbit burrows)



Plate 13: Overlooking a quarry



Plate 14: View north, overlooking a stockpile



Plate 15: Rabbit burrows facing south

#### IA-8: Plain

Investigation Area 8 is located along the western boundary of Pola Road, with Bennet Road to the north within a large agricultural field on a flat to gently inclined landform. Ground surface visibility (GSV) was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposures were identified underneath and around tree roots, along the fence line and property boundaries (Plate 16 to Plate 18).

- IA-8 was assessed as being of low archaeological sensitivity (1) due to the landform comprising flat to gently inclined plain with no nearby resources (such as natural watercourses), and also due to the absence of cultural heritage within an area of good to excellent visibility.
- IA-8 was assessed as having undergone a moderate level of ground disturbance (1) through the impact of farming practices such as land clearance and ongoing ploughing. Multiple snake burrows were also identified throughout the paddock.

As a result, IA-8 was assessed as having low archaeological potential (3).

Investigation Area	IA-8 (102.56 ha; or 1, 025, 649.56 sqm)			
Survey Method	Pedestrian			
Sampling Strategy	Systematic			
No. of Participants	6			
Transect Width	120 m			
Transect Spacing	30 m			
Visibility				
Exposures	Areas of grass dieback, between the furrows, fence lines and trees			
% Average ground surface visibility	75			
Environment				
Setting	Inland			
Land System/Elevation	Lowland			
Locality Landform	Flat, Level			
Slope	Very gently inclined (>0.5°-1.5°)			
Water	Artificial channels, Lalbert Creek (10 km west)			
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)			
Previous/Current Land Use	Farmland.			
Vegetation				
Vegetation Condition	Agricultural			

Table 7-11: Summary description of IA-8

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Investigation Area	IA-8 (102.56 ha; or 1, 025, 649.56 sqm)	
Vegetation Type	Introduced grassland	
Aboriginal Place Identified?	No	
Sensitivity Ratings	1: Low	
Disturbance Ratings	3: Moderate	
Archaeological Potential Rating	3: Low	



Plate 16: Excavated areas along the western boundary (facing north)



Plate 17: Example of low visibility due to felled crop stalks



Plate 18: small, raised area in IA-8 for a dam

#### IA-9: Mid Slope

Investigation Area 9 is located within a large agricultural field on a mid-slope inclined to the west. Ground surface visibility (GSV) was good where the ground had been ploughed or had dieback, with small areas clustered with felled crop stalks. Areas of exposures were identified underneath and around tree roots, along the fence line and property boundaries (Plate 19 to Plate 21).

- IA-9 was assessed as being of low archaeological sensitivity (1) due to the landform comprising flat to gently inclined plain with no nearby resources (such as natural watercourses), and also due to the absence of cultural heritage within an area of good to excellent visibility.
- IA-9 was assessed as having undergone a moderate level of ground disturbance (1) through the impact of farming practices such as land clearance and ongoing ploughing. Multiple snake burrows were also identified throughout the paddock.

As a result, IA-9 was assessed as having low archaeological potential (3).

Investigation Area	IA-9 (102.56 ha; or 1, 025, 649.56 sqm)			
Survey Method	Pedestrian			
Sampling Strategy	Systematic			
No. of Participants	6			
Transect Width	120 m			
Transect Spacing	30 m			
Visibility				
Exposures	Areas of grass dieback, between the furrows, fence lines and trees			
% Average ground surface visibility	75			
Environment				
Setting	Inland			
Land System/Elevation	Lowland			
Locality Landform	Flat, Level			
Slope	Very gently inclined (>0.5°-1.5°)			
Water	Artificial channels, Lalbert Creek (10 km west)			
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)			
Previous/Current Land Use	Farmland.			
Vegetation				
Vegetation Condition	Agricultural			

Table 7-12: Summary description of IA-9

Investigation Area	IA-9 (102.56 ha; or 1, 025, 649.56 sqm)	
Vegetation Type	Introduced grassland	
Aboriginal Place Identified?	No	
Sensitivity Ratings	1: Low	
Disturbance Ratings	3: Moderate	
Archaeological Potential Rating	3: Low	



Plate 19: Facing west towards the ridge – mid slope



Plate 20: Facing north within a tree cluster, example of ironstone rocks



Plate 21: View north towards the tree cluster

## IA-10: Access tracks/ roads and pipeline route

Investigation Area 10 encompasses all the access tracks between the paddocks and leading out onto Donald-Swan Hill Road. This IA also includes the proposed pipeline route towards Willis Road, Mystic Park and includes the following roads: Shepherd Road, Jobling Road (Plate 22), Lookout Road (Plate 23 and Plate 24), Bish Road, Mystic Park-Meatian Road (Plate 24), Mystic Park-Beauchamp Road and Bennett Road. A vehicular assessment was included of Donald – Swan Road and Lake Boga – Ultima Road.

- IA-10 was assessed as being of low to moderate archaeological sensitivity (2) due to the landform comprising flat to gently inclined plain with nearby resources, and also due to the absence of cultural heritage within an area of good to excellent visibility.
- IA-10 was assessed as having undergone a moderate to high level of ground disturbance (2) through the impact of farming practices such as land clearance for an access track for heavy machinery and the construction of all-weather roads. GSV was good where the ground had been cleared, with small areas clustered with leaf litter. Areas of exposure were identified underneath and around tree roots, along the fence line, drainage channels and property boundaries.

As a result, IA-10 was assessed as having low archaeological potential (4).

Investigation Area	IA-10 (308.01 ha; or 3, 080, 170.59 sqm)	
Survey Method	Pedestrian and Vehicular	
Sampling Strategy	Systematic	
No. of Participants	4 to 6	
Transect Width	120 m	
Transect Spacing	30 m	
Visibility		
Exposures	Areas of grass dieback, between the furrows, fence lines and trees	
% Average ground surface visibility	75	
Environment		
Setting	Inland	
Land System/Elevation	Lowland	
Locality Landform	Flat, Level	
Slope	Very gently inclined (>0.5°-1.5°)	
Water	Artificial channels, Lalbert Creek (10 km west), Kangaroo Lake (1.6 km east)	
Disturbance	Drainage works, farming practices (land clearance and ongoing ploughing)	

Table 7-13: Summary description of IA-10

Investigation Area	IA-10 (308.01 ha; or 3, 080, 170.59 sqm)	
Previous/Current Land Use	Farmland.	
Vegetation		
Vegetation Condition	Agricultural	
Vegetation Type	Introduced grassland	
Aboriginal Place Identified?	No	
Sensitivity Ratings	2: Low to moderate	
Disturbance Ratings	2: Moderate to high	
Archaeological Potential Rating	3: Low	



Plate 22: Example of the all-weather road along Jobling Road



Plate 23: Example photograph of Lookout Road.



Plate 24: Example of the all-weather road along Mystic-Park Beauchamp Road, including clearance on the eastern side (facing south).

## IA-11: Access tracks and pipeline route, including the proposed pumping station

Investigation Area 11 encompasses all the access tracks between Willis Road, Mystic Park towards the east of the study area (Kangaroo Lake) and leading out onto Donald-Swan Hill Road. GSV was good where the ground had been cleared, with small areas clustered with leaf litter. Areas of exposure were identified underneath and around bushes, along the fence line and utility buildings and drainage channels.

- IA-11 was assessed as having undergone a moderate to high level of ground disturbance (2) through the impact of road construction and installation, such as land clearance for an access track for heavy machinery and the construction of sealed bitumen roads. Land clearance and modification has also occurred within the location of the pumping station for a water supply station. Currently there are heavily vegetated areas, and a sealed road.
- IA-11 was assessed as being of low to moderate archaeological sensitivity (2) due to the landform comprising flat to gently inclined plain with nearby water resources, with a high level of disturbance (2) comprising of subsurface utilities and sealed roads.

IA-11 was assessed as having low archaeological potential (4).

Investigation Area	IA-11 (3.07 ha; or 30795.42 sqm)		
Survey Method	Pedestrian		
Sampling Strategy	Systematic		
No. of Participants	6		
Transect Width	120 m		
Transect Spacing	30 m		
Visibility			
Exposures	Areas of grass dieback, between the furrows, fence lines and trees		
% Average ground surface visibility	10		
Environment			
Setting	Inland		
Land System/Elevation	Lowland		
Locality Landform	Flat, Floodplain		
Slope	Level/Flat Ground (<0.5°)		
Water	Artificial channels, Lake Kangaroo		
Disturbance	Drainage works, road, installation of utilities		
Previous/Current Land Use	Farmland.		
Vegetation			

Table 7-14: Summary description of IA-11

Investigation Area	IA-11 (3.07 ha; or 30795.42 sqm)	
Vegetation Condition	Agricultural	
Vegetation Type	Introduced grassland	
Aboriginal Place Identified?	No	
Sensitivity Ratings	3: Moderate	
Disturbance Ratings	1: High	
Archaeological Potential Rating	4: Low	



Plate 25: View of the current station, showing overhear utilities and overgrown vegetation



Plate 26: View west of Gorton Drive and Mystic Park East Road.



Plate 27: View of Kangaroo Lake, including subsurface utilities

#### 7.1.8.5 Discussion

The archaeological ground survey was conducted over a eight-day period between 19 to 23 of April 2021, 10-11 November 2021 and on 21 July 2022. The pedestrian survey comprised between four to six participants and was conducted using systematic samples in linear transects where participants were spaced at a 2 to 30 m distance. Opportunistic pedestrian and vehicular surveying also occurred within areas where necessary (ie, access roads, tree clusters etc). All trees were assessed, and whilst scars were noted on multiple trees, they were all identified as being natural or through recent damage via collisions with vehicles (per comms. Landowner).

The landscape was entirely characterised by generally flat plains to low sloping ridges within ploughed fields with clayey or sandy soils exposed by ploughing. Multiple instances of ironstone, sandstone, small snail shells, ceramics, glass and slag were identified throughout the paddocks within the ridges and furrows. Disturbances identified within the study area were generally homogenous (moderate), owing to widespread ploughing, vegetation clearance, and rabbit and snake burrows scattered throughout the fields. All of the fields were determined to have been subject to historic and recent, as well as the excavation of a large quarry (IA-7; Plates 14 to Plate 15), and localised excavation of dams and artificial drainage channels throughout the study area (which were constructed around 1914-17 to provide water to the farms); these artificial drainage channels were replaced with subsurface drains in 2010.

A review of previous reports, the testing methodologies employed and the identification of stone artefacts in surface and/or subsurface contexts provides an insight into the nature of previous cultural heritage assessments within the geographic region. A collation of data from the VAHR indicates that both surface and subsurface artefacts within the geographic region are most likely to be identified within 100 -200 m of a watercourse or waterbody. This data is reviewed in accordance with the desktop and standard assessment results of the CHMP currently being prepared for the Project, and outlines the likelihood for subsurface or in situ Aboriginal cultural heritage to be present within the current study area.

Earth features are the most commonly occurring place type (n=15). Other place types within the geographic region include scarred trees (n=11), and stone artefact sites, either as artefact scatters (n=9) or low-density artefact distributions (LDAD) (n=2). A review of these Aboriginal places indicates their general location within 2 km of a waterway or waterbody.

Previous assessments conducted within the geographic region also identified that sites were concentrated on, or near watercourses or water bodies (such as Lake Lalbert and Lalbert Creek to the west or Kangaroo Lake and Back Creek to the east), and that other sensitive landforms and environments include ridges adjacent to low lying swamps (Terra Culture 2003). Ross (1981, 1985 and 1986) noted that all archaeological sites identified in the Mallee were found on dune blowouts, on lake-side sediments, or on aeolian ridges around salinas where grass cover is thin. Ross's predictive model suggested that sites should be found around permanent water and freshwater soaks in dry periods, and should occur throughout the area in wet periods. However, sites identified indicated occupation of permanent water resources through both dry and wet periods. Once areas became dry and saline, the area was abandoned and the population retreated back to the Mallee. A review of the landforms within the study area identified a low ridge (Cannie Ridge) orientated north to south that

appears as a slight elevation above the surrounding plains (110 to 120 asl). The ridge was originally rated as having a moderate potential for cultural heritage, however, upon further desktop review there are no low-lying swamps or other pre 1750s EVC factors nearby identified thus lowering the sensitivity of the ridge. The Cannie Ridge uplifted in late Pliocene to early Pleistocene times and was capped by ridges of Loxton Sand. Calcareous soils along the ridge appear to be remnant or thin cover Woorinen Formation calcareous sands and clay. Subsurface investigations in the form of logging, geophysics (gamma) and assay data confirm mineralisation within the Loxton Parilla Sands, with no evidence of younger dunes. Both deposits predate human occupation of the area, and on this basis any Loxton sand surface overlain by the Woorinen sediments will be culturally sterile (Rosengren 2020).

The archaeological ground survey identified a large quarry previously excavated within the low ridge landform in IA-7, and multiple excavated dams identified within the study area were targeted with a pedestrian survey and revealed the sandstone parent material at depths of greater than 1 m. No Aboriginal cultural heritage was identified despite the excellent visibility, instead large amounts of sandstone material remained. The desktop review ascertained that the only landform regarded as sensitive within the study area is likely to be Cannie Ridge, however the survey confirmed that the ridge landform has been disturbed by prior land use, and due to the lack of prior natural resources it was considered to be of low cultural heritage sensitivity.

Other disturbances noted within the study area also included the prior land clearance or tree removal which has resulted in erosion. Ploughed paddocks can disintegrate and disperse artefacts (if any), with movements between 2.2 to 26.8 m within three standard cycles of ploughing (Gaynor 2008 in Thomas 2012:24). Artefacts can therefore disperse from their initial location of deposition as a result of ploughing and other pastoral practices such as farming, grazing and smudging (grading/leveling (Parmington et al 2009:31 in Thomas 2012:20). Thomas (2012) discusses the implication for stone artefacts to become concentrated in particular areas such as along historic fence lines, or areas generally avoided by ploughing machinery such as trees lines. Communication with the landowners confirmed that paddocks had been in use for over four generations. Coupled with the excellent visibility throughout the study area, which identified many localised sandstones, ironstone and in specific locations the underlying subsoil, no Aboriginal cultural heritage was identified.

The study area is also an area devoid of natural waterways or other resource rich environments, and whilst a low ridge was evident within the centre of the study area, discussions with the Traditional Owner representatives who participated in the archaeological ground survey ascertained that areas in proximity to water or swamps were more likely to have been used as a seasonal camp, and the study area may instead have used as a transitory route between the richer resource-heavy areas such as the Murray River to the north, Kerang Lakes to the east and Lake Lalbert and river/ drainage systems to the west (Patterson 2003, Patterson 2004, Lambert and Lambert 2020). Additionally, there are no parts of the study area that are defined as areas of cultural heritage sensitivity, no sites were recorded or previously registered. The desktop review and archaeological ground survey, incorporating comparative data from across the geographic region and ploughzone archaeology, has identified that there is a very low likelihood of subsurface Aboriginal cultural heritage being present in the study area. Geomorphological analysis of the study area has also demonstrated that the most common sediments (Loxton – Parilla sands) often contain a carbonate or limestone horizon at shallow depths below the

surface. This layer of carbonate pre- dates human habitation. As observed during the archaeological ground survey, the entirety of the study area has undergone continuous ploughing activities, including the removal of the lower calcareous layer which has revealed the limestone/ironstone nodules to the surface. Where this has been demonstrated within the study area, it is therefore likely that any archaeological deposits that may have been present have been disrupted and would now be visible on the surface, especially when considered in light of the excellent ground surface visibility.

#### 7.1.8.6 Summary and Conclusions

The results of the archaeological ground survey are summarised as follows:

- Ground surfaces within the study area were assessed by means of an archaeological survey program undertaken on 19 to 23 of April 2021, 10 11 November 2021, and on 21 July 2022 by three archaeologists and three representatives of the Wemba Wamba Traditional Owner group.
- The study area was divided into ten Investigation Areas (IAs) based on landform, location and disturbance.
- The majority of the ground surface within the study area was not obscured by ground cover and was deemed as having excellent visibility. The effective ground surface visibility of the total study area was calculated as 80%.
- Observed impacts to the study area include road construction (IA-10), drainage channel works utility installations including above ground electricity, landscaping and agricultural practices including ploughing.
- A moderate disturbance rating was established for each IA.
- The disturbance and archaeological sensitivity ratings were combined to determine an overall Archaeological Potential Rating (APR) for each landform. IAs 1-4 and 6-10 were all rated as having a low archaeological potential, while IA-5 (small rise) was rated as having a low to moderate archaeological potential.
- Previous investigations within the geographic region identified that the study area may have been used as a transitory route between the richer resource-heavy areas such as the Murray River to the north, Kerang Lakes to the east or Lake Lalbert and river/ drainage systems to the west (Ross 1981, Patterson 2003, Patterson 2004, Lambert and Lambert 2020).

The results of previous archaeological studies and history of land use in the region and current study area have indicated that there is a low potential for the discovery of Aboriginal cultural heritage to occur. There are no permanent watercourses/waterbodies, pre-1750s Ecological Vegetation Classes contributions in relation to landform within the study area. Whilst the Cannie Ridge may contain some higher sensitivity due its elevation, the identified geology contains a shallow calcareous content and in combination with the survey results, and continued ploughing for close to 100 years, the APR was reduced, it was therefore characterised as having a low potential for archaeological sites to be present. Any Aboriginal cultural heritage, if present, is most likely to be diffuse, low density stone artefact scatters in disturbed surface and shallow subsurface deposits. The comparative analysis of the landforms and cultural heritage identified within the geographic region have indicated that there is a low likelihood for subsurface cultural heritage to be present, and that undertaking a subsurface excavation program was unlikely to yield any additional information. Any unidentified Aboriginal cultural heritage that may exist within the study area would be addressed through the management conditions and contingencies of a CHMP.

# 7.2 Historical Cultural Heritage

## 7.2.1 Database Searches

A search of the following historical heritage registers covering the full extent of the study area and wider geographic region was conducted on 17 March 2022.

World Heritage List

The World Heritage List includes places that are important to and belong to everyone, irrespective of where they are located.<sup>7</sup> They have universal value that transcends the value they hold for a particular nation.

These qualities are expressed in the Convention concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention). The World Heritage Convention aims to promote cooperation among nations to protect heritage from around the world that is of such outstanding universal value that its conservation is important for current and future generations.

A search of the Australian Heritage Database list8 did not identify any places included on the World Heritage List within the study area.

National and Commonwealth Heritage Lists

The National Heritage List is a register of places deemed to be of outstanding heritage significance to Australia. The list includes natural, historical and Indigenous places. There are currently 113 registered places included on the National Heritage List.<sup>9</sup>

The Commonwealth Heritage List is a register of places under the control of the Australian government, usually on land or in waters directly owned by the Crown, which are also deemed to have importance in relation to the natural, Indigenous and historical heritage of Australia. The Commonwealth Heritage List currently includes 399 places such as federally owned telegraph stations, defence sites, migration centres, customs houses, lighthouses, national institutions such as Parliament and High Court buildings, memorials, islands and marine areas <sup>10</sup>

The National Heritage List and Commonwealth Heritage List were established under the EPBC Act and replace the former RNE. Places registered on the National Heritage List and Commonwealth Heritage List are protected under relevant provisions of the EPBC Act.

A search of the National Heritage List and the Commonwealth Heritage list did not identify any places within the study area.

8 Australian Heritage Database (environment.gov.au) – accessed 17 March 2022

9 http://www.environment.gov.au/heritage/places/national-heritage-list - accessed 17 March 2022

<sup>10</sup> http://www.environment.gov.au/heritage/places/commonwealth-heritage-list - accessed 17 March 2022

<sup>7</sup> www.environment.gov.au/heritage/about/world-heritage - accessed 17 March 2022

## National Trust of Australia (Victoria)

The Australian Heritage Council Act 2003 (Cth) requires the compilation of a list of items recognised as possessing heritage significance to the Australian community but does not directly provide legislative protection regarding the conservation of heritage items in Australia. The Register of the National Estate, previously established under the Australian Heritage Commission Act 1975 (Cth) and now managed by the Australian Heritage Council, applies no legal constraints on heritage items included on this list.

A search of the Register of the National Estate did not identify any places within the study area.

Victorian Heritage Register and Victorian Heritage Inventory

The Heritage Act 2017 (Vic) enables the identification and protection of historical heritage places and objects that are of significance to the state of Victoria, the protection of known and unknown archaeological sites and establishes the Victorian Heritage Register (VHR), the Victorian Heritage Inventory (VHI) and the Heritage Council of Victoria. The Heritage Council of Victoria is the expert statutory body for determining matters relating to historical cultural heritage. The VHI is a listing of all known historical archaeological sites in Victoria. Any activities that will result in the excavation of or disturbance to a site recorded in the VHI or an archaeological site which is not recorded in the VHI must have first obtained the consent of Heritage Victoria. The Victorian Heritage Register is a list of places and objects of state significance. All non-Aboriginal archaeological sites in Victoria are protected by the Heritage Act, regardless of whether they are included in the VHI.

Consent approval from Heritage Victoria is required prior to any activities which will result in the excavation of or disturbance to a site recorded in the VHI. All unknown historical archaeological sites in Victoria are protected by the Heritage Act 2017. Previously unknown archaeological sites must be reported to Heritage Victoria within 30 days of discovery via submission of a site card and the site will be assessed by the Executive Director, Heritage Victoria for inclusion in the Victorian Heritage Inventory.

A search of the Victorian Heritage Register and the Victorian Heritage Inventory did not identify any places within the study area.

## HERMES

HERMES is an online database that includes information on all recorded historic heritage places and historic archaeological sites in Victoria, including those listed in the Victorian Heritage register, Victorian Heritage Inventory and local Heritage Overlays protected by the local Planning Schemes. HERMES is managed by Heritage Victoria, the Heritage Council of Victoria, the National Trust of Victoria and Local Government Authorities, or heritage consultants acting on behalf of one of these agencies.

HERMES Interactive uses the Victorian government's mapping platform to present spatial information on places recorded on the HERMES database<sup>11</sup>. This mapping system is a useful way of locating

<sup>11</sup> http://services.land.vic.gov.au/maps/hermes.jsp - accessed 17 March 2022

heritage sites, especially when they are outside major urban areas and have no accurate street address (e.g. archaeological sites situated in rural locations).

A search of Hermes did not identify any places listed within the study area.

## Local Council

Places of local historical significance can be listed for protection in Local Government Area local planning schemes, under the provisions of the Planning and Environment Act 1987 (Vic). Places are added to planning schemes through amendments and are included in local Heritage Overlays.

A search of the local planning scheme for Gannawarra Shire Council did not identify any places listed on the schedule to the heritage overlay within the study area.

A search of the local planning scheme for Swan Hill Rural City Council identified three places of local significance listed on the schedule to the heritage overlay adjacent to the study area.

Table 7-15: Historical heritage places search within the study area

Heritage Register	Heritage Place Name	Heritage Place ID	Heritage Place Location
Victorian Heritage Register (State)	N/A	N/A	No heritage places within or adjacent to the study area on this heritage register.
Victorian Heritage Inventory (State)	N/A	N/A	No heritage places within the study area on this heritage register. A single site H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall) is located 150 m north of the study area.
Victorian War Heritage Inventory (State)	N/A	N/A	No heritage places within the study area are located on this heritage register.
Gannawarra Shire Local Planning Scheme Heritage Overlay (Local)	N/A	N/A	No heritage places within or adjacent to the study area on this heritage register.
Swan Hill Local Planning Scheme Heritage Overlay (Local)	Eucalyptus Diptera (two-winged Gimlet Tree) CA 21, Sec E, Lake Boga- Ultima Road, Goschen Dillon Street Town	H0209	No heritage places are located within the study area. There are three heritage places located adjacent to the alignment. HO209 is located north and adjacent to Lake Boga – Ultima Road and consists of a single Eucalyptus tree and is of local and state significance.
	Centre Precinct, Ultima 'Operation Snail' House, David Street, Ultima	HO185	HO185 consists of a nominal boundary around the commercial centre of Ultima, and includes 5 streets (Breen, Dillion, Ailsa, Vernon and David Street) and the Ultima rail station and railway line. HO185 is adjacent to the western end of the study area and is of local significance.

Heritage Register	Heritage Name	Place	Heritage Place ID	Heritage Place Location
			HO175	HO175 is located adjacent to HO185 and the study area, at the western end along David Street, Ultima. The site consists of a single dwelling and is of local significance.

### 7.2.2 Previous Studies Relevant to the project area

An Archaeological Survey of The Cannie Ridge Area Pipelines (Patterson 2003, 2004)

An archaeological survey was prepared for the Cannie Ridge Pipelines project, the aim of which was to undertake an investigation of the cultural heritage values on or near the proposed Cannie Ridge pipelines routes. The investigation comprised a desktop study and a field survey along the actual pipeline routes. The study also assessed historical archaeological features within the study area. A survey was conducted over two days to assess for cultural heritage and historic sites, due to the large area, a sample survey was proposed, with random areas were chosen by walking 200 m every 10km on foot. Additionally, archaeologically sensitive landforms such as creek crossings were surveyed on foot. Almost 100% of the pipelines were driven in car, with inaccessible areas (such as mature crops in paddocks) not surveyed. A total of 24 areas were surveyed including random and sensitive archaeological landforms, with only 4.3 km or 1.39% of the pipeline routes were surveyed.

## Historical field results

The survey did record four historic archaeological sites (three former school sites and one house and farm site), three of which were within the proposed pipeline route. These sites were concluded to be common archaeological sites in the sparsely settled Mallee area of north-west Victoria and were reflective of the settlement by a wave of selectors and their families who arrived in the Cannie Ridge area from the 1880s onwards. These sites were:

- H76262-0005: Kunat State School No.3294,
- H7626-0004: Beauchamp State School No. 3560 and Beauchamp Memorial Hall (See Figure 7-6),
- H7526-0002: Mud-Brick house ruins, Cannie, and;
- H7526-0001: Budgerum Cemetery.



Figure 7-6: Victorian heritage Inventory places within the study area and geographic region

#### 7.2.3 Land use history

Initial European exploration of the study area occurred in the 1830s; by the late 1840s the area was fully occupied by squatters. The area remained sparsely settled and was grazed initially by sheep, and later by cattle, up until the late 1870s. Occupation of the landscape by pastoralists resulted in the clearance of native vegetation, the sinking of dams and the diversion/alteration of watercourses to provide for livestock (Ballinger 2008: 11).

Land selection acts of the late 1800s and high rainfall in the early 1870s brought selectors into the region. Selectors generally farmed small acreages of wheat or oats and ran a few head of pigs, poultry and cattle. However, dry years in the late 1870s which lead to failed crops and loss of livestock, coupled with rabbit infestations, forced many selectors off the land (Ballinger 2008: 13-15). Later land acts such as the Mallee Pastoral Leases Act in the 1880s saw land sold in larger allotments and wheat become the dominant crop. Further vegetation clearance, including grubbing out and burning of tree stumps, construction of water storages and fencing took place during this time, and continued ploughing and rabbit infestation led to widespread erosion. Dust storms were common by the early 1900s (Ballinger 2008: 16-18). Further settlement of the region was driven by closer settlement acts and the spread of irrigation schemes in the early twentieth century (Ballinger 2008: 18-32).

Agriculture continues to be the main economic driver in the region<sup>12</sup>. Water supplied though enhanced irrigation is derived from the Murray River and Goulburn River systems via a network of constructed channels. Wheat, barley and canola are the most popular crops and are grown primarily in the western Mallee, from Lake Meran through to Quambatook and Lalbert. Broadacre cropping is highly mechanised with large air seeders, tractors and harvesters allowing farmers to cover large areas of land. Many of the cereal farms in the Mallee are up to 4856.22 ha or larger.

By the 1830s pastoral settlements were being established in the Murray region near Yanco, with grazing runs settled along the Murray and Murrumbidgee as far west as Hay by 1839 (Eardley 1999). Swan Hill itself was not settled until the mid-1840s. Significant contact in this area between Aboriginal people and Europeans is thought to have begun in 1846 when the Kirby and Beveridge brothers took up their Tyntynder run, some 16 km northwest of Swan Hill on the Victorian side of the border.

In the 1840s there was great interest in the land west of the Loddon River on the Victorian side of the Murray. By this time most of the eastern Murray River frontage had been taken up by squatters who established large runs of which cattle was the primary pastoral activity (Eardley 1999). During the 1850s white settlement continued in the district, with the European population expanding rapidly with a corresponding decrease in the Aboriginal population. This was a trend that continued throughout the remainder of the century. A government Gazette of 1865 noted that there were now 550 Europeans in the Swan Hill district, 150 of them in Swan Hill (Gardner 1986: 2).

During the 1870s, an onset of dry years encouraged the development of water supply schemes for Northern Victoria, with a water conservancy board established in 1880 comprising of George Gordan and Alexander Black. Gordan and Black submitted a report in 1882 for the adoption of an efficient American system of carrying water on higher land in long semi -surface canals from which water could

12 http://www.gannawarra.vic.gov.au/Business-and-Events/Business-Development/Agriculture - accessed 17 March 2022

be distributed by gravitation (McColl 1883). By 1886, the Irrigation Act was passed, and a national programme was immediately instituted consisting of schemes relaying on pumps or gravity to deliver water to farms.

By 1901, the Kerang Lakes National Works opened, to provide support for 'considerable supplies for irrigation'. A heavy demand for water due to increased acreages of orchards, dairying, and lucerne crops, exhausted the gravitation supply, and by 1915, investigations were held to raise the surface level of nearby lakes (including Kangaroo Lake) by about four feet (or 1.2 m) (Ballinger 2008). Following this, the years of 1925-26 heralded the beginning of the remodelling the irrigation districts administered by the Kerang, Cohuna, Rochester and Loddon centres. The remodelling was effective and allowed surplus water passed into other channels, whilst resulting in a considerable saving of water, also marked a reduced in the water in the creeks in the Kerang area. During this time salinity became an issue, free water was allocated to assist in washing out the salt, and other drainage schemes to assist the farmers including the construction of additional weirs. By the 1950s, productivity losses reached 50% in the areas of Kerang, Cohuna, and Tragowel plains due to the salinity, to further avoid the impacts of salinity reaching the Murray River, Lake Tutchewop was turned into a salt disposal basin. By the 1990s, new farming methods aided by technology and government schemes established to address salinity have ensured that irrigated agriculture remains an economic mainstay of the Gannawarra Shire. Water has since dropped with the continuing drought, with the communities facing ongoing issues due to the dry conditions exacerbated by hydrology patterns fundamentally altered by 150+ years of white settlement, and the trading of water rights away from the region. The current low water quality in local streams and rivers is evidence of the impacts of historical land and water management practices (Ballinger, R. 2008).

#### 7.2.4 Historical Archaeological Survey

An historical archaeological ground survey of the study area was conducted in line with the requirements of the 'Guideline for conducting historical archaeological survey' (Heritage Victoria 2020), and in accordance with proper archaeological practice as outlined in Burke, Morrison and Smith (2017: 93-94). The aims of the archaeological survey were to:

- Inspect areas with ground surface visibility for any features or structures of archaeological sites within the study area.
- Undertake a general assessment of the overall archaeological potential of the study area.

## 7.2.4.1 Obstacles Encountered in Completing the Survey

Ground surface visibility was fair to good overall, however, there were sections of felled crops or stalks which limited the ground surface visibility. Whilst the entirety of the study area was accessible, due to the size of the paddock's only limited surveying was able to be conducted.

#### 7.2.4.2 Method of Assessment

The survey was undertaken over eight days (19-23 April 2021, 10-11 November 2021, 21 July 2022) by a team comprising between four to six participants. Pedestrian spacing varied from 2 to 30 m, with good survey coverage across the study area given its size. The study area was split into groups of three traversing the study area. Areas with trees were targeted, with a pedestrian inspection also conducted along the access and pipeline route (including the proposed pumping station location).

The landscape was entirely characterised by a generally flat plains to low sloping ridges within ploughed fields with clayey or sandy soils exposed by ploughing. Multiple instances of ironstone, sandstone, small snail shells, ceramics, glass and slag were identified exposed throughout the paddocks within the ridges and furrows. Disturbances identified within the study area were generally homogenous (moderate), owing to widespread ploughing, vegetation clearance, rabbit and snake burrows scattered throughout the fields. All of the fields were determined to have been subject to historic and recent ploughing (per comms. property owner), as well as the excavation of a large quarry, and localised excavations of dams and artificial drainage channels throughout the study area (which were constructed around 1914 to provide water to the farms). Historic artefacts such as glass, ceramic, metal and/or associated structures were also considered in the survey of the study area.

No historical artefacts, historical archaeological deposits or standing structures of historical significance were identified during the survey. A single VHI site: H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall) was identified 150 north of the study area. The VHI site, however, is located within a privately owned paddock and could not be accessed. A review of the ground surface immediately adjacent to the VHI site did not identify any artefacts, or structure.

The site has been heavily cleared of vegetation in order to facilitate pastoral agricultural practices and is regularly ploughed. A couple of disused and collapsing fences run through the site. Other disturbances to the study area include the installation of both underground and overhead services, and vehicle tracks.

# 8. Risk assessment

The identified risks and associated residual risk ratings are listed in Table 8-1. The likelihood and consequence ratings determined during the risk assessment process and the mitigation measures to be achieved are presented in Appendix A.

Risk ID	Potential threat and effects on the environment	Residual risk rating
	Construction, operation, and decommissioning	
CH01	Ground disturbance resulting in the identification and partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural places of low scientific significance and low significance to the Traditional Owners, resulting in the loss of heritage values.	Low
CH02	Ground disturbance resulting in the identification and partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural places of moderate scientific significance and moderate significance to the Traditional Owners, resulting in the loss of heritage values.	Medium
CH03	Ground disturbance resulting in the identification and partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural places of high scientific significance and high significance to the Traditional Owners, resulting in the loss of heritage values.	Medium

Table 8-1: Cultural heritage risks

Risk ID	Potential threat and effects on the environment	Residual risk rating
CH04	Ground disturbance resulting in partial or complete disturbance of previously unidentified and unregistered Aboriginal ancestral remains, resulting in loss of heritage values.	High
CH05	Ground disturbance resulting in partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural heritage places (e.g. aesthetic, social, religious, historic or cultural values) resulting in loss of heritage values.	Medium
CH06	Unauthorised ground disturbance resulting in disturbance of previously registered or unknown Aboriginal cultural heritage places outside of the project area/study area in the CHMP resulting in loss of heritage values and a breach of the CHMP conditions.	High
CH07	Unauthorised ground disturbance resulting in disturbance of previously registered or unknown historical cultural heritage places outside of the project area resulting in loss of heritage values.	High
CH08	Ground disturbance resulting in partial or complete disturbance of previously unidentified historical cultural heritage places resulting in loss of heritage values.	Medium

# 9. Construction impact assessment

This section discusses the potential impacts of the project as a result of construction activities and the associated mitigation measures that aim to reduce impacts to as low a level as possible. Mitigation measures referred to are summarised in Section 13.

Likely pathways of construction impact on Aboriginal cultural heritage and historical cultural heritage relate primarily to land clearance and excavation for the project. The magnitude of these impacts would likely vary depending on the nature of the infrastructure being constructed. For example, open cut trenching and drilling for the mine would result in the complete or partial removal of any unregistered places within the project area.

In contrast, areas which may be used for construction compounds or laydown may experience only limited subsurface impacts to level these sites for use. On this basis, it may be possible that heritage in subsurface deposits below the level of impact at such locations may not be impacted.

# 9.1 Aboriginal Cultural Heritage

The preparation of an Aboriginal Cultural Heritage Management Plan (CHMP) will be undertaken in accordance with the requirements of the Aboriginal Heritage Act 2006 (Vic) and the Aboriginal Heritage Regulations 2018 (Vic). The Aboriginal CHMP will include the findings of the present study area and will complement them by also including a survey program that will investigate the potential cultural heritage Aboriginal cultural heritage places to be present within the study area. The CHMP will include:

General management conditions that may include:

- the requirement for all personnel involved in ground disturbing activities to participate in a cultural heritage induction.
- the need for the proponent to regularly review their compliance with the management conditions contained in the CHMP.

Contingency measures (chance finds protocol) that provide clear instructions that must be followed in the event that Aboriginal cultural heritage places or materials are discovered during the construction, operation or decommissioning of the project. The following matters will need to be considered in relation to these measures for the project:

- Strategies to be implemented if any suspected human remains are found in the present study area
- process to follow if unexpected Aboriginal places or objects other than human remains are found during the activity
- custody and management of Aboriginal cultural heritage recovered
- reviewing compliance with the management plan
- dispute resolution
- delays and other obstacles
- authorised Project Delegates and the handling of sensitive information

## 9.2 Historical Cultural Heritage

The present study has not identified any known historical cultural heritage values that have the potential to be impacted by the project. No works or disturbance is proposed within this privately owned paddock where the VHI site is located.

Mitigation measures include:

a) The requirement for appropriate contractor induction to communicate the protections, requirements and the Unexpected Finds Protocol.

H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall) was identified 150 m north of Mystic Park Beauchamp Road. If the construction works are likely to impact this site, then the following mitigation measures must be followed:

- i. An archaeological assessment of H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall).
- ii. Submission of a revised site card H7626-0004 (Beauchamp State School No. 3560 and Memorial Hall), if required.
- iii. Ensuring consent approval is in place, if required

Contingency measures are also recommended to reduce harm to unknown historical cultural heritage values that may be present within the study area. All historical archaeological sites are protected under the Heritage Act 2017 and cannot be harmed without approval.

If historical heritage sites are discovered during the construction, operation or decommissioning of the project, the following steps should be applied:

- a) The person who identified the find will immediately notify the person in charge of the activity.
- b) The person in charge of the activity must then suspend any relevant works at the location of the discovery and to a distance within 50 m of the relevant site extent and isolate the find via the installation of safety webbing, or other suitable barrier and the material to remain in situ.
- c) Works for the activity may continue outside of the exclusion zone, although if additional heritage is identified this must also be protected following the steps outlined above.
- d) The person in charge of works should notify a suitably qualified archaeologist of the find within 24 hours of the discovery.
- e) Relevant management actions will be determined by the suitably qualified archaeologist in relation to the Heritage Act 2017 (Vic) and in consultation with HV.
- f) Site cards for identified historic archaeological sites required to be submitted to HV within 30 days of discovery.
- g) Approvals must be granted by HV for works to continue.

## 9.3 Summary of residual impacts

Residual impacts are those that remain after the application of the recommended avoidance, mitigation and management measures described above, and are based on a review of the original impacts identified in the impact assessment.

The study has not identified any known cultural heritage values that have the potential to be impacted by the project and no residual impacts remain. As a result, no site-specific risk reduction measures have been recommended as no cultural heritage places were identified during the course of the CHMP.

The level of risk to unknown Aboriginal cultural heritage places that may be situated within the study area is expected to decrease as a result of the preparation and implementation of an approved CHMP, given that the CHMP will contain general management conditions designed to increase awareness amongst project staff and contractors of the potential for Aboriginal cultural heritage to be present within the study area, and contingency measures which provide clear guidelines regarding the processes that must be implemented should Aboriginal cultural heritage be discovered during the construction of the project.

Similarly, the level of risk to unknown historical cultural heritage that may be discovered during the construction of the project should be reduced following the implementation of the contingency measures outlined above.

# 10. Operation impact assessment

This section discusses the potential impacts of the project as a result of operation of the project and the associated mitigation measures that aim to reduce impacts to as low a level as possible. Mitigation measures referred to are defined in Section 12.

## 10.1 Aboriginal Cultural Heritage

The preparation of an Aboriginal Cultural Heritage Management Plan (CHMP) will be undertaken in accordance with the requirements of the Aboriginal Heritage Act 2006 (Vic) and the Aboriginal Heritage Regulations 2018 (Vic). The Aboriginal CHMP will include the findings of the present study area and will complement them by also including a survey program that will investigate the potential cultural heritage Aboriginal cultural heritage places to be present within the study area. The CHMP will include:

General management conditions including:

- the requirement for all personnel involved in ground disturbing activities to participate in a cultural heritage induction.
- the need for the proponent to regularly review their compliance with the management conditions contained in the CHMP.

Contingency measures (chance finds protocol) that provide clear instructions that must be followed in the event that Aboriginal cultural heritage places or materials are discovered during the construction, operation or decommissioning of the project. The following matters will need to be considered in relation to these measures for the project:

- Strategies to be implemented if any suspected human remains are found in the present study area
- process to follow if unexpected Aboriginal places or objects other than human remains are found during the activity
- custody and management of Aboriginal cultural heritage recovered
- reviewing compliance with the management plan
- dispute resolution
- delays and other obstacles
- authorised Project Delegates and the handling of sensitive information

## 10.2 Historical Cultural Heritage

The present study has not identified any known historical cultural heritage values that have the potential to be impacted by the project. Mitigation measures include:

a) The requirement for appropriate contractor induction to communicate the protections, requirements and the Unexpected Finds Protocol

Contingency measures are also recommended to reduce harm to unknown historical cultural heritage values that may be present within the study area. All historical archaeological sites are protected under the Heritage Act 2017 and cannot be harmed without approval.

If historical heritage sites are discovered during the construction, operation or decommissioning of the project, the following steps should be applied:

- a) The person who identified the find will immediately notify the person in charge of the activity.
- b) The person in charge of the activity must then suspend any relevant works at the location of the discovery and to a distance within 50 m of the relevant site extent and isolate the find via the installation of safety webbing, or other suitable barrier and the material to remain in situ.
- c) Works for the activity may continue outside of the exclusion zone, although if additional heritage is identified this must also be protected following the steps outlined above.
- d) The person in charge of works should notify a suitably qualified archaeologist of the find within 24 hours of the discovery.
- e) Relevant management actions will be determined by the suitably qualified archaeologist in relation to the Heritage Act 2017 (Vic) and in consultation with HV.
- f) Site cards for identified historic archaeological sites required to be submitted to HV within 30 days of discovery.
- g) Approvals must be granted by HV for works to continue.

## 10.3 Summary of residual impacts

Residual impacts are those that remain once mitigation and management measures have been implemented. This section describes potential residual impacts during the operation phase of the project, once mitigation and management measures have been considered and applied.

The study has not identified any known cultural heritage values that have the potential to be impacted by the project and no residual impacts remain. As a result, no site-specific risk reduction measures have been recommended as no cultural heritage places were identified during the course of the CHMP.

The level of risk to unknown Aboriginal cultural heritage places that may be situated within the study area is expected to decrease as a result of the preparation and implementation of an approved CHMP, given that the CHMP will contain general management conditions designed to increase awareness amongst project staff and contractors of the potential for Aboriginal cultural heritage to be present within the study area, and contingency measures which provide clear guidelines regarding the processes that must be implemented should Aboriginal cultural heritage be discovered during the operation of the project.

Similarly, the level of risk to unknown historical cultural heritage that may be discovered during the operation of the project should be reduced following the implementation of the contingency measures outlined above.

# 11. Decommissioning impact assessment

This section discusses the potential impacts of the project as a result of decommissioning activities and the associated mitigation measures that aim to reduce impacts to as low a level as possible. Mitigation measures referred to are summarised in Section 12.

## 11.1 Aboriginal Cultural Heritage

The Aboriginal cultural heritage risk reduction measure to be implemented by the proponent will be the preparation of an Aboriginal Cultural Heritage Management Plan (CHMP), which will be undertaken in accordance with the requirements of the Aboriginal Heritage Act 2006 (Vic) and the Aboriginal Heritage Regulations 2018 (Vic). The Aboriginal CHMP will include the findings of the present study area and will complement them by also including a survey program that will investigate the potential cultural heritage Aboriginal cultural heritage places to be present within the study area.

General management conditions that may include:

- the requirement for all personnel involved in ground disturbing activities to participate in a cultural heritage induction.
- the need for the proponent to regularly review their compliance with the management conditions contained in the CHMP.

Contingency measures (chance finds protocol) that provide clear instructions that must be followed in the event that Aboriginal cultural heritage places or materials are discovered during the construction, operation or decommissioning of the project. The following matters will need to be considered in relation to these measures for the project:

- Strategies to be implemented if any suspected human remains are found in the present study area
- process to follow if unexpected Aboriginal places or objects other than human remains are found during the activity
- custody and management of Aboriginal cultural heritage recovered
- reviewing compliance with the management plan
- dispute resolution
- delays and other obstacles
- authorised Project Delegates and the handling of sensitive information

## 11.2 Historical Cultural Heritage

The present study has not identified any known historical cultural heritage values that have the potential to be impacted by the project. Mitigation measures include:

The requirement for appropriate contractor induction to communicate the protections, requirements and the Unexpected Finds Protocol

Contingency measures are also recommended to reduce harm to unknown historical cultural heritage values that may be present within the study area. All historical archaeological sites are protected under the Heritage Act 2017 and cannot be harmed without approval.

If historical heritage sites are discovered during the construction, operation or decommissioning of the project, the following steps should be applied:

- h) The person who identified the find will immediately notify the person in charge of the activity.
- i) The person in charge of the activity must then suspend any relevant works at the location of the discovery and to a distance within 50 m of the relevant site extent and isolate the find via the installation of safety webbing, or other suitable barrier and the material to remain in situ.
- j) Works for the activity may continue outside of the exclusion zone, although if additional heritage is identified this must also be protected following the steps outlined above.
- k) The person in charge of works should notify a suitably qualified archaeologist of the find within 24 hours of the discovery.
- I) Relevant management actions will be determined by the suitably qualified archaeologist in relation to the Heritage Act 2017 (Vic) and in consultation with HV.
- m) Site cards for identified historic archaeological sites required to be submitted to HV within 30 days of discovery.
- n) Approvals must be granted by HV for works to continue.

## 11.3 Summary of residual impacts

Residual impacts are those that remain once mitigation and management measures have been implemented. This section describes potential residual impacts during the operation phase of the project, once mitigation and management measures have been considered and applied.

The study has not identified any known cultural heritage values that have the potential to be impacted by the project and no residual impacts remain. As a result, no site-specific risk reduction measures have been recommended as no cultural heritage places were identified during the course of the CHMP.

The level of risk to unknown Aboriginal cultural heritage places that may be situated within the study area is expected to decrease as a result of the preparation and implementation of an approved CHMP, given that the CHMP will contain general management conditions designed to increase awareness amongst project staff and contractors of the potential for Aboriginal cultural heritage to be present within the study area, and contingency measures which provide clear guidelines regarding the processes that must be implemented should Aboriginal cultural heritage be discovered during the decommission of the project.

Similarly, the level of risk to unknown historical cultural heritage that may be discovered during the decommission of the project should be reduced following the implementation of the contingency measures outlined above.

# 12. Summary of mitigation, monitoring and contingency measures

## 12.1 Mitigation measures

The mitigation measures that are proposed to avoid, mitigate or manage cultural heritage impacts associated with the project are summarised in Table 12-1.

The CHMP will provide management measures and contingences in the event that previously unknown Aboriginal cultural heritage are uncovered during project works.

Mitigation measures for unexpected historical heritage includes an induction to appropriate contractors. This induction will outline the appropriate process and protections to contractors and their obligations under the Heritage Act 2017.

Table 12-1: Mitigation measures relevant to cultural heritage

Mitigation measure	Phase
Aboriginal CHMP and cultural awareness induction	Construction, operation and decommission
Historical heritage induction outlining the unexpected finds protocol	Construction, operation and decommission

## 12.2 Monitoring and contingency measures

The monitoring and contingency measures that are proposed to assess Cultural heritage impacts associated with the project are summarised in Table 12-2.

Table 12-2: Monitoring and contingency measures relevant to cultural heritage

Monitoring or contingency measure	Phase
Review of an Aboriginal compliance checklist situated within the CHMP	Construction, operation and decommission
Use of contingencies presented in the CHMP if unexpected Aboriginal cultural heritage is identified (other than human remains)	Construction, operation and decommission
Use of contingencies presented in the CHMP if unexpected human remains are identified	Construction, operation and decommission
Contingency measures to reduce harm if an unexpected historical heritage place is identified during works.	Construction, operation and decommission

# 13. Summary of implications under relevant legislation

This study has assessed the impacts of construction and operation of the project on cultural heritage assets and values to be protected.

The significance of the impacts has been assessed in accordance with the evaluation framework, based on applicable legislation, policy and standards and the evaluation objectives and environmental significance guidelines arising from the government terms of reference established to guide the assessments.

The following sections summarise these identified impacts under the relevant Commonwealth and Victorian legislation.

## 13.1 Commonwealth

In relation to the evaluation objectives set out in the EES Scoping Requirements, the project would not have significant impacts on cultural heritage as no registered Aboriginal cultural places or historical heritage places were identified during the assessments.

## 13.2 Victorian

In relation to the evaluation objectives set out in the EES Scoping Requirements, the project would not have significant impacts on cultural heritage for the following reasons:

Aboriginal Cultural Heritage: The preparation of a CHMP identified that the project effects on Aboriginal cultural heritage values was deemed as low.

Historical Cultural Heritage: The preparation of a historical desktop report and subsequent survey identified that the project effects on historical heritage values was deemed as low.

# 14. Conclusion

The purpose of this report is to assess the potential cultural heritage impacts associated with the Goschen Project to inform the preparation of the EES required for the project. A summary of the key assets, values or uses potentially affected by the project, and an associated assessment of cultural heritage impacts and recommended mitigation measures, are summarised below.

With the implementation of the mitigation measures recommended throughout this assessment, potential adverse impacts on the land at local and regional scales associated with cultural heritage changes have been minimised.

## 14.1 Existing environment

The results of the CHMP and the current study area have indicated that there is a low potential for the discovery of Aboriginal cultural heritage to occur. There are no permanent watercourses/waterbodies, pre-1750s Ecological Vegetation Classes contributions in relation to landform within the study area. Whilst the Cannie Ridge may contain some higher sensitivity due its elevation, the identified geology contains a shallow calcareous content and in combination with the survey results, continuous European land use history of agriculture, the sensitivity was reduced, it was therefore characterised as having a low potential for Aboriginal archaeological sites to be present. Any Aboriginal cultural heritage, if present, is most likely to be diffuse, low density stone artefact scatters in disturbed surface and shallow subsurface deposits. The comparative analysis of the landforms and cultural heritage identified within the geographic region have indicated that there is a low likelihood for subsurface cultural heritage to be present, and that undertaking a subsurface excavation program was unlikely to yield any additional information. Any unidentified Aboriginal cultural heritage that may exist within the study area would be addressed through the management conditions and contingencies of a CHMP.

The results of the historical survey and the land use of the study area have indicated that there is a low potential for the discovery historical cultural heritage to occur. There are no permanent watercourses/waterbodies within the immediate area, water channels were excavated to bring farming into the region in the 1900s and was later updated in the 1990s due to technological advances in the United States of America. Currently, any historical evidence of these achievements that have been identified have been found outside of the current study area, have been removed and placed on display. The survey of the land identified no physical remains of features or structures, additionally a
review of 1940s aerials identified no remaining structures. Furthermore, the paddocks have primarily been used for ploughing.

Any historical cultural heritage, if present, was most likely removed or destroyed prior to the 1940s. Any unidentified historical cultural heritage that may exist within the study area would be addressed through the contingencies of an unexpected finds protocol.

## 14.2 Impact assessment findings

An iterative assessment was undertaken to evaluate potential impacts associated with the project, considering the existing environment within the study area and associated construction, operational and decommissioning activities. No known Aboriginal/ or non-Aboriginal cultural heritage will be impacted as a result of the construction, operational and decommissioning phases.

The level of risk to unknown Aboriginal cultural heritage places that may be situated within the study area is expected to decrease as a result of the preparation and implementation of an approved CHMP, given that the CHMP will contain general management conditions designed to increase awareness amongst project staff and contractors of the potential for Aboriginal cultural heritage to be present within the study area, and contingency measures which provide clear guidelines regarding the processes that must be implemented should Aboriginal cultural heritage be discovered during the decommission of the project.

Similarly, the level of risk to unknown historical cultural heritage that may be discovered during the construction, operational and decommissioning of the project should be reduced following the implementation of the contingency measures outlined in Sections 9 to 11.

# 14.3 Mitigation and contingency measures

Aboriginal cultural heritage mitigation and contingency measures include:

- Preparation and approval of a CHMP prior to the proposed works
- Preparation and delivery of a CHMP induction, including a cultural awareness induction
- Use of a compliance checklist throughout the construction phase
- Awareness of the contingency protocols identified within the CHMP

Historical cultural heritage mitigation and contingency measures include:

• The requirement for appropriate contractor induction to communicate the protections, requirements and the Unexpected Finds Protocol

Contingency measures are also recommended to reduce risks to unknown historical cultural heritage values that may be present within the study area. If historical heritage sites are discovered during the construction, operation or decommissioning of the project, the following steps should be applied:

- a) The person who identified the find will immediately notify the person in charge of the activity.
- b) The person in charge of the activity must then suspend any relevant works at the location of the discovery and to a distance within 50 m of the relevant site extent and isolate the find via the installation of safety webbing, or other suitable barrier and the material to remain in situ.

- c) Works for the activity may continue outside of the exclusion zone, although if additional heritage is identified this must also be protected following the steps outlined above.
- d) The person in charge of works should notify a suitably qualified archaeologist of the find within 24 hours of the discovery.
- e) Relevant management actions will be determined by the suitably qualified archaeologist in relation to the Heritage Act 2017 (Vic) and in consultation with HV.
- f) Site cards for identified historic archaeological sites required to be submitted to HV within 30 days of discovery.
- g) Approvals must be granted by HV for works to continue.

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# Appendix A: Risk Register

### Appendix A: Table A: Risk Register

			Initial risk level			Residual risk level			
RISK ID	Risk patnway	Causes / Background	Likelihood	Consequence	Risk	Final mitigation	Likelihood	Consequence	Risk
Construction	n, operation, and decommissioning								
CH01	Ground disturbance resulting in the identification and partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural places of low scientific significance and low significance to the Traditional Owners, resulting in the loss of heritage values.	Disturbance of unknown Aboriginal places of low scientific significance and low significance to the Traditional Owners	Unlikely	Minor	Low	Preparation and approval of the Cultural Heritage Management Plan (CHMP) CHMP and awareness induction Compliance Review list CHMP contingencies	Rare	Minor	Low
CH02	Ground disturbance resulting in the identification and partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural places of moderate scientific significance and moderate significance to the Traditional Owners, resulting in the loss of heritage values.	Disturbance of unknown Aboriginal places of moderate scientific significance and moderate significance to the Traditional Owners	Unlikely	Moderate	Medium	Preparation and approval of the Cultural Heritage Management Plan (CHMP) CHMP and awareness induction Compliance Review list CHMP contingencies	Rare	Moderate	Medium
СН03	Ground disturbance resulting in the identification and partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural places of high scientific significance and high significance to the Traditional Owners, resulting in the loss of heritage values.	Disturbance of unknown Aboriginal places of high scientific significance and high significance to the Traditional Owners	Unlikely	Major	High	Preparation and approval of the Cultural Heritage Management Plan (CHMP) CHMP and awareness induction Compliance Review list CHMP contingencies	Rare	Major	Medium
CH04	Ground disturbance resulting in partial or complete disturbance of previously unidentified and unregistered Aboriginal ancestral remains, resulting in loss of heritage values.	Disturbance of unknown Aboriginal Ancestral remains	Unlikely	Critical	High	Preparation and approval of the Cultural Heritage Management Plan (CHMP) CHMP and awareness induction Compliance Review list CHMP contingencies	Rare	Critical	High

			Initial risk level			Residual risk level			
risk id kisk palnway		Causes / Background	Likelihood	Consequence	Risk	Final mitigation	Likelihood	Consequence	Risk
CH05	Ground disturbance resulting in partial or complete disturbance of previously unidentified and unregistered Aboriginal cultural heritage places (e.g. aesthetic, social, religious, historic or cultural values) resulting in loss of heritage values.	Disturbance of unknown intangible Aboriginal Places	Unlikely	Major	High	Preparation and approval of the Cultural Heritage Management Plan (CHMP) CHMP and awareness induction Compliance Review list CHMP contingencies	Rare	Major	Medium
CH06	Unauthorised ground disturbance resulting in disturbance of previously registered or unknown Aboriginal cultural heritage places outside of the project area/ study area in the CHMP resulting in loss of heritage values and a breach of the CHMP conditions.	Disturbance of areas outside of the project/ study area defined for CHMP 17848	Possible	Major	High	Preparation and approval of the Cultural Heritage Management Plan (CHMP) CHMP and awareness induction Compliance Review list CHMP contingencies	Unlikely	Major	High
CH07	Unauthorised ground disturbance resulting in disturbance of previously registered or unknown historical cultural heritage places outside of the project area resulting in loss of heritage values.	Disturbance of areas outside the defined project area.	Possible	Major	High	Historical heritage induction Consultation with Heritage Victoria. Implementation of an unexpected finds protocol.	Unlikely	Major	High
CH08	Ground disturbance resulting in partial or complete disturbance of previously unidentified historical cultural heritage places resulting in loss of heritage values.	Disturbance of unknown historical heritage places.	Unlikely	Moderate	Medium	Historical heritage induction Consultation with Heritage Victoria. Implementation of an unexpected finds protocol.	Rare	Moderate	Medium

The matrix presented in Appendix A: Table B is used to assess the significance of a project related impact on a cultural heritage value. The likelihood assesses the probability that a risk event will occur, while the consequence characterises the outcome of the impact on the cultural heritage value. Upon consideration of the consequences and likelihood of the risk event, they are then used together to determine the risk rating. The matrix below is used to determine the risk rating for each risk event to either eliminate or reduce the risk to an acceptable level.

A description of each risk rating is presented below (Appendix A: Table C). Characteristics for each likelihood rating are presented Appendix A: Table D, and the descriptions for each consequence rating in relation to Aboriginal and historical cultural heritage are presented in Appendix A: Table E.

Appendix A: Table B: Risk rating as per the Preparation of Work Plans and Work Plan Variations Guideline for Mining Projects December 2020

	Almost Certain	Medium	High	Very High	Very High	Very High
ро	Likely	Medium	Medium	High	Very High	Very High
eliho	Possible	Low	Medium	Medium	High	Very High
Lik	Unlikely	Low Low		Medium	High	High
	Rare	Low	Low	Medium	Medium	High
		Insignificant	Minor	Moderate	Major	Critical
				Consequence		

#### Appendix A: Table C: Risk Rating Acceptability

Risk rating	Description
Very High	Totally unacceptable level of risk. Controls must be put in place to reduce the risk to lower levels
High	Generally unacceptable level of risk. Controls must be put in place to reduce the risk to lower levels or seek specific guidance from ERR.
Medium	May be acceptable provided the risk has been minimised as far as reasonably practicable
Low	Acceptable level of risk provided the risk cannot be eliminated

#### Appendix A: Table D: Likelihood descriptions

Severity	Description
Almost Certain	The risk event is expected to occur in most circumstances (more than 90% probability).
Likely	The risk event will probably occur in most circumstances (70-90% probability).

Severity	Description
Possible	The risk event might occur at some time (30-70% probability).
Unlikely	The risk event could occur at some time (5-30%)
Rare	Highly unlikely, but the risk even may occur in exceptional circumstances (0-5%)

## Appendix A: Table E: Severity Description

Severity	Description	Consequence for cultural heritage
Critical	Hazard has critical impact, in terms of severity and/ or duration. Treatment or remediation effort is required, although some effects may be irreversible. Remediation of environmental contamination would require significant private and public resources.	Aboriginal heritage: Irreversible harm to features and/or places of Indigenous cultural value. Destruction of place(s) and/or associated cultural values of exceptional value. A place identified by First Peoples State Relations and/ or cultural values identified by Traditional Owners of exceptional value that the destruction would be catastrophic.
	Hazard event would be the subject of widespread community outrage.	Historical heritage: Irreversible damage, or destruction of a place, object or historical archaeological site listed on the Commonwealth Heritage List, the National Heritage List, the Victorian Heritage Register, the Victorian Heritage Inventory, or LGA Heritage Overlay.
Major	<ul> <li>Hazard has major impact, in terms of severity, duration and/ or frequency of occurrence. Treatment or remediation effort is required. Some effects may be irreversible.</li> <li>Remediation of environmental contamination would require significant private and public resources.</li> <li>Hazard event would be the subject of widespread community concern.</li> </ul>	Aboriginal heritage: Destruction of a rare occurrence place(s) and/or associated cultural values A place with a large number and diverse range of cultural materials. A place with stratified deposits and/or surface spatial patterning that reflects the way in which the cultural materials were deposited Historical heritage: Damage to a place, object or historical archaeological site listed on the Commonwealth Heritage List, the National Heritage List, the Victorian Heritage Register, the Victorian Heritage Inventory, or LGA Heritage Overlay. Removal or relocation of elements associated with places, objects or historical archaeological sites.
Moderate	Hazard has moderate, noticeable impact, in terms of severity, duration and/ or frequency of occurrence. Moderate treatment or remediation effort may be required.	Aboriginal heritage: Destruction of a common occurrence place(s) and/or associated cultural values A place with a limited range of cultural heritage materials and a place in fair to good condition with some degree of disturbance evident.

Severity	Description	Consequence for cultural heritage
	Hazard event would be the subject of limited community concern.	Historical heritage: Works to a place, object or historical archaeological site that will not alter the cultural significance as stated on the Commonwealth Heritage List, the National Heritage List, the Victorian Heritage Register, the Victorian Heritage Inventory, or LGA Heritage Overlay.
Minor	Hazard is perceived but has minor and typically temporary effects. Some remediation may be required.	Historical heritage: Destruction of a place(s) and/or associated cultural values in a deteriorated condition with a highdegree of disturbance evident and some cultural heritage remaining. Heritage: Isolated damage to regionally or locally significant natural or historic heritage features that is readily rectified.
Insignificant	Impacts are barely recognised and/or quickly recovered from. No specific remediation required.	No impact on cultural heritage places or values.